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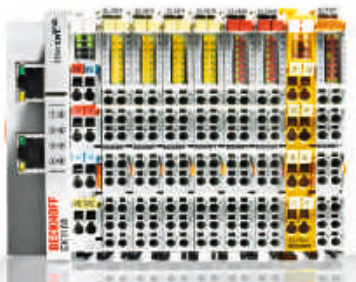
BECKHOFF New Automation Technology

Catalog

Industrial PC
Embedded PC



EtherCAT
EtherCAT Terminal
EtherCAT Box
EtherCAT Plug-in Modules
Bus Terminal
Fieldbus Box
Infrastructure Components

Drive Technology

TwinCAT
TwinSAFE

Beckhoff New Automation Technology

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High performance for harsh environments

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beckh

PC-based control technology

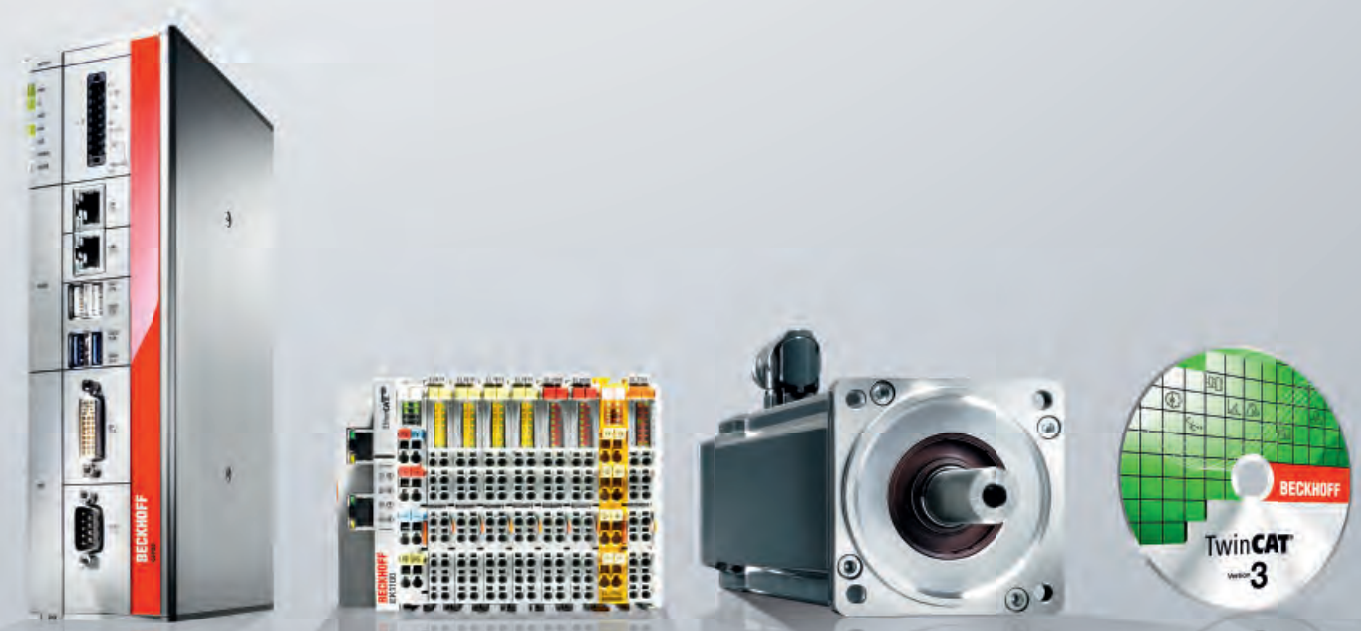
Since the foundation of the company in 1980, continuous development of innovative products and solutions using PC-based control technology has been the basis for the continued success of Beckhoff. Many automation technology standards that are taken for granted today were conceptualised by Beckhoff at an early stage and successfully introduced to the market.

The Beckhoff PC Control philosophy and the invention of the Lightbus system, the Bus Terminals and TwinCAT automation software represent milestones in automation technology and have become accepted as high-performance alternatives to traditional control technology. EtherCAT, the real-time Ethernet solution, makes forward-looking, high-performance technology available for a new generation of leading edge control concepts.

Milestones

1982 P1000 – single-board motion controller
1986 PC Control – first PC-based machine controller
1988 S1000 – software PLC/NC on PC (DOS)
1989 Lightbus – high-speed fieldbus utilising optical fibre
1990 All-in-one PC motherboard
1995 Bus Terminal – fieldbus technology in terminal block format
1996 TwinCAT – real-time software package under Windows with PLC and Motion Control functions
1998 Control Panel – remote IPC Control Panels
1999 Fieldbus Box – the I/O system in IP 67
2002 CX1000 – modular Embedded PCs for DIN rail mounting
2003 EtherCAT – real-time Ethernet fieldbus system
2005 TwinSAFE – the compact safety solution
2005 AX5000 – EtherCAT Servo Drives
2007 Industrial Motherboards – made in Germany
2008 XFC – eXtreme Fast Control Technology
2009 HD Bus Terminals – 16-channel terminals in 12 mm
2010 TwinCAT 3 – eXtended Automation Technology
2011 AM8000 – Synchronous Servomotors with One Cable Technology
2012 2nd generation of Control Panels – Panel PCs and Control Panels with multi-touch technology
2012 XTS – eXtended Transport System
2014 Many-core control – Industrial server maximises industrial computing power
2014 AX8000 – Multi-axis servo system
2014 EtherCAT plug-in modules – Bus Terminals for circuit boards
2015 EtherCAT P – One Cable Automation

IPC, I/O, Motion and Automation



The IPC Company

Beckhoff supplies the right Industrial PC for every application. High-quality components based on open standards and the rugged construction of the device housings mean that the Industrial PCs are ideally equipped for all control requirements. Embedded PCs make modular IPC technology available in miniature format for DIN rail mounting. In addition to their application in automation, Beckhoff Industrial PCs are also ideally suited to other kinds of tasks – wherever reliable and robust PC technology is required.

The I/O Company

Beckhoff has the right technology for every signal and every fieldbus. Beckhoff supplies a complete range of Fieldbus Components for all common I/Os and fieldbus systems. With the Bus Terminals in protection class IP 20, and the Fieldbus Box modules in IP 67, a complete range is available for all important signal types and fieldbus systems. In addition to conventional bus systems, Beckhoff offers a complete EtherCAT I/O range for the high-speed Ethernet fieldbus based on EtherCAT Terminals and the EtherCAT Box.

The Motion Company

In combination with the Motion Control solutions offered by the TwinCAT automation software, Beckhoff Drive Technology represents an advanced and complete drive system. PC-based control technology from Beckhoff is ideally suited for single and multiple axis positioning tasks with highly dynamic requirements. The AX5000 and AX8000 Servo Drive series with high-performance EtherCAT communication offer maximum performance and dynamics. Servomotors with One Cable Technology, which combines power and feedback system in a standard motor cable, reduce material and commissioning costs. The drive system XTS (eXtended Transport System) replaces classic mechanical systems by innovative mechatronics. It enables individual product transport applications with a continuous flow of material.

The Automation Company

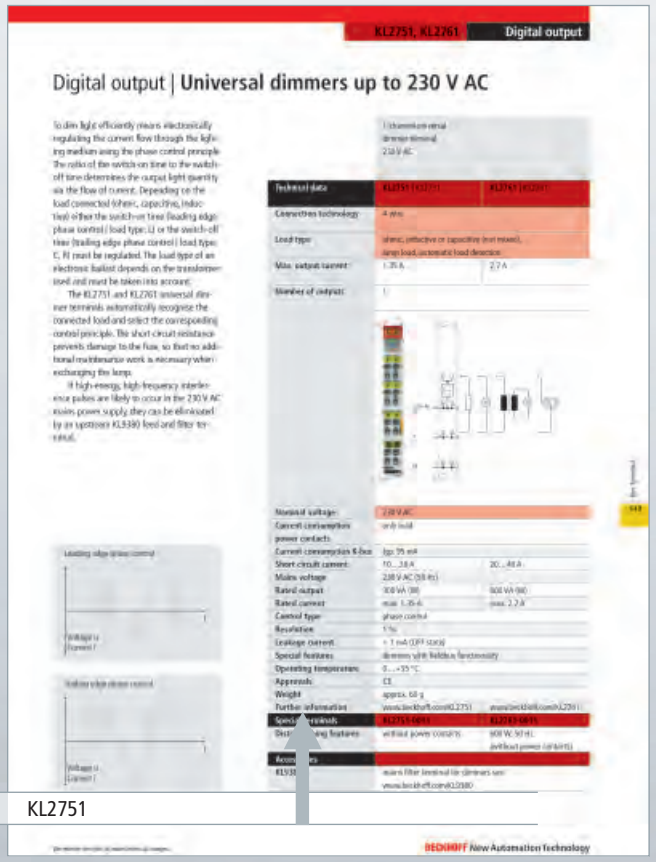
Beckhoff offers comprehensive system solutions in different performance classes for all areas of automation. Beckhoff control technology is scalable – from high-performance Industrial PCs to mini PLCs – and can be adapted precisely to the respective application. TwinCAT automation software integrates real-time control with PLC, NC and CNC functions in a single package. All Beckhoff controllers are programmed using TwinCAT in accordance with the globally-recognised IEC 61131-3 programming standard. With TwinCAT 3, C/C++ and MATLAB®/Simulink® are available as programming languages in addition to IEC 61131-3.

Direct link for additional information

The Beckhoff Main Catalog contains basic information for all product groups. Further information, such as more detailed technical data/drawings and other documentation, is available on the Beckhoff website. The information is complemented by multimedia files or Application Notes. Direct links are provided on the respective catalog pages:

Product web page

Additional information

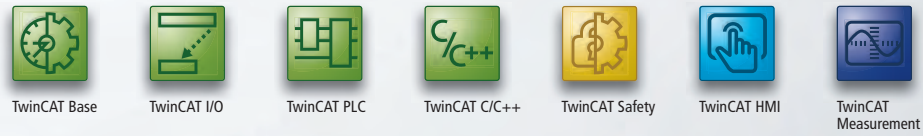


System overview

Ethernet

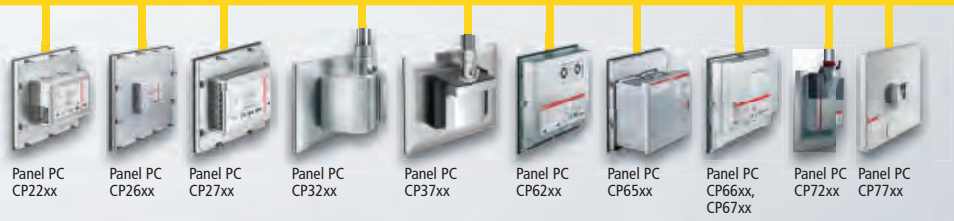
Automation

960 **TwinCAT**

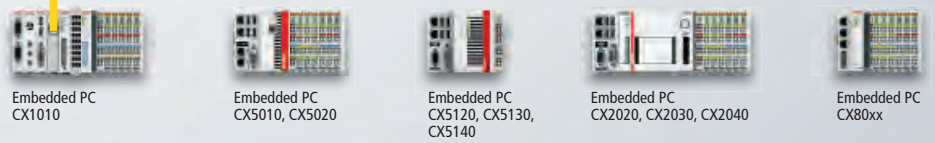


IPC

28 **Industrial PC**



184 **Embedded PC**



I/O

778 **Infrastructure Components**

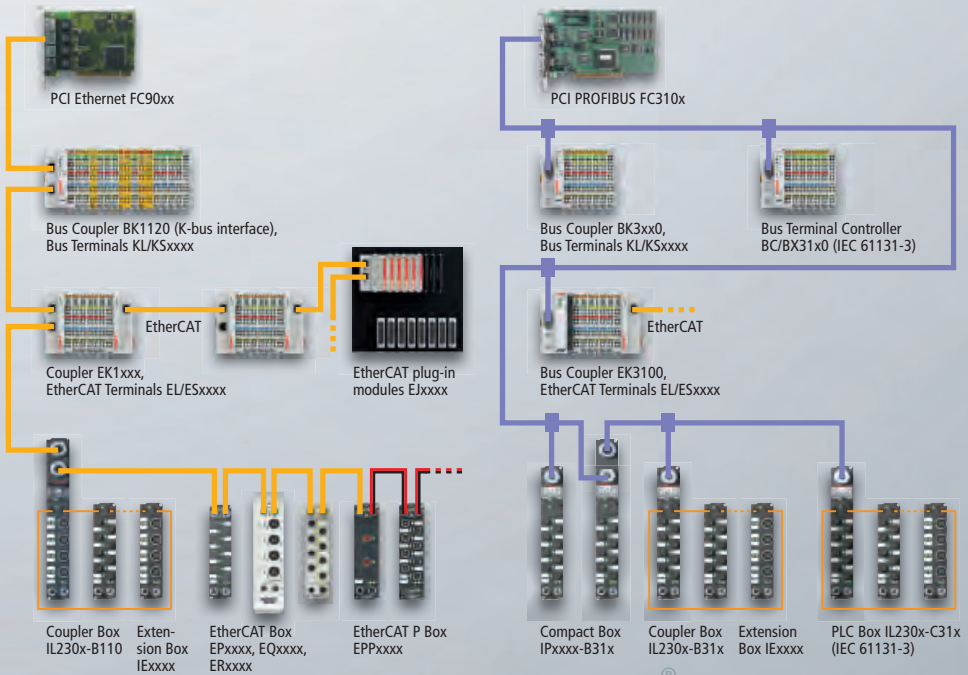
570 **Bus Terminal**

314 **EtherCAT Terminal**

550 **EtherCAT Plug-in Modules**

714 **Fieldbus Box**

450 **EtherCAT Box**



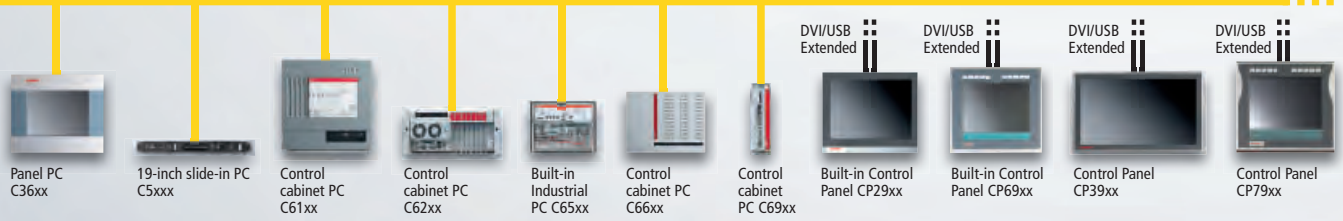
EtherCAT® EtherCAT® P PROFIBUS®

Motion

852 **Drive Technology**

Detailed system and fieldbus information from page 270

TwinCAT Control
TwinCAT Motion
TwinCAT PTP
TwinCAT NC I
TwinCAT CNC
TwinCAT Robotics
TwinCAT Connectivity
TwinCAT Industrie 4.0
TwinCAT Industry specific


DVI/USB Extended
DVI/USB Extended
DVI/USB Extended
DVI/USB Extended
Panel PC C36xx
19-inch slide-in PC C5xxx
Control cabinet PC C61xx
Control cabinet PC C62xx
Built-in Industrial PC C65xx
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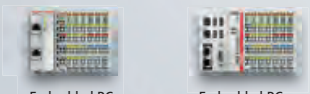
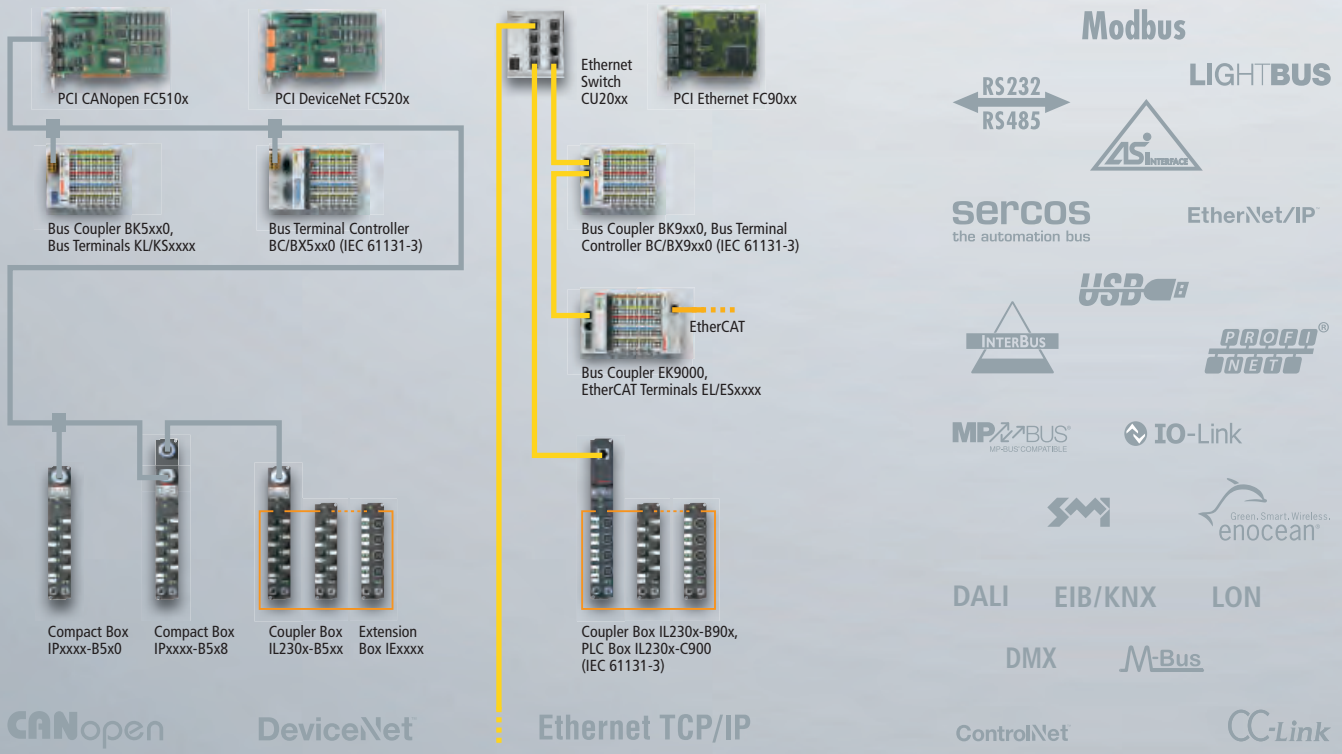
Control cabinet PC C69xx
Built-in Control Panel CP29xx
Built-in Control Panel CP69xx
Control Panel CP39xx
Control Panel CP79xx


Embedded PC CX9000, CX9010
Embedded PC CX9020


PCI CANopen FC510x
PCI DeviceNet FC520x
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PCI Ethernet FC90xx
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Bus Terminal Controller BC/BX5xx0 (IEC 61131-3)
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Extension Box IExxxx
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LIGHTBUS
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RS485
AS-Interface
sercos
the automation bus
EtherNet/IP
USB
INTERBUS
PROFINET
MP-BUS
IO-Link
SMI
Green. Smart. Wireless.
enocean
DALI
EIB/KNX
LON
DMX
M-Bus
CANopen
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XTS | eXtended Transport System

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TF4110 | TC3 Temperature Controller	1002
TF5000 | TC3 NC PTP 10 Axes	1003
TF5010 | TC3 NC PTP Axes Pack 25	1003
TF5020 | TC3 NC PTP Axes Pack unlimited	1003
TF5050 | TC3 NC Camming	1004
TF5055 | TC3 NC Flying Saw	1004
TF5060 | TC3 NC FIFO Axes	1005
TF5065 | TC3 Motion Control XFC	1005
TF5100 | TC3 NC I	1005
TF5110 | TC3 Kinematic Transformation L1	1006
TF5111 | TC3 Kinematic Transformation L2	1006
TF5112 | TC3 Kinematic Transformation L3	1006
TF5113 | TC3 Kinematic Transformation L4	1006
TF5120 | TC3 Robotics mxAutomation	1007
TF5130 | TC3 Robotics uniVAL PLC	1007
TF5200 | TC3 CNC	1007
TF5210 | TC3 CNC E	1008
TF5220 | TC3 CNC Axes Pack	1008
TF5230 | TC3 CNC Channel Pack	1008
TF5240 | TC3 CNC Transformation	1009
TF5250 | TC3 CNC HSC Pack	1009
TF5260 | TC3 CNC Spline Interpolation	1009
TF5270 | TC3 CNC Virtual NCK Basis	1009
TF5271 | TC3 CNC Virtual NCK Options	1010
TF5280 | TC3 CNC Volumetric Compensation	1010
TF5290 | TC3 CNC Cutting Plus	1010
TF5410 | TC3 Motion Collision Avoidance	1011
TF5420 | Motion Pick-and-Place	1011
TF5800 | TC3 Digital Cam Server	1011
TF5810 | TC3 Hydraulic Positioning	1011
TF5850 | TC3 XTS Extension	956
TF6000 | TC3 ADS Communication	1012
TF6100 | TC3 OPC UA	1012
TF6120 | TC3 OPC DA	1012
TF6220 | TC3 EtherCAT Redundancy 250	1012
TF6221 | TC3 EtherCAT Redundancy 250+	1013
TF6225 | TC3 EtherCAT External Sync	1013
TF6250 | TC3 Modbus TCP	1013
TF6255 | TC3 Modbus RTU	1013
TF6270 | TC3 PROFINET RT Device	1013
TF6271 | TC3 PROFINET RT Controller	1013
TF6281 | TC3 EtherNet/IP Master	1014
TF6300 | TC3 FTP Client	1014
TF6310 | TC3 TCP/IP	1014
TF6311 | TC3 TCP/UDP Realtime	1015
TF6340 | TC3 Serial Communication	1015
TF6350 | TC3 SMS/SMTP	1015
TF6360 | TC3 Virtual Serial COM	1015
TF6420 | TC3 Database Server	1015
TF6421 | TC3 XML Server	1015
TF6500 | TC3 IEC 60870-5-10x	1016
TF6510 | TC3 IEC 61850/ IEC 61400-25	1016
TF6600 | TC3 RFID Reader Communication	1016
TF6610 | TC3 S5/S7 Communication	1017
TF6650 | TC3 DBC File Import for CAN	1017
TF6701 | TC3 IoT Communication (MQTT)	1017
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TF6720 | TC3 IoT Data Agent	1018
TF6730 | TC3 IoT Communicator	1018
TF6735 | TC3 IoT Communicator App	1018
TF8000 | TC3 BA Connectivity Library	1019
TF8040 | TC3 Building Automation	1019
TF8310 | TC3 Wind Framework	1019
TR1xxx	1068
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TR8110	1077
TR8200	1077
TS1010 | TwinCAT Eventlogger	1026
TS1110 | TwinCAT Simulation Manager	1027
TS1120 | TwinCAT ECAD Import	1026
TS1140 | TwinCAT Management Server	1029
TS1150 | TwinCAT Backup	1027
TS1500 | TwinCAT Valve Diagram Editor	1034
TS1510 | TwinCAT Cam Design Tool	1033
TS1600 | TwinCAT Engineering Interface Server	1026
TS1800 | TwinCAT PLC HMI	1028
TS1800-0030 | TwinCAT PLC HMI CE	1028
TS1810 | TwinCAT PLC HMI Web	1028
TS3300 | TwinCAT Scope 2	1029
TS3900 | TwinCAT Solar Position Algorithm	1029
TS4100 | TwinCAT PLC Controller Toolbox	1030
TS4110 | TwinCAT PLC Temperature Controller	1030
TS5050 | TwinCAT NC Camming	1033
TS5055 | TwinCAT NC Flying Saw	1032
TS5060 | TwinCAT NC FIFO Axes	1032
TS5065 | TwinCAT PLC Motion Control XFC	1031
TS5066 | TwinCAT PLC Remote Synchronisation	1032
TS511x | TwinCAT Kinematic Transformation	1034
TS5800 | TwinCAT Digital Cam Server	1033
TS5810 | TwinCAT PLC Hydraulic Positioning	1031
TS6100 | TwinCAT OPC UA Server	1038
TS6100-0030 | TwinCAT OPC UA Server CE	1038
TS6120 | TwinCAT OPC Server	1038
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TS6250 | TwinCAT Modbus TCP Server	1036

TS6250-0030 | TwinCAT Modbus TCP Server CE	1036
TS6255 | TwinCAT PLC Modbus RTU	1035
TS6270 | TwinCAT PROFINET RT Device	1040
TS6271 | TwinCAT PROFINET RT Controller	1040
TS6280 | TwinCAT EtherNet/IP Slave	1040
TS6300 | TwinCAT FTP Client	1041
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TS6350 | TwinCAT SMS/SMTP Server	1039
TS6350-0030 | TwinCAT SMS/SMTP Server CE	1039
TS6360 | TwinCAT Virtual Serial COM Driver	1041
TS6370 | TwinCAT DriveCOM OPC Server	1037
TS6371 | TwinCAT DriveTop Server	1037
TS6420 | TwinCAT Database Server	1027
TS6420-0030 | TwinCAT Database Server CE	1028
TS6421 | TwinCAT XML Data Server	1026
TS6421-0030 | TwinCAT XML Data Server CE	1027
TS6506-0030 | TwinCAT PLC IEC 60870-5-104 Master CE	1036
TS6507 | TwinCAT PLC IEC 60870-5-101, -104 Slave	1036
TS6507-0030 | TwinCAT PLC IEC 60870-5-104 Slave CE	1036
TS6509 | TwinCAT PLC IEC 61400-25 Server	1037
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TS6511 | TwinCAT PLC IEC 61850 Server	1037
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TwinCAT 2	1020
TwinCAT 3	974
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TX1000 | TwinCAT CP	1025
TX1100 | TwinCAT I/O	1025
TX1200 | TwinCAT PLC	1022
TX1250 | TwinCAT NC PTP	1023
TX1260 | TwinCAT NC I	1023
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U

USB Bus Coupler K-bus	605

X

XAT	974
XFC	298
XTS	940

Z

Z1000	836
Z1003	840
Z1010	836
Z1020	836
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Z11xx	836
ZB260x	844
ZB3100	837
ZB3101	837
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ZB4100	840
ZB4101	840
ZB4200	840
ZB5100	838
ZB5200	838
ZB7000	812
ZB7001	812
ZB7101	822
ZB7202	824
ZB7203	829
ZB8110	848
ZB8610	849
ZB8800	847
ZB903x	809
ZB904x	815
ZB905x	813
ZK1031-xxxx	836
ZK1052-xxxx	838
ZK1090-9xxx-xxxx	808
ZK1090-0101-xxxx	840
ZK4500-802x-xxxx	878
ZK4509-00xx-xxxx	880
ZK4800-802x-xxxx	871
ZK480x-80xx-zzzz	871
ZK8500-8282-70x0	841
ZS1090-xxxx	808
ZS2000-xxxx	818
ZS2001-000x	844
ZS2010	844
ZS2020-xxxx	819
ZS6100-0900	850
ZS6201-0410	850
ZS6201-0500	851

Highlights

- Designed for machine-oriented use
- Long-term availability of components
- Developed in accordance with the requirements of automation technology
- Appealing industrial design housings

Industrial PC

PC Control for all applications

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64 Single-touch Panel PCs
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94 Built-in Panel PCs C36xx

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172 Accessories

Product overview Industrial PC

Industrial PC

	ATX motherboard Intel® Core™	3½-inch motherboard Intel® Core™	3½-inch motherboard Intel® Atom™/ Celeron® ULV	3½-inch motherboard ARM Cortex™-A8	Control Panel
Multi-touch Panel PC/Control Panel		CP22xx 46	CP27xx 54	CP26xx 50	CP29xx 154
		CP32xx 58	CP37xx 62		CP39xx 156
Single-touch Panel PC/Control Panel	CP65xx 72	CP62xx 66	CP67xx 82	CP66xx 76	CP69xx 168
	C36xx 96	CP72xx 88	CP77xx 92		CP79xx 170
19-inch slide-in Industrial PC	C5102 102	C5210 103			
Control cabinet Industrial PC	C6140/C6150 106	C6515/C6525 114			
	C6240/C6250 110				
	C6640/C6650 120				
Compact Industrial PC		C6920/C6930 128	C6905/C6915 126		
			C6925 130		

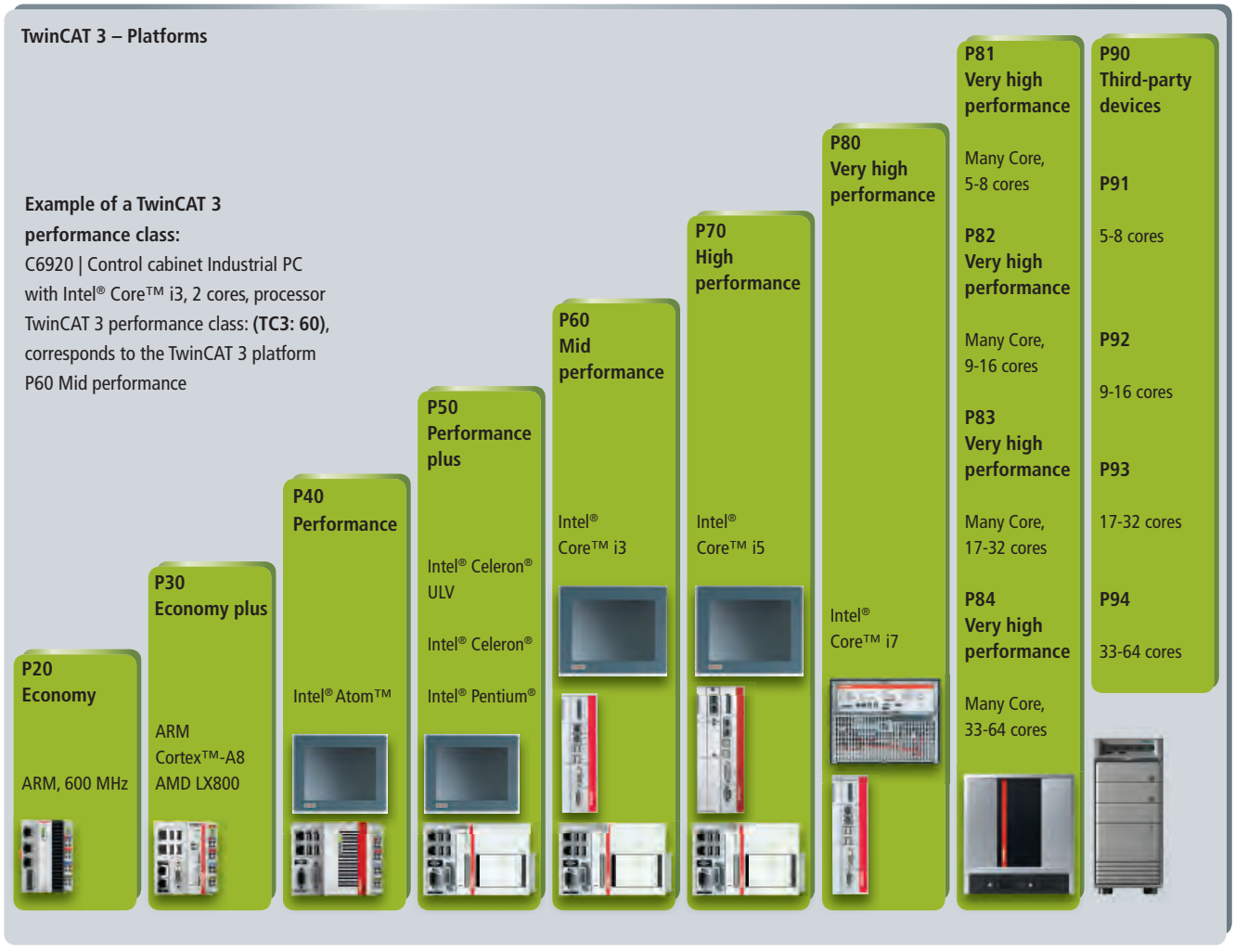
Industrial server

	SSI EEB motherboard Intel® Core™
	C6670 123

We reserve the right to make technical changes.

Product overview TwinCAT 3

The TwinCAT 3 runtime components are available for different platforms.



The controllers shown in the platform categorisation are only example configurations.

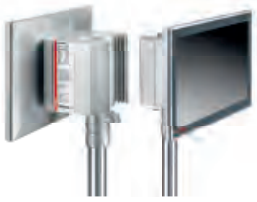
For further information on TwinCAT 3 see page ▶

Product overview multi-touch Panel PCs

CP22xx

CP26xx

CP27xx


CP32xx

CP37xx

Multi-touch built-in Panel PCs, front side IP 65

	Display Resolution Format	7-inch 800 x 480 16:9.6	11.6-inch 1366 x 768 16:9	12-inch 800 x 600 4:3	15-inch 1024 x 768 4:3	15.6-inch 1366 x 768 16:9	18.5-inch 1366 x 768 16:9	19-inch 1280 x 1024 5:4	21.5-inch 1920 x 1080 16:9	24-inch 1920 x 1080 16:9	
CP22xx-0000/-0010 – up to Core™ i3/i5/i7	multi-finger touch screen		CP2211	CP2212	CP2215	CP2216	CP2218	CP2219	CP2221	CP2224	46
CP26xx-0000 – ARM Cortex™-A8	dual-finger touch screen	CP2607	CP2611	CP2612	CP2615	CP2616	CP2618	CP2619	CP2621	CP2624	50
CP27xx-0000/-0010 – up to Atom™	multi-finger touch screen, only horizontal		CP2711	CP2712	CP2715	CP2716	CP2718	CP2719	CP2721	CP2724	54

Multi-touch Panel PCs, all sides IP 65

	Display Resolution Format	7-inch 800 x 480 16:9.6	11.6-inch 1366 x 768 16:9	12-inch 800 x 600 4:3	15-inch 1024 x 768 4:3	15.6-inch 1366 x 768 16:9	18.5-inch 1366 x 768 16:9	19-inch 1280 x 1024 5:4	21.5-inch 1920 x 1080 16:9	24-inch 1920 x 1080 16:9	
CP32xx-0000/-0010 – up to Core™ i3/i5/i7	multi-finger touch screen, only horizontal			CP3212	CP3215	CP3216	CP3218	CP3219	CP3221	CP3224	58
CP37xx-0010 – up to Atom™	multi-finger touch screen, only horizontal			CP3712	CP3715	CP3716	CP3718	CP3719	CP3721	CP3724	62

We reserve the right to make technical changes.

Product overview multi-touch Control Panels

CP29xx

CP39xx

Multi-touch built-in Control Panels, front side IP 65

	Display Resolution Format	7-inch 800 x 480 16:9.6	11.6-inch 1366 x 768 16:9	12-inch 800 x 600 4:3	15-inch 1024 x 768 4:3	15.6-inch 1366 x 768 16:9	18.5-inch 1366 x 768 16:9	19-inch 1280 x 1024 5:4	21.5-inch 1920 x 1080 16:9	24-inch 1920 x 1080 16:9	
CP29xx-0000 – DVI/USB Extended interface	multi-finger touch screen	**CP2907-0000**	**CP2911-0000**	**CP2912-0000**	**CP2915-0000**	**CP2916-0000**	**CP2918-0000**	**CP2919-0000**	**CP2921-0000**	**CP2924-0000**	154
CP29xx-0010 – CP-Link 4	multi-finger touch screen	**CP2907-0010**	**CP2911-0010**	**CP2912-0010**	**CP2915-0010**	**CP2916-0010**	**CP2918-0010**	**CP2919-0010**	**CP2921-0010**	**CP2924-0010**	154

Multi-touch Control Panels, all sides IP 65

	Display Resolution Format	7-inch 800 x 480 16:9.6	11.6-inch 1366 x 768 16:9	12-inch 800 x 600 4:3	15-inch 1024 x 768 4:3	15.6-inch 1366 x 768 16:9	18.5-inch 1366 x 768 16:9	19-inch 1280 x 1024 5:4	21.5-inch 1920 x 1080 16:9	24-inch 1920 x 1080 16:9	
CP39xx-0000 – DVI/USB Extended interface	multi-finger touch screen	**CP3907-0000**	**CP3911-0000**	**CP3912-0000**	**CP3915-0000**	**CP3916-0000**	**CP3918-0000**	**CP3919-0000**	**CP3921-0000**	**CP3924-0000**	156
CP39xx-0010 – CP-Link 4	multi-finger touch screen	**CP3907-0010**	**CP3911-0010**	**CP3912-0010**	**CP3915-0010**	**CP3916-0010**	**CP3918-0010**	**CP3919-0010**	**CP3921-0010**	**CP3924-0010**	156

For further information on CP-Link 4 see page 136, for further information on DVI/USB Extended see page 166

Product overview single-touch panels

CP62xx

CP65xx

CP66xx

CP67xx

C36xx

Single-touch built-in Panel PCs, front side IP 65

	Display	5.7-inch	6.5-inch	7-inch	12-inch	15-inch	19-inch	
	Resolution	640 x 480	640 x 480	800 x 480	800 x 600	1024 x 768	1280 x 1024	
	Format	4:3	4:3	5:3	4:3	4:3	5:4	
CP62xx – 3½-inch motherboard – up to Core™ i3/i5/i7	without keys				CP6201	CP6202	CP6203	66
	function keys				CP6211	CP6212	CP6213	
	numerical				CP6221	CP6222	CP6223	
	alphanumerical				CP6231	CP6232/42	CP6233	
CP65xx – ATX motherboard – up to Core™ i3/i5/i7 – 7 slots free	without keys				CP6501	CP6502	CP6503	72
	function keys				CP6511	CP6512	CP6513	
	numerical				CP6521	CP6522	CP6523	
	alphanumerical				CP6531	CP6532/42	CP6533	
CP66xx – 3½-inch motherboard – ARM Cortex™-A8	without keys	CP6607	CP6609		CP6601	CP6602	CP6603	76
	function keys		CP6619		CP6611	CP6612	CP6613	
	numerical		CP6629		CP6621	CP6622	CP6623	
	alphanumerical				CP6631	CP6632	CP6633	
CP6606 – 3½-inch motherboard – ARM Cortex™-A8	without keys			CP6606				78
CP67xx – 3½-inch motherboard – Celeron™ ULV or Atom™	without keys	CP6707			CP6701	CP6702	CP6703	80
	function keys				CP6711	CP6712	CP6713	
	numerical				CP6721	CP6722	CP6723	
	alphanumerical				CP6731	CP6732/42	CP6733	
CP6706 – 3½-inch motherboard – Celeron™ ULV or Atom™	without keys			CP6706				84
C36xx – ATX motherboard – up to Core™ i3/i5/i7 – 7 slots free	without keys				C3620	C3640		96

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

With PLC keys on the sides

CP72xx

CP77xx

CP69xx

CP79xx

CP790x-14xx, stainless steel

Single-touch Panel PCs, all sides IP 65

	Display	5.7-inch	6.5-inch	12-inch	15-inch	19-inch	
	Resolution	640 x 480	640 x 480	800 x 600	1024 x 768	1280 x 1024	
	Format	4:3	4:3	4:3	4:3	5:4	
CP72xx	without keys			CP7201	CP7202	CP7203	88
– 3½-inch motherboard	function keys			CP7211	CP7212	CP7213	
– up to Core™ i3/i5/i7	numerical			CP7221	CP7222	CP7223	
	alphanumerical			CP7231	CP7232/42	CP7233	
CP77xx	without keys			CP7701	CP7702	CP7703	92
– CP motherboard	function keys			CP7711	CP7712	CP7713	
– Celeron® ULV	numerical			CP7721	CP7722	CP7723	
	alphanumerical			CP7731	CP7732	CP7733	

Single-touch built-in Control Panels, front side IP 65

	Display	5.7-inch	6.5-inch	12-inch	15-inch	19-inch	
	Resolution	640 x 480	640 x 480	800 x 600	1024 x 768	1280 x 1024	
	Format	4:3	4:3	4:3	4:3	5:4	
CP69xx	without keys	CP6907	CP6909	CP6901	CP6902	CP6903	168
– DVI/USB Extended interface	function keys		CP6919	CP6911	CP6912	CP6913	
	numerical		CP6929	CP6921	CP6922	CP6923	
	alphanumerical			CP6931	CP6932	CP6933	
					CP6942		

Single-touch Control Panels, all sides IP 65

	Display	5.7-inch	6.5-inch	12-inch	15-inch	19-inch	
	Resolution	640 x 480	640 x 480	800 x 600	1024 x 768	1280 x 1024	
	Format	4:3	4:3	4:3	4:3	5:4	
CP79xx	without keys		CP7909	CP7901	CP7902	CP7903	170
– DVI/USB Extended interface	function keys		CP7919	CP7911	CP7912	CP7913	
	numerical		CP7929	CP7921	CP7922	CP7923	
	alphanumerical			CP7931	CP7932	CP7933	
					CP7942		
CP79xx-14xx	without keys,			CP7901-14xx	CP7902-14xx	CP7903-14xx	170
– DVI/USB Extended interface	stainless steel housing						

Product overview control cabinet Industrial PCs

C5210

C6515
basic
configuration

C6515
with PCIe
module slots

C6525
basic
configuration

C6525
with PCIe
module slots

C6525
with plug-in
card slots

C6905

C6915

C6925

C6920

C6920
with plug-in
card slots

C6930

C6930
with plug-in
card slots

Control cabinet Industrial PCs with 3½-inch motherboard

	Processor	Intel® Atom™	Intel® Celeron® ULV	Intel® Celeron®, 1.6 GHz Intel® Core™ i3/i5/i7 2nd/3rd generation	Intel® Celeron®, 2.2 GHz Intel® Core™ i3/i5/i7 4th generation	
19-inch slide-in Industrial PC series C5210	1 Mini PCI slot, 1 rack unit			**C5210-0010**	**C5210-0020**	103
Control cabinet PC series C65xx	1 Mini PCI slot			**C6515-0040**	**C6515-0050**	114
	1 Mini PCI slot, RAID			**C6525-0040**	**C6525-0050**	116
Compact Industrial PC series C69xx, connectors on front	fanless	**C6905-0010**				126
	fanless, 1 CFast card slot	**C6915-0010**				127
	2 PCIe module slots	**C6925-0030**	**C6925-0020**			130
	1 Mini PCI slot, optional plug-in card slots			**C6920-0040**	**C6920-0050**	129
	1 Mini PCI slot, 2 PCIe module slots, optional plug-in card slots			**C6930-0040**	**C6930-0050**	131

Embedded PCs see page 184

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C5102

C6140

C6150

C6240

C6250

C6640

C6650

C6670

Control cabinet Industrial PCs with ATX motherboard — Industrial server

	Processor	Intel® Celeron®, 1.6 GHz Intel® Core™ i3/i5/i7 2nd/3rd generation	Intel® Pentium®, 2.3 GHz Intel® Core™ i3/i5/i7 4th generation	Intel® Pentium®, 2.4 GHz Intel® Core™ i3/i5/i7 6th generation	Dual Intel® Xeon®, SSI EEB motherboard	
19-inch slide-in Industrial PC series C5102	7 slots, 4 rack units	C5102-0050	C5102-0060	C5102-0070		102
Control cabinet PC series C61xx, connectors on top	7 slots	C6140-0050 C6150-0050	C6140-0060 C6150-0060	C6140-0070 C6150-0070		106 107
Control cabinet PC series C62xx, connectors on front	7 slots	C6240-0050 C6250-0060	C6240-0060 C6250-0070	C6240-0070 C6250-0080		110 111
Control cabinet PC series C6640/C6650	7 slots	C6640-0030	C6640-0040	C6640-0050		120
	7 slots, 2 removable frames	C6650-0030	C6650-0040	C6650-0050		121
Control cabinet industrial server C6670	6 slots, 2 removable frames				C6670-0000	123

Requirements for PC-based control technology

Balance between latest PC technology and long-term availability of control components

The personal computer has experienced an unprecedented success story and has become a firmly established part of everyday life, including industrial environments. Together with associated software, PCs in different shapes and forms are at the core of a wide range of diverse automation tasks such as control of machines, processes or logistics systems, networking of system components, data acquisition, or image processing. For classic control tasks, PC-based control technology offers excellent scalability and flexibility and is therefore increasingly used in place of hardware PLCs.

Beckhoff is one of the pioneers of PC-based automation: the first PC control system was delivered as early as 1986. Beckhoff Industrial PCs are characterised by a wealth of technology know-how accumulated over recent years. In combination with the TwinCAT automation software, they offer a high-performance control system for PLC, NC and CNC functionalities.

An important feature of the Beckhoff product philosophy is the use of advanced, high-performance components and processors for the development and design of Industrial PCs: they integrate the latest developments offered by the technology market and are used successfully worldwide. Fine scaling is provided for through processor incrementing from Intel® Atom™ up to Intel® Core™ i7. Due to the low processor power dissipation, Intel® Atom™ processors enable extremely small, fanless controllers and are to be found in the lower price range.

In addition to long-standing experience, another factor driving the development of our comprehensive IPC product portfolio is customer-orientation. More than ten Industrial PC series with a wide range of basic PC types form the basis of our product range. The optimally tailored control computer can be found for every application from the large choice of devices and options.

The PC housing varies in size between paperback format and ATX PC, depending on the device type. In addition to long-term availability of the built-in processors and motherboards, Beckhoff also offers full commissioning of all integrated components, including software and different drives. Customised solutions can also be realised for optimum adaptation to the respective task.

Elegant Control Panels and Panel PCs

The IPC is complemented by an industrial display unit. The Beckhoff Control Panels and Panel PCs are the visual front end for machines or plants. Spatial separation of display/control unit and control computer offers maximum flexibility. Appealing design, robustness and suitability for industrial applications were important criteria in the development of the Control Panel series, which comes with display sizes between 5.7″ and 24″.

All displays can be fully tailored to customer requirements: options include visual adaptation to the corporate design or application of a customer logo a wide range of special mechanical keys, emergency stop switches, card scanners or RFID readers.

The Control Panel housing is made from high-quality solid aluminium and is suitable for protection class IP 65, as usually required in industrial environments. Thorough development and integration of electronic modules, displays, touch screens and front membranes ensure high availability and reliability during operation. All Beckhoff Control Panels can optionally be operated as:

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- stand-alone device (Panel PC with Windows 7, Embedded Standard 7, Embedded Compact 7 or Windows 10 IoT Enterprise)
- DVI/USB Extended Control Panel for direct or indirect operation at the PC (distance up to 50 m)
- CP-Link 3 (Panel PCs connected to the host PC via Ethernet), see page 146
- CP-Link 4 Control Panel for operation at the PC with a distance of up to 100 m, see page 152

Careful selection of components

A great deal of attention and care is put into the development and choice of the IPC components used, their compatibility, their long-term availability, mechanical loading capacity and industrial suitability. In developing electronic modules, Beckhoff fulfils the high requirements for Industrial PC components that are necessary in order to ensure permanent reliable operation.

Beckhoff is the developer and manufacturer of the motherboards in the Industrial PCs. The BIOS for the motherboards even has its own development department. In addition to that, 24 V DC power supplies with integrated UPS, Ethernet adapters and Ethernet switches, Fieldbus Cards, DVI display interfaces, DVI/USB extensions and USB hubs are produced by Beckhoff's own development and manufacturing facilities. International standards and experience in the application of PC systems under difficult industrial conditions provide the basis for Beckhoff system integration. Only a few LC displays, plug-in cards or hard disks are suited to use in tough industrial environments. Experience and detailed testing are therefore required for checking whether the components meet the stringent requirements in terms of temperature resistance, resistance to vibration, and electromagnetic compatibility. Prior to delivery, all Industrial PCs are subjected to comprehensive quality control procedures in order to verify that they are fit for the purpose. Beckhoff Industrial PCs satisfy the Machine Guidelines and carry the CE mark: all PC components are checked for electromagnetic compatibility (EMC) and comply with the relevant standards.

Robust industrial design PCs with highest performance components

Beckhoff Industrial PCs satisfy industry's demands:

- the right Industrial PC for every controller
- highest performance PCs with Intel® Celeron® up to Intel® Core™ i7 processors
- PCs with low power consumption with Intel® Mobile processors
- open standards following the norm ATX
- components carefully tested to ensure appropriateness for industrial applications
- appealing industrial design housings
- easy access to PC components
- Individual housing construction allows optimum adaptation to controller requirements.
- integration of electromechanical buttons, switches, scanners, handwheels and other components in the Control Panel
- designed for machine-oriented use
- long-term availability of components

The right Industrial PC for every application

Panel PCs

A Beckhoff Panel PC consisting of a Control Panel and an Industrial PC is suitable for control cabinet installation (CP2xxx, CP6xxx) or mounting arm installation (CP3xxx, CP7xxx). High-performance components make machine-level operation, control and monitoring one of the strengths of the Beckhoff Panel PCs, whose elegant housings are designed for easy accessibility of all components and optimal space utilisation. Different display sizes between 5.7-inch and 24-inch and various add-on PCs with processors ranging from Intel® Atom™ to Core™ i7 can be combined to form tailored high-performance platforms for machine construction and plant engineering applications.

See page 42

Control cabinet Industrial PCs

Beckhoff Industrial PCs for control cabinet installation can be scaled in size (paperback format up to ATX PC) and performance class (Intel® Atom™ to Core™ i7), depending on the application. The Industrial PC technology represents a balance between the latest PC technology and long-term component availability. In addition, the different product lines are characterised by adaptation to the special circumstances in industrial applications.

See page 98

We reserve the right to make technical changes.

Control Panels

The Beckhoff Control Panels used as human-machine interfaces in conjunction with the high-performance Industrial PCs round off a system through their elegant design and the latest PC technology. The display sizes between 5.7-inch and 24-inch meet almost any industrial application requirements and are suitable for mounting arm installation (CP3xxx and CP7xxx) or wall installation (CP2xxx and CP6xxx). A wide range of different push-button extensions in conjunction with custom housing designs enable the Control Panel as the visual front end of a system or machine to be tailored to match the corporate identity.

See page 148

Accessories

Beckhoff accessories complement the Industrial PCs while complying with industrial standards: CP-Link 3 desktop transfer software, DVI splitters, USB extensions and hubs, USB CFast slot, USB Compact Flash slot, USB Ethernet controllers, battery packs, USB sticks, PCIe modules, plug-in cards.

Industrial PC accessories see page 133

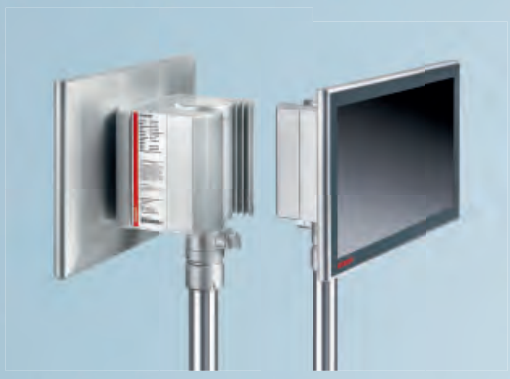
Extensions for Control Panels and Panel PCs: push-button extensions (with electromechanical buttons, switches and indicator lamps), auxiliary keyboards, keyboard shelves, touch screen pens, RFID readers

Multi-touch Control Panel accessories see page 158
Single-touch Control Panel accessories see page 172

Panel PCs

C36xx | **ATX built-in Panel PC, Intel® Celeron®, Pentium® or Core™**
– display sizes: 12- or 15-inch

See page 94



CP32xx | **Multi-touch Panel PC with mounting arm, Intel® Celeron® or Core™**
– display sizes: 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch
– protection IP 65

See page 58

CP22xx | **Multi-touch built-in Panel PC, Intel® Celeron® or Core™**
– display sizes: 11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch

See page 46

CP65xx | **ATX built-in Panel PC, Intel® Celeron®, Pentium® or Core™**
– display sizes: 12-, 15- or 19-inch

See page 70

CP72xx | **Panel PC with mounting arm, Intel® Celeron® or Core™**
– display sizes: 12-, 15- or 19-inch
– protection IP 65

See page 86

CP62xx | **Built-in Panel PC, Intel® Celeron® or Core™**
– display sizes: 12-, 15- or 19-inch

See page 64

We reserve the right to make technical changes.

CP37xx | **Multi-touch Panel PC with mounting arm, Intel® Atom™**
– display sizes: 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch
– protection IP 65

See page 62

CP27xx | **Multi-touch built-in Panel PC, Intel® Celeron® ULV or Atom™**
– display sizes: 11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch

See page 52

CP26xx | **Built-in Panel PC, ARM Cortex™-A8**
– display sizes: 7-, 11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch

See page 48

CP77xx | **Panel PC with mounting arm, Intel® Celeron® ULV**
– display sizes: 12-, 15- or 19-inch
– protection IP 65

See page 90

CP67xx | **Built-in Panel PC, Intel® Celeron® ULV or Atom™**
– display sizes: 5.7-, 12-, 15- or 19-inch

See page 80

CP66xx | **Built-in Panel PC, ARM Cortex™-A8**
– display sizes: 5.7-, 6.5-, 12-, 15- or 19-inch

See page 74

We reserve the right to make technical changes.

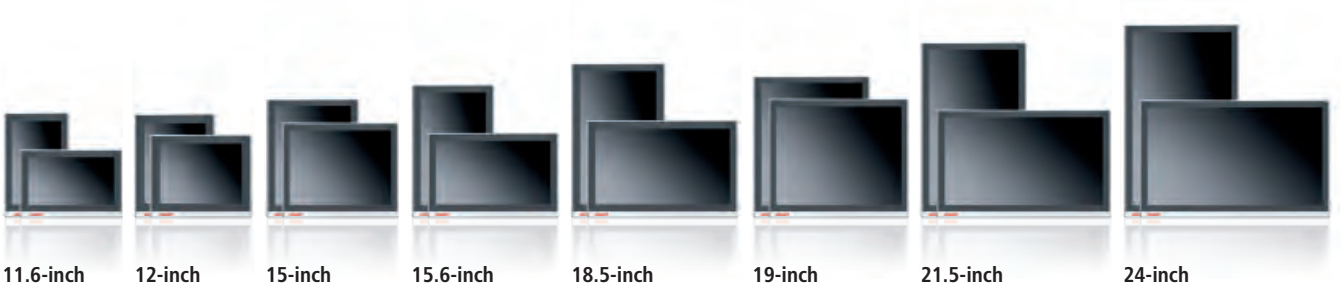
CP22xx | Multi-touch built-in Panel PC

The CP22xx built-in Panel PC series is characterised by a modern operating concept with multi-touch display as well as an advanced, elegant device design. It is designed for installation in the front of a control cabinet. The CP22xx combine reliable Beckhoff Control Panel design with state-of-the-art Industrial PC technology. The right display size is available for every application – in landscape or portrait orientation (horizontal/vertical). With their highly integrated 3½-inch motherboards, the CP22xx built-in Industrial PCs represent a high-performance platform for machine construction and plant engineering applications that can be used in conjunction with TwinCAT automation software under Windows 7 Professional, Windows 7 Ultimate or Windows Embedded Standard 7. CP22xx Panel PCs are equipped with Intel® Celeron® or Intel® Core™ i3, i5 or i7 processors and have one or two hard disks, SSDs or CFast cards or combinations thereof. With the on-board RAID controller, two same hard disks, SSDs or CFast cards can be mirrored.

CP22xx are supplied with a 24 V power supply unit, optionally also with an integrated uninterruptible power supply (UPS).

We reserve the right to make technical changes.

Display sizes

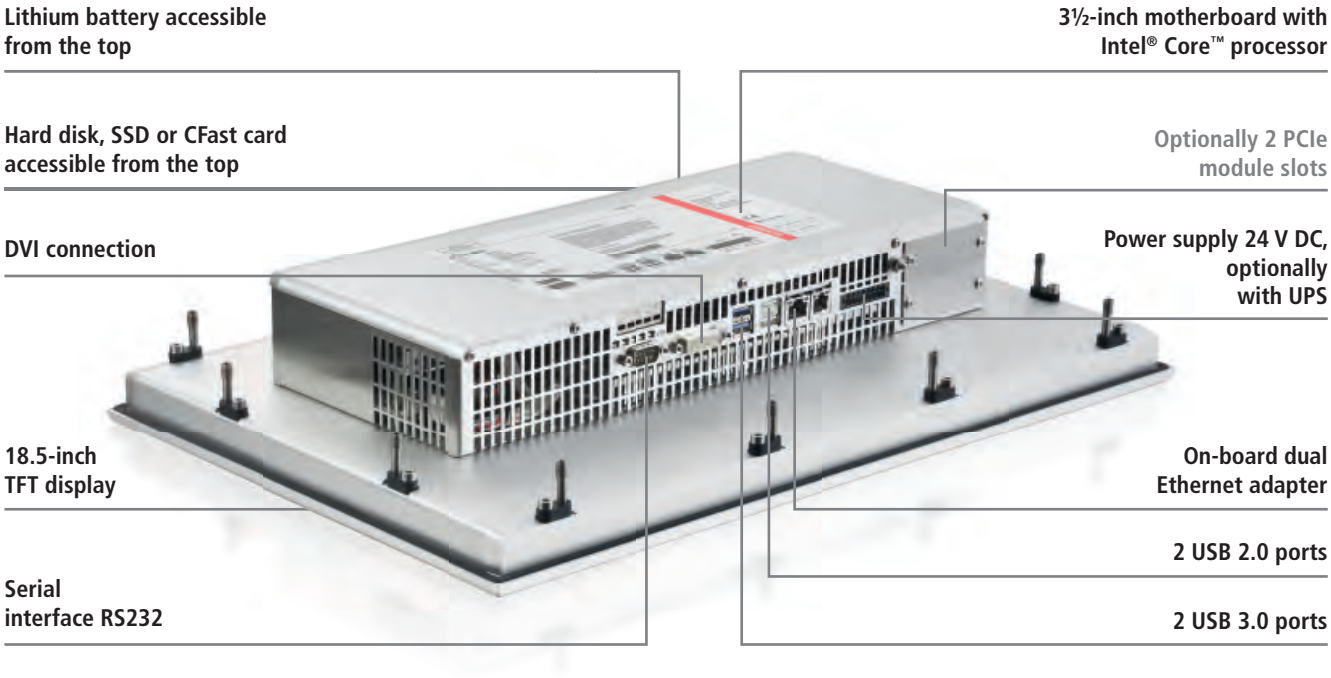


A battery pack can be connected externally and installed on a DIN rail close to the PC.

Data media, the fan and the lithium battery of the system clock are accessible from the rear under the fan cover.

Due to its two independent Ethernet interfaces the CP22xx is ideally suited as a compact central processing unit for an EtherCAT control system. A free Mini PCI slot enables different fieldbus cards or a third, independent Ethernet interface to be used. NOVRAM for fail-safe data storage can also be plugged into the Mini PCI slot.

Two free slots for PCIe modules can be optionally integrated in the PC housing, offering the possibility to extend the PC, e.g. with additional Ethernet interfaces.



CP22xx

Rear view of CP22xx-0010 for 12-inch, 15-inch and all portrait orientations

CP22xx | Panel PC with Intel® Core™ i processor

The high-performance multi-touch built-in Panel PC

CP2211 CP2212 CP2215 CP2216 CP2218 CP2219 CP2221 CP2224

Ordering information	Multi-finger touch screen
11.6-inch display 1366 x 768	CP2211-0010
12-inch display 800 x 600	CP2212-00xx
15-inch display 1024 x 768	CP2215-00xx
15.6-inch display 1366 x 768	CP2216-00xx
18.5-inch display 1366 x 768	CP2218-00xx
19-inch display 1280 x 1024	CP2219-00xx
21.5-inch display 1920 x 1080	CP2221-00xx
24-inch display 1920 x 1080	CP2224-00xx

We reserve the right to make technical changes.

Rear view of CP22xx-0010
for all landscape orientations
from 15.6-inch

CP22xx	CP22xx-0000, -0010
Housing	aluminium housing with glass front
	all connectors at the bottom of the rear side
	PC to be opened from the back side
	all components easily accessible
	1 slot for one 2½-inch hard disk or SSD and 1 slot for one CFast card, accessible from outside
	2 connector brackets to lead out interfaces of the motherboard at the connection section
	fan cartridge at the PC top side, accessible from outside
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C

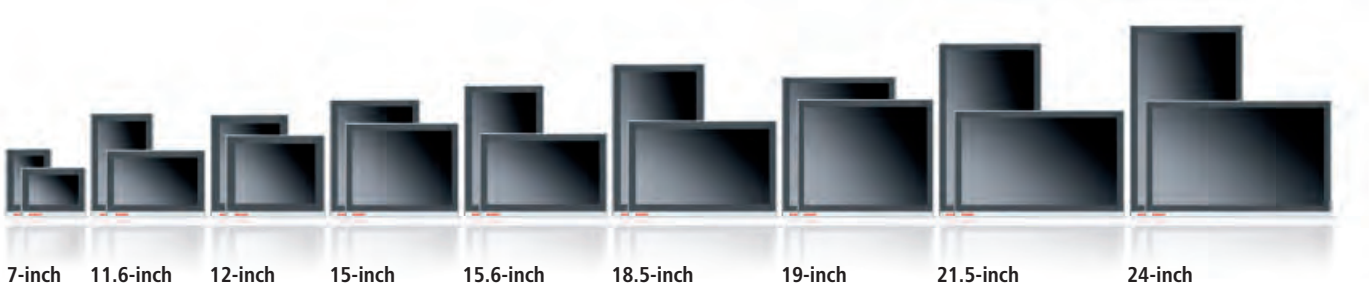
Features	CP22xx-0000	CP22xx-0010
Display	12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display	11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display
Processor	Celeron®, Core™ i3/i5/i7 2nd/3rd generation	Celeron®, Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI slot, optionally 2 PCIe modules	1 Mini PCI slot, optionally 2 PCIe modules
Free slots	1 Mini PCI slot, optionally 2 PCIe modules	1 Mini PCI slot, optionally 2 PCIe modules
Max. card length	Mini PCI	Mini PCI
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	1 or 2 x 2½-inch HDD, SSD or CFast	1 or 2 x 2½-inch HDD, SSD or CFast
RAID 1	2 x 2½-inch HDD, SSD or CFast	2 x 2½-inch HDD, SSD or CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

CP26xx | Dual-touch built-in Panel PC

The CP26xx built-in Panel PC series is characterised by a modern operating concept with dual-touch display as well as an advanced, elegant device design. It is designed for installation in the front of a control cabinet. The CP26xx combine reliable Beckhoff Control Panel design with state-of-the-art Industrial PC technology. The right display size from 7 to 24 inches is available for every application – in landscape or portrait orientation (horizontal/vertical). With their highly integrated 3½-inch motherboards, the CP26xx built-in Industrial PCs represent a high-performance platform for machine construction and plant engineering applications that can be used in conjunction with TwinCAT automation software under Windows Embedded Compact 7.

We reserve the right to make technical changes.

Display sizes

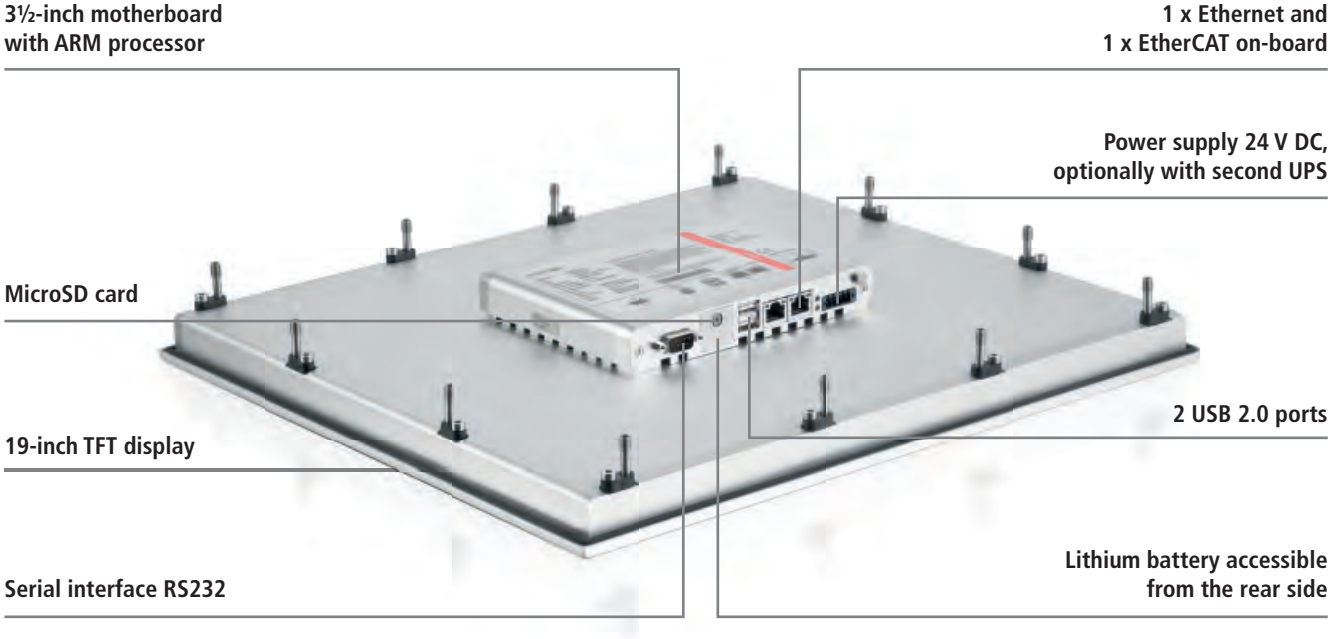


CP26xx Panel PCs are equipped with an ARM Cortex™-A8 processor. They are equipped with a microSD card and have no rotating parts.

CP26xx are supplied with a 24 V power supply unit, optionally also with a capacitive uninterruptible power supply (second UPS).

The microSD card and the lithium battery of the system clock are accessible from the rear in the connector bracket.

Due to its independent Ethernet and EtherCAT interfaces the CP26xx is ideally suited as a compact central processing unit for an EtherCAT control system. NOVRAM for fail-safe data storage is integrated on the motherboard.



CP26xx

CP26xx | Panel PC with ARM Cortex™-A8

The compact dual-touch built-in Panel PC

CP2607 CP2611 CP2612 CP2615 CP2616 CP2618 CP2619 CP2621 CP2624

Ordering information		Dual-finger touch screen
7-inch display	800 x 480	CP2607
11.6-inch display	1366 x 768	CP2611
12-inch display	800 x 600	CP2612
15-inch display	1024 x 768	CP2615
15.6-inch display	1366 x 768	CP2616
18.5-inch display	1366 x 768	CP2618
19-inch display	1280 x 1024	CP2619
21.5-inch display	1920 x 1080	CP2621
24-inch display	1920 x 1080	CP2624

We reserve the right to make technical changes.

CP26xx	CP26xx-0000
Housing	aluminium housing with glass front
	all connectors at the bottom of the rear side
	PC to be opened from the back side, all components easily accessible
	1 slot for a microSD flash card, accessible from outside
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C

Features	CP26xx-0000
Display	7-, 11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display
Processor	ARM Cortex™-A8, 1 GHz
Motherboard	3½-inch
Slots	–
Memory	1 GB DDR3 RAM
Graphic adapter	integrated in the processor
Ethernet	1 x Ethernet and 1 x EtherCAT on-board
Hard disks/flash	microSD flash card
Power supply	24 V DC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

CP27xx | Fanless multi-touch built-in Panel PC

The CP27xx built-in Panel PC series is characterised by a modern operating concept with multi-touch display as well as an advanced, elegant device design. It is designed for installation in the front of a control cabinet. The CP27xx combine reliable Beckhoff Control Panel design with state-of-the-art Industrial PC technology. The right display size is available for every application. With their highly integrated 3½-inch motherboards, the CP27xx built-in Industrial PCs represent a high-performance platform for machine construction and plant engineering applications that can be used in conjunction with TwinCAT automation software under Windows 7 Professional, Windows 7 Ultimate, Windows Embedded Standard 7, Windows Embedded Compact 7 or with Intel® Atom™ also under Windows 10 IoT Enterprise.

CP27xx Panel PCs are equipped with Intel® Celeron® ULV 1.4 GHz or with Intel® Atom™ with up to four cores and have one or two CFast cards. With the on-board RAID

We reserve the right to make technical changes.

Display sizes

11.6-inch | 12-inch | 15-inch | 15.6-inch | 18.5-inch | 19-inch | 21.5-inch | 24-inch

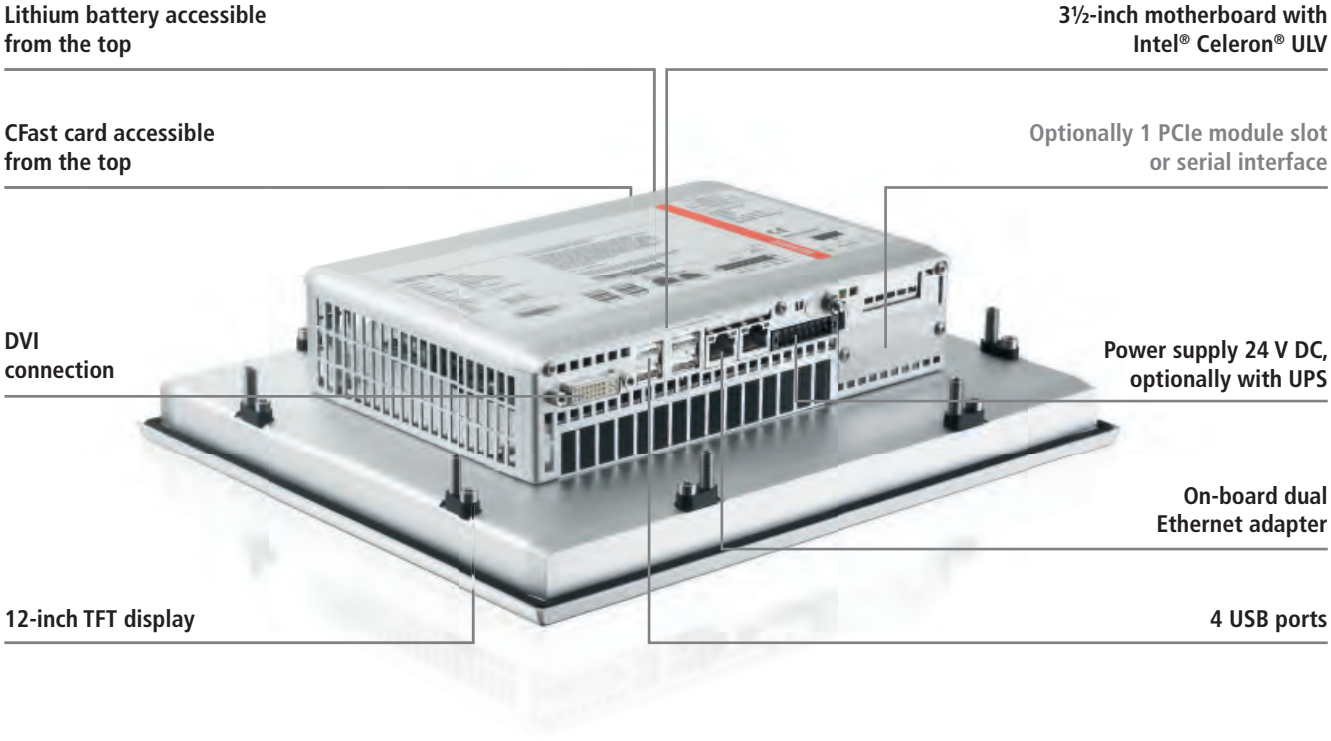
controller, two same CFast cards can be mirrored in the CP27xx-0000.

CP27xx are supplied with a 24 V power supply unit, optionally also with an integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail close to the PC.

Data media and the lithium battery of the system clock are accessible from the rear.

Due to its two independent Ethernet interfaces the CP27xx is ideally suited as a compact central processing unit for an EtherCAT control system. A third independent Ethernet interface is available as an option.

An optional PCIe module slot offers the possibility to extend the PC, e.g. with additional Ethernet interfaces.



CP27xx

CP27xx | Fanless multi-touch built-in Panel PC

CP2711 CP2712 CP2715 CP2716 CP2718 CP2719 CP2721 CP2724

Ordering information	Multi-finger touch screen
11.6-inch display 1366 x 768	CP2711
12-inch display 800 x 600	CP2712
15-inch display 1024 x 768	CP2715
15.6-inch display 1366 x 768	CP2716
18.5-inch display 1366 x 768	CP2718
19-inch display 1280 x 1024	CP2719
21.5-inch display 1920 x 1080	CP2721
24-inch display 1920 x 1080	CP2724

We reserve the right to make technical changes.

CP27xx	CP27xx-0000, -0010
Housing	aluminium housing with glass front
	all connectors at the bottom of the rear side
	PC to be opened from the back side
	all components easily accessible
	2 slot for for CFast cards, accessible from outside
	1 connector bracket to lead out interfaces of the motherboard at the connection section
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C

Features	CP27xx-0000	CP27xx-0010
Display	11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display	11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display
Processor	Intel® Celeron® ULV	Intel® Atom™
Motherboard	3½-inch	3½-inch
Slots	optionally 1 PCIe module	optionally 1 PCIe module
Memory	2…8 GB DDR3 RAM	2…8 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	1 or 2 x CFast	1 or 2 x CFast
RAID 1	2 x CFast	–
Power supply	24 V DC	24 V DC
Recommendation	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

CP32xx | Multi-touch Panel PC

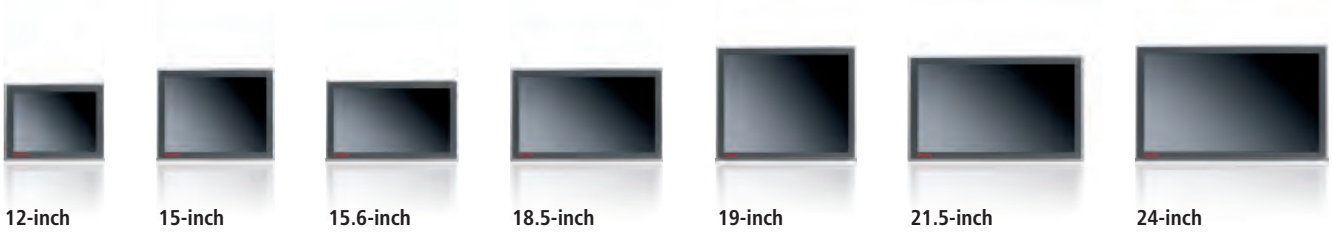
With the CP32xx series, a high-end Panel PC with multi-touch can be used directly in the field. The devices in a slender aluminium housing feature complete IP 65 protection and are designed for mounting arm installation. The Panel PCs offer maximum computing power with processors of the latest generation, such as Intel® Celeron® or Core™ i3, i5, or i7.

A choice of seven different multi-touch TFT displays in sizes between 12-inch and 24-inch and 4:3, widescreen, landscape or portrait formats are available. Cooling is achieved by means of cooling fins on the outer wall as well as fans inside the closed housing. The operating temperature range is 0 to 45 °C.

The Panel PC features an integrated rotatable and tiltable mounting arm adapter for a 48 mm diameter mounting arm tube. There is a choice of attaching the mounting arm from above or below. The connecting cables are laid through the mounting arm. The Industrial PC connections (up to six) with IP 65 connectors are positioned in the large wiring space and are easily accessible. The wiring area

We reserve the right to make technical changes.

Display sizes

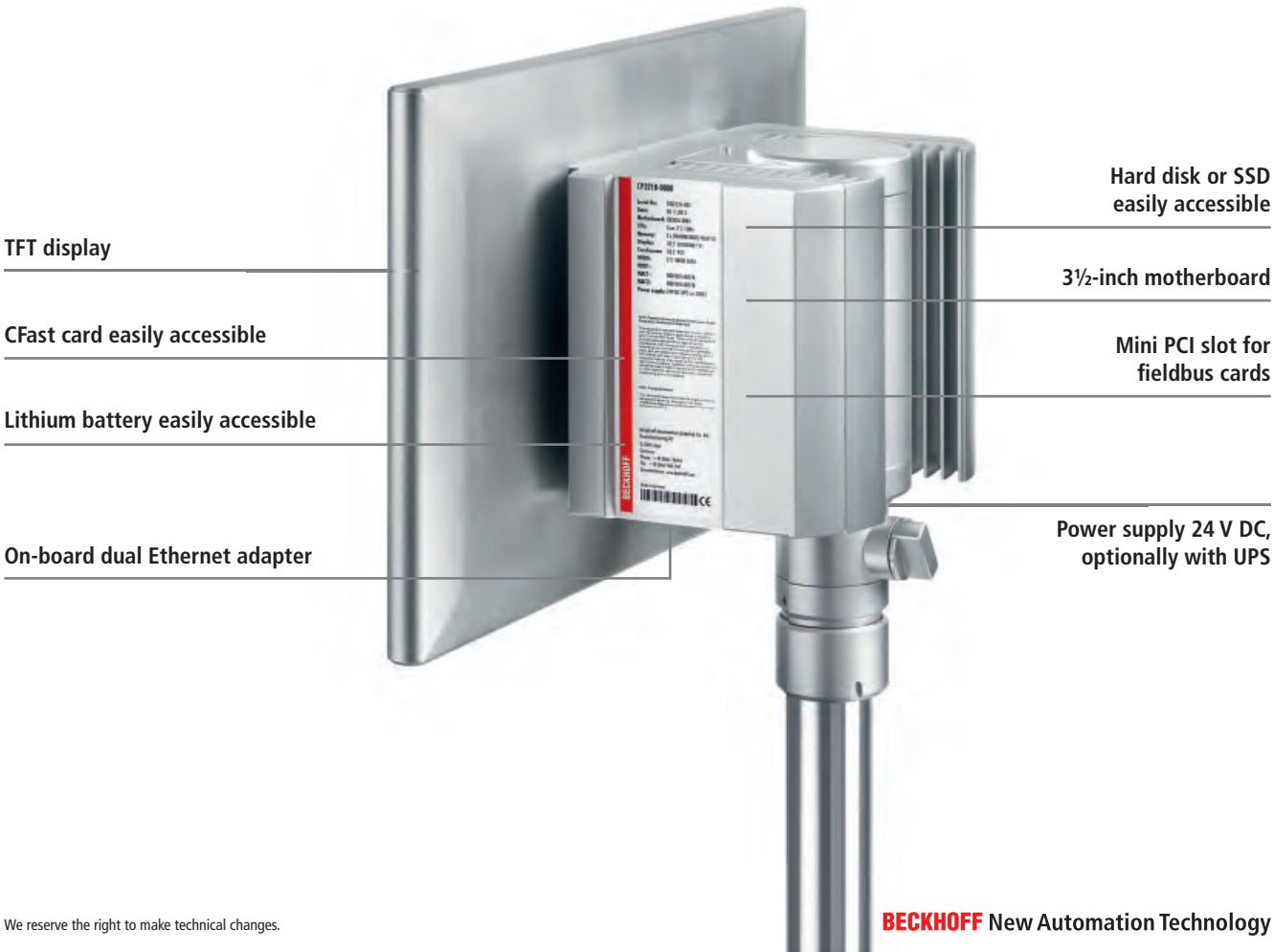


can be opened easily without dismounting the device from the mounting arm, offering fast access to the IP 65 connectors for power supply, Ethernet and optional fieldbus, USB or RS232. Prefabricated cables in various lengths are available for all connections.The C32xx series Panel PCs are supplied with a 24 V power supply unit, optionally with integrated uninterruptible power supply (UPS).

A battery pack can be connected externally and installed on a DIN rail in the control cabinet.

The CP32xx Panel PCs are equipped with one or two hard disks, SSDs or CFast cards or combinations thereof. With the on-board RAID controller, two same hard disks, SSDs or CFast cards can be mirrored. The data media and the lithium battery of the system clock are accessible from the rear under the cover.

There is a Mini PCI slot in the CP32xx. The Beckhoff Mini PCI Ethernet or fieldbus cards can be factory-fitted. NOVRAM up to 512 kB is also available in the form of an optional Mini PCI plug-in card for fail-safe data storage.



CP32xx

CP32xx | Multi-touch Panel PC

The high-performance multi-touch Panel PC

CP3212 CP3215 CP3216 CP3218 CP3219 CP3221 CP3224

Ordering information		Multi-finger touch screen
12-inch display	800 x 600	CP3212
15-inch display	1024 x 768	CP3215
15.6-inch display	1366 x 768	CP3216
18.5-inch display	1366 x 768	CP3218
19-inch display	1280 x 1024	CP3219
21.5-inch display	1920 x 1080	CP3221
24-inch display	1920 x 1080	CP3224

We reserve the right to make technical changes.

CP32xx

CP32xx	CP32xx-0000, -0010
Housing	Industrial PC with Control Panel for mounting arm installation
	rotatable and tiltable mounting arm adapter for Rittal and Rolec mounting arm systems with 48 mm tube from top
	wiring area for up to 6 IP 65 connectors
	1 slot for a 2½-inch hard disk or SDD and 1 slot for CFast
	lithium battery of the system clock changeable from outside
	passive cooling through heat sink structure, internal fans for equal heat distribution to all the walls of the housing
	20 cm free space required around the PC for air circulation
	protection class IP 65
	operating temperature 0…45 °C

Features	CP32xx-0000	CP32xx-0010
Display	12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display	12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI slot	1 Mini PCI slot
Free slots	1 Mini PCI slot	1 Mini PCI slot
Max. card length	Mini PCI	Mini PCI
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board, one of these is led out in the wiring area	2 on-board, one of these is led out in the wiring area
Hard disks/flash	1 or 2 x 2½-inch HDD or SSD, 1 x 2½-inch HDD or SSD and 1 x CFast or 2 x CFast	1 or 2 x 2½-inch HDD or SSD, 1 x 2½-inch HDD or SSD and 1 x CFast or 2 x CFast
RAID 1	2 x 2½-inch HDD, SSD or CFast	2 x 2½-inch HDD, SSD or CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

CP37xx | Multi-touch Panel PC

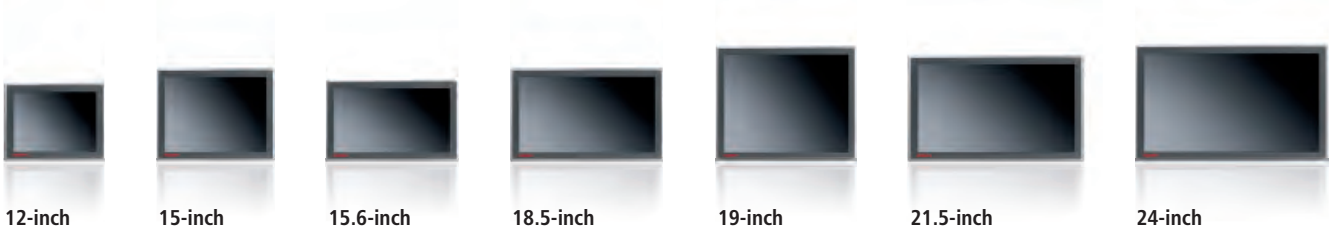
With the CP37xx series, a Panel PC with multi-touch can be used directly in the field. The devices in a slender aluminium housing feature complete IP 65 protection and are designed for mounting arm installation. The Panel PCs offer high computing power with Intel® Atom™ processors with up to four cores.

A choice of seven different multi-touch TFT displays in sizes between 12-inch and 24-inch in 4:3, 5:4 or widescreen formats are available. Cooling is achieved by means of cooling fins on the outer wall as well as fans inside the closed housing. The operating temperature range is 0 to 45 °C.

The Panel PC features an integrated rotatable and tiltable mounting arm adapter for a 48 mm diameter mounting arm tube. There is a choice of attaching the mounting arm from above or below. The connecting cables are laid through the mounting arm. The Industrial PC connections (up to four)

We reserve the right to make technical changes.

Display sizes



12-inch | 15-inch | 15.6-inch | 18.5-inch | 19-inch | 21.5-inch | 24-inch

with IP 65 connectors are positioned in the large wiring space and are easily accessible. The wiring area can be opened easily without dismounting the device from the mounting arm, offering fast access to the IP 65 connectors for power supply, Ethernet and optional USB or RS232. Prefabricated cables in various lengths are available for all connections. The C37xx series Panel PCs are supplied with a 24 V power supply unit, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail in the control cabinet.

The CP37xx Panel PCs are equipped with one or two CFast cards. The data media and the lithium battery of the system clock are accessible from the rear under the cover.

CP37xx

CP37xx | Multi-touch Panel PC

Intel® Atom™ with up to four cores

CP3712 CP3715 CP3716 CP3718 CP3719 CP3721 CP3724

Ordering information	Multi-finger touch screen
12-inch display 800 x 600	CP3712
15-inch display 1024 x 768	CP3715
15.6-inch display 1366 x 768	CP3716
18.5-inch display 1366 x 768	CP3718
19-inch display 1280 x 1024	CP3719
21.5-inch display 1920 x 1080	CP3721
24-inch display 1920 x 1080	CP3724

We reserve the right to make technical changes.

CP37xx

CP37xx	CP37xx-0010
Housing	Industrial PC with Control Panel for mounting arm installation
	rotatable and tiltable mounting arm adapter for Rittal and Rolec mounting arm systems with 48 mm tube from top
	wiring area for up to 4 IP 65 connectors
	2 slots for CFast cards
	CFast cards and lithium battery of the system clock, changeable from outside
	passive cooling through heat sink; internal fan for equal heat distribution to all the walls of the housing
	20 cm free space required around the PC for air circulation
	protection class IP 65
	operating temperature 0…45 °C

Features	CP37xx-0010
Display	12-, 15-, 15.6-, 18.5-, 19-, 21.5- or 24-inch display
Processor	Intel® Atom™
Motherboard	3½-inch
Slots	optionally 1 PCIe module
Memory	2…8 GB DDR3L RAM
Graphic adapter	integrated in the processor
Ethernet	2 on-board, one of these is led out in the wiring area
Hard disks/flash	1 or 2 x CFast
Power supply	24 V DC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

CP62xx | "Economy" built-in Panel PC

The CP62xx built-in Panel PC-series is designed for installation in the front of a control cabinet. The CP62xx series combines the Beckhoff Control Panel design with state-of-the-art Industrial PC technology. The right display size and keyboard are available for every application. With their highly integrated 3½-inch motherboards, the CP62xx built-in Industrial PCs represent a high-performance platform for machine construction and plant engineering applications that can be used in conjunction with TwinCAT automation software under Windows 7 Professional, Windows 7 Ultimate, Windows Embedded Standard 7 or Windows 10 IoT Enterprise.

The CP62xx Panel PCs are available with a choice of Intel® processors. The CP62xx Panel PCs can be equipped with a CFast card and a 2½-inch hard disk or SSD. Units containing the more powerful Intel® Core™ i3/i5/i7 processors feature a fan cartridge with speed-controlled fans supported by dual ball bearings. In front of the fan cartridge a 2 cm space is required for ventilation. In each configuration the Panel PCs of this series are approved for ambient temperatures between 0 and 55 °C.

We reserve the right to make technical changes.

Front laminates

Without keys

Function keys

Numeric keyboard

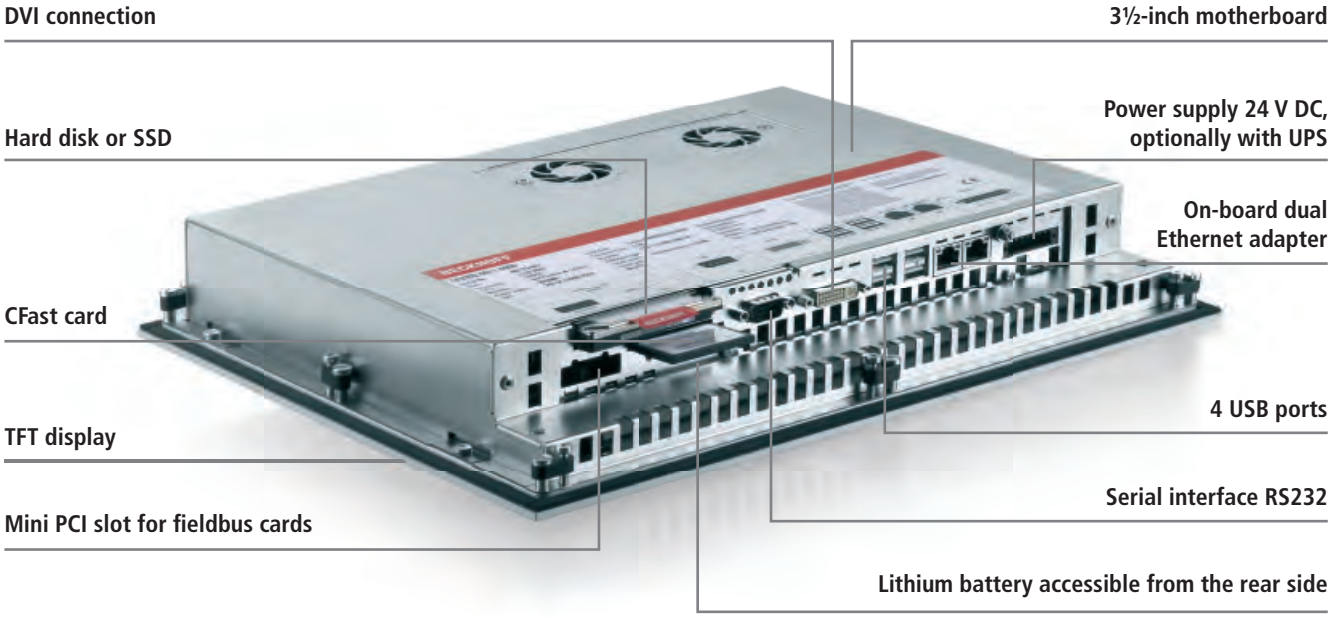
Alphanumeric keyboard

With PLC keys on the sides

The CP62xx are supplied with a 24 V power supply unit, optionally also with an integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail close to the PC.

Due to its two independent Ethernet interfaces the CP62xx is ideally suited as a compact central processing unit for an EtherCAT control system. A free Mini PCI slot enables different fieldbus cards or a third, independent Ethernet interface to be used. NOVRAM for fail-safe data storage can also be plugged into the Mini PCI slot.

The CP62xx can optionally be extended with PCIe module or plug-in card slots.



Optionally 2 PCI or PCIe plug-in card slots, optionally 2 PCIe module slots

CP62xx

CP62xx | “Economy” built-in Panel PC

The slimline built-in Industrial PC with 3½-inch motherboard

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
12-inch display 800 x 600	CP6201-0000-00xx	CP6201-0001-00xx	
15-inch display 1024 x 768	CP6202-0000-00xx	CP6202-0001-00xx	
19-inch display 1280 x 1024	CP6203-0000-00xx	CP6203-0001-00xx	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP6201-0020-00xx	CP6201-0021-00xx	
15-inch display 1024 x 768	CP6202-0020-00xx	CP6202-0021-00xx	
19-inch display 1280 x 1024	CP6203-0020-00xx	CP6203-0021-00xx	
With function keys			
12-inch display 800 x 600	CP6211-0000-00xx	CP6211-0001-00xx	
15-inch display 1024 x 768	CP6212-0000-00xx	CP6212-0001-00xx	
19-inch display 1280 x 1024	CP6213-0000-00xx	CP6213-0001-00xx	
Numeric keyboard			
12-inch display 800 x 600	CP6221-0000-00xx	CP6221-0001-00xx	CP6221-0002-00xx
15-inch display 1024 x 768	CP6222-0000-00xx	CP6222-0001-00xx	CP6222-0002-00xx
19-inch display 1280 x 1024	CP6223-0000-00xx	CP6223-0001-00xx	CP6223-0002-00xx
Alphanumeric keyboard			
12-inch display 800 x 600	CP6231-0000-00xx	CP6231-0001-00xx	CP6231-0002-00xx
15-inch display 1024 x 768	CP6232-0000-00xx	CP6232-0001-00xx	CP6232-0002-00xx
19-inch display 1280 x 1024	CP6233-0000-00xx	CP6233-0001-00xx	CP6233-0002-00xx
Alphanumeric keyboard with PLC keys on the sides			
15-inch display 1024 x 768	CP6242-0000-00xx	CP6242-0001-00xx	

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

Alphanumeric keyboard with PLC keys on the sides

CP62xx	CP62xx-xxxx-0050, -0060
Housing	aluminium front with steel sheet rear cover
	drives easily accessible
	all connectors at the bottom of the rear side
	1 slot for 2½-inch hard disk and 1 slot for a CFast card accessible from the rear side
	fan cartridge at the rear side, accessible from outside
	lithium battery of the system clock accessible from the rear side
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C

Features	CP62xx-xxxx-0050	CP62xx-xxxx-0060
Display	12-, 15- or 19-inch TFT display	12-, 15- or 19-inch TFT display
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI, optionally 2 PCIe modules or 2 plug-in card slots	1 Mini PCI, optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots
Free slots	1 Mini PCI and optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots	1 Mini PCI and optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots
Max. card length	Mini PCI, optionally 2 PCIe modules or 2 x 190 mm plug-in cards	Mini PCI, optionally 2 PCIe modules or 2 x 190 mm plug-in cards
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast	2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast
RAID 1	2 x CFast	2 x CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

CP62xx

CP62xx with PCIe module slots C9900-B500

Extension for PCIe modules

The Panel PCs CP62xx can be expanded by two additional PCIe module slots. The rear cover is constructed 30 mm deeper for PCIe modules (see above). The module slots can accept Beckhoff PCIe modules, for example, the FC9062 dual gigabit Ethernet module, or they can serve to lead out motherboard interfaces, such as COM ports, USB or sound.

PCIe module FC9062, dual gigabit Ethernet

Ordering information	Options for CP62xx-xxxx-0050, -0060
C9900-B500	2 PCIe module slots integrated inside CP62xx, to plug-in Beckhoff PCIe modules or to lead out interfaces of the motherboard ex factory. The depth of the back cover is increased by 30 mm (1.2″).

Ordering information	Options for CP62xx with 2 module slots C9900-B500
FC9062	gigabit Ethernet PCIe module for PCs with Beckhoff PCIe module slots, 2-channel, PCI Express x1 bus
C9900-E232	sound line input and sound line output of the motherboard led out at the connection section of a CP62xx
C9900-E233	1 serial port RS232 of the motherboard led out at the connection section of a CP62xx
C9900-E234	2 USB ports of the motherboard led out at the connection section of a CP62xx

We reserve the right to make technical changes.

CP62xx with plug-in card slots
C9900-B504, -B508 or -B512

Extension for PCI and PCIe plug-in cards

The Panel PCs CP62xx can be expanded by two slots for standard PC plug-in cards. They can accept conventional PC plug-in cards up to 190 mm in length. The 66 mm deeper hood at the rear (see above) covers a back-plane that provides a choice of two PCI slots, two PCI Express slots or one PCI and one PCI Express slot. Card holders ensure the secure fixation of large cards.

Ordering information	Options for CP62xx-xxxx-0050, -0060
C9900-B504	2 PCIe plug-in card slots on the passive backplane integrated inside CP62xx, to plug-in PCIe x1 cards up to 190 mm length. The depth of the back cover is increased by 66 mm (2.6").
C9900-B508	2 PCI plug-in card slots on the passive backplane integrated inside CP62xx, to plug-in PCI cards up to 190 mm length. The depth of the back cover is increased by 66 mm (2.6").
C9900-B512	1 PCI and 1 PCIe plug-in card slot on a passive backplane integrated inside CP62xx, to plug-in one PCI and one PCIe x1 card up to 190 mm (6.3") length. The depth of the back cover is increased by 66 mm (2.6").

CP65xx | Built-in Panel PC

The Panel PC series CP65xx is designed for installation in the front of a control cabinet. A built-in Control Panel with DVI and USB interface is the front of the Panel PC. The correct display size and keyboard are thus available for every application. The CP65xx built-in Industrial PCs represent a powerful platform for machine construction and plant engineering applications, for example with the TwinCAT automation software under Windows 7 Professional, Windows 7 Ultimate or Windows Embedded Standard 7.

The 7-slot ATX Panel PCs CP65xx can be equipped with 12-, 15- or 19-inch TFT display, as a monitor without keys or with different types of keyboards. A touch screen or touch pad is optionally available. A large number of push-button extensions are also available.

We reserve the right to make technical changes.

Front laminates

Without keys

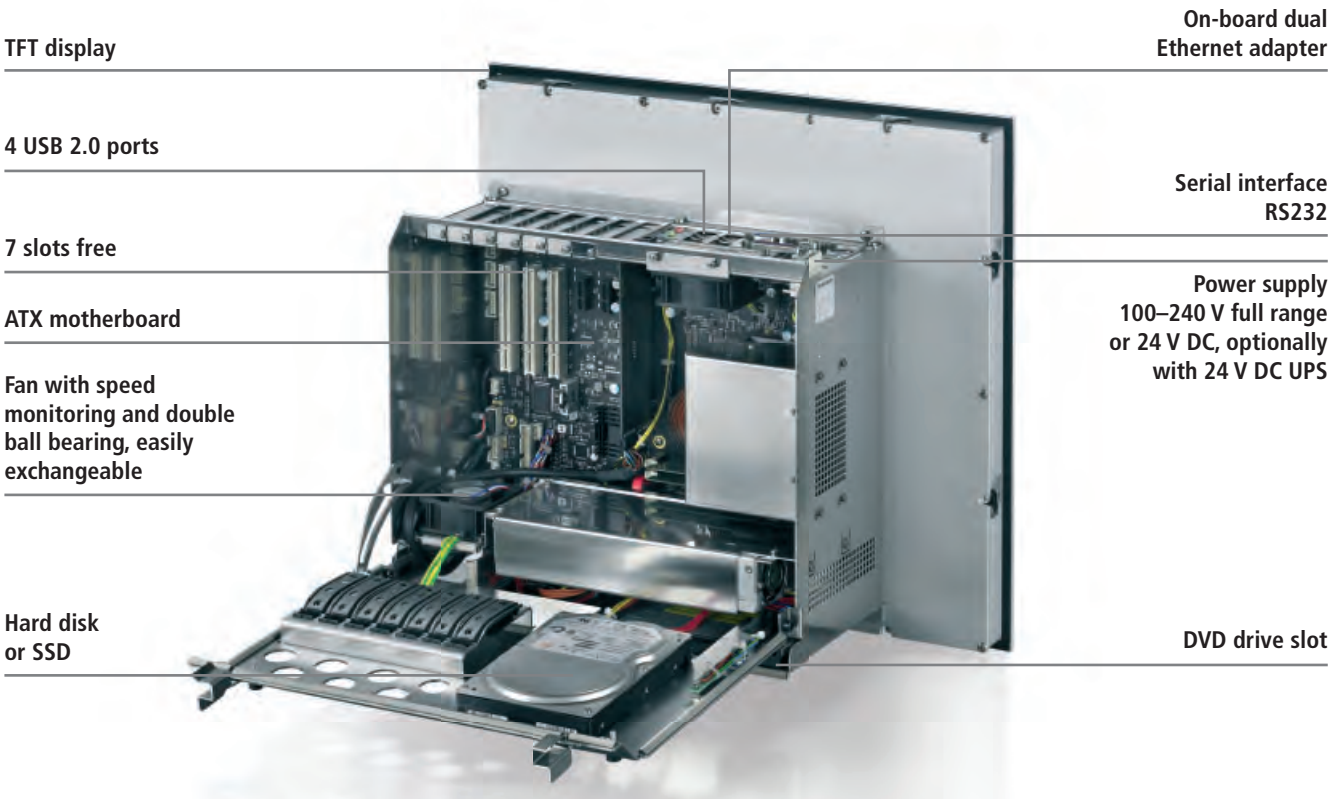
Function keys

Numeric keyboard

Alphanumeric keyboard

With PLC keys on the sides

The CP65xx are equipped with Intel® Celeron®, Pentium® or Core™ i3/i5/i7 processors on an ATX motherboard and have PCI and PCI Express slots. A CD/DVD-ROM or multi DVD drive can be installed. A 100 to 240 AC full range power supply or a 24 V DC power supply is used in the PC. The Control Panel is connected to the PC via DVI and USB. The PC deals with the power supply for the Control Panel. The cables are installed in the PC housing.



CP65xx

CP65xx | Built-in Panel PC

The universal built-in Industrial PC with ATX motherboard

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
12-inch display 800 x 600	CP6501-0000-00xx	CP6501-0001-00xx	
15-inch display 1024 x 768	CP6502-0000-00xx	CP6502-0001-00xx	
19-inch display 1280 x 1024	CP6503-0000-00xx	CP6503-0001-00xx	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP6501-0020-00xx	CP6501-0021-00xx	
15-inch display 1024 x 768	CP6502-0020-00xx	CP6502-0021-00xx	
19-inch display 1280 x 1024	CP6503-0020-00xx	CP6503-0021-00xx	
With function keys			
12-inch display 800 x 600	CP6511-0000-00xx	CP6511-0001-00xx	
15-inch display 1024 x 768	CP6512-0000-00xx	CP6512-0001-00xx	
19-inch display 1280 x 1024	CP6513-0000-00xx	CP6513-0001-00xx	
Numeric keyboard			
12-inch display 800 x 600	CP6521-0000-00xx	CP6521-0001-00xx	CP6521-0002-00xx
15-inch display 1024 x 768	CP6522-0000-00xx	CP6522-0001-00xx	CP6522-0002-00xx
19-inch display 1280 x 1024	CP6523-0000-00xx	CP6523-0001-00xx	CP6523-0002-00xx
Alphanumeric keyboard			
12-inch display 800 x 600	CP6531-0000-00xx	CP6531-0001-00xx	CP6531-0002-00xx
15-inch display 1024 x 768	CP6532-0000-00xx	CP6532-0001-00xx	CP6532-0002-00xx
19-inch display 1280 x 1024	CP6533-0000-00xx	CP6533-0001-00xx	CP6533-0002-00xx
Alphanumeric keyboard with PLC keys on the sides			
15-inch display 1024 x 768	CP6542-0000-00xx	CP6542-0001-00xx	

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

Alphanumeric keyboard with PLC keys on the sides

CP65xx	CP65xx-xxxx-0070, -0080, -0090
Housing	7-slot ATX housing
	all slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the housing
	card holders, actuated without tools
	status LEDs and protected reset key
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C

Features	CP65xx-xxxx-0070	CP65xx-xxxx-0080	CP65xx-xxxx-0090
Display	12-, 15- or 19-inch TFT display	12-, 15- or 19-inch TFT display	12-, 15- or 19-inch TFT display
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x 190 mm	7 x 190 mm	7 x 190 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1 x 3½-inch HDD or 2½-inch SSD	1 x 3½-inch HDD or 2½-inch SSD	1 x 3½-inch HDD or 2½-inch SSD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

CP66xx | Built-in Panel PC

The built-in Panel PCs of the CP66xx series have a wide range of uses including remote desktop display or CP-Link 3 client. They are available in five display sizes: 5.7, 6.5, 12, 15 or 19 inches.

CP66xx Panel PCs are equipped with an ARM Cortex™-A8 processor. They are equipped with a microSD card and have no rotating parts.

CP66xx are supplied with a 24 V power supply unit, optionally also with a capacitive uninterruptible power supply (second UPS).

We reserve the right to make technical changes.

Front laminates

Without keys

Function keys

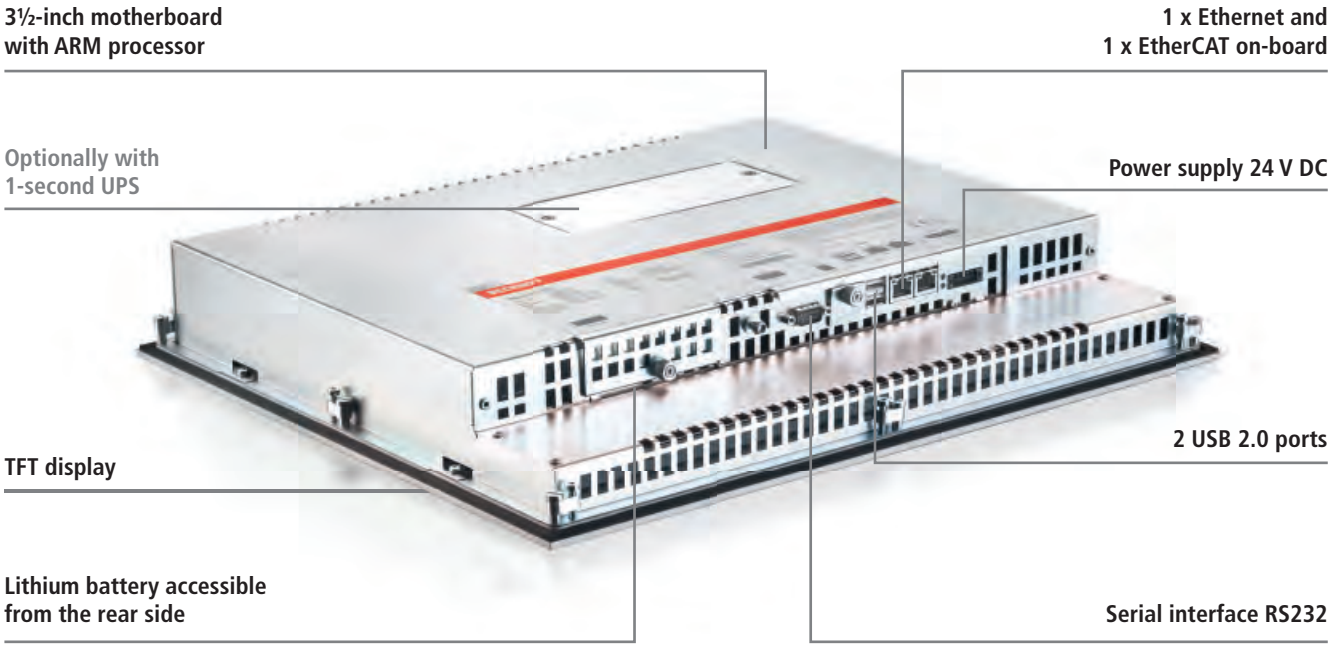
Numeric keyboard

Alphanumeric keyboard

The microSD card and the lithium battery of the system clock are accessible from the rear in the connector bracket.

These devices are ideally suited as small controllers for machine construction and plant engineering applications in conjunction with TwinCAT automation software under Windows Embedded Compact 7.

Due to its independent Ethernet and EtherCAT interfaces the CP66xx is ideally suited as a compact central processing unit for an EtherCAT control system. NOVRAM for fail-safe data storage is integrated on the motherboard.



CP66xx

CP66xx | Panel PC with ARM Cortex™-A8

The “Economy” built-in Panel PC

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
5.7-inch display 640 x 480	CP6607-0000-0020	CP6607-0001-0020	
6.5-inch display 640 x 480	CP6609-0000-0020	CP6609-0001-0020	
12-inch display 800 x 600	CP6601-0000-0020	CP6601-0001-0020	
15-inch display 1024 x 768	CP6602-0000-0020	CP6602-0001-0020	
19-inch display 1280 x 1024	CP6603-0000-0020	CP6603-0001-0020	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP6601-0020-0020	CP6601-0021-0020	
15-inch display 1024 x 768	CP6602-0020-0020	CP6602-0021-0020	
19-inch display 1280 x 1024	CP6603-0020-0020	CP6603-0021-0020	
With function keys			
6.5-inch display 640 x 480	CP6619-0000-0020	CP6619-0001-0020	
12-inch display 800 x 600	CP6611-0000-0020	CP6611-0001-0020	
15-inch display 1024 x 768	CP6612-0000-0020	CP6612-0001-0020	
19-inch display 1280 x 1024	CP6613-0000-0020	CP6613-0001-0020	
Numeric keyboard			
6.5-inch display 640 x 480	CP6629-0000-0020	CP6629-0001-0020	
12-inch display 800 x 600	CP6621-0000-0020	CP6621-0001-0020	CP6621-0002-0020
15-inch display 1024 x 768	CP6622-0000-0020	CP6622-0001-0020	CP6622-0002-0020
19-inch display 1280 x 1024	CP6623-0000-0020	CP6623-0001-0020	CP6623-0002-0020
Alphanumeric keyboard			
12-inch display 800 x 600	CP6631-0000-0020	CP6631-0001-0020	CP6631-0002-0020
15-inch display 1024 x 768	CP6632-0000-0020	CP6632-0001-0020	CP6632-0002-0020
19-inch display 1280 x 1024	CP6633-0000-0020	CP6633-0001-0020	CP6633-0002-0020

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

CP66xx	CP66xx-xxxx-0020
Housing	aluminium front with steel sheet rear cover
	all connectors at the bottom of the rear side
	1 slot for microSD flash card, accessible from the rear side
	lithium battery of the system clock, accessible from the rear side
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C

Features	CP66xx-xxxx-0020
Display	5.7-, 6.5-, 12-, 15- or 19-inch TFT display
Processor	ARM Cortex™-A8, 1 GHz
Motherboard	3½-inch
Slots	–
Free slots	–
Max. card length	–
Memory	1 GB DDR3 RAM
Graphic adapter	integrated in the processor
Ethernet	1 x Ethernet and 1 x EtherCAT on-board
Hard disks/flash	microSD flash card
Power supply	24 V DC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

CP6606 | 7-inch "Economy" built-in Panel PC

With its highly integrated 3½-inch motherboard, the CP6606 built-in Panel PC is ideally suited for use in machine construction and plant engineering, for example with the TwinCAT automation software under Windows Embedded Compact 7 or as a CP-Link 3 client or Ethernet Control Panel.

The CP6606 is conceived for installation in the front of a control cabinet and has a 7-inch touch screen display. Equipped with a fanless ARM Cortex™-A8 processor and a MicroSD card the CP6606 contains no rotary components.

The CP6606 is supplied with a 24 V power supply unit. The microSD card and the lithium battery of the system clock are accessible from the rear in the connector bracket.

We reserve the right to make technical changes.

CP6606 | Panel PC with ARM Cortex™-A8

Ordering information	with single-touch screen
7-inch display 800 x 480	CP6606-0001-0020

CP6606	CP6606-0001-0020
Housing	aluminium front with steel sheet rear cover
	all connectors at the bottom of the rear side
	1 slot for microSD flash card, accessible from the rear side
	lithium battery of the system clock, accessible from the rear side
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 54, rear side IP 20
	operating temperature 0…55 °C

Features	CP6606-0001-0020
Display	7-inch TFT display
Processor	ARM Cortex™-A8, 1 GHz
Motherboard	3½-inch
Slots	–
Free slots	–
Max. card length	–
Memory	1 GB DDR3 RAM
Graphic adapter	integrated in the processor
Ethernet	1 x Ethernet and 1 x EtherCAT on-board
Hard disks/flash	microSD flash card
Power supply	24 V DC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

CP67xx | “Economy” built-in Panel PC

The CP67xx built-in Panel PC series is designed for installation in the front of a control cabinet or control housing. The CP67xx series combines the Beckhoff Control Panel design with state-of-the-art Industrial PC technology. The right display size and keyboard are available for every application.

With their highly integrated 3½-inch motherboard the CP67xx built-in Industrial PCs represent a high-performance platform for machine construction and plant engineering applications running the TwinCAT automati-on software under Windows 7 Professional, Windows 7 Ultimate, Windows Embedded Standard 7 or Windows 10 IoT Enterprise, with Intel® Atom™ also under Windows Embedded Compact 7. The PC can be equipped with a 5.7-, 12-, 15- or 19-inch LC display, or as a monitor without keys or with different types of keyboard. Optionally, a touch screen or touch pad is available. In

We reserve the right to make technical changes.

Front laminates

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

With PLC keys on the sides

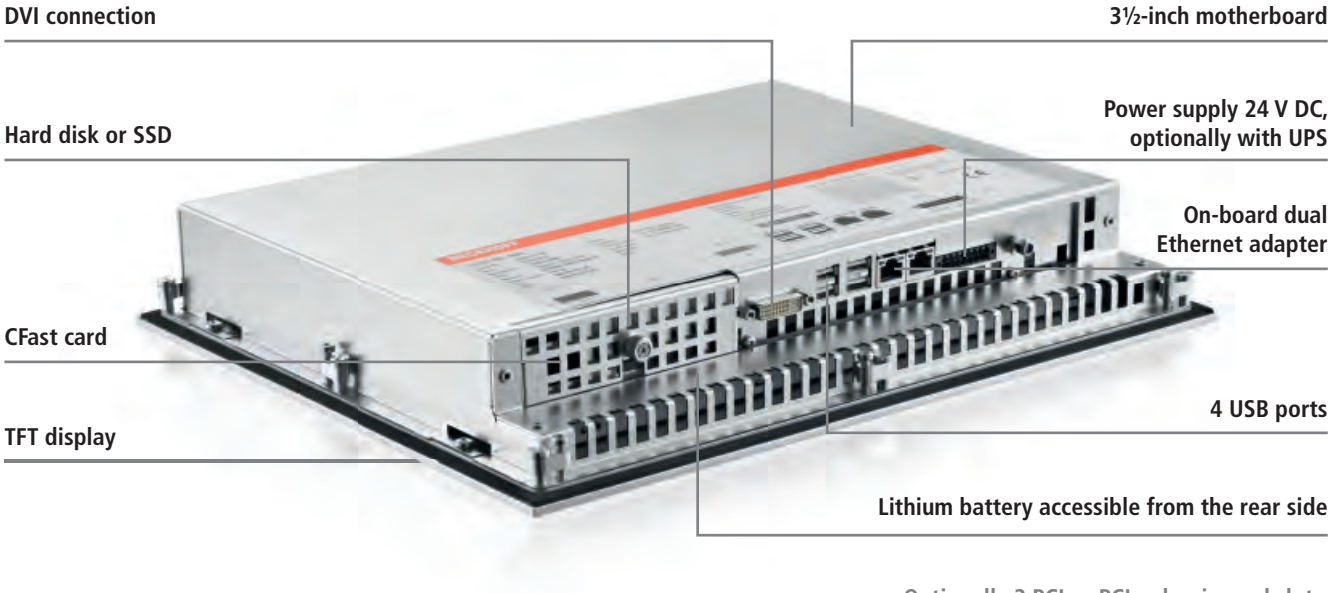
addition, a large number of push-button extensions are available.

A CP67xx Panel PC is equipped with an Intel® Celeron® ULV 1.4 GHz or with Intel® Atom™ with up to four cores and a CFast card. It contains no rotating parts. In each configuration the fanless Panel PCs of this series are approved for ambient temperatures between 0 and 55 °C.

The CP67xx Panel PCs are supplied with a CFast card and a 2½-inch hard disk or SSD. The CP67xx have a 24 V power supply unit. The data media and the lithium battery for the system clock are accessible from the rear.

Due to its two independent Ethernet interfaces, the CP67xx is ideally suited as a compact central processing unit for an EtherCAT control system.

The CP67xx can be optionally extended with PCIe module or plug-in card slots (see from page 68).



Optionally 2 PCI or PCIe plug-in card slots, optionally 2 PCIe module slots

CP67xx

CP67xx | “Economy” built-in Panel PC

The slimline built-in Industrial PC with 3½-inch motherboard

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
5.7-inch display 640 x 480	CP6707-0000-0050	CP6707-0001-0050	
12-inch display 800 x 600	CP6701-0000-00xx	CP6701-0001-00xx	
15-inch display 1024 x 768	CP6702-0000-00xx	CP6702-0001-00xx	
19-inch display 1280 x 1024	CP6703-0000-00xx	CP6703-0001-00xx	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP6701-0020-00xx	CP6701-0021-00xx	
15-inch display 1024 x 768	CP6702-0020-00xx	CP6702-0021-00xx	
19-inch display 1280 x 1024	CP6703-0020-00xx	CP6703-0021-00xx	
With function keys			
12-inch display 800 x 600	CP6711-0000-00xx	CP6711-0001-00xx	
15-inch display 1024 x 768	CP6712-0000-00xx	CP6712-0001-00xx	
19-inch display 1280 x 1024	CP6713-0000-00xx	CP6713-0001-00xx	
Numeric keyboard			
12-inch display 800 x 600	CP6721-0000-00xx	CP6721-0001-00xx	CP6721-0002-00xx
15-inch display 1024 x 768	CP6722-0000-00xx	CP6722-0001-00xx	CP6722-0002-00xx
19-inch display 1280 x 1024	CP6723-0000-00xx	CP6723-0001-00xx	CP6723-0002-00xx
Alphanumeric keyboard			
12-inch display 800 x 600	CP6731-0000-00xx	CP6731-0001-00xx	CP6731-0002-00xx
15-inch display 1024 x 768	CP6732-0000-00xx	CP6732-0001-00xx	CP6732-0002-00xx
19-inch display 1280 x 1024	CP6733-0000-00xx	CP6733-0001-00xx	CP6733-0002-00xx
Alphanumeric keyboard with PLC keys on the sides			
15-inch display 1024 x 768	CP6742-0000-00xx	CP6742-0001-00xx	

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

Alphanumeric keyboard with PLC keys on the sides

CP67xx	CP67xx-xxxx-0040, -0050
Housing	aluminium front with steel sheet rear cover
	drives easily accessible
	all connectors at the bottom of the rear side
	1 slot for one CFast card accessible from the rear side
	lithium battery of the system clock accessible from the rear side
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C

Features	CP67xx-xxxx-0040	CP67xx-xxxx-0050
Display	12-, 15- or 19-inch TFT display	5.7-, 12-, 15- or 19-inch TFT display
Processor	Intel® Celeron® ULV	Intel® Atom™
Motherboard	3½-inch	3½-inch
Slots	optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots	optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots
Free slots	optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots	optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots
Max. card length	optionally 2 PCIe modules or 2 x 190 mm plug-in cards	optionally 2 PCIe modules or 2 x 190 mm plug-in cards
Memory	2…8 GB DDR3 RAM	2…8 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	1 or 2 x 2½-inch HDD, SSD or CFast	1 or 2 x 2½-inch HDD, SSD or CFast
RAID 1	2 x 2½-inch HDD, SSD or CFast	–
Power supply	24 V DC	24 V DC
Recommendation	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

CP6706 | 7-inch “Economy” Panel PC

With its highly integrated 3½-inch motherboard, the CP6706 built-in Panel PC is ideally suited for use in machine construction and plant engineering, for example with the TwinCAT automation software under Windows Embedded Compact 7, Windows Embedded Standard 7, Windows 7 Professional, Windows 7 Ultimate or Windows 10 IoT Enterprise. The CP6706 is conceived for installation in the front of a control cabinet and has a 7-inch touch screen display. Equipped with an Intel® Atom™ with up to four cores and a CFast card the CP6706 contains no rotary components. The CP6706 is supplied with a 24 V power supply unit. The CFast card and the lithium battery of the system clock are accessible from the rear in the connector bracket.

We reserve the right to make technical changes.

CP6706 | 7-inch “Economy” Panel PC

Intel® Atom™ with up to four cores

Ordering information		with single-touch screen
7-inch display	800 x 480	CP6706-0001-0050

CP6706	CP6706-0001-0050
Housing	aluminium front with steel sheet rear cover
	all connectors at the bottom of the rear side
	1 slot for one CFast card accessible from the rear side
	lithium battery of the system clock, accessible from the rear side
	pull-out clamping levers for fast installation without loose parts
	protection class front side IP 54, rear side IP 20
	operating temperature 0…55 °C

Features	CP6706-0001-0050
Display	7-inch TFT display
Processor	Intel® Atom™
Motherboard	3½-inch
Slots	–
Free slots	–
Max. card length	–
Memory	2…8 GB DDR3L RAM
Graphic adapter	integrated in the processor
Ethernet	2 on-board
Hard disks/flash	CFast card
Power supply	24 V DC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

CP72xx | "Economy" Panel PC with mounting arm

The CP72xx "Economy" Panel PC series is designed for mounting arm installation. Control Panels form the front of the IP 65 Panel PC. The right display size and keyboard are thus available for every application. The CP72xx Industrial PCs represent a powerful platform for use in machine and plant construction, for example using the TwinCAT automation software under Windows 7 Professional, Windows 7 Ultimate, Windows Embedded Standard 7 or Windows 10 IoT Enterprise.

The PC can be equipped with a 12-, 15- or 19-inch LC display as a monitor without keys or with different types of keyboards. Optionally, a touch screen or touch pad is available. In addition, a large number of push-button extensions are available.

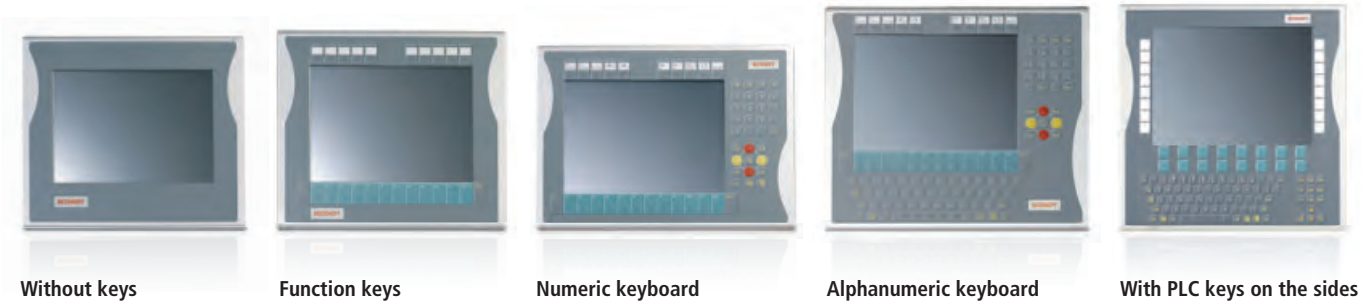
Cooling is achieved via cooling ribs between the Control Panel and the add-on PC. A fan inside the closed housing ensures that the heat is distributed evenly. The PC can be operated at up to 45 °C ambient temperature.

The housing is designed for installation on a mounting arm. There is a choice of attaching the mounting arm from above or below. The Panel PC features an integrated rotatable mounting arm adapter for a 48 mm diameter mounting arm tube. Optionally, a rotatable and tiltable mounting arm adapter can be integrated in the Panel PC. The connecting cables are laid through the mounting arm.

The compact aluminium housing of the CP72xx Panel PCs is equipped with a 3½-inch

We reserve the right to make technical changes.

Front laminates



Without keys | Function keys | Numeric keyboard | Alphanumeric keyboard | With PLC keys on the sides

Beckhoff Motherboard for Intel® Core™ i3/i5/i7 processors of the latest generation.

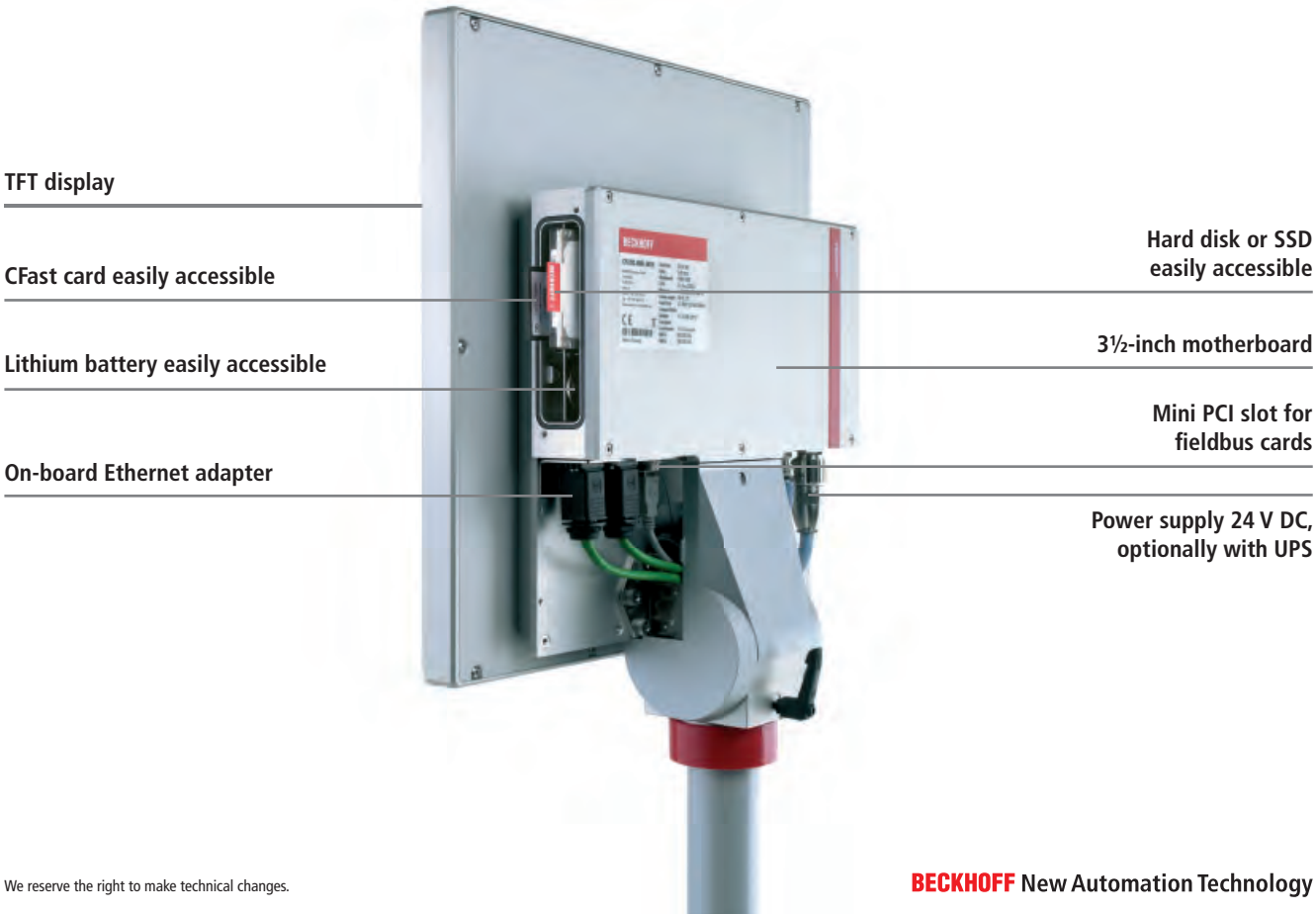
The Industrial PC connections (up to six) with IP 65 connectors are positioned in the large wiring space and are easily accessible. The wiring area can be opened easily without dismounting the device from the mounting arm, offering fast access to the IP 65 connectors for power supply, Ethernet and optional fieldbus, USB or RS232. Prefabricated cables in various lengths are available for all connections.

Due to its two independent Ethernet interfaces the CP72xx is ideally suited as a compact central processing unit for an EtherCAT control system.

The CP72xx series Panel PCs are supplied with a 24 V power supply unit, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected externally and installed on a DIN rail in the control cabinet.

One or two CFast cards or up to two hard disks or SSDs, as well as the lithium battery for the system clock, are accessible from the rear side underneath a cover. Two hard disks, two SSDs or two CFast cards can be mirrored using the on-board SATA RAID 1 controller.

There is a Mini PCI slot in the CP72xx. The Beckhoff Mini PCI Ethernet or fieldbus cards can be factory-fitted. NOVRAM up to 512 kB is also available in the form of an optional Mini PCI plug-in card for fail-safe data storage.



CP72xx

CP72xx | “Economy” Panel PC

The Industrial PC with mounting arm and 3½-inch motherboard

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
12-inch display 800 x 600	CP7201-0000-00xx	CP7201-0001-00xx	
15-inch display 1024 x 768	CP7202-0000-00xx	CP7202-0001-00xx	
19-inch display 1280 x 1024	CP7203-0000-00xx	CP7203-0001-00xx	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP7201-0020-00xx	CP7201-0021-00xx	
15-inch display 1024 x 768	CP7202-0020-00xx	CP7202-0021-00xx	
19-inch display 1280 x 1024	CP7203-0020-00xx	CP7203-0021-00xx	
With function keys			
12-inch display 800 x 600	CP7211-0000-00xx	CP7211-0001-00xx	
15-inch display 1024 x 768	CP7212-0000-00xx	CP7212-0001-00xx	
19-inch display 1280 x 1024	CP7213-0000-00xx	CP7213-0001-00xx	
Numeric keyboard			
12-inch display 800 x 600	CP7221-0000-00xx	CP7221-0001-00xx	CP7221-0002-00xx
15-inch display 1024 x 768	CP7222-0000-00xx	CP7222-0001-00xx	CP7222-0002-00xx
19-inch display 1280 x 1024	CP7223-0000-00xx	CP7223-0001-00xx	CP7223-0002-00xx
Alphanumeric keyboard			
12-inch display 800 x 600	CP7231-0000-00xx	CP7231-0001-00xx	CP7231-0002-00xx
15-inch display 1024 x 768	CP7232-0000-00xx	CP7232-0001-00xx	CP7232-0002-00xx
19-inch display 1280 x 1024	CP7233-0000-00xx	CP7233-0001-00xx	CP7233-0002-00xx
Alphanumeric keyboard with PLC keys on the sides			
15-inch display 1024 x 768	CP7242-0000-00xx	CP7242-0001-00xx	

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

Alphanumeric keyboard with PLC keys on the sides

CP72xx	CP72xx-xxxx-0040, -0050
Housing	Industrial PC with Control Panel for mounting arm installation
	rotatable mounting arm adapter for Rittal and Rolec mounting arm systems with 48 mm tube from top
	wiring area for up to 6 IP 65 connectors
	1 slot for one 2½-inch hard disk or SSD and 1 slot for one CFast card
	lithium battery of the system clock, changeable from outside
	passive cooling through heat sink structure between Control Panel and add-on PC, internal fan for equal heat distribution to all the walls of the housing
	20 cm free space required around the PC for air circulation
	protection class IP 65
	operating temperature 0…45 °C

Features	CP72xx-xxxx-0040	CP72xx-xxxx-0050
Display	12-, 15- or 19-inch TFT display	12-, 15- or 19-inch TFT display
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI slot	1 Mini PCI slot
Free slots	1 Mini PCI slot	1 Mini PCI slot
Max. card length	Mini PCI	Mini PCI
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board, one of these is led out in the wiring area	2 on-board, one of these is led out in the wiring area
Hard disks/flash	1 or 2 x 2½-inch HDD or SSD, 1 x 2½-inch HDD or SSD and 1 x CFast or 2 x CFast	1 or 2 x 2½-inch HDD or SSD, 1 x 2½-inch HDD or SSD and 1 x CFast or 2 x CFast
RAID 1	2 x 2½-inch HDD or 2 x CFast	2 x 2½-inch HDD or 2 x CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

CP77xx | “Economy” Panel PC

The CP77xx Panel PC series is designed for mounting arm installation. Control Panels form the front of the IP 65 Panel PC. The right display size and keyboard are thus available for every application. The CP77xx Industrial PCs represent a powerful platform for use in machine and plant construction, for example using the TwinCAT automation software.

The PC can be equipped with a 12-, 15- or 19-inch LC display, as a monitor without keys or with different types of keyboard. Optionally, a touch screen or touch pad is available. In addition, a large number of push-button extensions are available.

Cooling is achieved directly via the rear panel of the Control Panel. No fan is required. The PC can be operated at up to 45 °C ambient temperature.

The housing is optionally designed for direct wall mounting or for mounting arm installation. The mounting arm can be attached from above or below. If a mounting arm is used, the connection cables are fed through the mounting arm adapter attached

We reserve the right to make technical changes.

Front laminates

Without keys

Function keys

Numeric keyboard

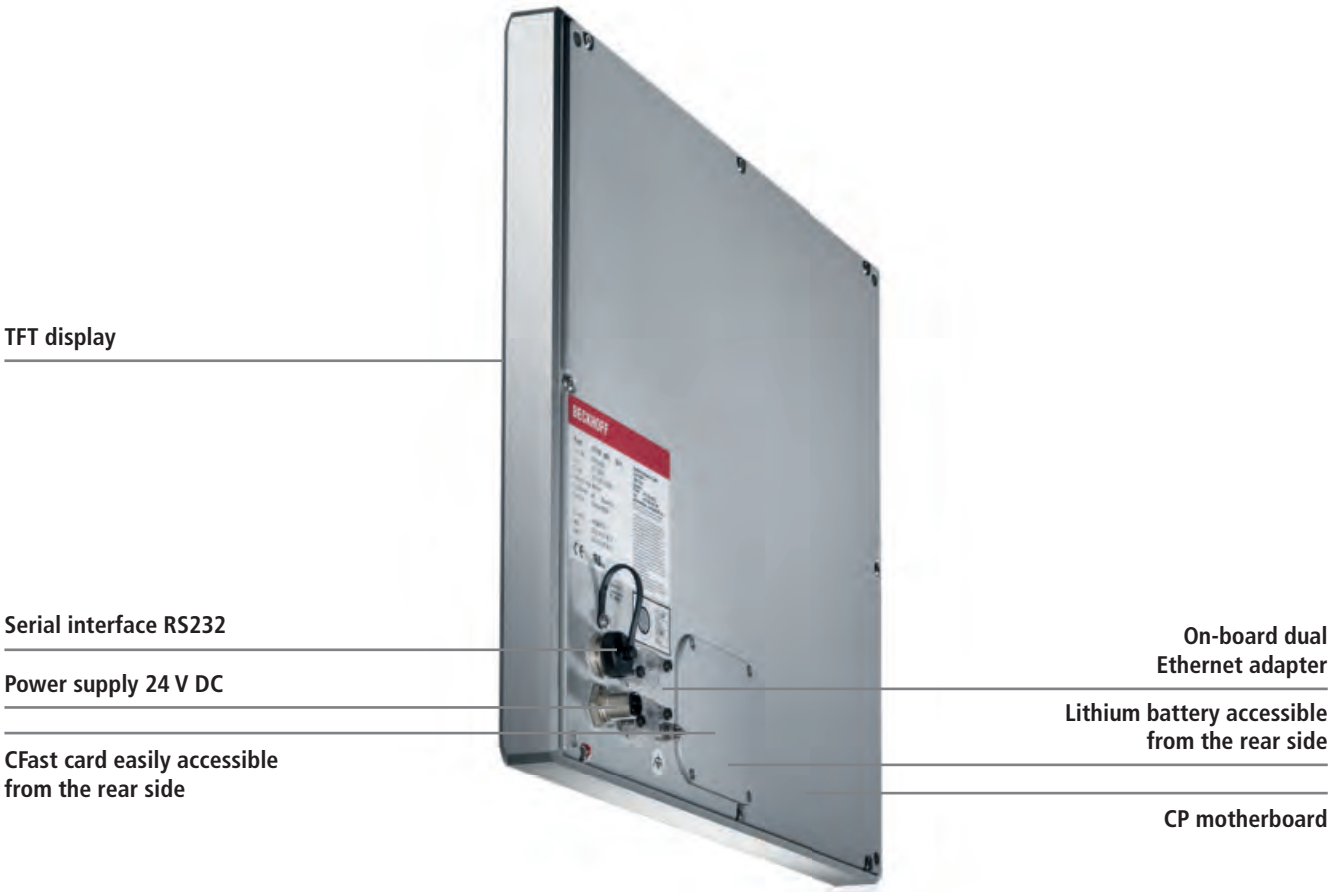
Alphanumeric keyboard

centrally at the rear. Prefabricated cables in various lengths are available for the Ethernet connections.

The compact aluminium housing of the Panel PCs CP77xx is equipped with a Beckhoff motherboard for Intel® Celeron® ULV.

Due to its two independent gigabit Ethernet interfaces, the CP77xx are ideally suited as a compact central processing unit for an EtherCAT control system.

The CP77xx series Panel PCs are supplied with a 24 V power supply unit. The CFast card and the lithium battery for the system clock are located under a cover and accessible from the rear.



CP77xx

CP77xx | “Economy” Panel PC

The compact Industrial PC with mounting arm

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
12-inch display 800 x 600	CP7701-0000-0040	CP7701-0001-0040	
15-inch display 1024 x 768	CP7702-0000-0040	CP7702-0001-0040	
19-inch display 1280 x 1024	CP7703-0000-0040	CP7703-0001-0040	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP7701-0020-0040	CP7701-0021-0040	
15-inch display 1024 x 768	CP7702-0020-0040	CP7702-0021-0040	
19-inch display 1280 x 1024	CP7703-0020-0040	CP7703-0021-0040	
With function keys			
12-inch display 800 x 600	CP7711-0000-0040	CP7711-0001-0040	
15-inch display 1024 x 768	CP7712-0000-0040	CP7712-0001-0040	
19-inch display 1280 x 1024	CP7713-0000-0040	CP7713-0001-0040	
Numeric keyboard			
12-inch display 800 x 600	CP7721-0000-0040	CP7721-0001-0040	CP7721-0002-0040
15-inch display 1024 x 768	CP7722-0000-0040	CP7722-0001-0040	CP7722-0002-0040
19-inch display 1280 x 1024	CP7723-0000-0040	CP7723-0001-0040	CP7723-0002-0040
Alphanumeric keyboard			
12-inch display 800 x 600	CP7731-0000-0040	CP7731-0001-0040	CP7731-0002-0040
15-inch display 1024 x 768	CP7732-0000-0040	CP7732-0001-0040	CP7732-0002-0040
19-inch display 1280 x 1024	CP7733-0000-0040	CP7733-0001-0040	CP7733-0002-0040

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

CP77xx	CP77xx-xxxx-0040
Housing	TFT display in three sizes
	aluminium housing, protection class IP 65
	front laminate in four variants
	special keys identified by slide-in labels
	for mounting 4 M6 x 18 mm threaded holes in the backplane
	operating temperature 0…45 °C

Features	CP77xx-xxxx-0040
Display	12-, 15- or 19-inch TFT display
Processor	Intel® Celeron® ULV 1.4 GHz
Motherboard	CP format
Memory	2 GB DDR3 RAM
Graphic adapter	integrated in the processor
Ethernet	2 on-board
Hard disks/flash	CFast card
Power supply	24 V DC
Recommendation	available
Further information	for further options, technical drawings, documentations, etc.

C36xx | Panel PC series

The Panel PC series C36xx, fitted with Intel® Celeron®, Pentium® or Core™ i3/i5/i7 processors of the latest generation on an ATX motherboard, offers controllers of the highest performance class with 12- or 15-inch TFT display, as a display/computer unit optionally with touch screen. The housing is opened from the rear. All components can be reached quickly and easily.

A CD/DVD-ROM drive for commissioning and software updates or a multi DVD drive for data backup are optionally accessible from the rear side. The drives can be removed without tools once the housing has been opened. Card holders for the plug-in cards generate insensitivity to shocks and vibrations. The card holders can be fixed and removed without tools.

The type plate on the rear provides detailed information regarding the PC's configuration. Data on the function and type is

We reserve the right to make technical changes.

C3620

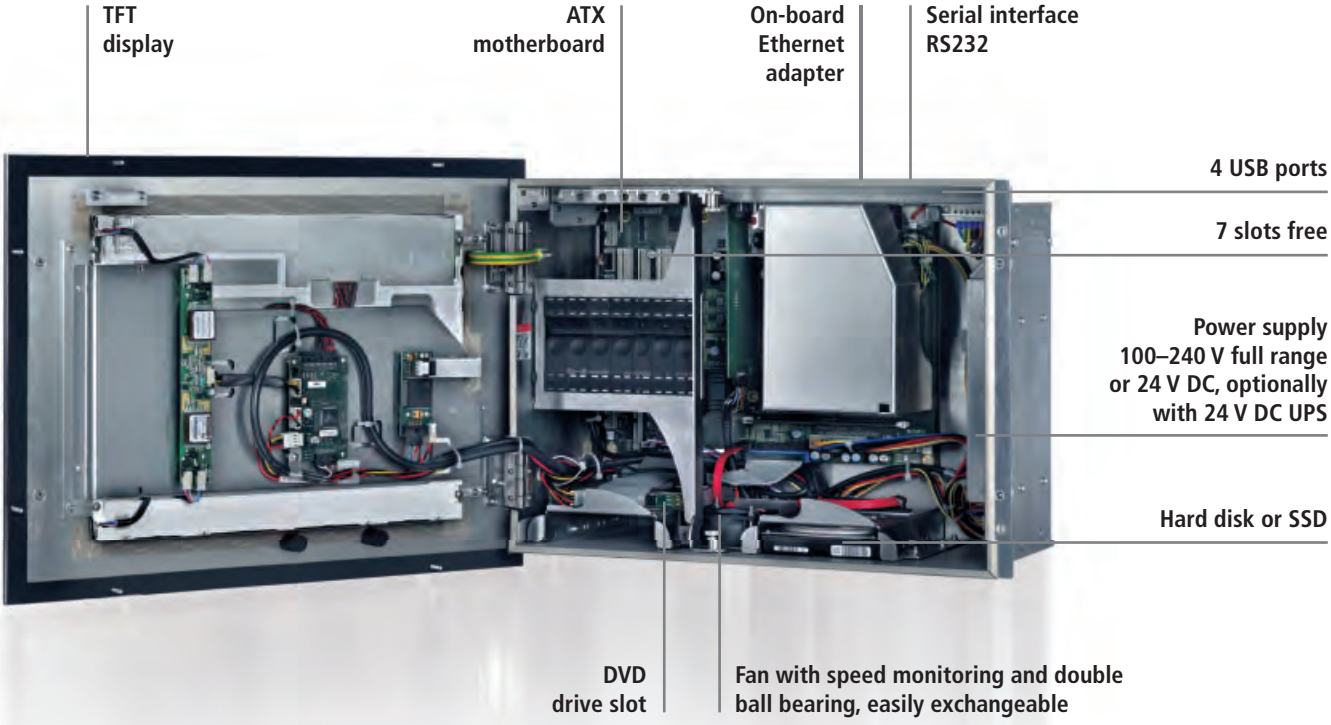
C3640

listed for the fitted plug-in cards. Data about drives indicates not just the manufacturer and type, but also provides information about type of connection and jumpers.

The construction of the housing of the C36xx series accords with the ATX standard, thus ensuring long-term compatibility with any PC components that will appear in the next few years.

Customer-specific design

For the Industrial PC series represented here, customer-specific designs are available that will be created according to individual requirements, for example with an individual logo on the front or a completely different design of the front laminate.



C3620

C3620 | **Panel PC**

C3620	C3620-0050, -0060, -0070
Housing	built-in housing, 388 x 324 mm
	7-slot processor core for ATX motherboard
	PC to be opened from the back side
	all components easily accessible
	7 slots for up to 220 mm long plug-in cards
	card holders, actuated without tools
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 11.5 kg (25.4 lbs)
	dimensions (W x H x D) 388 x 324 x 201 mm (15.3" x 12.8" x 7.9"), depth behind front 193 mm (7.6")

Features	C3620-0050	C3620-0060	C3620-0070
Display	12-inch TFT display, resolution 800 x 600	12-inch TFT display, resolution 800 x 600	12-inch TFT display, resolution 800 x 600
Touch screen	single-touch as an option	single-touch as an option	single-touch as an option
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x 220 mm	7 x 220 mm	7 x 220 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1 x 3½-inch HDD or 2½-inch SSD	1 x 3½-inch HDD or 2½-inch SSD	1 x 3½-inch HDD or 2½-inch SSD
RAID 1	–	–	–
Possible disk drives	slimline CD/DVD-ROM or multi-DVD	slimline CD/DVD-ROM or multi-DVD	slimline CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

We reserve the right to make technical changes.

C3640 | **Panel PC**

C3640	C3640-0050, -0060, -0070
Housing	built-in housing, 470 x 348 mm
	7-slot processor core for ATX motherboard
	PC to be opened from the back side
	all components easily accessible
	7 slots for up to 235 mm long plug-in cards
	card holders, actuated without tools
	protection class front side IP 65, rear side IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 14.1 kg (31.1 lbs)
	dimensions (W x H x D) 470 x 348 x 199 mm (18.5" x 13.7" x 7.8"), depth behind front 191 mm (7.5")

Features	C3640-0050	C3640-0060	C3640-0070
Display	15-inch TFT display, resolution 1024 x 768	15-inch TFT display, resolution 1024 x 768	15-inch TFT display, resolution 1024 x 768
Touch screen	single-touch as an option	single-touch as an option	single-touch as an option
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x 235 mm	7 x 235 mm	7 x 235 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1–2 x 3½-inch HDD or 2½-inch SSD	1–2 x 3½-inch HDD or 2½-inch SSD	1–2 x 3½-inch HDD or 2½-inch SSD
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	slimline CD/DVD-ROM or multi-DVD	slimline CD/DVD-ROM or multi-DVD	slimline CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

Control cabinet Industrial PCs

C6670 | **Control cabinet industrial server, 2 x Intel® Xeon®**

See page 122

C61xx | **ATX control cabinet Industrial PC, Intel® Celeron®, Pentium® or Core™**

See page 104

C5102 | **ATX 19-inch slide-in Industrial PC, Intel® Celeron®, Pentium® or Core™**

See page 100

C62xx | **ATX control cabinet Industrial PC, Intel® Celeron®, Pentium® or Core™**

See page 108

We reserve the right to make technical changes.

C6640/C6650 | **ATX control cabinet Industrial PC, Intel® Celeron®, Pentium® or Core™**

See page 118

C65xx | **Built-in Industrial PC, Intel® Celeron® or Core™**

See page 112

C6920/C6930 | **Compact Industrial PC, Intel® Celeron® or Core™**

See page 128

C5210 | **19-inch slide-in Industrial PC, Intel® Celeron® or Core™**

See page 103

C6905/C6915/C6925 | **Compact Industrial PC, Intel® Celeron® ULV or Atom™**

See page 126

We reserve the right to make technical changes.

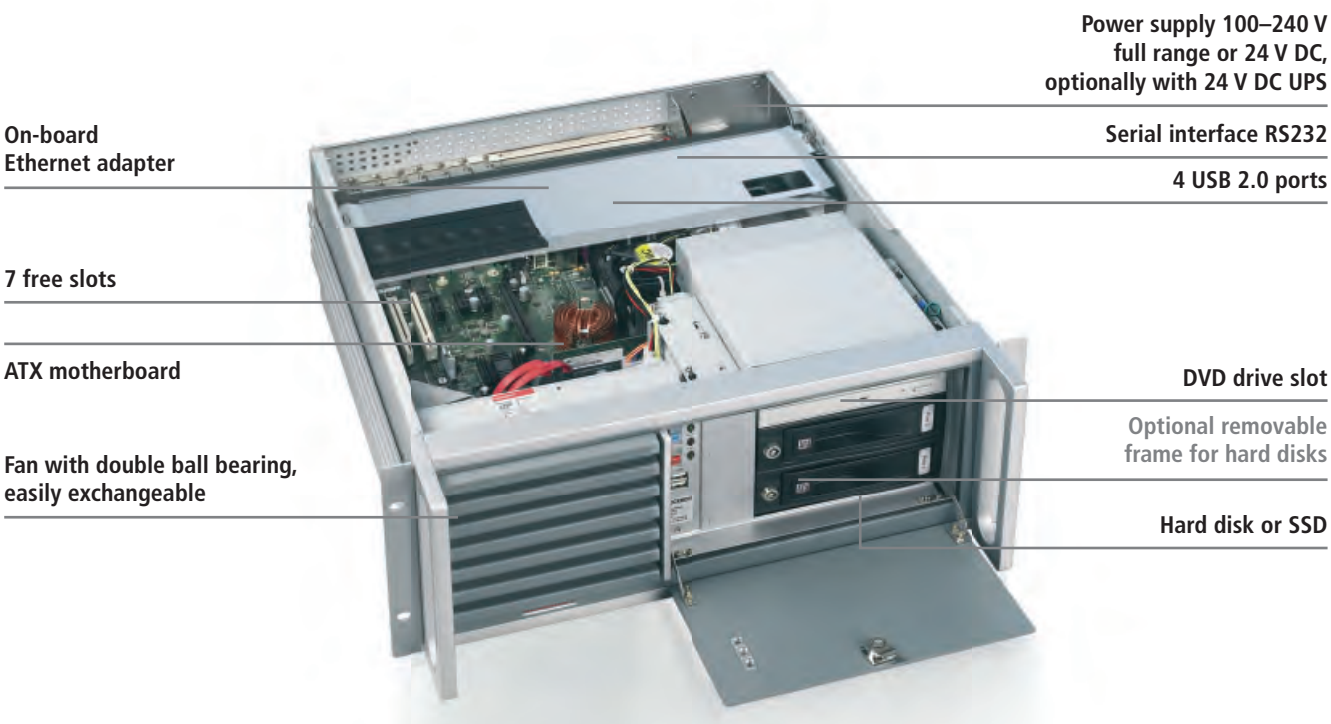
C5xxx | Industrial PC series for 19-inch rack installation

The 19-inch rack mount C5102 Industrial PC, equipped with Intel® Celeron®, Pentium® or Core™ i3/i5/i7 of the latest generation on an ATX motherboard, offers maximum performance class controls. The 19-inch slide-in housing measures only four rack units, yet has plenty of internal space for expansions of any form. A CD/DVD-ROM or multi DVD drive can be fitted behind the lockable front door.

The type plate provides detailed information regarding the PC's configuration. Carefully designed ventilation creates a slight excess pressure inside the housing, effectively preventing the entry of dust. A stable card holder generates insensitivity to shocks and vibrations. A C5102 Industrial PC and a Control Panel as its operating unit create an ideal combination.

The C5210 19-inch slide-in Industrial PC measures only one height unit. This IPC has an Intel® Celeron® or Core™ i3/i5/i7 processor of the latest generation on a 3½-inch motherboard with on-board RAID controller and two 3½-inch hard drive removable frames.

The combination of industrially-capable performance and functionality with an

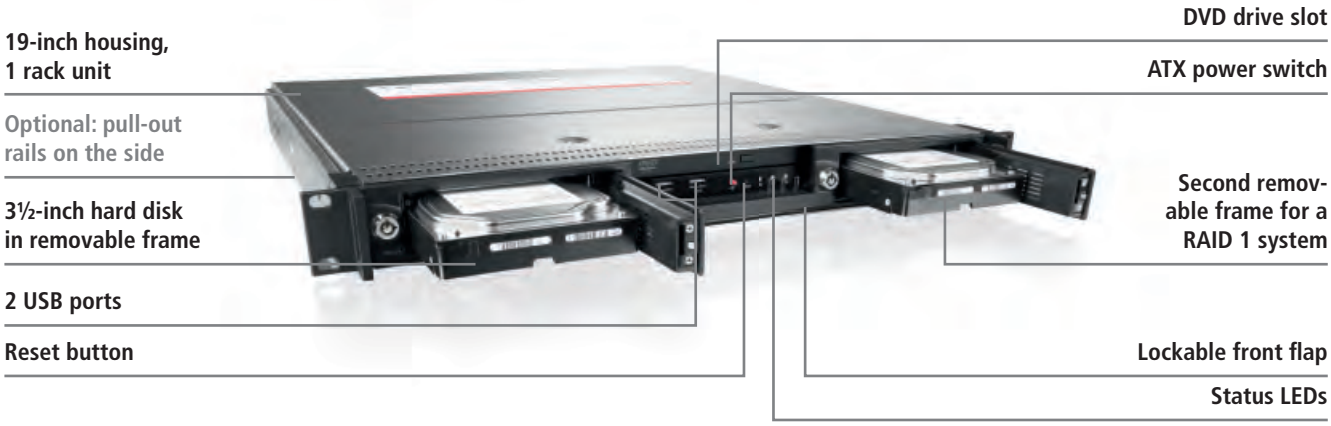


We reserve the right to make technical changes.

C5102

C5210

extremely flat design makes the C5210 particularly well-suited for space-saving applications. The low installation height is made possible with the Beckhoff 3½-inch motherboards. The motherboard is equipped with a multitude of on-board interfaces, such as two Gigabit Ethernet ports, a DVI and a COM port as well as four USB ports. Further COM or USB ports as well as a sound inteface and a second DVI connection can be led out as an option. The C5210 can be extended with two PCIe modules and a Mini PCI card. A DVD-ROM or multi DVD drive can be optionally installed behind the front flap. The following operating systems are offered for the 19-inch Industrial PC: Windows 7 Professional, Windows 7 Ultimate, Windows Embedded Standard 7 or Windows 10 IoT Enterprise.



C5102

C5102 | 19-inch slide-in Industrial PC

C5102	C5102-0050, -0060, -0070
Housing	7-slot slide-in housing ATX for 19-inch racks, 4 rack units
	all slots for full-length plug-in cards
	lockable front flap
	card holders
	protection class IP 60 when operating
	operating temperature 0…55 °C
	weight of the basic configuration 17.0 kg (37.5 lbs)
	dimensions (W x H x D) 483 x 177 x 500 mm (19" x 7" x 19.5")

Features	C5102-0050	C5102-0060	C5102-0070
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x fullsize	7 x fullsize	7 x fullsize
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

We reserve the right to make technical changes.

C5210 | 19-inch slide-in Industrial PC

C5210	C5210-0010, -0020
Housing	slide-in housing for 19-inch racks, 1 rack unit
	all drives accessible from the front
	2 removable frames for hard disks
	1 DVD drive slot, 2 USB sockets, reset key and ATX key behind a lockable front flap
	status LEDs
	all connectors at the rear side
	2 PCIe module slots to plug-in Beckhoff PCIe modules or to lead out interfaces of the motherboard ex factory
	protection class IP 20
	operating temperature 0…55 °C
	dimensions (W x H x D) 482.7 x 44 x 493.8 mm (19″ x 1.7″ x 19.44″)
	depth behind the front 471.3 mm (18.56″)

Features	C5210-0010	C5210-0020
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI and 2 PCIe modules	1 Mini PCI and 2 PCIe modules
Free slots	1 Mini PCI and 2 PCIe modules	1 Mini PCI and 2 PCIe modules
Max. card length	Mini PCI/PCIe module	Mini PCI/PCIe module
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	1–2 x 3½-inch HDD	1–2 x 3½-inch HDD
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

C61xx | Industrial PC series for control cabinet installation

The C61xx control cabinet PC is equipped with maximum performance class components with Intel® Celeron®, Pentium® or Core™ i3/i5/i7 of the latest generation on an ATX motherboard. The PCs in the C61xx series are constructed according to a uniform plan, optimised for the exploitation of available space and easy accessibility of all components.

The construction of the housing for the C61xx series ensures long-term compatibility with any new PC components that appear over the next few years. If, in a few years, the Industrial PC needs to be upgraded, you swap the motherboard, the processor, the memory or the hard disk, but the housing remains unchanged and is compatible with the technology of the future.

All the PC's connections face upwards, so that the connecting cable can be taken directly to the wiring channel. The side walls are completely passive and allow the Industrial PC to be fitted immediately next to other control cabinet devices.

The housing permits fast access to the fitted components. After removing the front cover, plug-in cards and drives are freely

We reserve the right to make technical changes.

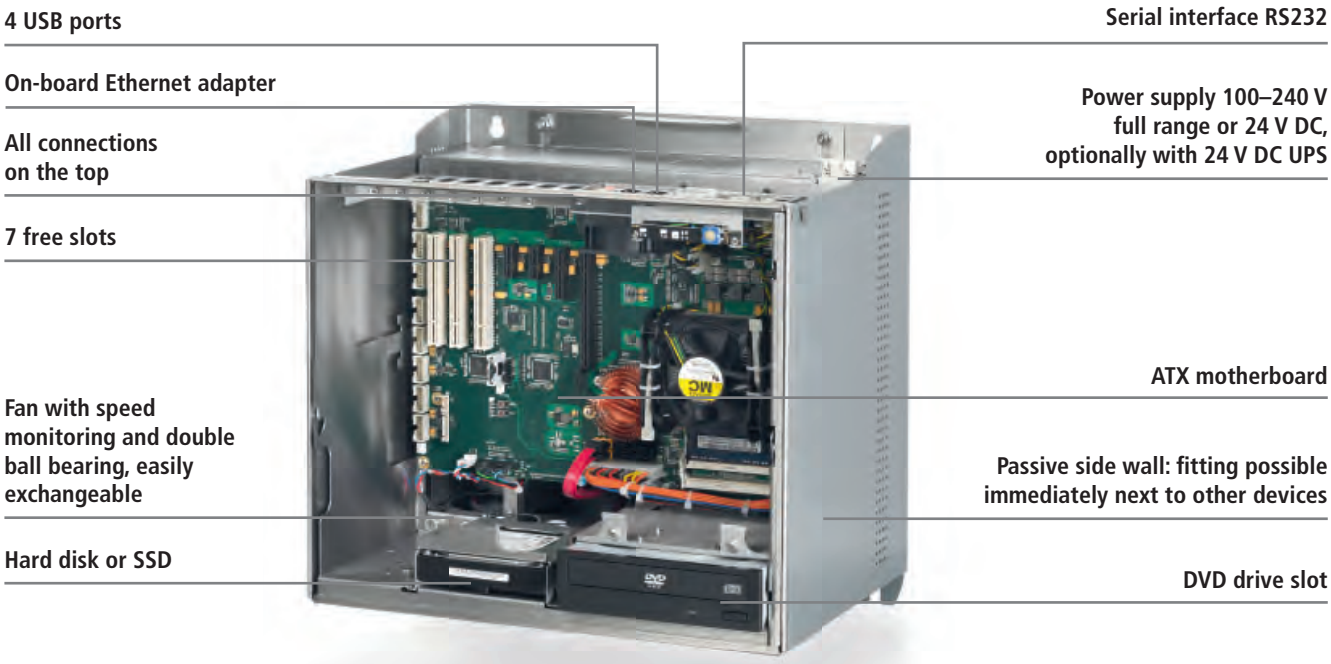
C6140

C6150

accessible. Hard disks are held by spring-loaded ball catches and can be removed in a single action. Three screws must be undone, after which the PC's inner chassis, to which all the components are attached, can be removed from the outer housing. The inner chassis can be placed on a table in any orientation for maintenance purposes. When removed, the inner chassis still has the full function of a PC and can be operated with a standard monitor and a standard keyboard.

The C61xx series PCs are supplied with a 100 to 240 V AC full range or 24 V DC power supply unit. An industrial latching socket strip is used for the power supply. A CD/DVD-ROM or multi DVD drive can be fitted. Card holders for the plug-in cards generate insensitivity to shocks and vibrations. The card holders can be fixed and removed without tools.

A type plate is located on the front cover behind an inspection window, giving detailed information about the configuration of the PC. The construction of the housing has been designed to allow individual adaptation, and many features can be adjusted for your application.



C6140

C6140 | Control cabinet Industrial PC

C6140	C6140-0050, -0060, -0070
Housing	7-slot ATX Industrial PC for control cabinet installation
	3 slots for plug-in cards with a length of up to 270 mm and 4 slots for plug-in cards with a length of up to 240 mm
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 14 kg (30.9 lbs)
	dimensions (W x H x D) 383 x 362 x 265 mm (14.9" x 14.1" x 10.5")

Features	C6140-0050	C6140-0060	C6140-0070
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	3 x 270 mm and 4 x 240 mm	3 x 270 mm and 4 x 240 mm	3 x 270 mm and 4 x 240 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

We reserve the right to make technical changes.

C6150 | Control cabinet Industrial PC

C6150	C6150-0050, -0060, -0070
Housing	7-slot ATX Industrial PC for control cabinet installation
	all slots for full-length plug-in cards
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 15 kg (33.1 lbs)
	dimensions (W x H x D) 383 x 423 x 265 mm (14.9" x 16.7" x 10.5")

Features	C6150-0050	C6150-0060	C6150-0070
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x fullsize	7 x fullsize	7 x fullsize
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

C62xx | Industrial PC series for control cabinet installation

The control cabinet PC series C62xx is equipped with maximum performance class components: with Intel® Celeron®, Pentium® or Core™ i3/i5/i7 of the latest generation on an ATX motherboard. The PCs in the C62xx series are constructed according to a uniform plan, optimised for the exploitation of available space and easy accessibility of all components.

The construction of the housing for the C62xx series ensures long-term compatibility with any new PC components that appear over the next few years. If, in a few years, the Industrial PC needs to be upgraded, you swap the motherboard, the processor, the memory or the hard disk, but the housing remains unchanged, and is compatible with the technology of the future.

All the PC's connections face to the front. The inner chassis can be drawn out forward on telescopic rails, thus offering free access to all the fitted components.

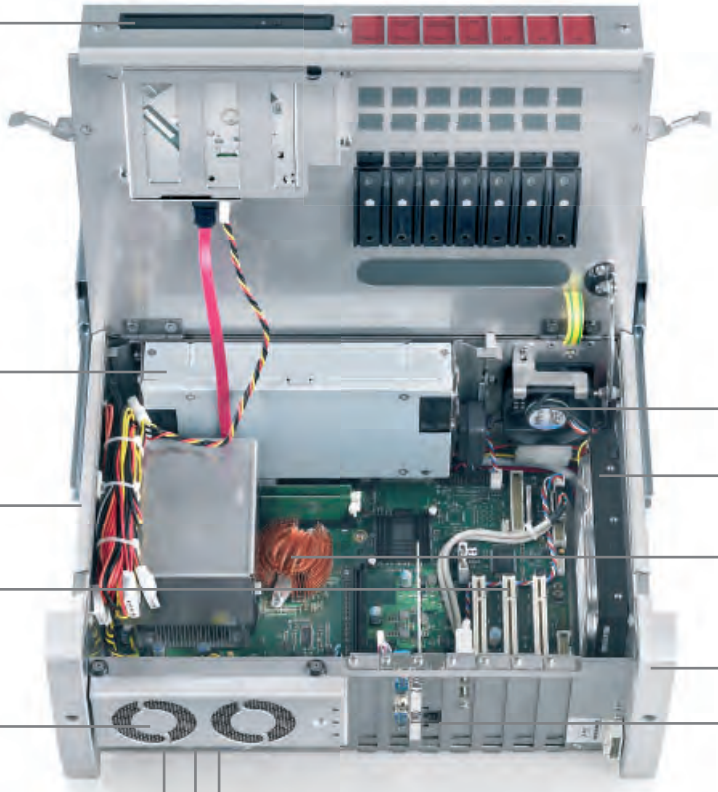
The C62xx series PCs are offered with a 100 to 240 V AC full range or 24 V DC power supply unit. An industrial latching socket strip is used for the power supply.

We reserve the right to make technical changes.

C6240

C6250

Card holders for the plug-in cards generate insensitivity to shocks and vibrations. The card holders can be fixed and removed without tools. Data describing the function and type for the fitted plug-in cards is listed on the front.



DVD drive slot

Power supply 100–240 V full range or 24 V DC, optionally with 24 V DC UPS

Passive side wall: fitting possible immediately next to other devices

7 free slots

Fan with speed monitoring and double ball bearing, easily exchangeable

Serial interface RS232

Fan with speed monitoring and double ball bearing, easily exchangeable

Hard disk or SSD

ATX industrial motherboard

Inner chassis can be pulled forward

All connections on the front

On-board Ethernet adapter

4 USB ports

C6240

C6240 | **Control cabinet Industrial PC**

C6240	C6240-0050, -0060, -0070
Housing	7-slot ATX Industrial PC for control cabinet installation
	mounting sheet for horizontal PC installation
	all slots for plug-in cards with a length of up to 190 mm
	drives and plug-in cards easily accessible
	all connectors on the front
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 12.3 kg (27.2 lbs)
	dimensions (W x H x D) 430 x 170 x 274 mm (16.9" x 6.7" x 10.8")

Features	C6240-0050	C6240-0060	C6240-0070
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x 190 mm	7 x 190 mm	7 x 190 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1 x 3½-inch HDD or 2 x 2½-inch HDD or SSD	1 x 3½-inch HDD or 2 x 2½-inch HDD or SSD	1 x 3½-inch HDD or 2 x 2½-inch HDD or SSD
RAID 1	2 x 2½-inch HDD	2 x 2½-inch HDD	2 x 2½-inch HDD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

We reserve the right to make technical changes.

C6250 | Control cabinet Industrial PC

C6250	C6250-0060, -0070, -0080
Housing	7-slot ATX Industrial PC for control cabinet installation
	mounting sheet for horizontal installation
	4 slots for up to 220 mm long plug-in cards and 3 slots for up to 190 mm long plug-in cards
	drives and plug-in cards easily accessible
	all connectors on the front
	detailed PC configuration information on the front
	status LEDs and protected reset key
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 19.8 kg (43.7 lbs)
	dimensions (W x H x D) 680 x 184 x 270 mm (26.8" x 7.2" x 10.7")

Features	C6250-0060	C6250-0070	C6250-0080
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x 190 mm	7 x 190 mm	7 x 190 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD	1–3 x 3½-inch HDD or 2½-inch SSD
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

C65xx | Industrial PC series for control cabinet installation

The C65xx Industrial PC series is designed to be installed in control cabinet walls or in the rear panel of a control housing or console housing. The heat sink of the IPC is thereby fed to the outside through a suitable cut-out in the panel or wall of the control cabinet. Power dissipation from the processor and chipset takes place directly to ambient. Integrated seals provide for an IP 65 closure.

This enables high thermal stability and at the same time fanless operation. Industrial PCs of type C65xx can thus be constructed completely without rotating parts. Installation in a control housing in combination with a Beckhoff Control Panel results in a fanless Panel PC that can be operated at ambient temperatures up to 45 °C.

The compact housing is equipped with a 3½-inch motherboard for Intel® Celeron® or Core™ i3/i5/i7 of the latest generation. All of the PC's connectors are located on the top side of the housing. The C65xx series PCs are supplied with an integrated power supply unit with 24 V DC input voltage, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected

We reserve the right to make technical changes.

C6515
basic configuration

C6515
with PCIe module slots

C6525
basic configuration

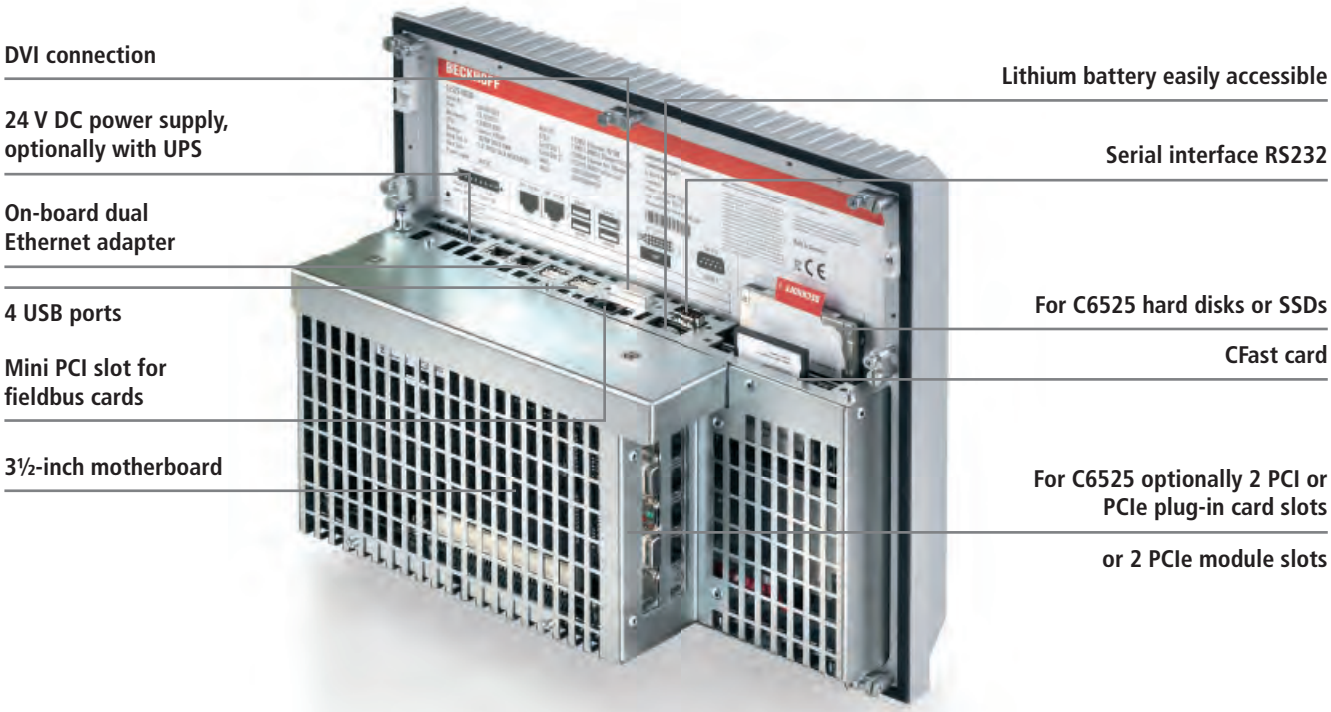
C6525
with PCIe module slots

C6525
with plug-in card slots

externally and installed on a DIN rail close to the PC. The PC has a free Mini PCI slot that can be used for NOVRAM modules for fail-safe storage of process data. The C6525 also enables the use of Mini PCI fieldbus cards or a further Ethernet card.

Industrial PCs from this series and Beckhoff Control Panels as control units make an ideal combination for high-performance control platforms in machine construction and plant engineering applications, particularly in conjunction with TwinCAT automation software under Windows 7 Professional, Windows 7 Ultimate, Windows Embedded Standard 7 or Windows 10 IoT Enterprise. Due to their two independent Ethernet interfaces the C6515 and C6525 Industrial PCs are ideally suited as compact central processing units for an EtherCAT control system.

The on-board SATA RAID 1 controller can mirror two hard disks, two SSDs or two CFast cards. If one of the RAID disks fails, the system continues to run. The faulty data medium can be replaced and mirrored during operation.



C6515

C6515 | Fanless built-in Industrial PC

C6515	C6515-0040, -0050
Housing	built-in Industrial PC with external cooling to be mounted in the back panel of a control housing or in the wall of a control cabinet
	2 slots for CFast
	CFast and lithium battery of the system clock easily exchangeable
	passive cooling through heat sink structure outside
	20 cm free space required around the heat sink of the PC for air circulation
	protection class outside IP 65, inside IP 20
	operating temperature outside 0…45 °C, inside 0…55 °C
	weight of the basic configuration 3 kg (6.61 lbs)
	dimensions (W x H x D) 240 x 230 x 81 mm (9.5" x 9.1" x 3.2")

Features	C6515-0040	C6515-0050
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI, optionally 2 PCIe modules	1 Mini PCI, optionally 2 PCIe modules
Free slots	1 Mini PCI for NOVRAM and optionally 2 PCIe modules	1 Mini PCI for NOVRAM and optionally 2 PCIe modules
Max. card length	Mini PCI, optionally 2 PCIe modules	Mini PCI, optionally 2 PCIe modules
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	1 or 2 x CFast	1 or 2 x CFast
RAID 1	2 x CFast	2 x CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

We reserve the right to make technical changes.

C6515 with PCIe module slots

Extension for PCIe modules

The built-in PCs C6515 can be expanded by two additional PCIe module slots. The inner enclosure cover is constructed 26 mm deeper for PCIe modules (see above). The module slots can accept Beckhoff PCIe modules, for example, the FC9062 dual gigabit Ethernet module, or they can serve to lead out motherboard interfaces, such as COM ports, USB or sound. The module slots also enable the use of fieldbus cards in the Mini PCI slot.

Module slots that are not occupied by a PCIe module can be used to lead out the fieldbus connection of a Mini PCI card from the PC. An Ethernet or fieldbus interface for PROFIBUS, CANopen, DeviceNet or SERCOS can be inserted into the Mini PCI slot on the C6515, even though the basic configuration of this PC only allows NOVRAM Mini PCI cards.

PCIe module FC9062, dual gigabit Ethernet

Ordering information	Options for C6515
C9900-B502	2 PCIe module slots integrated inside C6515, to plug-in Beckhoff PCIe modules or to lead out interfaces of the motherboard ex factory. The depth of the inner enclosure cover is increased by 26 mm (1“).

Ordering information	Options for C6515 with 2 module slots C9900-B502
FC9062	gigabit Ethernet PCIe module for PCs with Beckhoff PCIe module slots, 2-channel, PCI Express x1 bus
C9900-E159	serial port COM2, RS232, electrically isolated, overload protection, D-sub 9-pin connector
C9900-E188	serial port COM2, RS485, electrically isolated, overload protection, D-sub 9-pin connector
C9900-E189	serial port COM2, RS422, electrically isolated, overload protection, D-sub 9-pin connector
C9900-E232	sound line input and sound line output of the motherboard led out at the connection section of a C6515
C9900-E233	1 serial port RS232 of the motherboard led out at the connection section of a C6515
C9900-E234	2 USB ports of the motherboard led out at the connection section of a C6515
C9900-E237	additional DVI-D plug led out on a module bracket

C6525

C6525 | Fanless built-in Industrial PC

C6525	C6525-0040, -0050
Housing	built-in Industrial PC with external cooling to be mounted in the back panel of a control housing or in the wall of a control cabinet
	1 slot for a 2½-inch hard disk or SSD and 1 slot for CFast
	hard disk, SSD, CFast and lithium battery of the system clock easily exchangeable
	passive cooling through heat sink structure outside
	20 cm free space required around the heat sink of the PC for air circulation
	protection class outside IP 65, inside IP 20
	operating temperature outside 0…45 °C, inside 0…55 °C
	weight of the basic configuration 5.9 kg (13.0 lbs)
	dimensions (W x H x D) 330 x 275 x 82 mm (13" x 10.8" x 3.2")

Features	C6525-0040	C6525-0050
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI, optionally 2 PCIe modules or 2 plug-in card slots	1 Mini PCI, optionally 2 PCIe modules or 2 plug-in card slots
Free slots	1 Mini PCI and optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots	1 Mini PCI and optionally 2 PCIe modules or 2 PCI/PCIe plug-in card slots
Max. card length	Mini PCI, optionally 2 PCIe modules or 2 x 190 mm plug-in cards	Mini PCI, optionally 2 PCIe modules or 2 x 190 mm plug-in cards
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	2½-inch HDD or SSD and/or CFast or 2 x CFast or 2 x 2½-inch HDD or SSD	2½-inch HDD or SSD and/or CFast or 2 x CFast or 2 x 2½-inch HDD or SSD
RAID 1	2 x 2½-inch HDD or 2 x CFast	2 x 2½-inch HDD or 2 x CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

We reserve the right to make technical changes.

C6525 with PCIe module slots

C6525 with plug-in card slots

Extension for PCIe modules

The built-in PCs C6525 can be expanded by two additional PCIe module slots The inner enclosure cover is constructed 27 mm deeper for PCIe modules (see above). The module slots can accept Beckhoff PCIe modules, for example, the FC9062 dual gigabit Ethernet module, or they can serve to lead out motherboard interfaces, such as COM ports, USB or sound.

Ordering information	Options for C6525
C9900-B503	2 PCIe module slots integrated inside C6525, to plug-in Beckhoff PCIe modules or to lead out interfaces of the motherboard ex factory. The depth of the inner enclosure cover is increased by 27 mm (1.1“).

Ordering information	Options for C6525 with 2 module slots C9900-B503
FC9062	gigabit Ethernet PCIe module for PCs with Beckhoff PCIe module slots, 2-channel, PCI Express x1 bus
C9900-E232	sound line input and sound line output of the motherboard led out at the connection section of a C6525
C9900-E233	1 serial port RS232 of the motherboard led out at the connection section of a C6525
C9900-E234	2 USB ports of the motherboard led out at the connection section of a C6525
C9900-E237	additional DVI-D plug led out on a module bracket

Extension for PCI and PCIe plug-in cards

The built-in PCs C6525 can be expanded by two slots for standard PC plug-in cards. They can accept conventional PC plug-in cards up to 190 mm in length. The 58 mm deeper hood at the rear (see above) covers a backplane that provides a choice of two PCI slots, two PCI Express slots or one PCI and one PCI Express slot. Card holders ensure the secure fixation of large cards.

Ordering information	Options for C6525
C9900-B505	2 PCIe plug-in card slots on the passive backplane integrated inside C6525, to plug-in PCIe x1 cards up to 190 mm (6.3“) length. The depth of the inner enclosure cover is increased by 58 mm (2.3“).
C9900-B509	2 PCI plug-in card slots on the passive backplane integrated inside C6525, to plug-in PCI cards up to 190 mm (6.3“) length, the depth of the inner enclosure cover is increased by 58 mm (2.3“).
C9900-B513	1 PCI and 1 PCIe plug-in card slot on a passive backplane integrated inside C6525, to plug-in one PCI and one PCIe x1 card up to 190 mm (6.3“) length. The depth of the back cover is increased by 58 mm (2.3“).

C6640/C6650 | Industrial PC series for control cabinet installation

The C6640/C6650 control cabinet PC series includes two devices, both of which are equipped with top-performance components with Intel® Celeron®, Pentium® or Core™ i3/i5/i7 of the latest generation on an ATX motherboard. All slots are available for plug-in cards with a length of up to 210 mm. Graphics and Ethernet adapters are already available on-board, without taking up a slot.

All PC connections face upwards, so that the connecting cable can be taken directly to the wiring channel. The side walls are completely passive, and allow the Industrial PC to be fitted immediately next to other control cabinet devices.

The C6640/C6650 series is designed for optimum space utilisation and easy accessibility of all components. The C6640 is the most compact PC with ATX motherboard but nevertheless offers convenient access to drives, memory and plug-in cards.

The C6650 features hard drive removable frames which, together with the on-board RAID controller, form a RAID 1 system with two mirrored hard disks. This ensures high data security. Hard disks which failed can easily be exchanged during operation.

We reserve the right to make technical changes.

C6640

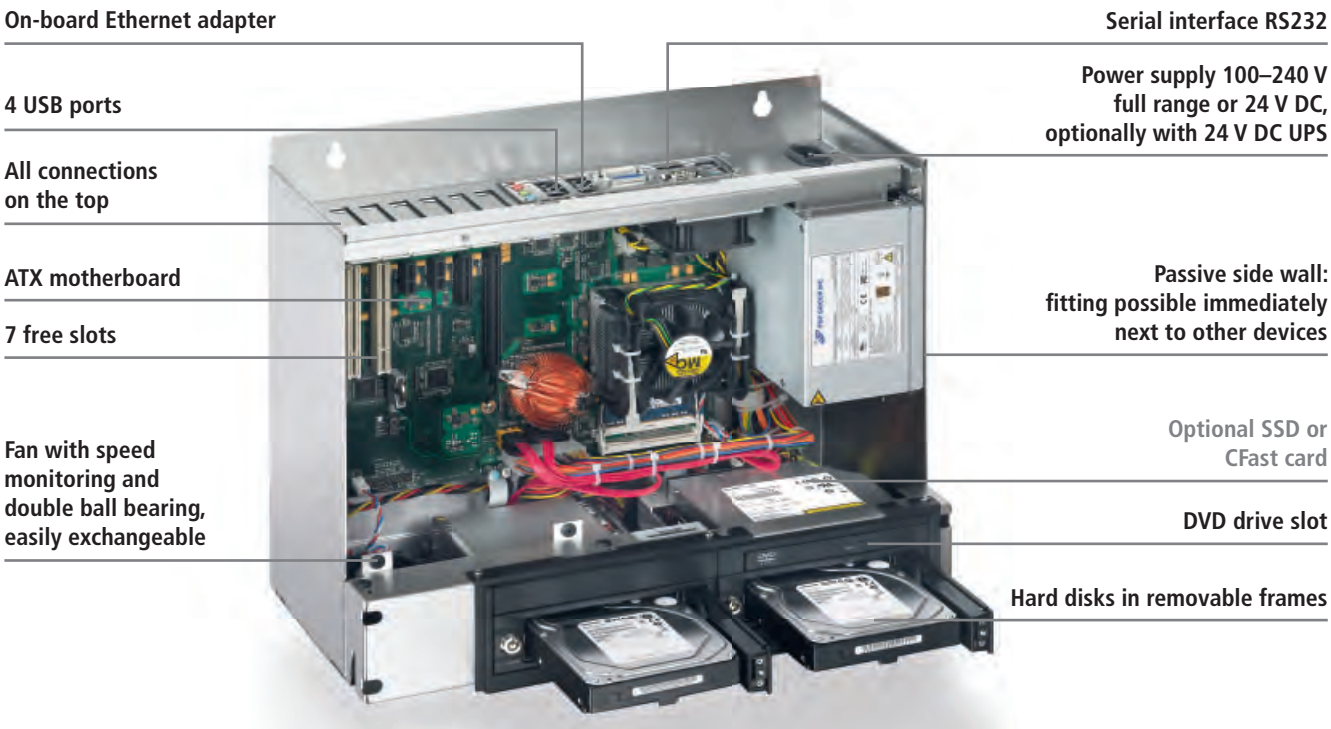
C6650

The housing design of the C6640/C6650 series ensures long-term compatibility with new PC components. The motherboard, processor, memory or hard disk are upgradable, while the same housing can be used for years to come.

The device can be equipped with a CD/DVD ROM or multi DVD drive. A choice of a CFast socket or a 2½-inch SSD slot is offered for flash disks. Card holders for the plug-in cards generate insensitivity to impacts and vibrations. The C6640/C6650 series PCs are supplied with 100 to 240 V AC full range or 24 V DC power supply unit.

A type plate is located on the top of the front cover, giving detailed information about the PC configuration.

The housing design offers plenty of scope for adjustment to the respective application.



C6640

C6640 | Control cabinet Industrial PC

C6640	C6640-0030, -0040, -0050
Housing	7-slot ATX Industrial PC for control cabinet installation
	all slots for up to 210 mm long plug-in cards
	drives and plug-in cards easily accessible
	2 brackets to led out serial interfaces
	all connectors on the top
	detailed PC configuration information on the front
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 11 kg (24.3 lbs)
	dimensions (W x H x D) 371 x 336 x 198 mm (14.6" x 13.2" x 7.8")

Features	C6640-0030	C6640-0040	C6640-0050
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x 210 mm	7 x 210 mm	7 x 210 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1 x 3½-inch and 1 x 2½-inch HDD or SSD or CFast	1 x 3½-inch and 1 x 2½-inch HDD or SSD or CFast	1 x 3½-inch and 1 x 2½-inch HDD or SSD or CFast
RAID 1	–	–	–
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc. see		

We reserve the right to make technical changes.

C6650 | Control cabinet Industrial PC

C6650	C6650-0030, -0040, -0050
Housing	7-slot ATX Industrial PC for control cabinet installation
	all slots for up to 210 mm long plug-in cards
	2 removable frames for hard disks
	drives and plug-in cards easily accessible
	3 brackets to led out serial interfaces
	all connectors on the top
	detailed PC configuration information on the front
	card holders, actuated without tools
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 12 kg (26.5 lbs)
	dimensions (W x H x D) 410 x 360 x 201 mm (16.1" x 14.2" x 7.9")

Features	C6650-0030	C6650-0040	C6650-0050
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation	up to Core™ i3/i5/i7 6th generation
Motherboard	ATX	ATX	ATX
Slots	7	7	7
Free slots	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	3 PCI, 2 PCIe x1, 1 PCIe x4 and 1 PCIe x16	2 PCI, 2 PCIe x1, 2 PCIe x4 and 1 PCIe x16
Max. card length	7 x 210 mm	7 x 210 mm	7 x 210 mm
Memory	2…16 GB DDR3 RAM	2…32 GB DDR3L RAM	4…64 GB DDR4 RAM
Graphic adapter	integrated in the processor	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board	2 on-board
Hard disks/flash	1–2 x 3½-inch and 1 x 2½-inch HDD or SSD or CFast	1–2 x 3½-inch and 1 x 2½-inch HDD or SSD or CFast	1–2 x 3½-inch and 1 x 2½-inch HDD or SSD or CFast
RAID 1	2 x 3½-inch HDD	2 x 3½-inch HDD	2 x 3½-inch HDD
Possible disk drives	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC	100…240 V AC or 24 V DC
Recommendation	available	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.		

C6670 | Industrial server for control cabinet installation

The C6670 industrial server is designed for installation in control cabinets. The C6670 and a Beckhoff Control Panel with DVI and USB connection make an ideal combination, representing a powerful platform for machine construction and plant engineering applications with the TwinCAT automation software.

In combination with TwinCAT 3, two Intel® Xeon® processors, each with 6, 12 or 18 cores on one motherboard with two Gigabit Ethernet controllers and a powerful graphics card produce a machine or plant controller that offers computing power for completely new ideas. Apart from the extremely high performance, up to 2048 GB DDR4 RAM, one PCIe Gen2 x4, one PCIe Gen3 x8 and three PCIe Gen3 x16 plug-in card slots are also available for several camera interface cards for video evaluation.

All connections of the industrial server face upwards, so that the connecting cables can be taken directly to the wiring channel. The side walls are completely passive, and allow the industrial server to be fitted immediately next to other control cabinet devices.

The C6670 features two hard drive removable frames which, together with the on-board RAID controller, form a RAID 1 system with two mirrored hard disks or SSDs. This ensures high data security. Hard disks or SSDs which failed can easily be exchanged during operation.

The device can be equipped with a CD/DVD ROM or multi DVD drive. Card holders for the plug-in cards generate insensitivity to impacts and vibrations. The C6670 offers convenient access to drives, memory and plug-in cards. The industrial server is supplied with a 100 to 240 V AC full range power supply unit.

A type plate is located on the top of the front cover, giving detailed information about the server configuration.

We reserve the right to make technical changes.

C6670 | Control cabinet industrial server

C6670	C6670-0000
Housing	6-slot SSI EEB industrial server for control cabinet installation
	all slots for full-size plug-in cards
	2 removable frames for hard disks
	drives and plug-in cards easily accessible
	all connectors on the top
	detailed PC configuration information on the front
	protection class IP 20
	operating temperature 0…45 °C
	weight of the basic configuration 16 kg (35.3 lbs)
	dimensions (W x H x D) 410 x 480 x 201 mm (16.1“ x 18.9“ x 7.9“)

Features	C6670-0000
Processor	2 x Intel® Xeon® with 6, 12 or 18 cores per processor
Motherboard	SSI EEB
Slots	6
Free slots	1 PCIe x4 Gen2.x, 1 PCIe x8 Gen3 and 3 PCIe x16 Gen3
Max. card length	6 x fullsize
Memory	64…2048 GB DDR4 RAM EEC
Graphic adapter	graphic card, 1 DVI-I and 1 DVI-D connector, occupies a PCIe x16 slot
Ethernet	2 on-board
Hard disks/flash	1–2 x 3½-inch HDD or 1–2 x 2½-inch HDD or SSD
RAID 1	2 x 3½-inch HDD or 2 x 2½-inch HDD or SSD
Possible disk drives	CD/DVD-ROM or multi-DVD
Power supply	100…240 V AC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

C69xx | Industrial PC series for control cabinet installation

The C69xx Industrial PC series is designed for installation in control cabinets. The compact aluminium housing of the C69xx Industrial PCs is equipped with a 3½-inch motherboard. All PC connections are on one side of the housing. The PC can optionally be equipped with mounting plates on two sides and fastened with screws in the control cabinet. Installation is possible at the rear panel or on the right-hand side panel.

The C69xx series PCs are supplied with a 24 V DC power supply unit, optionally with integrated uninterruptible power supply (UPS). A battery pack can be connected ex-ternally and installed on a DIN rail close to the PC. Cooling fins behind the right-hand side panel enable fanless operation of the PC at temperatures up to 55 °C. The four types of Industrial PCs in the C69xx series differ in their processors and data storage devices.

Cooling of the C6915 with Intel® Atom™ with up to four cores and the C6925 with Intel® Celeron® ULV or Intel® Atom™ with up to four cores requires no fan. The basic configuration of the C6915 and C6925 features a flash disk, thus creating PCs without moving parts. A hard disk or a second flash card can be integrated in all of the PCs from this series as an option.

The C6920 with Intel® Celeron® or Core™ i3/i5/i7 of the latest generation has an easily exchangeable fan cartridge on the underside of the housing. The C6930 Industrial PC is also offered with Intel® Celeron® or Core™ i3/i5/i7 of the latest generation. It has a SATA RAID controller

C6905

We reserve the right to make technical changes.

C6915

C6920
basic configuration

C6920
with plug-in card slots

C6925

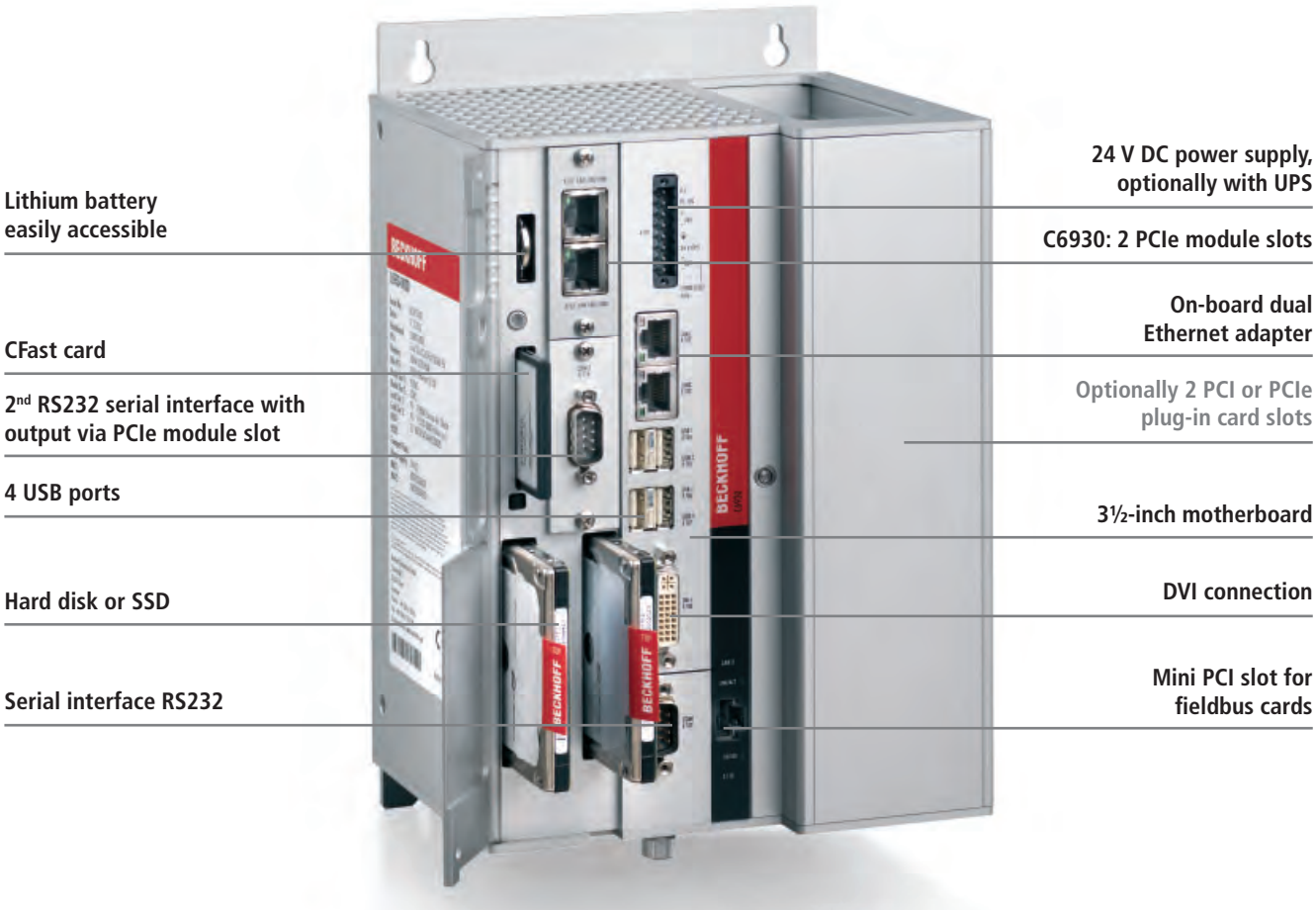
C6930
basic configuration

C6930
with plug-in card slots

for mirroring two hard disks, SSDs or CFast cards. In the basic configuration, one of the two hard disk slots is equipped with a 2½ inch drive. A second hard disk is offered as an option. In addition, a CFast slot is accessible behind the front cover.

The C6920, C6925 and C6930 feature a free Mini PCI slot. The Beckhoff Mini PCI fieldbus cards for PROFIBUS (FC3151), CANopen (FC5151), DeviceNet (FC5251), SERCOS (FC7551), or a further Ethernet card (FC9151) can be used.

Industrial PCs of this series and a Beckhoff Control Panel with DVI and USB connection make an ideal combination and offer a high-performance control platform for machine construction and plant engineering applications, particularly in conjunction with the TwinCAT automation software under Windows 7 Professional, Windows 7 Ultimate, Windows Embedded Standard 7 or Windows 10 IoT Enterprise, with Intel® Atom™ also under Windows Embedded Compact 7. Due to its two independent Ethernet interfaces, the C69xx is ideally suited as a compact central processing unit for an EtherCAT control system.



C6905

C6905 | “Economy” control cabinet Industrial PC

C6905	C6905-0010
Housing	fanless industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	passive cooling without fan
	5 cm (2”) free space on top and bottom of the PC necessary for air circulation
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 0.9 kg (1.9 lbs)
	compact dimensions (W x H x D) 45 x 163 x 115 mm (1.8” x 6.4” x 4.5”) without mounting plate

Features	C6905-0010
Processor	Intel® Atom™
Motherboard	3½-inch
Slots	–
Free slots	–
Max. card length	–
Memory	2…8 GB DDR3L RAM
Graphic adapter	integrated in the processor
Ethernet	2 on-board
Hard disks/flash	1 x 2½-inch HDD or SSD or CFast
Power supply	24 V DC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

We reserve the right to make technical changes.

C6915 | **Control cabinet Industrial PC**

C6915	C6915-0010
Housing	fanless industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	1 slot for one Compact Flash card behind the front flap
	passive cooling without fan
	5 cm (2") free space on top and bottom of the PC necessary for air circulation
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 1.25 kg (2.8 lbs)
	compact dimensions (W x H x D) 48 x 164 x 119 mm (1.9" x 6.5" x 4.7") without mounting plate

Features	C6915-0010
Processor	Intel® Atom™
Motherboard	3½-inch
Slots	–
Free slots	–
Max. card length	–
Memory	2…8 GB DDR3L RAM
Graphic adapter	integrated in the processor
Ethernet	2 on-board
Hard disks/flash	2½-inch HDD or SSD or 1 x CFast or 2 x CFast
Power supply	24 V DC
Recommendation	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.

C6920

C6920 | Control cabinet Industrial PC

C6920	C6920-0040, -0050
Housing	Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	1 slot for one 2½-inch hard disk or SSD behind the front flap
	1 slot for one CFast card behind the front flap
	fan cartridge with speed control and double ball bearing fans, accessible from the front
	5 cm (2") free space above and under the PC required for air circulation
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 1.9 kg (4.2 lbs)
	compact dimensions (W x H x D) 65 x 235 x 121 mm (2.6" x 9.3" x 4.8") without mounting plate

Features	C6920-0040	C6920-0050
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI, optionally 2 plug-in card slots	1 Mini PCI, optionally 2 plug-in card slots
Free slots	1 Mini PCI and optionally 2 PCI/PCIe plug-in card slots	1 Mini PCI and optionally 2 PCI/PCIe plug-in card slots
Max. card length	Mini PCI, optionally 2 x 190 mm plug-in cards	Mini PCI, optionally 2 x 190 mm plug-in cards
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast	2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast
RAID 1	2 x CFast	2 x CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

We reserve the right to make technical changes.

C6920 with plug-in card slots

Extension for PCI and PCIe plug-in cards

The control cabinet PCs C6920 can be expanded by two slots for standard PC cards with a length of up to 190 mm. The 70 mm wider PC (see above) housing includes a backplane that provides a choice of two PCI slots, two PCI Express slots or one PCI and one PCI Express slot. The plug-in card connectors are located on the top side of the PC. The plug-in card slots are arranged on the right side of the PC. An aluminium cover on the front of the slot expansion enables easy installation of the plug-in cards without having to open the housing of the computer core. The slots are powered internally by the PC power supply.

Ordering information	Options for C6920-0040, -0050
C9900-B506	2 PCIe plug-in card slots on the passive backplane integrated inside C6920, to plug-in PCIe x1 cards up to 190 mm (6.3") length. The connectors of the plug-in cards are located at the top side of the PC on the right. The width of the PC housing is increased by 70 mm (2.76"), the depth is increased by 18 mm (0.7").
C9900-B510	2 PCI plug-in card slots on the passive backplane integrated inside C6920, to plug-in PCI cards up to 190 mm (6.3") length. The connectors of the plug-in cards are located at the top side of the PC on the right. The width of the PC housing is increased by 70 mm (2.76"), the depth is increased by 18 mm (0.7").
C9900-B514	1 PCI and 1 PCIe plug-in card slot on a passive backplane integrated inside C6920, to plug-in one PCI and one PCIe x1 card up to 190 mm (6.3") length. The connectors of the plug-in cards are located at the top side of the PC on the right. The width of the PC enclosure is increased by 70 mm (2.76"), the depth is increased by 18 mm (0.7").

C6925

C6925 | Fanless control cabinet Industrial PC

C6925	C6925-0020, -0030
Housing	fanless Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	1 slot for one CFast flash card behind the front flap
	2 PCIe module slots to plug-in Beckhoff PCIe modules or to lead out interfaces of the motherboard ex factory
	passive cooling without fan with a heat sink
	5 cm (2") free space on top and bottom of the PC necessary for air circulation
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 1.75 kg (3.9 lbs)
	compact dimensions (W x H x D) 65 x 223 x 121 mm (2.6" x 8.8" x 4.8") without mounting plate

Features	C6925-0020	C6925-0030
Processor	Intel® Celeron® ULV	Intel® Atom™
Motherboard	3½-inch	3½-inch
Slots	2 PCIe modules	2 PCIe modules
Free slots	2 PCIe	2 PCIe
Max. card length	PCIe module	PCIe module
Memory	2…8 GB DDR3 RAM	2…8 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast	2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast
RAID 1	2 x CFast	–
Power supply	24 V DC	24 V DC
Recommendation	recommended for new projects	recommended for new projects
Further information	for further options, technical drawings, documentations, etc.	

We reserve the right to make technical changes.

C6930 | Control cabinet Industrial PC

C6930	C6930-0040, -0050
Housing	Industrial PC for space-saving control cabinet installation
	mounting sheet at the rear wall
	all connectors on the front
	status LEDs
	lithium battery accessible behind the front flap
	2 slots for 2½-inch hard disks or SSDs behind the front flap
	1 slot for one CFast flash card behind the front flap
	2 PCIe module slots to plug-in Beckhoff PCIe modules or to lead out interfaces of the motherboard ex factory
	fan cartridge with speed control and double ball bearing fans, accessible from the front
	5 cm (2") free space above and under the PC required for air circulation
	protection class IP 20
	operating temperature 0…55 °C
	weight of the basic configuration 2.1 kg (4.6 lbs)
	compact dimensions (W x H x D) 89 x 231 x 119 mm (3.5" x 9.1" x 4.7") without mounting plate

Features	C6930-0040	C6930-0050
Processor	up to Core™ i3/i5/i7 2nd/3rd generation	up to Core™ i3/i5/i7 4th generation
Motherboard	3½-inch	3½-inch
Slots	1 Mini PCI and 2 PCIe modules, optionally 2 plug-in card slots	1 Mini PCI and 2 PCIe modules, optionally 2 plug-in card slots
Free slots	1 Mini PCI and 2 PCIe modules, optionally 2 PCI/PCIe plug-in card slots	1 Mini PCI and 2 PCIe modules, optionally 2 PCI/PCIe plug-in card slots
Max. card length	Mini PCI and 2 PCIe modules, optionally 2 x 190 mm plug-in cards	Mini PCI and 2 PCIe modules, optionally 2 x 190 mm plug-in cards
Memory	2…16 GB DDR3 RAM	2…16 GB DDR3L RAM
Graphic adapter	integrated in the processor	integrated in the processor
Ethernet	2 on-board	2 on-board
Hard disks/flash	1 or 2 x 2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast	1 or 2 x 2½-inch HDD or SSD and/or 1 x CFast or 2 x CFast
RAID 1	2 x 2½-inch HDD or 2 x CFast	2 x 2½-inch HDD or 2 x CFast
Power supply	24 V DC	24 V DC
Recommendation	available	recommended for new projects
Further information	for further options, technical drawings, documentations, etc. see C6930	

C6930

C6930 with plug-in card slots

Extension for PCI and PCIe plug-in cards

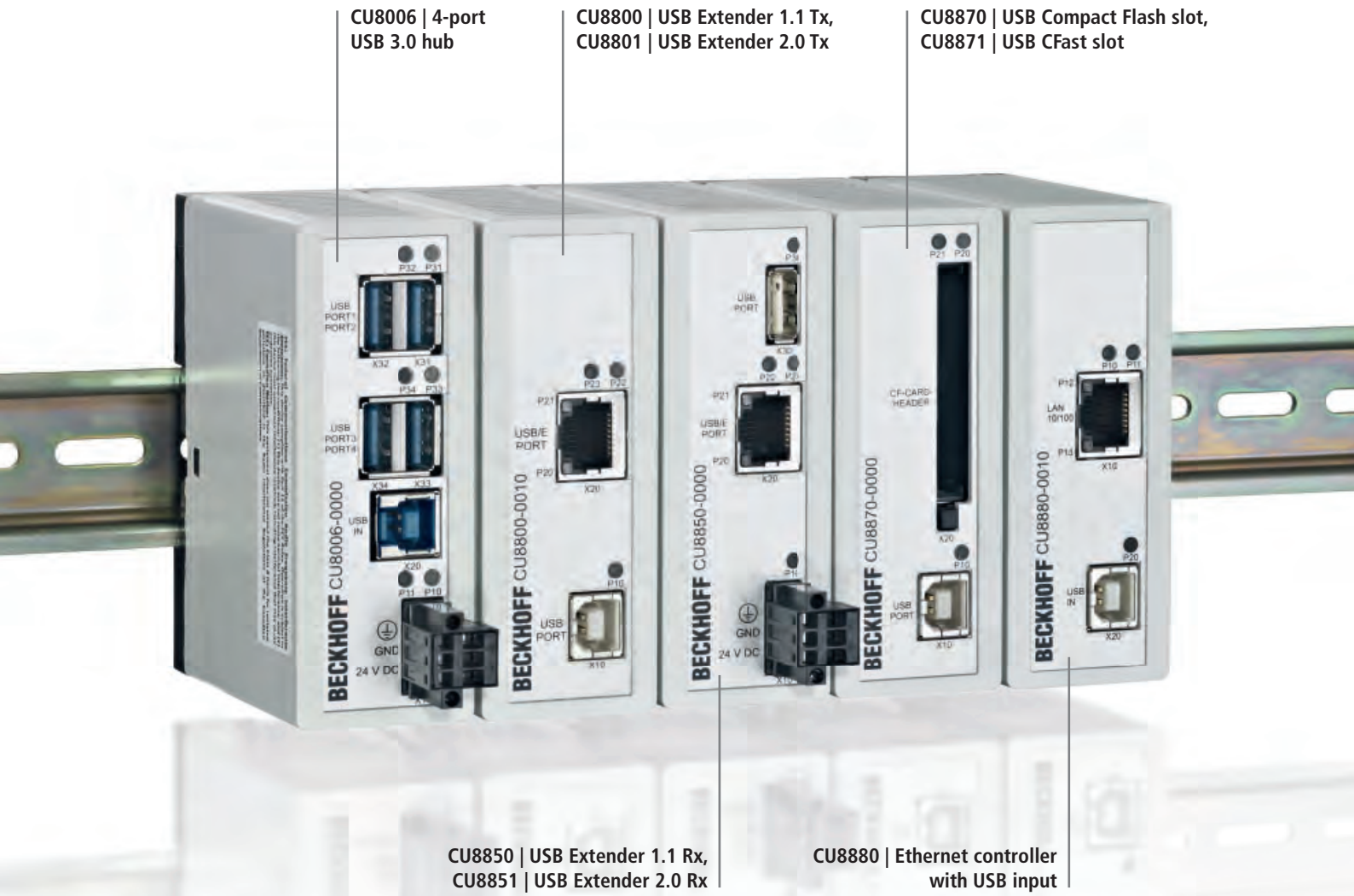
The control cabinet PCs C6930 can be expanded by two slots for standard PC cards with a length of up to 190 mm. The 70 mm wider PC housing (see above) includes a backplane that provides a choice of two PCI slots, two PCI Express slots or one PCI and one PCI Express slot. The plug-in card connectors are located on the top side of the PC. The plug-in card slots are arranged on the right side of the PC. An aluminium cover on the front of the slot expansion enables easy installation of the plug-in cards without having to open the housing of the computer core. The slots are powered internally by the PC power supply.

Ordering information	Options for C6930-0040, -0050
FC9062	gigabit Ethernet PCIe module for PCs with Beckhoff PCIe module slots, 2-channel, PCI Express x1 bus
C9900-B507	2 PCIe plug-in card slots on the passive backplane integrated inside C6930, to plug-in PCIe x1 cards up to 190 mm (6.3") length. The connectors of the plug-in cards are located at the top side of the PC on the right. The width of the PC housing is increased by 70 mm (2.76"), the depth is increased by 18 mm (0.7").
C9900-B511	2 PCI plug-in card slots on the passive backplane integrated inside C6930, to plug-in PCI cards up to 190 mm (6.3") length. The connectors of the plug-in cards are located at the top side of the PC on the right. The width of the PC housing is increased by 70 mm (2.76"), the depth is increased by 18 mm (0.7").
C9900-B515	1 PCI and 1 PCIe plug-in card slot on a passive backplane integrated inside C6930, to plug-in one PCI and one PCIe x1 card up to 190 mm (6.3") length. The connectors of the plug-in cards are located at the top side of the PC on the right. The width of the PC housing is increased by 70 mm (2.76"), the depth is increased by 18 mm (0.7").

We reserve the right to make technical changes.

Industrial PC accessories

▶ IPC-accessories



USB Extended

CU8800, CU8850, C9900-E270 | **USB Extended, the USB 1.1 extension**

The USB specification allows a distance of 5 m between the PC and the USB devices. A further 5 m of cable can be added by using a USB hub. In the construction of machines and plants, larger distances must be bridged without having to insert a USB hub every 5 m. The CU8800 USB Extender sends the USB signal via a Cat.5 cable that can be up to 50 m long to the CU8850 USB Extended receiver or the CP69xx or CP79xx Control Panels, which convert the signal back to USB. The USB Extender boxes are designed for DIN rail mounting. The CU8800 transmitter is supplied with power by the PC via USB. The CU8850 receiver has an integrated 24 V DC power supply unit. Data rates of up to 12 Mbit/s can be transmitted.

Technical data	CU8800 | USB Extender Tx	CU8850 | USB Extender Rx
	USB Extended transmitter box	USB Extended receiver box
	1 USB input with USB B socket to be connected to the PC in maximum 1 m distance	1 USB Extended input with RJ45 socket for up to 50 m Cat.5 cable
	1 USB Extended output with RJ45 socket for up to 50 m Cat.5 cable	1 USB output with USB A socket to be connected to an USB device in maximum 5 m distance
	–	quick error analysing with diagnostic LEDs
	plastic housing for DIN rail installation	plastic housing for DIN rail installation
	USB transfer rate up to 12 Mbit/s for USB 1.1, downwards compatible to USB 1.0	
	protection class IP 20	protection class IP 20
	operating temperature 0…55 °C	operating temperature 0…55 °C
	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")
	power supply via USB	24 V DC power supply

Technical data	C9900-E270 | USB Extender Tx PCIe module
	USB Extended transmitter module
	1 USB Extended output with RJ45 socket for up to 50 m Cat.5 cable for connecting a Control Panel with DVI/USB Extended interface CP69xx or CP79xx
	for ex factory mounting in PCs with Beckhoff PCIe module slot
	USB transfer rate up to 12 Mbit/s according to USB 1.1

We reserve the right to make technical changes.

CU8801, CU8851, C9900-E271 | **USB Extended 2.0, the USB 2.0 extension**

The USB specification allows a distance of 5 m between the PC and the USB devices. A further 5 m of cable can be added by using a USB hub. In the construction of machines and plants, larger distances must be bridged without having to insert a USB hub every 5 m. The CU8801 USB Extender sends the 2.0 USB signal via a Cat.5 cable that can be up to 50 m long to the CU8851 USB Extended receiver, which converts the signal back to USB. Data rates of up to 480 Mbit/s can be transmitted. Both USB Extender boxes are designed for DIN rail mounting. The CU8801 transmitter is powered by the PC. The CU8851 receiver has an integrated 24 V DC power supply unit. The USB Extended 2.0 receiver is already integrated into the Control Panels from the CP29xx and CP39xx series.

Technical data	CU8801 | USB Extender 2.0 Tx	CU8851 | USB Extender 2.0 Rx
	USB Extended 2.0 transmitter box	USB Extended 2.0 receiver box
	1 USB input with USB B socket to be connected to the PC in maximum 1 m distance	1 USB Extended 2.0 input with RJ45 socket for up to 50 m Cat.5 cable
	1 USB Extended 2.0 output with RJ45 socket for up to 50 m Cat.5 cable	1 USB output with USB A socket to be connected to an USB device in maximum 5 m distance
	–	quick error analysing with diagnostic LEDs
	plastic housing for DIN rail installation	plastic housing for DIN rail installation
	USB transfer rate up to 480 Mbit/s for USB 2.0	USB transfer rate up to 480 Mbit/s for USB 2.0
	protection class IP 20	protection class IP 20
	operating temperature 0…55 °C	operating temperature 0…55 °C
	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")
	power supply via USB	24 V DC power supply

Technical data	C9900-E271 | USB Extender 2.0 Tx PCIe module
	USB Extended 2.0 transmitter module
	1 USB Extended 2.0 output with RJ45 socket for up to 50 m Cat.5 cable for connecting a Control Panel with DVI/USB Extended 2.0 interface CP29xx-0000 or CP39xx-0000
	for ex factory mounting in PCs with Beckhoff PCIe module slot
	USB transfer rate up to 480 Mbit/s according to USB 2.0

CU8802, CU8803, C9900-E276 | **CP-Link 4 transmitter modules**

CP-Link 4 – The Two Cable Display Link

The CP29xx-0010 multi-touch built-in panels and the CP39xx-0010 multi-touch panels for mounting arm installation can be operated up to 100 m away from the PC. CP-Link 4 – The Two Cable Display Link – transfers DVI and USB together via a Cat.6A cable. The CU8802 CP-Link 4 transmitter box is connected to the PC via DVI and USB, or else the C9900-E276 PCIe module for CP-Link 4 is installed in the PC.

CP-Link 4 – The One Cable Display Link

The power supply for the Control Panel can also be provided via CP-Link 4 – The One Cable Display Link. The CU8803 CP-Link 4 transmitter box is used instead of the CU8802 or the PCIe module. The Control Panel remains unchanged. The CU8803 transmitter box provides power to the Control Panel via the Cat.6A cable, which also transfers DVI and USB. The power supply socket of the panel is not used.

We reserve the right to make technical changes.

Technical data	CU8802 | Transmitter box for CP-Link 4 – The Two Cable Display Link	CU8803 | Transmitter box for CP-Link 4 – The One Cable Display Link
	CP-Link 4 Extender Tx for connecting a Control Panel with CP-Link 4 interface CP29xx-0010 or CP39xx-0010	CP-Link 4 Extender Tx for connecting a Control Panel with CP-Link 4 interface CP29xx-0010 or CP39xx-0010
	1 USB input with USB B socket to be connected to the PC in maximum 1 m distance	1 USB input with USB B socket to be connected to the PC in maximum 1 m distance
	1 DVI input with DVI-D socket to be connected to the PC in maximum 1 m distance	1 DVI input with DVI-D socket to be connected to the PC in maximum 1 m distance
	1 CP-Link 4 output with RJ45 socket for up to 100 m Cat.6A cable for connecting a Control Panel with CP-Link 4 interface CP29xx-0010 or CP39xx-0010	1 CP-Link 4 output with RJ45 socket for up to 100 m Cat.6A cable for connecting a Control Panel with CP-Link 4 interface CP29xx-0010 or CP39xx-0010
	power supply for the Control Panel with connection of 24 V at the Control Panel	power supply of the Control Panel with CU8803 via the Cat.6A cable
	metal housing for DIN rail installation	metal housing for DIN rail installation
	CP-Link 4 transfers USB 2.0 with 100 Mbit/s and DVI.	CP-Link 4 transfers USB 2.0 with 100 Mbit/s and DVI.
	24 V input for power supply of the CU8802 transmitter box	24 V input for power supply of the CU8803 transmitter box and the Control Panel
	protection class IP 20	protection class IP 20
	operating temperature 0…55 °C	operating temperature 0…55 °C
	dimensions (W x H x D) 45 x 100 x 80 mm (1.8″ x 3.9″ x 3.1″)	dimensions (W x H x D) 84 x 100 x 80 mm (3″ x 3.9″ x 3.1″)
	1 m USB connecting cable	1 m USB connecting cable
	1 m DVI connecting cable	1 m DVI connecting cable

Technical data	C9900-E276 | PCIe module for CP-Link 4 – The Two Cable Display Link
	CP-Link 4 Extender Tx PCIe module
	CP-Link 4 transmitter module for ex factory installation in PCs with Beckhoff PCIe module slots
	1 CP-Link 4 output with RJ45 socket for up to 100 m Cat.6A cable for connecting a Control Panel with CP-Link 4 interface CP29xx-0010 or CP39xx-0010
	CP-Link 4 transfers USB 2.0 with 100 Mbit/s and DVI.
	power supply for the Control Panel with connection of 24 V at the Control Panel

▶CP-Link4

CU8006 | **4-port USB 3.0 hub**

The CU8006 DIN rail-mount USB hub has four ports and supports the USB 3.0 data transfer rate of up to 5 Gbit/s, but is also compatible with slower USB standards. USB 3.0 devices can be connected at a distance of up to 3 m. Connection to USB 2.0 devices is possible with 5-m cables. An 1-m USB cable is provided for connecting the USB hub with the PC. 3-m USB 3.0 cables are permitted between PC and CU8006.

Technical data	CU8006 | 4-port USB 3.0 hub
	1 USB 3.0 input with USB B socket
	4 USB 3.0 outputs with USB A socket
	delivers up to 1 A supply current at each USB port
	USB transfer rate up to 5 Gbit/s, compatible to all USB standards
	plastic housing for DIN rail installation
	protection class IP 20
	operating temperature 0…55 °C
	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")
	24 V DC power supply
	1 m USB connecting cable

C9900-E277 | **USB 3.0 PCIe module**

The C9900-E277 PCIe module for USB 3.0 has two ports and supports the USB 3.0 data transfer rate of up to 5 Gbit/s, but is also compatible with slower USB standards. PCIe modules can be used in 3½-inch motherboard Beckhoff PCs with a PCIe module slot. The C9900-E277 USB module can also be plugged in later. USB 3.0 devices can be connected at a distance of up to 3 m. Connection to USB 2.0 devices is possible with 5-m cables.

Technical data	C9900-E277 | USB 3.0 PCIe module
	2-port USB 3.0 interfaces
	delivers up to 1 A supply current at each USB port
	USB transfer rate up to 5 Gbit/s for USB 3.0
	compatible to all USB standards

We reserve the right to make technical changes.

CU8810 | **DVI splitter with USB extender for CP69xx and CP79xx**

A common application in machine and plant construction is the simultaneous display of a PC screen on several monitors. Up to four CP69xx or CP79xx DVI/USB Control Panels can be connected to a PC via the CU8810 DVI splitter. Thanks to DVI/USB extension technology, the Control Panels can each be connected at distances of 50 m from the DVI splitter. PCs with two DVI outputs, which are configured as extended desktops, generate two different screen contents. Both DVI outputs can be fed into the DVI splitter. Using DIP switches, the four DVI outputs can each be assigned to one of the two DVI inputs, so that the Control Panels show either the left or the right half of the desktop, as selected.

Technical data	CU8810 | DVI splitter for CP69xx and CP79xx
	metal housing for DIN rail installation
	compact industrial design
	2 DVI-D inputs
	4 DVI-D outputs
	assignment of the 4 DVI outputs to the 2 inputs freely configurable via DIP switches
	DVI inputs and outputs with full DVI data range up to 1.65 Gbit/s
	unused DVI input and outputs can be switched off to save energy
	1 USB input with USB B socket
	4-port USB hub with 4 USB Extended outputs as RJ45 connectors
	USB transfer rate up to 12 Mbit/s for USB 1.1, downwards compatible to USB 1.0
	protection class IP 20
	operating temperature 0…55 °C
	dimensions (W x H x D) 146.5 x 100 x 38 mm (5.8" x 4" x 1.5")
	24 V DC power supply

CU8815 | **DVI splitter**

A common application in machine and plant construction is the simultaneous display of a PC screen on several monitors. Up to four CP29xx, CP39xx, CP68xx, CP69xx, CP79xx or CP79xx DVI/USB Control Panels can be connected to a PC via the CU8815 DVI splitter. PCs with two DVI outputs, which are configured as extended desktops, generate two different screen contents. Both DVI outputs can be fed into the DVI splitter. Using DIP switches, the four DVI outputs can each be assigned to one of the two DVI inputs, so that the Control Panels show either the left or the right half of the desktop, as selected.

Technical data	CU8815 | DVI splitter without USB extender
	metal housing for DIN rail installation
	compact industrial design
	2 DVI-D inputs
	4 DVI-D outputs
	assignment of the 4 DVI outputs to the 2 inputs freely configurable via DIP switches
	DVI inputs and outputs with full DVI data range up to 1.65 Gbit/s
	unused DVI input and outputs can be switched off to save energy
	protection class IP 20
	operating temperature 0…55 °C
	dimensions (W x H x D) 146.5 x 100 x 38 mm (5.8" x 4" x 1.5")
	24 V DC power supply

CU8870 | **USB Compact Flash slot**

The CU8870 offers a Compact Flash socket with USB connector. The Compact Flash cards are hot-plug capable in the CU8870 and can hence be plugged and unplugged like removable data storage devices for exchanging data with other PCs during operation. Together with the CU8800 and the CU8850, this CF socket can be mounted on a DIN rail at a distance of up to 50 m from the PC.

Technical data	CU8870 | USB Compact Flash slot
	Compact Flash slot for CF cards type I and II
	front LED indicators for PWR (power), LOCK (read only) and CF access
	1 USB 2.0 input with USB B socket
	USB transfer rate up to 480 Mbit/s, compatible to all USB standards
	plastic housing for DIN rail installation
	protection class IP 20
	operating temperature 0…55 °C
	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")
	power supply via USB

CU8871 | **USB CFast slot**

The CU8871 offers a CFast socket with USB connector in a compact housing for DIN rail mounting. CFast cards are used in the industrial environment as data memory for process and control data. The CFast cards are hot-plug capable in the CU8871 and can hence be plugged and unplugged like removable data storage devices for exchanging data with other PCs during operation. The USB 3.0 connection offers the highest data transfer rate possible with a CFast card, but the CFast adapter can also be connected to PCs with a USB 2.0 interface. Power is also supplied via USB. Status LEDs indicate whether the CU8871 is connected, signal data accesses and provide information as to whether a CFast card is inserted.

Technical data	CU8871 | USB CFast slot
	CFast slot
	front LED indicators for PWR (power), LOCK (only read permission) and CFast (access)
	1 USB 3.0 input with USB B socket
	compatible to all USB standards
	plastic housing for DIN rail installation
	protection class IP 20
	operating temperature 0…55 °C
	dimensions (W x H x D) 34 x 98 x 77 mm (1.3" x 3.9" x 3")
	power supply via USB
	1 m USB connecting cable

We reserve the right to make technical changes.

CU8880 | **Ethernet controller with USB input**

With the CU8880 USB-to-LAN adapter, Industrial PCs can be extended with an additional industrially-suited and independent Ethernet interface. The CU8880 is used for necessary IT communication. It is not suitable for EtherCAT or real-time Ethernet communication. However, the on-board Ethernet interfaces of the respective Industrial PCs are available for this. Drivers for the USB-to-LAN adapter are available for Windows XP, Windows 7 as well as Windows Embedded Standard.

Technical data	CU8880 | Ethernet controller with USB input
	Ethernet controller box
	1 USB 2.0 input with USB B socket
	1 Ethernet interface with 1 x 10/100BASE-T connector RJ45
	not suitable for real-time Ethernet or EtherCAT
	plastic housing for DIN rail installation
	protection class IP 20
	operating temperature 0…55 °C
	dimensions (W x H x D) 34 x 98 x 77 mm (1.3″ x 3.9″ x 3″)
	power supply via USB

C9900-H3xx | **USB sticks**

USB sticks are used for data exchange between PCs or for data backup. For data backup operating system and application programs of a PC are saved as an image on a USB stick once the PC has been configured. In the event of a data loss on the PC the data can be restored from the USB stick.

As a data backup device the USB stick must be able to store the data reliably and for many years. In contrast to USB sticks with MLC or TLC flash memory, the high-quality SLC flash memory in the Beckhoff USB stick ensures long-term data integrity.

Ordering information	USB sticks
C9900-H356	4 GB USB stick, USB 3.0
C9900-H359	8 GB USB stick, USB 3.0
C9900-H376	16 GB USB stick, USB 3.0

Ordering information	USB sticks with Beckhoff Service Tool (BST)
C9900-H357	4 GB USB stick, USB 3.0, with Beckhoff Service Tool (BST) for backup and update of Windows CE or Windows Embedded Standard for x86 compatible PCs BST requires USB 2.0 or higher.
C9900-H360	8 GB USB stick, USB 3.0, with Beckhoff Service Tool (BST) for backup and update of Windows CE or Windows Embedded Standard for x86 compatible PCs BST requires USB 2.0 or higher.

Ordering information	USB sticks with Beckhoff Service Tool (BST) and Acronis® Backup & Recovery
C9900-H371	4 GB USB stick, USB 3.0, with Beckhoff Service Tool (BST) for backup and update of Windows CE or Windows Embedded Standard for x86 compatible PCs, incl. Acronis Backup & Recovery, BST requires USB 2.0 or higher.
C9900-H372	8 GB USB stick, USB 3.0, with Beckhoff Service Tool (BST) for backup and update of Windows x86 compatible PCs, incl. Acronis Backup & Recovery, BST requires USB 2.0 or higher.
C9900-H377	16 GB USB stick, USB 3.0, with Beckhoff Service Tool (BST) for backup and update of Windows for x86 compatible PCs, incl. Acronis Backup & Recovery, BST requires USB 2.0 or higher.

FC3161, NOVRAM

FC3161 | PCIe modules with PROFIBUS master and/or NOVRAM

Beckhoff PCIe modules are highly integrated PCI Express plug-in cards and follow the trend towards ever smaller PCs. The function of PC plug-in cards is integrated in a compact format that is suitable for harsh industrial environments.

The new PCIe modules for Beckhoff Industrial PCs allow the use of a PROFIBUS master without NOVRAM (FC3161-0000) or with 512 KB NOVRAM for easy data backup (FC3161-0002). A separate storage module with 512 KB NOVRAM is also available (C9900-R266).

In TwinCAT, PROFIBUS and NOVRAM are available. Other applications also benefit from the diverse features: general PROFIBUS drivers for Windows NT/2000/XP/Vista or Windows 7 and convenient configuration tools are included in the TwinCAT I/O software package. High-level language programs use the DLL, Visual Basic applications the ActiveX interface. Applications with OPC interface can access process data and parameters via an OPC server.

Technical data	FC3161-0000	FC3161-0002
Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1	PROFIBUS DP (standard), PROFIBUS DP-V1
Number of fieldbus channels	1	1
Data transfer rates	9.6 kbaud…12 Mbaud	9.6 kbaud…12 Mbaud
Interface to the PC	PCIe (PCI Express) interface	PCIe (PCI Express) interface
Bus interface	1 x D-sub socket, 9-pin, galvanically decoupled	1 x D-sub socket, 9-pin, galvanically decoupled
Communication	master and slave functionality	master and slave functionality
Bus device	max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	
Hardware diagnosis	2 LEDs per channel	2 LEDs per channel
NOVRAM	–	512 kB
Driver	TwinCAT 2.11 R3 and higher	TwinCAT 2.11 R3 and higher

Ordering information	PCI Express module
C9900-R266	Memory PCIe module for PCs with Beckhoff PCIe module slots, NOVRAM for fail-safe storage of process data, 512 kB, PCI Express x1 bus

For availability status see Beckhoff website at: IPC

We reserve the right to make technical changes.

FC9062 | **PCIe module**

The compact PC expansion card with industrial form factor

Beckhoff PCIe modules are highly integrated PCI Express plug-in cards and follow the trend towards ever smaller PCs. The function of PC plug-in cards is integrated in a compact format that is suitable for harsh industrial environments.

Compared with PCI or PCIe plug-in cards, which require a special card holder in the Industrial PC, the Beckhoff PCIe module is a industrially compatible plug-in card that is firmly screwed to the inside of the PC via the plug connector bracket. The PCIe modules can be retrofitted on site without special PC knowledge. The PC housing does not have to be opened.

The 3½-inch motherboard offers four PCI Express lanes to be distributed to the PCIe module slots or standard plug-in card slots. The result are PCs with module slots and/or slots for plug-in cards. A PCIe module is connected to the motherboard via one PCI Express lane with a data transfer rate of 5 Gigabit. A module can therefore provide two Gigabit Ethernet interfaces, for example. The FC9062 module complements the Panel PCs CP22xx and CP62xx as well as the control cabinet PCs C5210, C6515, C6525 and C6930 with two Gigabit Ethernet ports. If two modules are used, these PCs have a total of six Ethernet interfaces, while the Mini PCI slot continues to be available for a seventh Ethernet port or a fieldbus interface for PROFIBUS, CANopen, DeviceNet or SERCOS. If only one of the two module slots is equipped with a PCIe module, the second slot is available for feeding motherboard interfaces such as COM ports, USB or sound out of the PC. The connection for a Mini PCI card can also be fed out through the module slots, even if the basic configuration of the PC, e.g. the C6515, does not allow for Mini PCI fieldbus cards.

Ordering information	PCI Express module
FC9062	gigabit Ethernet PC module for PCs with Beckhoff PCIe module slots, 2-channel, PCI Express x1 bus

FC9071 | **Gigabit Ethernet PC interface card**

The FC9071 Ethernet PCIe Network card can be used in office and automation networks. It is installed in the PC's connecting area at the position of the Mini PCI connector board and is wired to the 3½-inch motherboard by a flexible PCIe cable. Compared to the Mini PCI bus, the PCIe bus offers a faster transfer rate and a better long time availability. The Mini-PCI slot, if still present, remains free for the use of NOVRAM cards. The FC9071 can also be operated with TwinCAT drivers – and therefore in real-time.

Ordering information	
FC9071-0000	Gigabit Ethernet PC interface card, 10/100/1000 Mbit/s, 1-channel, PCIe interface

C9900-U33x

C9900-U33x | Battery pack

All Industrial PCs can be equipped with a 24 V power supply unit and an integrated UPS. The UPS supplies the PC with power if the mains power fails. This allows data to be saved on the hard disk or Flash, after which the PC can be shut down properly. A battery pack, which serves as the energy storage device, is mounted on a DIN rail outside the PC.

Rated at 3.4 Ah, the maintenance-free C9900-U330 24 V battery pack offers a very high nominal capacity in a compact package. With its rated capacity of 1.3 Ah, the very compact 24 V C9900-U332 battery pack is designed for PCs with Intel® Atom™ processor.

Technical data	C9900-U330	C9900-U332
	battery pack for PCs with 24 V power supply with intergrated UPS	
	metal housing for mounting on norm rail TS35x15 2.3	metal housing for mounting on norm rail TS35x15 2.3
	24 V nominal voltage	24 V nominal voltage
	3.4 Ah nominal capacity (20 h discharge)	1.3 Ah nominal capacity (20 h discharge)
	two 12 V batteries in series connection	two 12 V batteries in series connection
	VRLA AGM Technology = valve regulated lead acid batteries with glass fiber mat inside the separator (VRLA = valve regulated lead acid, AGM = absorbed glass mat technology)	
	maintenance-free	maintenance-free
	9 A fuse by PTC element	9 A fuse by PTC element
	operating temperature 0…50 °C	operating temperature 0…50 °C
	weight 3.3 kg (7.3 lbs)	weight 2.1 kg (4.63 lbs)
	dimensions (W x H x D) 157 x 70 x 175 mm (6.2" x 2.8" x 6.9")	dimensions (W x H x D) 68.7 x 106.6 x 143.8 mm (4.2" x 2.8" x 5.66")

We reserve the right to make technical changes.

C9900-E2xx | Slotbox for extending Industrial PCs with two plug-in card slots

The slotbox makes PCI Express and PCI slots available outside the IPC as well. The PCI Express bus is fed via a plug connector and cable to a slotbox located up to 7 m (23-ft) away. Users can use the installation space in the control cabinet flexibly and locate further plug-in cards locally.

Both PCI and PCI Express card slots are available by using different versions of the slotbox. The slotbox is made of sturdy aluminium and ideal for use in industrial environments.

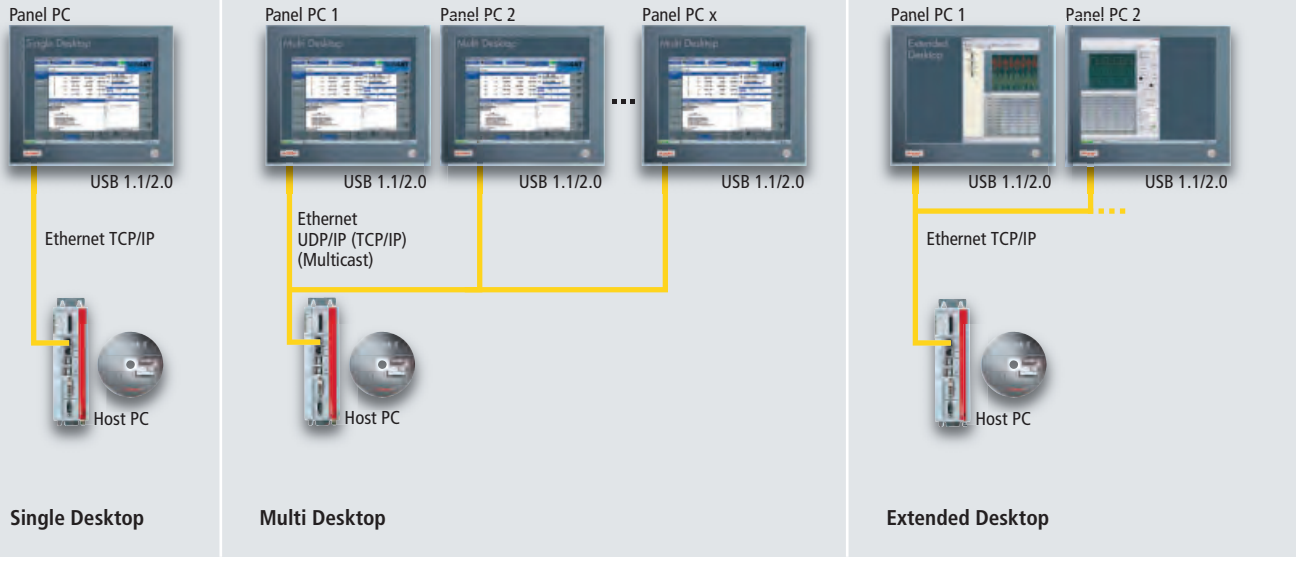
PCIe module C9900-E239 for installation in the PC

C9900-E2xx	C9900-E249	C9900-E250	C9900-E251
Technical data	fanless aluminium housing for control cabinet installation		
	2 slots for up to 190 mm long plug-in cards		
	all connectors on the top	all connectors on the top	all connectors on the top
	PCIe x1 input for connection with an Industrial PC with PCIe module C9900-E236 or -E239		
	7 m max. distance between Industrial PC and slotbox		
	1 PCI and 1 PCIe x1 slot	2 PCIe x1 slots	2 PCI slots
	IP 20	IP 20	IP 20
	operating temperature 0…55 °C	operating temperature 0…55 °C	operating temperature 0…55 °C
	weight without plug-in cards 1.7 kg	weight without plug-in cards 1.7 kg	weight without plug-in cards 1.7 kg
	dimensions (W x H x D) 94 x 222 x 132 mm (3.7″ x 8.7″ x 5.2″) without mounting plate		
	24 V DC power supply	24 V DC power supply	24 V DC power supply

C9900-E23x	PCIe modules
C9900-E236	PCIe modules with external PCIe x1 connector for CP22xx, CP62xx, C5210 or C65xx with PCIe module slot
C9900-E239	PCIe modules with external PCIe x1 connector for C6930

C9900-K50x	Connecting cables for the slotbox
C9900-K501	connecting cable PCIe x1 external, 1 m
C9900-K502	connecting cable PCIe x1 external, 3 m
C9900-K503	connecting cable PCIe x1 external, 5 m
C9900-K504	connecting cable PCIe x1 external, 7 m

CP-Link 3



CP-Link 3 | **Ethernet- and IP protocol-based desktop transfer software**

CP-Link 3 transfers the desktop of a PC via Ethernet to several Panel PCs and the operator mouse and keyboard entries to the host PC. The screen contents are captured by a virtual graphic adapter in the host PC and sent using Ethernet to one or more Panel PCs with Windows operating systems (CE, XP, Windows 7 or Windows Embedded Standard). Networking can be done using cost-effective standard Ethernet cables (CAT 5) which are suitable for drag chains.

Since the data and image transfer are based on TCP/IP, the operating and display functions can be extended using the Internet. Panel PCs can be integrated using the Internet via VPN (Virtual Private Network). A VPN service must be available for the Internet security functions.

Keyboard entries, touch screen and special key functions are transferred from the client to the host PC via Virtual USB. USB devices connected to a Panel PC appear in the host PC like locally plugged-in devices and can be used in the normal way.

Virtual USB emulates a USB root hub in the host PC. If a USB device is plugged into a Panel PC, then the virtual hub logs the device on to the operating system of the host PC and transparently transmits the ensuing communication. For the operating system, the USB device behaves as though it was directly connected to the PC. Virtual USB transfers the standards USB 1.1 and USB 2.0. As communication takes place using 100 Mbit/s Ethernet, the USB 2.0 transmission performance (480 Mbit/s) is restricted.

Additional input/output devices on the Panel PCs, such as rotary switches, buttons, etc., are read in by the host PC using an additional communication channel. Printers and webcams, which are connected to a Panel PC by means of USB, can be used from the host PC.

The scope of delivery for CP-Link 3 includes host and client software. The host PC may have Windows XP, Windows 7 or Windows Embedded Standard installed. Panel PCs with Windows CE, Windows XP, Windows 7 or Windows Embedded Standard are used as clients. As the application software (PLC/NC, HMI, etc.), once started, runs on the host PC, any necessary software licenses are only payable once for the host PC. The client Panel PCs only receive image data. Apart from the operating system and CP-Link 3, no other software license is required for the clients. Even for PCs with more than one graphics card only one license per application software is necessary. For host PCs of other vendors an upgrade license is required.

The CP-Link 3 software is available in three versions:

- Single Desktop
- Multi Desktop
- Extended Desktop

License upgrades are available for third-party host PCs.

▶CP-Link3

We reserve the right to make technical changes.

Single Desktop

A Panel PC is connected with a host PC via Ethernet and shows the image of the host PC. Communication takes place using TCP/IP.

Keyboard entries, touch screen and special key functions are transferred from the client to the host PC via Virtual USB. USB devices connected to a Panel PC appear in the host PC just like locally connected devices.

Ordering information	CP-Link 3 Single Desktop
	Ethernet and IP protocol-based desktop transfer software CP-Link 3
	transfers the desktop of a PC via Ethernet to one Panel PC
	transmission of mouse and keyboard inputs of the client user to the host PC
	connection by Ethernet or Internet, TCP/IP
	1 virtual graphic adapter
	Virtual USB
	USB devices connected at the client are found by the host PC like a local USB device.
	1 client controllable
	The client shows the screen of the host PC.
	host software for PCs with Windows XP, Windows 7 or Windows Embedded Standard
	client software for Beckhoff Panel PCs with Windows CE, Windows XP, Windows 7 or Windows Embedded Standard

Multi Desktop

Several Panel PCs are connected with a PC via Ethernet and display the image of the host PC. All connected client Panel PCs show the same image.

Communication takes place using TCP/IP (up to 10 Panel PCs) or via UDP Multicast (up to 255 Panel PCs). The benefit of Multicast lies in the fact that messages can be transferred to several Panel PCs simultaneously without the transmitter bandwidth multiplying by the number of receivers.

Ordering information	CP-Link 3 Multi Desktop
	Ethernet and IP protocol-based desktop transfer software CP-Link 3
	transfers the desktop of a PC via Ethernet to Panel PCs
	transmission of mouse and keyboard inputs of client users to the host PC
	connection by Ethernet or Internet, TCP/IP or UDP/IP (Multicast)
	1 virtual graphic adapter
	Virtual USB
	USB devices connected at a client are found by the host PC like a local USB device.
	Up to 255 clients are controllable in UDP/IP mode, up to 10 clients in TCP/IP mode.
	All clients show the same picture, the screen of the host PC.
	The input devices can be locked at any client by TwinCAT-PLC or via application programming interface (API)
	host software for PCs with Windows XP, Windows 7 or Windows Embedded Standard
	client software for Beckhoff Panel PCs with Windows CE, Windows XP, Windows 7 or Windows Embedded Standard

Extended Desktop

One or several virtual graphic adapters are used to extend the host PC desktop. The program windows of the application software can be moved to additional monitors covered by the extended desktop. Applications may be started on a specific monitor. The desktop can be extended to up to 9 monitors. CP-Link 3 can transfer the data via Ethernet to several client Panel PCs.

The mouse and keyboard entries of individual clients can be locked via TwinCAT PLC or a software interface (API), in order to prevent interference between several users.

Ordering information	CP-Link 3 Extended Desktop
	Ethernet and IP protocol-based desktop transfer software CP-Link 3
	transfers up to 9 screens of the extended desktop of a PC via Ethernet to Panel PCs
	transmission of mouse and keyboard inputs of client users to the host PC
	connection via Ethernet or Internet, TCP/IP or UDP/IP (Multicast)
	Up to 9 virtual graphic adapters extend the desktop of the host PC.
	Virtual USB
	USB devices connected at a client are found by the host PC like a local USB device.
	Up to 255 clients are controllable in UDP/IP mode, up to 10 clients in TCP/IP mode.
	Each client shows 1 of maximally 9 screens of the extended desktop of the host PC.
	The input devices can be locked at any client by TwinCAT PLC or via application programming interface (API).
	Applications are allocable to one of the additional screens of the extended desktop.
	host software for PCs with Windows XP, Windows 7 or Windows Embedded Standard
	client software for Beckhoff Panel PCs with Windows CE, Windows XP, Windows 7 or Windows Embedded Standard

Control Panels

▶ ControlPanel

Multi-touch Control Panels
- built-in (CP29xx) or mounting arm devices (CP39xx)
- multi-finger touch screen
- 7-, 11.6-, 12-, 15-, 15.6-, 18.5-, 19-, 21.5- and 24-inch displays
- vertical or horizontal orientation (portrait/landscape)
- DVI/USB Extended interface
- CP-Link 4 – The One Cable Display Link

See page 150

Single-touch Control Panels
- built-in (CP69xx) or mounting arm devices (CP79xx)
- without touch screen, with single-finger touch screen or touch pad
- 5.7-, 6.5-, 12-, 15- and 19-inch displays
- DVI/USB Extended interface

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We reserve the right to make technical changes.

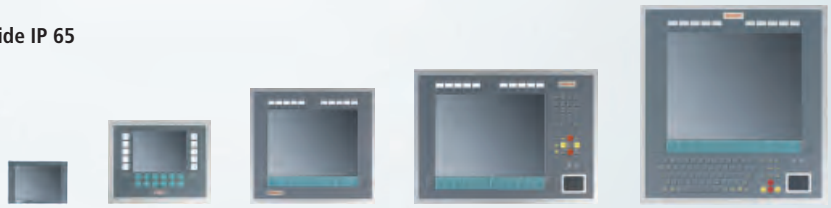
Built-in Control Panels, front side IP 65

CP2907 7-inch | CP2911 11.6-inch | CP2912 12-inch | CP2915 15-inch | CP2916 15.6-inch | CP2918 18.5-inch | CP2919 19-inch | CP2921 21.5-inch | CP2924 24-inch

Control Panels, IP 65 on all sides

CP3907 7-inch | CP3911 11.6-inch | CP3912 12-inch | CP3915 15-inch | CP3916 15.6-inch | CP3918 18.5-inch | CP3919 19-inch | CP3921 21.5-inch | CP3924 24-inch

Built-in Control Panels, front side IP 65



CP6907 5.7-inch | CP6919 6.5-inch | CP6911 12-inch | CP6922 15-inch | CP6933 19-inch

Control Panels, IP 65 on all sides

CP7909 6.5-inch | CP7911 12-inch | CP7922 15-inch | CP7933 19-inch | CP790x-14xx 12-, 15-, 19-inch

Multi-touch Control Panels CP29xx and CP39xx

▶ **multitouch**

With Windows 7 the multi-finger touch screen is becoming popular at PCs. Industrial applications are using the projected capacitive multi-touch technology. An anti-reflective glass plate forms the display front. The operation with hand gloves is possible. Five fingers are detected separately even if the distance between the fingers is only 1 cm.

The multi-touch Control Panels are conceived both for control cabinet installation and for the mounting arm installation. The CP29xx built-in Panel series is implemented with IP 65 protection at the front and IP 20 at the rear. The CP39xx Control Panels for mounting arm installation feature all-round IP 65 protection. The panels CP29xx-0000 and CP39xx-0000 with DVI/USB Extended interface can be operated up to 50 m away from the Industrial PC. With CP-Link 4 – The One Cable Display Link – and CP29xx-0010 and CP39xx-0010 Control Panels the distance between Industrial PC and operating panel can be increased to 100 m.

CP39xx

We reserve the right to make technical changes.

CP29xx

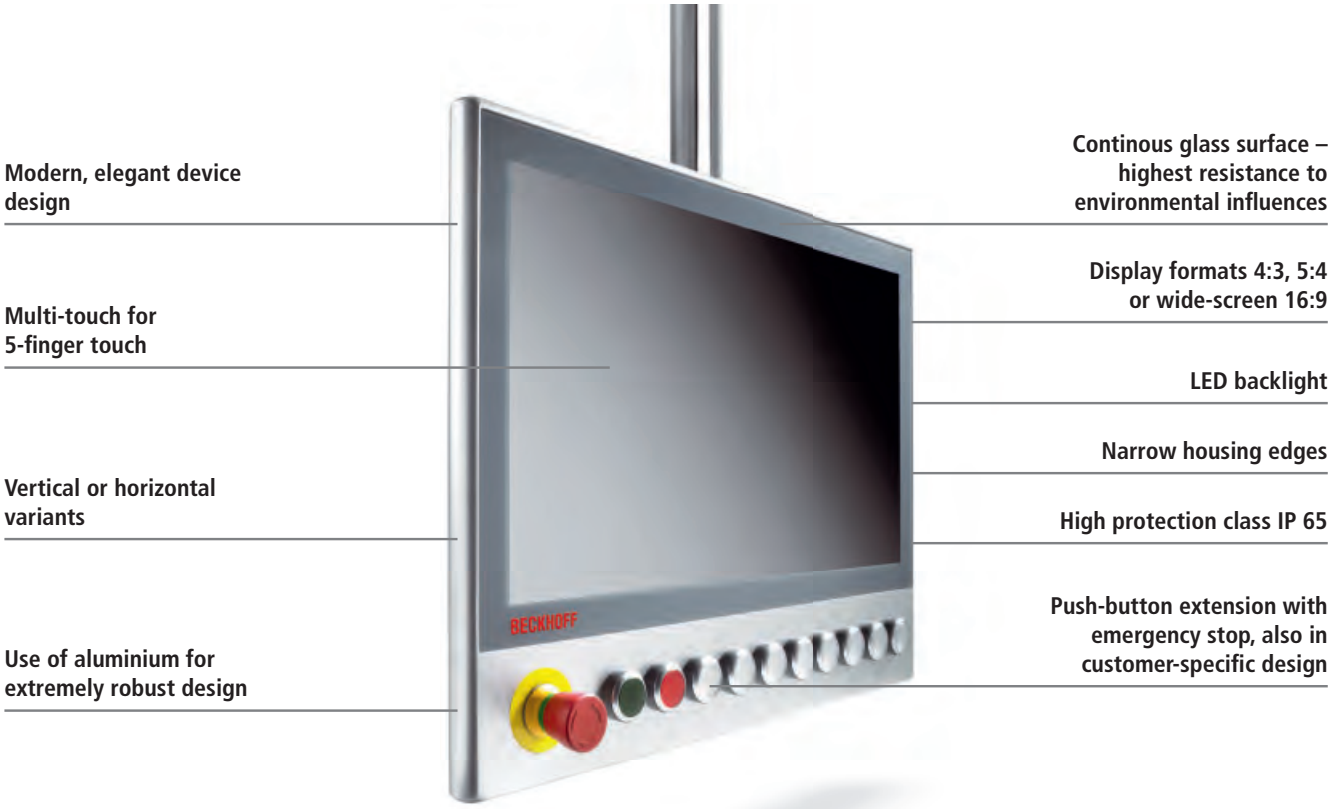
CP39xx

Beckhoff offers the following display sizes:
Wide screen (16:9)
- 7-inch, resolution 800 x 480
- 11.6-inch, resolution 1366 x 768
- 15.6-inch, resolution 1366 x 768
- 18.5-inch, resolution 1366 x 768
- 21.5-inch, full HD resolution 1920 x 1080
- 24-inch, full HD resolution 1920 x 1080

Further display sizes
- 12-inch, resolution 800 x 600 (4:3)
- 15-inch, resolution 1024 x 768 (4:3)
- 19-inch, resolution 1280 x 1024 (5:4)

With the option C9900-M575 all of the displays are also available in portrait format.

Customer-specific adaptations for a push-button extension individualise the multi-touch Control Panel series.



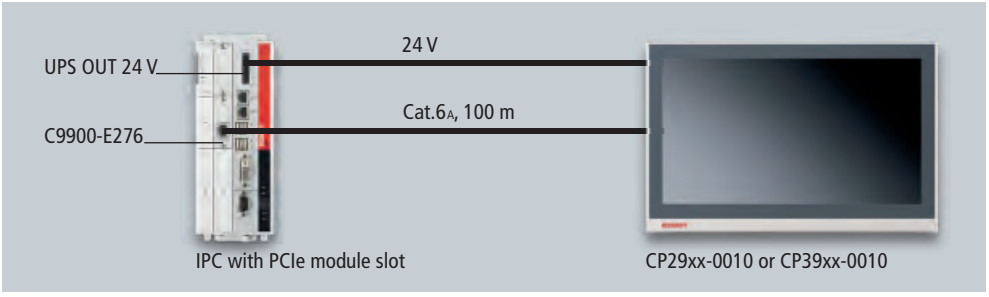
CP-Link 4 | The One Cable Display Link

▶ CP-Link4

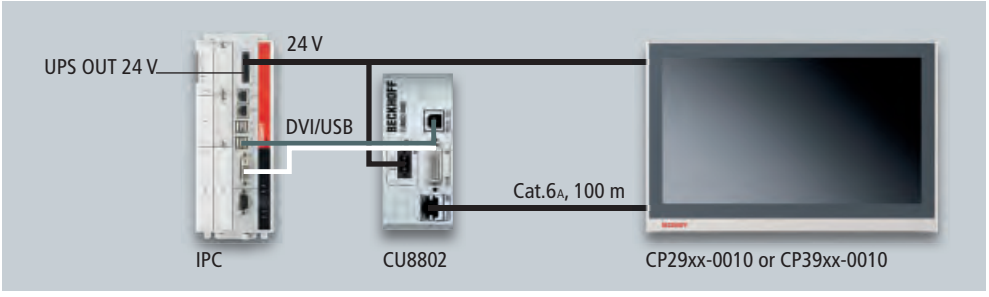
CP-Link 4 – The Two Cable Display Link
The CP29xx-0010 multi-touch built-in panels and the CP39xx-0010 multi-touch panels for mounting arm installation can be operated up to 100 m away from the PC. CP-Link 4 – The Two Cable Display Link – transfers DVI and USB together via a Cat.6A cable. The CU8802 CP-Link 4 transmitter box is connected to the PC via DVI and USB, or else the C9900-E276 PCIe module for CP-Link 4 is installed in the PC.

CP-Link 4 – The One Cable Display Link
The power supply for the Control Panel can also be provided via CP-Link 4 – The One Cable Display Link. The CU8803 CP-Link 4 transmitter box is used instead of the CU8802 or the PCIe module. The Control Panel remains unchanged. The CU8803 transmitter box provides power to the Control Panel via the Cat.6A cable, which also transfers DVI and USB. The power supply socket of the panel is not used.

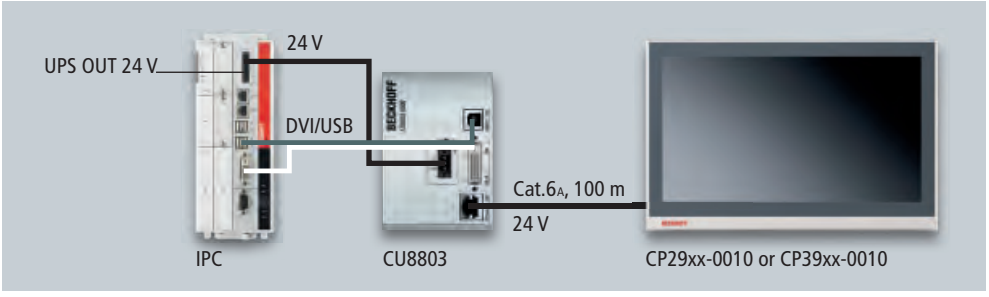
CP-Link 4 – The Two Cable Display Link: via C9900-E276 PCIe module integrated in the PC



CP-Link 4 – The Two Cable Display Link: via CU8802 transmitter box



CP-Link 4 – The One Cable Display Link: DVI, USB and 24 V via CU8803 transmitter box



We reserve the right to make technical changes.

Customised Beckhoff multi-touch Control Panels

Multi-touch Control Panel in portrait orientation with customised push-button extension

Multi-touch Control Panel with RFID reader

Multi-touch Control Panel with RGB illuminated ring keys

Multi-touch Control Panel with emergency stop, electromechanical keys and graycode switch

Multi-touch Control Panel with emergency stop, start/stop keys and membrane keys with slide-in labels

21.5-inch multi-touch Control Panel for machine tools

18.5-inch multi-touch Control Panel with emergency stop and 3 buttons, connection alternatively via USB or directly wired

15-inch multi-touch Control Panel with RFID reader, emergency stop and 3 RGB illuminated ring keys

CP29xx

CP29xx | Multi-touch built-in Control Panel

CP2907 CP2911 CP2912 CP2915 CP2916 CP2918 CP2919 CP2921 CP2924

Ordering information		Multi-finger touch screen with DVI/USB Extended	Multi-finger touch screen with CP-Link 4
7-inch display	800 x 480	CP2907-0000	CP2907-0010
11.6-inch display	1366 x 768	CP2911-0000	CP2911-0010
12-inch display	800 x 600	CP2912-0000	CP2912-0010
15-inch display	1024 x 768	CP2915-0000	CP2915-0010
15.6-inch display	1366 x 768	CP2916-0000	CP2916-0010
18.5-inch display	1366 x 768	CP2918-0000	CP2918-0010
19-inch display	1280 x 1024	CP2919-0000	CP2919-0010
21.5-inch display	1920 x 1080	CP2921-0000	CP2921-0010
24-inch display	1920 x 1080	CP2924-0000	CP2924-0010

We reserve the right to make technical changes.

CP29xx	CP29xx-0000	CP29xx-0010
Features	TFT display in nine sizes – 7-inch display 800 x 480 – 11.6-inch display 1366 x 768 – 12-inch display 800 x 600 – 15-inch display 1024 x 768 – 15.6-inch display 1366 x 768 – 18.5-inch display 1366 x 768 – 19-inch display 1280 x 1024 – 21.5-inch display 1920 x 1080 – 24-inch display 1920 x 1080	TFT display in nine sizes – 7-inch display 800 x 480 – 11.6-inch display 1366 x 768 – 12-inch display 800 x 600 – 15-inch display 1024 x 768 – 15.6-inch display 1366 x 768 – 18.5-inch display 1366 x 768 – 19-inch display 1280 x 1024 – 21.5-inch display 1920 x 1080 – 24-inch display 1920 x 1080
	aluminium housing with glass front, front side IP 65, rear side IP 20	aluminium housing with glass front, front side IP 65, rear side IP 20
	multi-finger touch screen – multi-finger touch screen driver for Windows 7 – single-finger touch screen driver for Windows XP and Windows CE 6	multi-finger touch screen – multi-finger touch screen driver for Windows 7 – single-finger touch screen driver for Windows XP and Windows CE 6
	integrated DVI/USB extension technology – DVI-E and USB-E 2.0 enable remote panel operation at a distance of up to 50 m from the PC. – USB-E 2.0 transmits USB 2.0 with 480 Mbit/s. – DVI-E input is compatible to the standard DVI output of a PC.	integrated CP-Link 4 connection technology – CP-Link 4 enables remote panel operation at a distance of up to 100 m from the PC via a Cat.6A cable with integrated or separate 24 V DC power supply depending on the transmitter module. – CP-Link 4 transmits USB 2.0 with 100 Mbit/s and DVI.
	USB 3.0 input for the direct connection to a standard USB output of a PC with distances of up to 3 m	connection via an RJ45 connector for CP-Link 4 in the backplane
	2-port USB 3.0 socket inside the Control Panel backplane, for USB-E 2.0 limited to USB 2.0	additional pin contact strip, for optional 24 V power supply
	all connectors at the lower rear side	2-port USB 2.0 socket inside the Control Panel backplane
	24 V power supply	all connectors at the lower rear side
	operating temperature 0…55 °C	operating temperature 0…50 °C
	pull-out clamping levers for fast installation without loose parts	pull-out clamping levers for fast installation without loose parts
Further information	for further options, technical drawings, documentations, etc. see CP29xx	

CP39xx

CP39xx | Multi-touch Control Panel

CP3907 CP3911 CP3912 CP3915 CP3916 CP3918 CP3919 CP3921 CP3924

Ordering information	Multi-finger touch screen with DVI/USB Extended	Multi-finger touch screen with CP-Link 4
7-inch display 800 x 480	CP3907-0000	CP3907-0010
11.6-inch display 1366 x 768	CP3911-0000	CP3911-0010
12-inch display 800 x 600	CP3912-0000	CP3912-0010
15-inch display 1024 x 768	CP3915-0000	CP3915-0010
15.6-inch display 1366 x 768	CP3916-0000	CP3916-0010
18.5-inch display 1366 x 768	CP3918-0000	CP3918-0010
19-inch display 1280 x 1024	CP3919-0000	CP3919-0010
21.5-inch display 1920 x 1080	CP3921-0000	CP3921-0010
24-inch display 1920 x 1080	CP3924-0000	CP3924-0010

We reserve the right to make technical changes.

reddot design award
winner 2013

Mounting arm adapter
C9900-M751

Connection block of the basic configuration with optional USB socket

CP39xx	CP39xx-0000	CP39xx-0010
Features	TFT display in nine sizes – 7-inch display 800 x 480 – 11.6-inch display 1366 x 768 – 12-inch display 800 x 600 – 15-inch display 1024 x 768 – 15.6-inch display 1366 x 768 – 18.5-inch display 1366 x 768 – 19-inch display 1280 x 1024 – 21.5-inch display 1920 x 1080 – 24-inch display 1920 x 1080	TFT display in nine sizes – 7-inch display 800 x 480 – 11.6-inch display 1366 x 768 – 12-inch display 800 x 600 – 15-inch display 1024 x 768 – 15.6-inch display 1366 x 768 – 18.5-inch display 1366 x 768 – 19-inch display 1280 x 1024 – 21.5-inch display 1920 x 1080 – 24-inch display 1920 x 1080
	aluminium housing with glass front, protection class IP 65	aluminium housing with glass front, protection class IP 65
	multi-finger touch screen – multi-finger touch screen driver for Windows 7 – single-finger touch screen driver for Windows XP and Windows CE 6	multi-finger touch screen – multi-finger touch screen driver for Windows 7 – single-finger touch screen driver for Windows XP and Windows CE 6
	integrated DVI/USB extension technology – DVI-E and USB-E 2.0 enable remote panel operation at a distance of up to 50 m from the PC. – USB-E 2.0 transmits USB 2.0 with 480 Mbit/s. – DVI-E input is compatible to the standard DVI output of a PC.	integrated CP-Link 4 connection technology – CP-Link 4 enables remote panel operation at a distance of up to 100 m from the PC via a Cat.6A cable with integrated or separate 24 V DC power supply depending on the transmitter module. – CP-Link 4 transmits USB 2.0 with 100 Mbit/s and DVI.
	connection via 3 round connectors (IP 65) for DVI, USB-E 2.0 and 24 V power supply unit in the backplane	connection via M12 round connector (IP 65) for CP-Link 4 in the backplane
	24 V power supply	additional M12 round connector for optional 24 V power supply
	operating temperature 0…55 °C	operating temperature 0…50 °C
Further information	for further options, technical drawings, documentations, etc. see CP39xx	

Accessories for CP2xxx and CP3xxx multi-touch Control Panels and Panel PCs

▶ IPC-accessories

We reserve the right to make technical changes.

C9900-M406 | **Keyboard shelf for CP3xxx multi-touch Control Panels and Panel PCs**

The keyboard shelf at a Beckhoff Panel PC or Control Panel permits a standard PC keyboard to be placed in front of the Control Panel, allowing convenient operation during commissioning or software updates. During normal production, the machine operator can rest tools and other items here while using the multi-finger touch screen.

A USB socket is integrated at the back of the keyboard shelf for connecting the keyboard. Any keyboard USB cable excess can be wrapped around a bracket at the underside of the keyboard shelf.

The shelf is made of coated aluminium, and its design matches that of the Control Panel. The keyboard shelf has a width of 468 mm.

Ordering information	Keyboard shelf for CP3xxx
C9900-M406	Toolboard for keyboard or tools, mounted under a Control Panel or Panel PC CP3xxx, with integrated USB socket IP 65 at the back side, can only be ordered in combination with the Control Panel or Panel PC.

Push-button extension

CP2912 with C9900-G002 and CP2924 with C9900-G007

C9900-G00x, -G01x | Push-button extension for built-in multi-touch panels

C9900-G00x, -G01x	Push-button extension for built-in multi-touch panels
Features	push-button extension for CP2xxx
	push-button extension below
	push-button keys with signal lamp, type RAFI RAFIX 22FS+, round, 30 mm
	1 emergency stop key, type RAFI RAFIX 22FS+
	labels for push-button caps for individual marking of each push-button
	All push-buttons are transmitted via USB with one normally-open contact.
	Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.
	All signal lamps are transmitted via USB only.
	Selector switches and keylock switches as well as other elements from the series RAFIX 22FS+ are integrateable.
Further information	C9900-G00x

Ordering information	Push-button extension for built-in multi-touch panels
C9900-G001	push-button extension for CP2x11 11.6" landscape: 4 push-button keys and 1 emergency stop key
C9900-G002	push-button extension for CP2x12 12" landscape: 4 push-button keys and 1 emergency stop key
C9900-G003	push-button extension for CP2x15 15" landscape: 7 push-button keys and 1 emergency stop key
C9900-G004	push-button extension for CP2x16 15.6" landscape: 8 push-button keys and 1 emergency stop key
C9900-G005	push-button extension for CP2x18 18.5" landscape: 10 push-button keys and 1 emergency stop key
C9900-G006	push-button extension for CP2x19 19" landscape: 9 push-button keys and 1 emergency stop key
C9900-G008	push-button extension for CP2x21 21.5" landscape: 12 push-button keys and 1 emergency stop key
C9900-G007	push-button extension for CP2x24 24" landscape: 13 push-button keys and 1 emergency stop key
C9900-G012	push-button extension for CP2x12 12" portrait: 3 push-button keys and 1 emergency stop key
C9900-G013	push-button extension for CP2x15 15" portrait: 4 push-button keys and 1 emergency stop key
C9900-G014	push-button extension for CP2x16 15.6" portrait: 4 push-button keys and 1 emergency stop key
C9900-G015	push-button extension for CP2x16 15.6" portrait: 3 push-button keys and 1 emergency stop key
C9900-G016	push-button extension for CP2x19 19" portrait: 7 push-button keys and 1 emergency stop key
C9900-G018	push-button extension for CP2x21 21.5" portrait: 6 push-button keys and 1 emergency stop key
C9900-G017	push-button extension for CP2x24 24" portrait: 6 push-button keys and 1 emergency stop key

We reserve the right to make technical changes.

CP3919 with C9900-G026 and CP3921 with C9900-G028

C9900-G02x, -G03x | Push-button extension for multi-touch panels with mounting arm

C9900-G02x, -G03x	Push-button extension for multi-touch panels with mounting arm
Features	push-button extension for CP3xxx
	push-button extension below
	push-button keys with signal lamp, type RAFI RAFIX 22FS+, round, 30 mm
	1 emergency stop key, type RAFI RAFIX 22FS+
	labels for push-button caps for individual marking of each push-button
	All push-buttons are transmitted via USB with one normally-open contact.
	Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.
	All signal lamps are transmitted via USB only.
	aluminium cable channel to the mounting arm adapter on the backside
	Selector switches and keylock switches as well as other elements from the series RAFIX 22FS+ are integrateable.
Further information	C9900-G02x

Ordering information	Push-button extension for multi-touch panels with mounting arm
C9900-G021	push-button extension for CP3x11 11.6" landscape: 4 push-button keys and 1 emergency stop key
C9900-G022	push-button extension for CP3x12 12" landscape: 4 push-button keys and 1 emergency stop key
C9900-G023	push-button extension for CP3x15 15" landscape: 7 push-button keys and 1 emergency stop key
C9900-G024	push-button extension for CP3x16 15.6" landscape: 8 push-button keys and 1 emergency stop key
C9900-G025	push-button extension for CP3x18 18.5" landscape: 10 push-button keys and 1 emergency stop key
C9900-G026	push-button extension for CP3x19 19" landscape: 9 push-button keys and 1 emergency stop key
C9900-G028	push-button extension for CP3x21 21.5" landscape: 12 push-button keys and 1 emergency stop key
C9900-G027	push-button extension for CP3x24 24" landscape: 13 push-button keys and 1 emergency stop key
C9900-G032	push-button extension for CP3x12 12" portrait: 3 push-button keys and 1 emergency stop key
C9900-G033	push-button extension for CP3x15 15" portrait: 4 push-button keys and 1 emergency stop key
C9900-G034	push-button extension for CP3x16 15.6" portrait: 4 push-button keys and 1 emergency stop key
C9900-G035	push-button extension for CP3x18 18.5" portrait: 4 push-button keys and 1 emergency stop key
C9900-G036	push-button extension for CP3x19 19" portrait: 7 push-button keys and 1 emergency stop key
C9900-G038	push-button extension for CP3x21 21.5" portrait: 6 push-button keys and 1 emergency stop key
C9900-G037	push-button extension for CP3x24 24" portrait: 6 push-button keys and 1 emergency stop key

We reserve the right to make technical changes.

Single-touch Control Panels CP6xxx and CP7xxx

▶ singletouch-control-panel

What frame does an image need?
The carefully planned use of design elements gives the Control Panel its reserved and elegant appearance.

The open design possibilities of a membrane keyboard are fully exploited here. The robust keyboard ensures that the IP 65 protection class is retained as if new, even after long use in a tough industrial environment.

Light emitting diodes are integrated into the keys, while slide-in labels mean that exchangeable key identification can match the needs of the plant.

The emergency stop at the Control Panel
Push-button extensions in the design of the Control Panel make it thicker, but permit the application-specific arrangement of electromechanical keys and other components such as all kinds of switches, barcode scanners, graycode switches and handwheels. External housings can be attached to either side of the Control Panel. The signal leads may be laid separately or can be operated via USB.

Assembly
The back plate of the Control Panel series CP7xxx offers a free surface for a variety of assembly methods, for example a mounting arm system.

We reserve the right to make technical changes.

Mounting arm

Additional keyboard in IP 65

Touch pad

USB socket in IP 65

Control Panel for installation in the control cabinet door

The built-in Control Panels CP6xxx are designed for control cabinet installation. Only 4 mm of the front are visible in front of the control cabinet wall. Installation via pull-out clamping levers makes the process very simple without loose parts.

The built-in Control Panels CP69xx are available with 5.7-, 6.5-, 12-, 15-inch or 19-inch TFT display, with touch screen or touch pad, as a monitor without keyboard or with different membrane keyboard models up to full alphanumeric keyboards with 10 PLC special keys and 10 LEDs. The same range of push-button extensions with electromechanical keys as for the CP7xxx series is available.

The Control Panels are connected to the PC with a DVI/USB Extended interface for distances up to 50 m.

The Control Panel toolkit

A housing that can be dimensioned precisely in line with the needs of the particular application according to the customer's wishes can be combined with an individually designed membrane keyboard. This puts customisation on a wide footing at Beckhoff. Hardly one Control Panel is like another.

The Bus Terminal interface integrated into the Control Panel permits the connection of standard Beckhoff Bus Terminals to realise handwheels, graycode switches, buttons, switches, indicator lamps or other components without any additional wiring. Such elements can be integrated into the Control Panel and connected to the PC via USB.

Customised Beckhoff CP6xxx/CP7xxx Control Panels

- cost-effective implementation of company logos in form of a slide-in label for standard Control Panels
- complete revision of the colour scheme of the front membrane based on the corporate design of the company
- customised keyboard extensions according to customer specifications
- realisation of customer-specific bracket adapter plates for integrating different bracket systems
- realisation of complex operating terminals with fieldbus connections (PROFIBUS, Lightbus, CANopen, Ethernet, …)
- modification of the mechanical/electrical connection of the devices according to the local situation
- development and realisation of the design jointly with the customer

Stainless steel Panel PC

Customer-specific front laminate

Individual housing construction

Individual housing adaptation

Modified membrane keypad colour scheme and keypad matrix

Individual housing construction for flush-mounted installation

We reserve the right to make technical changes.

Individual housing design, colour scheme and key shape/layout according to customer requirements

Individual housing construction

Multifunctional terminal

Push-button extension with hand wheel

Panel PC for injection molding applications

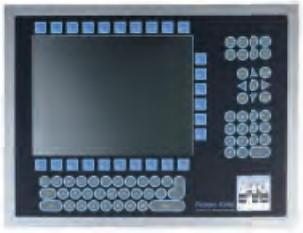
Control solution for blow molding machines

Extension with additional display, incremental encoders and switch elements

Integration of a barcode scanner and signal transducer

Extension with joystick, graycode switch and incremental encoder

Keyboard with larger number and higher density of membrane keys



Front membrane design with modified colour scheme and different size membrane keys

CP69xx, CP79xx | "Economy" Control Panels with DVI/USB Extended interface

▶ CP69xx ▶ CP79xx

The digital visual interface (DVI), defined as successor to analog VGA connections, digitally transfers the PC image to the display. The universal serial bus (USB) enables connection of input devices and drives to the PC. DVI/USB Extended enables CP69xx and CP79xx "Economy" Control Panels to be operated at a distance of up to 50 metres from the PC. Apart from a graphics card or a motherboard with DVI output and the USB port available with every motherboard, no additional card is required in the PC.

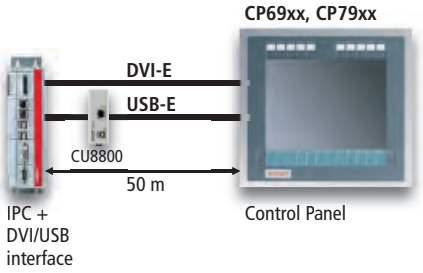
CP79xx Control Panels are designed for mounting arm installation. They offer all-round IP 65 protection. To this end they are equipped via industrial IP 65 round connectors for DVI or USB Extended and the 24 V power supply.

The CP69xx built-in Control Panels are connected via standard USB and DVI connectors and feature an industrial pin contact strip for the 24 V power supply. A 2-port USB socket in the rear panel enables connection of keyboard, mouse, USB stick or CD/DVD drive. The integrated USB 1.1 hub enables a transfer rate of 12 Mbit/s.

We reserve the right to make technical changes.

CP69xx | "Economy"
built-in Control Panel

CP79xx | "Economy"
Control Panel



DVI/USB Extended

DVI/USB Extended

The DVI/USB Extended technology integrated in each CP69xx and CP79xx "Economy" DVI/USB panel enables remote panel operation at a distance of up to 50 m from the PC via standard cables. The graphics signal is transferred directly via DVI cable over a maximum distance of 50 m, while the USB signal is transferred to a Cat.5 cable at the PC in order to extend the 5 m limit of the USB specification to a distance of up to 50 m.

A 50 m DVI cable has 10 times the length allowed by the DVI specification. Such a cable length leads to strong distortion of the graphics signal on arrival at the Control Panel. The CP69xx "Economy" Control Panel features a signal processor that restores the DVI signal. Since it is a digital signal, it can be fully restored. The display shows a perfect image without interference. The PC requires a conventional DVI output. An on-board graphics controller such as Intel® Extreme Graphic or a graphics card can be used.

For USB the specification requires installation of a hub every 5 m. In order to realise a distance of 50 m without hubs, with USB Extended the USB signal is converted so that it can be transferred via 50 m Cat.5 cables with RJ45 connectors commonly used for Ethernet wiring. In the Control Panel the signal is converted back to USB. Through the 12 Mbit/s transfer rate a USB 1.1 interface is available in the Control Panel. In addition to touch screen, membrane keyboard and push-button extension, a hub in the Control Panel enables connection of two external USB devices such as keyboard, mouse, USB stick or CD/DVD drive. However, no further USB hub can be connected to the Control Panel. The PC must have a USB 1.1 or USB 2.0 interface. The CU8800 USB-to-USB Extended converter box requires no auxiliary power supply. It has a USB input and an RJ45 USB Extended output. The box together with all required cables is offered as a set for distances of 10, 20, 30, 40 or 50 m between the PC and the Control Panel. For distances up to 5 m the PC and the Control Panels CP69xx can be connected directly via a USB cable. The Control Panels CP79xx are connected via the adapter CU8800, even at short distance.

CP69xx

CP69xx | “Economy” built-in Control Panel with DVI/USB Extended interface

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
5.7-inch display 640 x 480	CP6907-0000-0000	CP6907-0001-0000	
6.5-inch display 640 x 480	CP6909-0000-0000	CP6909-0001-0000	
12-inch display 800 x 600	CP6901-0000-0000	CP6901-0001-0000	
15-inch display 1024 x 768	CP6902-0000-0000	CP6902-0001-0000	
19-inch display 1280 x 1024	CP6903-0000-0000	CP6903-0001-0000	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP6901-0020-0000	CP6901-0021-0000	
15-inch display 1024 x 768	CP6902-0020-0000	CP6902-0021-0000	
19-inch display 1280 x 1024	CP6903-0020-0000	CP6903-0021-0000	
With function keys			
6.5-inch display 640 x 480	CP6919-0000-0000	CP6919-0001-0000	
12-inch display 800 x 600	CP6911-0000-0000	CP6911-0001-0000	
15-inch display 1024 x 768	CP6912-0000-0000	CP6912-0001-0000	
19-inch display 1280 x 1024	CP6913-0000-0000	CP6913-0001-0000	
Numeric keyboard			
6.5-inch display 640 x 480	CP6929-0000-0000	CP6929-0001-0000	
12-inch display 800 x 600	CP6921-0000-0000	CP6921-0001-0000	CP6921-0002-0000
15-inch display 1024 x 768	CP6922-0000-0000	CP6922-0001-0000	CP6922-0002-0000
19-inch display 1280 x 1024	CP6923-0000-0000	CP6923-0001-0000	CP6923-0002-0000
Alphanumeric keyboard			
12-inch display 800 x 600	CP6931-0000-0000	CP6931-0001-0000	CP6931-0002-0000
15-inch display 1024 x 768	CP6932-0000-0000	CP6932-0001-0000	CP6932-0002-0000
19-inch display 1280 x 1024	CP6933-0000-0000	CP6933-0001-0000	CP6933-0002-0000
Alphanumeric keyboard with PLC keys on the sides			
15-inch display 1024 x 768	CP6942-0000-0000	CP6942-0001-0000	

We reserve the right to make technical changes.

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

Alphanumeric keyboard with PLC keys on the sides

CP69xx	"Economy" built-in Control Panel
Features	TFT display in five sizes – 5.7-inch display 640 x 480 – 6.5-inch display 640 x 480 – 12-inch display 800 x 600 – 15-inch display 1024 x 768 – 19-inch display 1280 x 1024
	aluminium front with sheet-steel rear cover, front side IP 65, rear side IP 20
	front laminate in five variants – only display – function keys and 10 PLC special keys with LED – numeric keyboard and 10 PLC special keys with LED – alphanumeric PC keyboard in US layout and 10 PLC special keys with LED – alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides
	integrated DVI/USB extension technology – DVI-E and USB-E enable remote panel operation at a distance of up to 50 m from the PC. – DVI-E input is compatible to the standard DVI output of a PC.
	USB input for the direct connection to a standard USB output of a PC with distances of up to 5 m
	all connectors at the lower rear side
	24 V power supply
	operating temperature 0…55 °C
	pull-out clamping levers for fast installation without loose parts
Options	touch screen pen with wall holder
	push-button extension with electromechanical switches and keys
	connecting kits for up to 50 m distance to the PC
	wall mounting frame for building installation
Stainless steel options	stainless steel front (1.4301) with bevelled edges at top and bottom and touch screen for CP690x
Further information	for further options, technical drawings, documentations, etc. see CP69xx

CP79xx

CP79xx | "Economy" Control Panel with DVI/USB Extended interface

Ordering information	without touch screen	with single-touch screen	with touch pad
Display only			
6.5-inch display 640 x 480	CP7909-0000-0000	CP7909-0001-0000	
12-inch display 800 x 600	CP7901-0000-0000	CP7901-0001-0000	
15-inch display 1024 x 768	CP7902-0000-0000	CP7902-0001-0000	
19-inch display 1280 x 1024	CP7903-0000-0000	CP7903-0001-0000	
Display only, USB A socket in the front			
12-inch display 800 x 600	CP7901-0020-0000	CP7901-0021-0000	
15-inch display 1024 x 768	CP7902-0020-0000	CP7902-0021-0000	
19-inch display 1280 x 1024	CP7903-0020-0000	CP7903-0021-0000	
With function keys			
6.5-inch display 640 x 480	CP7919-0000-0000	CP7919-0001-0000	
12-inch display 800 x 600	CP7911-0000-0000	CP7911-0001-0000	
15-inch display 1024 x 768	CP7912-0000-0000	CP7912-0001-0000	
19-inch display 1280 x 1024	CP7913-0000-0000	CP7913-0001-0000	
Numeric keyboard			
6.5-inch display 640 x 480	CP7929-0000-0000	CP7929-0001-0000	
12-inch display 800 x 600	CP7921-0000-0000	CP7921-0001-0000	CP7921-0002-0000
15-inch display 1024 x 768	CP7922-0000-0000	CP7922-0001-0000	CP7922-0002-0000
19-inch display 1280 x 1024	CP7923-0000-0000	CP7923-0001-0000	CP7923-0002-0000
Alphanumeric keyboard			
12-inch display 800 x 600	CP7931-0000-0000	CP7931-0001-0000	CP7931-0002-0000
15-inch display 1024 x 768	CP7932-0000-0000	CP7932-0001-0000	CP7932-0002-0000
19-inch display 1280 x 1024	CP7933-0000-0000	CP7933-0001-0000	CP7933-0002-0000
Alphanumeric keyboard with PLC keys on the sides			
15-inch display 1024 x 768	CP7942-0000-0000	CP7942-0001-0000	
Stainless steel housing		**with single-touch screen**	**with single-touch screen, push-buttons and USB socket**
12-inch display 800 x 600		CP7901-1400-0000	CP7901-1401-0000
15-inch display 1024 x 768		CP7902-1400-0000	CP7902-1401-0000
19-inch display 1280 x 1024		CP7903-1400-0000	CP7903-1401-0000

We reserve the right to make technical changes.

Stainless steel finish

Without keys

Function keys

Numeric keyboard

Alphanumeric keyboard

Alphanumeric keyboard with PLC keys on the sides

CP79xx	"Economy" Control Panel
Features	TFT display in four sizes – 6.5-inch display 640 x 480 – 12-inch display 800 x 600 – 15-inch display 1024 x 768 – 19-inch display 1280 x 1024
	aluminium housing, protection class IP 65
	front laminate in five variants – only display – function keys and 10 PLC special keys with LED – numeric keyboard and 10 PLC special keys with LED – alphanumeric PC keyboard in US layout and 10 PLC special keys with LED – alphanumeric PC keyboard in US layout and 16 PLC special keys with LED on the sides
	special keys identified by slide-in labels
	integrated DVI/USB extension technology – DVI-E and USB-E enable remote panel operation at a distance of up to 50 m from the PC. – DVI-E input is compatible to the standard DVI output of a PC.
	connection via 3 round connectors (IP 65) for DVI, USB-E and 24 V power supply unit in the backplane
	operating temperature 0…55 °C
	for mounting 4 M6 x 18 mm threaded holes in the backplane
Options	2-port IP 65 USB interface in the backplane
	touch screen pen with holder for aluminium Control Panels
	additional keyboard IP 65 or toolboard for keyboard and tools
	push-button extension with electromechanical switches and keys
	connection set up to 50 m length
	adapter plate for mounting arm installation
Stainless steel options	stainless steel housing with flush-mounted touch screen for CP7901, CP7902 and CP7903
Further information	for further options, technical drawings, documentations, etc. see CP79xx

Accessories for CP6xxx and CP7xxx single-touch Control Panels and Panel PCs

We reserve the right to make technical changes.

Keyboard shelf

Touch screen pen

Additional keyboard

RFID reader

Electromechanical buttons on the Control Panel or Panel PC

Control Panels and Panel PCs with push-button extension enable the application-specific arrangement of electromechanical buttons, switches, signal lamps, additional membrane keys and a hand wheel directly on the operating unit. It enables precise adaptation of the Control Panel to the machine control requirements. In many cases, a machine operator control panel is no longer required, since all functions are integrated in the Control Panel. The Control Panel housing is increased in size on one side. Depending on the required functions and the electromechanical components, the flat rear panel is enlarged or extended with a trough-shaped rear panel for the button area.

For the CP77xx and CP79xx units the Rolec Tara Plus mounting arm system, article numbers 149.025.012, 149.025.013, 149.025.014, 149.035.012, 149.035.013 or 149.035.015, can be mounted centrally at the rear of the Control Panel. The mounting arm can optionally be connected from above or below. The Rittal mounting arm system is available as an additional option. The CP6508.020 or CP6501.170 Rittal adapters can be mounted at the back of the Control Panel. The cables are routed through the mounting arm, through a cable gland in the mounting arm adapter and from there concealed through a channel at the rear of the Control Panel to the push-button extension. A circular plug-in connector instead of a screwed cable gland is available on request. The housings of the CP7xxx range have protection class IP 65 on all sides. The wiring space can be opened without removing the Control Panel from the mounting arm.

The buttons, switches and indicator lamps are connected to the control system via USB. A second contact on the buttons and switches can at the same time be wired directly via a terminal row. Besides the push-button extensions shown on the following pages, numerous other variants are conceivable, which can be individually designed in accordance with requirements.

Open wiring space

Push-button extension

CP6233-0001-0010 with C9900-E595

Push-button extensions for CP6xxx

C9900-Exxx	Push-button extension for "Economy" built-in Panel PCs, built-in Panel PCs, "Economy" built-in Control Panels
Features	push-button extension on the right side
	push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm
	1 emergency stop key Siemens Signum
	Labels for push-button caps allow individual marking.
	All push-buttons are transmitted via USB with one normally-open contact.
	Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.
	All signal lamps are transmitted via USB only.
	Selector switches and keylock switches as well as other elements from the Signum series are integrateable on request.
Options	A circular plug-in connector is available on request (instead of a screwed cable gland).
Further information	C9900-Exxx

Ordering information	Push-button extension for "Economy" built-in Panel PC CP62xx
C9900-E505	push-button extension for CP6221 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E515	push-button extension for CP6231 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E545	push-button extension for CP6202 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E555	push-button extension for CP6212 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E565	push-button extension for CP6222 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E575	push-button extension for CP6232 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E525	push-button extension for CP6203 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E535	push-button extension for CP6213 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E594	push-button extension for CP6223 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E595	push-button extension for CP6233 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

We reserve the right to make technical changes.

CP6232-0002-0035 with C9900-E575

Ordering information	Push-button extension for built-in Panel PC CP65xx
C9900-E705	push-button extension for CP6521 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E715	push-button extension for CP6531 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E745	push-button extension for CP6502 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E755	push-button extension for CP6512 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E765	push-button extension for CP6522 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E775	push-button extension for CP6532 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E725	push-button extension for CP6503 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E735	push-button extension for CP6513 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E796	push-button extension for CP6523 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E797	push-button extension for CP6533 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

Ordering information	Push-button extension for "Economy" built-in Panel PC CP66xx
C9900-E406	push-button extension for CP6621 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E416	push-button extension for CP6631 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E446	push-button extension for CP6602 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E456	push-button extension for CP6612 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E466	push-button extension for CP6622 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E476	push-button extension for CP6632 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E426	push-button extension for CP6603 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E436	push-button extension for CP6613 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E496	push-button extension for CP6623 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E497	push-button extension for CP6633 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

Push-button extension

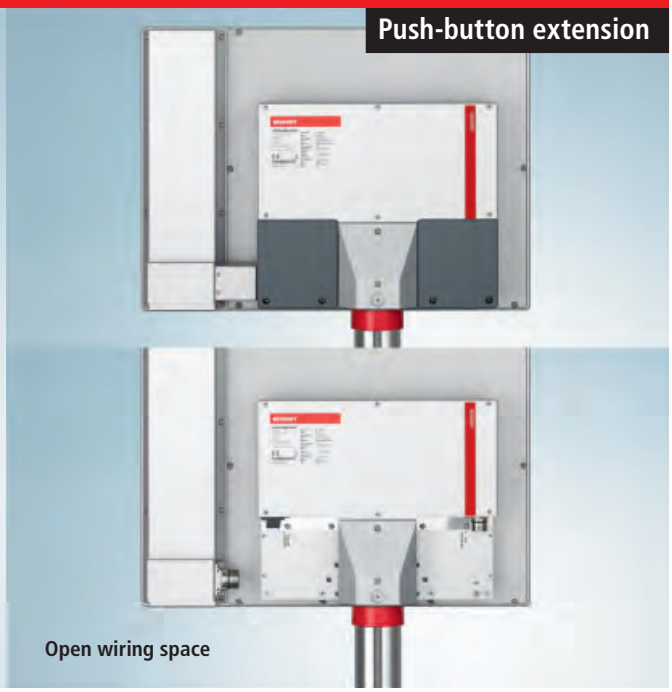
CP6922-0001-0000 with C9900-E965

Ordering information	Push-button extension for "Economy" built-in Panel PC CP67xx-00xx-0040/-0050
C9900-E505	push-button extension for CP6721-00xx-0040/-0050 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E515	push-button extension for CP6731-00xx-0040/-0050 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E545	push-button extension for CP6702-00xx-0040/-0050 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E555	push-button extension for CP6712-00xx-0040/-0050 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E565	push-button extension for CP6722-00xx-0040/-0050 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E575	push-button extension for CP6732-00xx-0040/-0050 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E525	push-button extension for CP6703-00xx-0040/-0050 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E535	push-button extension for CP6713-00xx-0040/-0050 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E594	push-button extension for CP6723-00xx-0040/-0050 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E595	push-button extension for CP6733-00xx-0040/-0050 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

Ordering information	Push-button extension for "Economy" built-in Control Panel CP69xx
C9900-E905	push-button extension for CP6921 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E915	push-button extension for CP6931 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E945	push-button extension for CP6902 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E955	push-button extension for CP6912 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E965	push-button extension for CP6922 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E975	push-button extension for CP6932 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E925	push-button extension for CP6903 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E935	push-button extension for CP6913 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E996	push-button extension for CP6923 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E997	push-button extension for CP6933 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

We reserve the right to make technical changes.

CP7202-0001-0010
with C9900-E547 and
C9900-M161



Open wiring space

Push-button extensions for CP72xx

C9900-E5xx	Push-button extension for "Economy" Panel PC
Features	push-button extension on the right side
	push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm
	1 emergency stop key Siemens Signum
	Labels for push-button caps allow individual marking.
	All push-buttons are transmitted via USB with one normally-open contact.
	Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.
	All signal lamps are transmitted via USB only.
	circular plug-in connector between push-button extension and connection section
	Selector switches for keylock switches as well as other elements from the Signum series are integrateable on request.
Further information	C9900-Exxx

Ordering information	Push-button extension for "Economy" Panel PC CP72xx
C9900-E507	push-button extension for CP7221 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E517	push-button extension for CP7231 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E547	push-button extension for CP7202 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E557	push-button extension for CP7212 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E567	push-button extension for CP7222 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E577	push-button extension for CP7232 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E527	push-button extension for CP7203 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E537	push-button extension for CP7213 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E597	push-button extension for CP7223 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E599	push-button extension for CP7233 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

We reserve the right to make technical changes.

Push-button extension

CP7932-0001-0000 with C9900-E771

Push-button extensions for CP7xxx without mounting arm connection

C9900-E7xx, -E8xx	Push-button extension for Panel PC and Control Panel
Features	push-button extension on the right side
	push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm
	1 emergency stop key Siemens Signum
	Labels for push-button caps allow individual marking.
	All push-buttons are transmitted via USB with one normally-open contact.
	Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.
	All signal lamps are transmitted via USB only.
	without mounting arm connection
	without cable bushing
	Selector switches and keylock switches as well as other elements from the Signum series are integrateable on request.
Options	screwed cable gland for feeding a signal line into a push-button extension, mounting arm adapter plates
Further information	C9900-Exxx
Ordering information	**Push-button extension for Panel PC CP77xx**
C9900-E801	push-button extension for CP7721 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E811	push-button extension for CP7731 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E841	push-button extension for CP7702 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E851	push-button extension for CP7712 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E861	push-button extension for CP7722 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E871	push-button extension for CP7732 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E823	push-button extension for CP7703 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E831	push-button extension for CP7713 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E892	push-button extension for CP7723 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E893	push-button extension for CP7733 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp
Ordering information	**Push-button extension for Control Panel CP79xx**
C9900-E701	push-button extension for CP7921 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E711	push-button extension for CP7931 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E741	push-button extension for CP7902 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E751	push-button extension for CP7912 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E761	push-button extension for CP7922 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E771	push-button extension for CP7932 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E723	push-button extension for CP7903 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E731	push-button extension for CP7913 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E792	push-button extension for CP7923 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E793	push-button extension for CP7933 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

We reserve the right to make technical changes.

CP7721-0001-0030 with C9900-E808

Open wiring space

Push-button extensions for CP7xxx with mounting arm adapter plate

C9900-E7xx, -E8xx	Push-button extension for Panel PC and Control Panel
Features	push-button extension on the right side
	push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm
	1 emergency stop key Siemens Signum
	Labels for push-button caps allow individual marking.
	All push-buttons are transmitted via USB with one normally-open contact.
	Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.
	All signal lamps are transmitted via USB only.
	mounting arm adapter plate at Control Panel backplane for top or bottom installation of mounting arm system Rolec
	Selector switches for keylock switches as well as other elements from the Signum series are integrateable on request.
	Circular plug-in connector instead of screwed cable gland is integrateable on request.
Options	mounting arm adapter plate for mounting arm systems Rittal instead of Rolec
Further information	C9900-Exxx
Ordering information	**Push-button extension for Panel PC CP77xx**
C9900-E808	push-button extension for CP7721 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E818	push-button extension for CP7731 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E848	push-button extension for CP7702 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E858	push-button extension for CP7712 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E868	push-button extension for CP7722 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E878	push-button extension for CP7732 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E828	push-button extension for CP7703 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E838	push-button extension for CP7713 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E898	push-button extension for CP7723 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E899	push-button extension for CP7733 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp
Ordering information	**Push-button extension for Control Panel CP79xx**
C9900-E708	push-button extension for CP7921 with 12" display and numeric keyboard, 12 push-button keys with signal lamp
C9900-E718	push-button extension for CP7931 with 12" display and alphanumeric keyboard, 16 push-button keys with signal lamp
C9900-E748	push-button extension for CP7902 with 15" display and without keyboard, 16 push-button keys with signal lamp
C9900-E758	push-button extension for CP7912 with 15" display and function keys, 16 push-button keys with signal lamp
C9900-E768	push-button extension for CP7922 with 15" display and numeric keyboard, 14 push-button keys with signal lamp
C9900-E778	push-button extension for CP7932 with 15" display and alphanumeric keyboard, 18 push-button keys with signal lamp
C9900-E728	push-button extension for CP7903 with 19" display and without keyboard, 20 push-button keys with signal lamp
C9900-E738	push-button extension for CP7913 with 19" display and function keys, 20 push-button keys with signal lamp
C9900-E798	push-button extension for CP7923 with 19" display and numeric keyboard, 20 push-button keys with signal lamp
C9900-E799	push-button extension for CP7933 with 19" display and alphanumeric keyboard, 20 push-button keys with signal lamp

Push-button extension

CP6942-0001-0000 with C9900-E781

PLC push-button extensions for tool machines

C9900-E78x	PLC push-button extension for tool machines at "Economy" built-in Panel PC, built-in Panel PC, built-in Control Panel, Panel PC and Control Panel
Features	push-button extension below
	16 push-button keys with signal lamp, type Siemens Signum square, 30 x 30 mm
	1 emergency stop key Siemens Signum
	inscription of the keys via slide-in labels
	All push-buttons are transmitted via USB with one normally-open contact.
	Additionally, all push-buttons are directly wireable with a second normally-open contact via a terminal row.
	All signal lamps are transmitted via USB only.
	1 graycode switch with 23 positions, controlled via USB
	2-port USB A interface in the front with screw cap IP 65
Additional features CP7942	mounting arm adapter plate at the Control Panel backplane for mounting arm installation from top or bottom for mounting arm system Rolec
Options	Circular plug-in connector instead of screwed cable gland is integrateable on request.
Additional options CP7942	mounting arm adapter plate for mounting arm system Rittal instead of Rolec
	mounting arm adapter plate for mounting arm system Rose instead of Rolec, with 2-port USB interface on the side with screw cap IP 65
Further information	C9900-Exxx

Ordering information	PLC push-button extension for CP6242, CP6542, CP6742-00xx-0040, CP6942, CP7242 and CP7942
C9900-E781	push-button extension for CP6242 with 15" display and alphanumeric keyboard
C9900-E780	push-button extension for CP6542 with 15" display and alphanumeric keyboard
C9900-E781	push-button extension for CP6742-00xx-0040 with 15" display and alphanumeric keyboard
C9900-E781	push-button extension for CP6942 with 15" display and alphanumeric keyboard
C9900-E784	push-button extension for CP7242 with 15" display and alphanumeric keyboard
C9900-E783	push-button extension for CP7942 with 15" display and alphanumeric keyboard

We reserve the right to make technical changes.

CP7942-0001-0000 with C9900-E789 and C9900-E181

CNC push-button extensions for tool machines

C9900-E7xx	CNC push-button extension for tool machines at "Economy" built-in Panel PC, built-in Panel PC, built-in Control Panel, Panel PC and Control Panel
Features	push-button extension below
	2 push-button keys with signal lamp, type Siemens Signum round, directly wireable
	1 emergency stop key Siemens Signum
	1 key switch, type Siemens Signum round, directly wireable
	45 membrane keys with an LED in each key, controlled via USB
	inscription of the keys via slide-in labels
	1 graycode switch with 17 positions, controlled via USB
	1 graycode switch with 23 positions, controlled via USB
	circular plug-in connector
Additional features CP7942	mounting arm adapter plate at the Control Panel backplane for mounting arm installation from top or bottom for mounting arm system Rolec
Options CP7242	connection IP 65 for control unit Euchner at the bottom of the CNC push-button extension
Options CP7942	connection IP 65 for control unit Euchner at the bottom of the CNC push-button extension
	mounting arm adapter plate for mounting arm system Rittal instead of Rolec
	mounting arm adapter plate for mounting arm system Rose instead of Rolec, with 2-port USB interface on the side with screw cap IP 65
Further information	C9900-Exxx

Ordering information	CNC push-button extension for CP6242, CP6542, CP6742-00xx-0040, CP6942, CP7242 and CP7942
C9900-E787	push-button extension for CP6242 with 15" display and alphanumeric keyboard
C9900-E786	push-button extension for CP6542 with 15" display and alphanumeric keyboard
C9900-E787	push-button extension for CP6742-00xx-0040 with 15" display and alphanumeric keyboard
C9900-E787	push-button extension for CP6942 with 15" display and alphanumeric keyboard
C9900-E791	push-button extension for CP7242 with 15" display and alphanumeric keyboard
C9900-E789	push-button extension for CP7942 with 15" display and alphanumeric keyboard

We reserve the right to make technical changes.

K7xxx, KT7xxx | Additional keyboard for CP7xxx Control Panels and Panel PCs

The indestructible PC keyboard

The K7xxx and KT7xxx PC keyboards add a keyboard to the Control Panel which allows the comfortable entry of large amounts of data with a keyboard designed for industrial use. The Control Panel keyboards K7xxx and KT7xxx are even more robust than a membrane keyboard and yet feel almost like a standard keyboard. They offer the optimum in operating comfort in tough industrial environments.

An aluminium keyboard housing in Control Panel design combines the keyboard and the Control Panel to form a homogeneous unit. The width of the housing is adapted to the Control Panel for which the keyboard is intended.

A touch pad can be integrated into the keyboard housing. Here, large, easily accessible keys meeting protection class IP 67 serve as mouse keys. The keyboards K7xxx and KT7xxx are mounted in a holder on the Control Panel which is available in a version located at a fixed angle of 100° and a version which can be adjusted between 90° and 180°. The Control Panel is modified to have additional open sections in the side contour which allow the cabling to be stored in an invisible way.

Ordering information	
K7100-0000	additional keyboard to be mounted to a Control Panel CP79xx or to a Panel PC CP72xx and CP77xx
KT7100-0000	additional keyboard with touch pad to be mounted to a Control Panel CP79xx or to a Panel PC CP72xx and CP77xx
C9900-M300	mounting adapter with fixed 100° angle for mounting a keyboard K7xxx or KT7xxx to a Control Panel
C9900-M310	mounting adapter with adjustable 90° to 180° angle for mounting a keyboard K7xxx or KT7xxx to a Control Panel

C9900-M400 | Keyboard shelf for CP7xxx Control Panels and Panel PCs

The keyboard shelf at a Beckhoff Control Panel permits a standard PC keyboard to be placed in front of the Control Panel, allowing convenient operation during commissioning or software updates. During normal production, the machine operator can rest tools and other items here while using the Control Panel.

The shelf is constructed from anodised aluminium. Its design matches that of the Control Panel. A ribbed rubber mat is glued to the surface of the shelf. The keyboard shelf is made as wide as the Control Panel. In the case of small Control Panels, the shelf is wider than the Control Panel housing, so that a keyboard can be rested on it. The Control Panel is given additional holes on the lower side, so the shelf should be ordered at the same time as the Control Panel.

Ordering information	
C9900-M400	toolboard for keyboard or tools, mounted under a Control Panel CP7xxx or Panel PCs CP7xxx
C9900-M401	drill holes at the bottom of a Control Panel or Panel PC CP7xxx for assembly of a keyboard shelf (supply without shelf)

We reserve the right to make technical changes.

C9900-T90x | Touch screen pen for CP6xxx, CP7xxx and C3xxx Control Panels and Panel PCs

The touch screen is the ideal operating medium for the Industrial PC. By using the Beckhoff touch screen pen, it is possible to make the touch screen technology available for tough operating environments and to allow higher operating precision than using the finger or another pointing medium.

The stable, round point of the pen allows easy, flowing operation of the touch screen and gives a better view of the display at the same time. It is also possible for operators who wear gloves to work in a precise and comfortable way with the Beckhoff touch screen pen. Grit or dirt on the finger is no longer a problem. The plastic tip is gentle on the surface of the touch screen. Direct operation without a pen still remains possible.

The user of the Beckhoff touch screen pen receives a precise input medium with an ergonomically formed, non-slip aluminium shaft, in a design which conforms to that of the Control Panel, and with the right balance of weight, form and friction. This pen is also ideal for the built-in Panel PCs with touch screen.

The touch screen pen is kept in a holder fastened to the Control Panel or to the Panel PC. A connecting cord between the pen and the holder makes the pen accessible at any time.

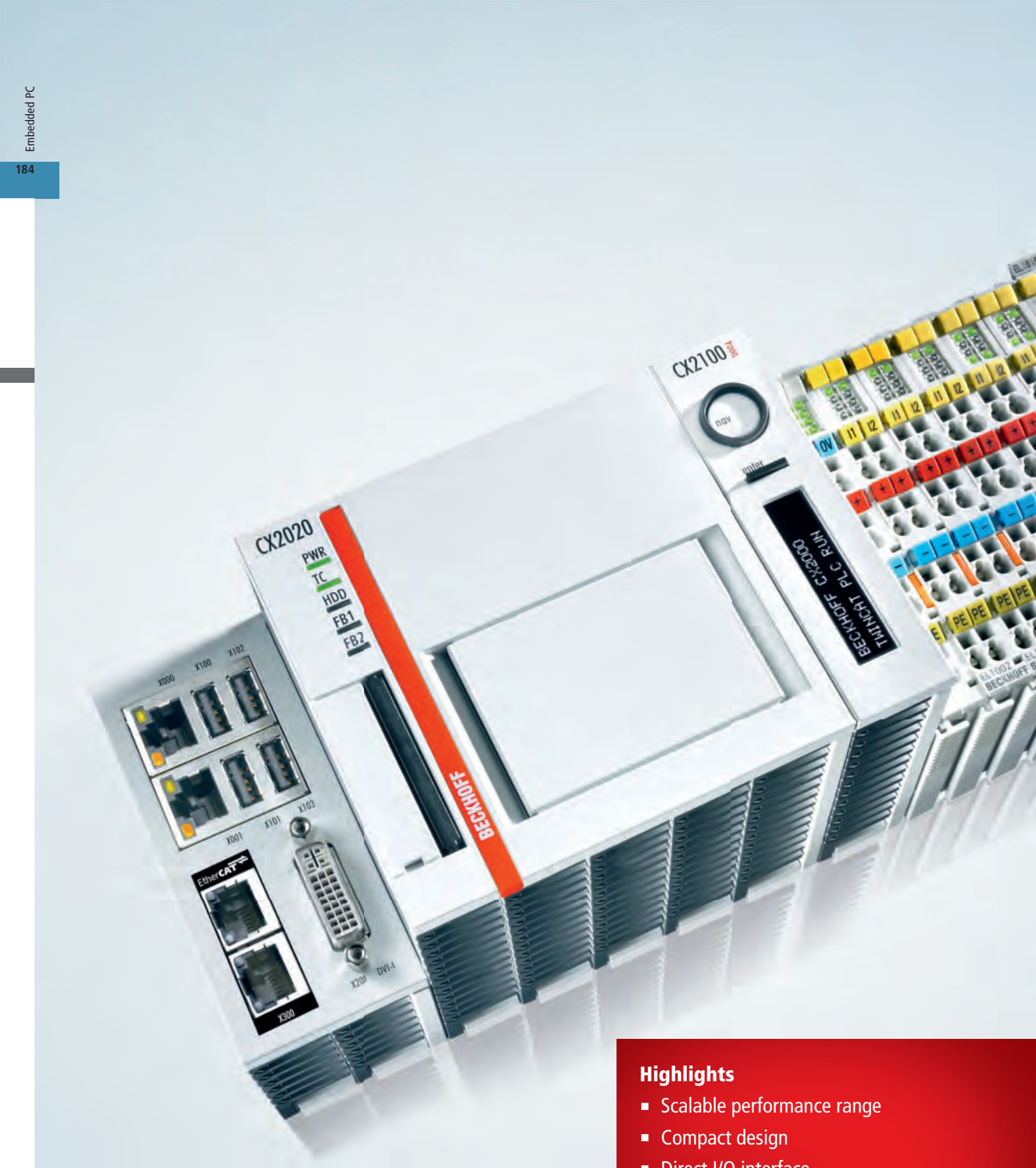
Ordering information	
C9900-T900	touch screen pen with holder for Control Panel and Panel PCs CP7xxx
C9900-T902	touch screen pen with wall holder for built-in Control Panel and Panel PCs CP6xxx and C3xxx

C9900-E21x | RFID reader in the CP7xxx Control Panel front

The CP720x and CP770x Panel PCs and the CP790x Control Panels with 15- or 19-inch display without membrane keyboard are available with RFID reader in the front panel. The card reader enables user identification at the device. The RFID module reads Legic transponders at a distance of up to 30 mm. The data are transferred to the PC via USB. The RFID reader is integrated in the Control Panel or the Panel PC behind the front laminate. The print on the front laminate indicates the position of the RFID reader below the display on the right-hand side. IP 65 protection class is maintained and enables operation in harsh industrial environments. The RFID option has no influence on the dimensions of the Control Panel.

C9900-E21x	RFID reader
	Legic transponder type
	transponder frequency 13.56 MHz
	integrated in the Control Panel behind the front laminate
	up to 30 mm reading distance
	internally connected via USB interface
	protection class IP 65

Ordering information	
C9900-E213	RFID reader for Legic transponder inside the front of a Panel PC CP7202 or CP7702 or of a Control Panel CP7902, integrated behind the front laminate, protection class IP 65, connected internally by USB
C9900-E214	RFID reader for Legic transponder inside the front of a Panel PC CP7203 or CP7703 or of a Control Panel CP7903, integrated behind the front laminate, protection class IP 65, connected internally by USB



Highlights

- Scalable performance range
- Compact design
- Direct I/O interface
- Modular extension options
- DIN rail mounting

Embedded PC

Modular DIN rail IPCs and Industrial Motherboards

▸ Embedded-PC

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203 PROFINET CX8093
203 EtherNet/IP CX8095

204 **Embedded PC series CX81xx (ARM)**
205 Ethernet CX8190

206 **Embedded PC series CX90x0 (ARM)**
208 Basic CPU module CX9000
210 Basic CPU module CX9010
212 System interfaces CX9000-A001/N0xx, CX9010-A001/N0xx
214 Basic CPU module CX9020

216 **Embedded PC series CX1010 (x86)**
218 Basic CPU module CX1010
220 System interfaces CX1010-N0xx

222 **Embedded PC series CX5010, CX5020 (x86)**

226 **Embedded PC series CX5100 (x86)**

230 **Embedded PC series CX1020, CX1030 (x86)**
232 Basic CPU module CX1020
234 Basic CPU module CX1030
236 System interfaces CX1020-N0xx
237 System interfaces CX1030-N0xx

238 **Power supply units and I/O interfaces**
239 Power supply units CX1100-000x for CX1010/CX1020
240 Power supply units CX1100-001x for CX1030

241 **Fieldbus masters**
241 Lightbus CX1500-M200
241 PROFIBUS CX1500-M310
241 CANopen CX1500-M510
241 DeviceNet CX1500-M520
241 SERCOS interface CX1500-M750

242 **Fieldbus slaves**
242 Lightbus CX1500-B200
242 PROFIBUS CX1500-B310
242 CANopen CX1500-B510
242 DeviceNet CX1500-B520

243 **UPS**
243 UPS modules CX1100-09x0

244 **Embedded PC series CX20x0 (x86)**
246 Basic CPU modules CX20x0
248 Power supply units and UPS modules CX2100-0xxx
249 System interfaces CX25x0-00xx

254 **Industrial Motherboards**

256 ATX Industrial Motherboards CB10xx
258 3½-inch Industrial Motherboards CB30xx

Product overview Embedded PC

Embedded PC

Basic CPU	CX80xx 198	CX8190 205	CX9000, CX9010 208
Processor	32 bit, 400 MHz	ARM Cortex™-A9, 600 MHz	Intel® IXP420 with XScale® technology, clock frequency 266/533 MHz
Flash memory	512 MB microSD (optionally 1 GB, 2 GB or 4 GB)	512 MB microSD (optionally expandable), 1 x microSD card slot	32 MB Flash (internal, not expandable)
Internal main memory	64 MB RAM (internal, not expandable)	512 MB DDR3 RAM	128 MB RAM (internal, not expandable)
Interfaces	1 x USB device (behind the front flap), 1 x RJ45 Ethernet 10/100 Mbit/s (ADS or TCP/IP), 2 x RJ45 (switched) 10/100 Mbit/s (PROFINET)	1 x RJ45 (Ethernet), 2 x RJ45 (RT Ethernet, internal switch), 100 Mbit/s, DVI-D	2 x RJ45 (Ethernet, internal switch), 10/100 Mbit/s
I/O connection	E-bus or K-bus, automatic recognition	E-bus or K-bus, automatic recognition	direct connection for E-bus or K-bus
System interfaces	**optionally integrated or via EtherCAT Terminals**	**optionally integrated or via EtherCAT Terminals**	**modularly expandable**
DVI/USB	–	–	CX90x0-N010 212
RS232	CX8080 202	–	CX9000-N030 212 CX9010-N030 212
RS422/RS485	CX8080 202	–	CX9000-N031 212 CX9010-N031 212
Audio	–	–	–
Ethernet	in the basic CPU 198	in the basic CPU 205	–
4-port USB hub	–	–	CX90x0-N070 212
Memory medium	–	–	CX90x0-A001 212
Fieldbus interfaces	**optionally integrated or via EtherCAT Terminals**	**via EtherCAT Terminals**	**via EtherCAT Terminals**
EtherCAT	CX8010 slave 200	–	–
Lightbus	EL6720 master 432	EL6720 master 432	EL6720 master 432
PROFIBUS	CX8030 master 200 CX8031 slave 201	EL6731 master 429 EL6731-0010 slave 429	EL6731 master 429 EL6731-0010 slave 429
CANopen	CX8050 master 201 CX8051 slave 201	EL6751 master 430 EL6751-0010 slave 430	EL6751 master 430 EL6751-0010 slave 430
DeviceNet	EL6752 master 431 EL6752-0010 slave 431	EL6752 master 431 EL6752-0010 slave 431	EL6752 master 431 EL6752-0010 slave 431
PROFINET RT	CX8093 device 203	–	–
EtherNet/IP	CX8095 slave 203	–	–
SERCOS interface	–	–	–
UPS	**1-second UPS**	**1-second UPS**	–

We reserve the right to make technical changes.

CX9020 214	CX1010 218	CX5010, CX5020 224
ARM Cortex™-A8, 1 GHz	compatible with Pentium® MMX, clock frequency 500 MHz	Intel® Atom™, 1.1/1.6 GHz clock frequency
512 MB microSD (optionally expandable), 2 x microSD card slot	128 MB Compact Flash card (optionally expandable)	128 MB Compact Flash card (optionally expandable)
1 GB DDR3 RAM	256 MB DDR RAM (not expandable)	CX5010: 512 MB RAM (internal, not expandable) CX5020: 512 MB RAM (optional expandable to 1 GB)
2 x RJ45 (Ethernet, internal switch), 10/100 Mbit/s, DVI-D, 4 x USB 2.0, 1 x optional interface	1 x RJ45 (Ethernet), 10/100 Mbit/s	2 x RJ45, 10/100/1000 Mbit/s, DVI-D, 4 x USB 2.0, 1 x optional interface
E-bus or K-bus, automatic recognition	via power supply module (E-bus, K-bus, K-bus/IP-Link)	E-bus or K-bus, automatic recognition
optionally integrated	**modularly expandable**	**optionally integrated**
in the basic CPU 214	CX1010-N010 220	in the basic CPU 224
CX9020-N030 214	CX1010-N030 (COM 1/2) 220	CX50x0-N030 224
	CX1010-N040 (COM 3/4) 220	
CX9020-N031 214	CX1010-N031 (COM 1/2) 220	CX50x0-N031 224
	CX1010-N041 (COM 3/4) 220	
CX9020-N020 214	CX1010-N020 220	CX50x0-N020 224
in the basic CPU 214	CX1010-N060 220	in the basic CPU 224
in the basic CPU 214	–	in the basic CPU 224
2nd microSD slot in the basic CPU 214	–	in the basic CPU 224
optionally integrated or via EtherCAT Terminals	**modularly expandable**	**optionally integrated or via EtherCAT Terminals**
CX9020-B110 slave 214	–	CX50x0-B110 slave 224
EL6720 master 432	CX1500-M200 master 241	EL6720 master 432
	CX1500-B200 slave 242	
CX9020-M310 master 214	CX1500-M310 master 241	CX50x0-M310 master 224
CX9020-B310 slave 214	CX1500-B310 slave 242	CX50x0-B310 slave 224
CX9020-M510 master 214	CX1500-M510 master 241	CX50x0-M510 master 224
CX9020-B510 slave 214	CX1500-B510 slave 242	CX50x0-B510 slave 224
EL6752 master 431	CX1500-M520 master 241	EL6752 master 431
EL6752-0010 slave 431	CX1500-B520 slave 242	EL6752-0010 slave 431
CX9020-M930 controller 214	–	CX50x0-M930 controller 224
CX9020-B930 device 214		CX50x0-B930 device 224
CX9020-B950 slave 214	–	CX50x0-B950 slave 224
–	CX1500-M750 SERCOS II master 241	–
1-second UPS (optional)	**CX1100-0910, -0900 243**	**1-second UPS**

Embedded PC

Basic CPU	CX5120 228	CX5130 228	CX5140 228
Processor	Intel® Atom™ E3815, 1.46 GHz, 1 core	Intel® Atom™ E3827, 1.75 GHz, 2 cores	Intel® Atom™ E3845, 1.91 GHz, 4 cores
Flash memory	slot for CFast card (card not included), slot for microSD card	slot for CFast card (card not included), slot for microSD card	slot for CFast card (card not included), slot for microSD card
Internal main memory	2 GB DDR3 RAM (not expandable)	4 GB DDR3 RAM (not expandable)	4 GB DDR3 RAM (not expandable)
Interfaces	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface
I/O connection	E-bus or K-bus, automatic recognition	E-bus or K-bus, automatic recognition	E-bus or K-bus, automatic recognition
System interfaces	optionally integrated	optionally integrated	optionally integrated
DVI/USB	in the basic CPU 228	in the basic CPU 228	in the basic CPU 228
RS232	CX5120-N030 228	CX5130-N030 228	CX5140-N030 228
RS422/RS485	CX5120-N031 228	CX5130-N031 228	CX5140-N031 228
Audio	CX5120-N020 228	CX5130-N020 228	CX5140-N020 228
Ethernet	in the basic CPU 228	in the basic CPU 228	in the basic CPU 228
4-port USB hub	in the basic CPU 228	in the basic CPU 228	in the basic CPU 228
Memory medium	in the basic CPU 228	in the basic CPU 228	in the basic CPU 228
Fieldbus interfaces	optionally integrated or via EtherCAT Terminals	optionally integrated or via EtherCAT Terminals	optionally integrated or via EtherCAT Terminals
EtherCAT	CX5120-B110 slave 228	CX5130-B110 slave 228	CX5140-B110 slave 228
Lightbus	EL6720 master 432	EL6720 master 432	EL6720 master 432
PROFIBUS	CX5120-M310 master 228	CX5130-M310 master 228	CX5140-M310 master 228
	CX5120-B310 slave 228	CX5130-B310 slave 228	CX5140-B310 slave 228
CANopen	CX5120-M510 master 228	CX5130-M510 master 228	CX5140-M510 master 228
	CX5120-B510 slave 228	CX5130-B510 slave 228	CX5140-B510 slave 228
DeviceNet	EL6752 master 431	EL6752 master 431	EL6752 master 431
	EL6752-0010 slave 431	EL6752-0010 slave 431	EL6752-0010 slave 431
PROFINET RT	CX5120-M930 controller 228	CX5130-M930 controller 228	CX5140-M930 controller 228
	CX5120-B930 device 228	CX5130-B930 device 228	CX5140-B930 device 228
EtherNet/IP	CX5120-B950 slave 228	CX5130-B950 slave 228	CX5140-B950 slave 228
SERCOS interface	–	–	–
UPS	1-second UPS	1-second UPS	1-second UPS

We reserve the right to make technical changes.

CX1020	232	CX1030	234
Intel® Celeron® M ULV, 1 GHz clock frequency		Intel® Pentium® M, 1.8 GHz clock frequency	
128 MB Compact Flash card (optionally expandable)		128 MB Compact Flash card (optionally expandable)	
256 MB DDR RAM (expandable to 512 MB, 1 GB)		256 MB DDR RAM (expandable to 512 MB, 1 GB)	
2 x RJ45 (Ethernet, internal switch)		2 x RJ45 (Ethernet, internal switch), 10/100 Mbit/s	
via power supply module (E-bus, K-bus, K-bus/IP-Link)		via power supply module (E-bus, K-bus, K-bus/IP-Link)	
modularly expandable		**modularly expandable**	
CX1020-N010	236	CX1030-N010	237
CX1020-N030 (COM 1/2)	236	CX1030-N030 (COM 1/2)	237
CX1020-N040 (COM 3/4)	236	CX1030-N040 (COM 3/4)	237
CX1020-N031 (COM 1/2)	236	CX1030-N031 (COM 1/2)	237
CX1020-N041 (COM 3/4)	236	CX1030-N041 (COM 3/4)	237
CX1020-N020	236	CX1030-N020	237
CX1020-N060	236	CX1030-N060	237
–		–	
–		–	
modularly expandable		**modularly expandable**	
–		–	
CX1500-M200 master	241	CX1500-M200 master	241
CX1500-B200 slave	242	CX1500-B200 slave	242
CX1500-M310 master	241	CX1500-M310 master	241
CX1500-B310 slave	242	CX1500-B310 slave	242
CX1500-M510 master	241	CX1500-M510 master	241
CX1500-B510 slave	242	CX1500-B510 slave	242
CX1500-M520 master	241	CX1500-M520 master	241
CX1500-B520 slave	242	CX1500-B520 slave	242
–		–	
–		–	
CX1500-M750 SERCOS II master	241	CX1500-M750 SERCOS II master	241
CX1100-0920	243	**CX1100-0930**	243

Embedded PC

Basic CPU	CX2020 246	CX2030 246	CX2040 246
Processor	Intel® Celeron® 827E 1.4 GHz, 1 core	Intel® Core™ i7 2610UE 1.5 GHz, 2 cores	Intel® Core™ i7 2715QE 2.1 GHz, 4 cores
Flash memory	4 or 8 GB CFast flash card (optionally expandable)	4 or 8 GB CFast flash card (optionally expandable)	4 or 8 GB CFast flash card (optionally expandable)
Internal main memory	2 GB DDR3 RAM	2 GB DDR3 RAM	4 GB DDR3 RAM
Interfaces	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface
I/O connection	via power supply module (E-bus or K-bus, automatic recognition)	via power supply module (E-bus or K-bus, automatic recognition)	via power supply module (E-bus or K-bus, automatic recognition)
System interfaces	**modularly expandable**	**modularly expandable**	**modularly expandable**
DVI/USB	in the basic CPU, 2nd DVI port as option CX2020-N010 246	in the basic CPU, 2nd DVI port as option CX2030-N010 246	in the basic CPU, 2nd DVI port as option CX2040-N010 246
RS232	CX2020-N030 or CX2500-0030 246	CX2030-N030 or CX2500-0030 246	CX2040-N030 or CX2500-0030 246
RS422/RS485	CX2020-N031 or CX2500-0031 246	CX2030-N031 or CX2500-0031 246	CX2040-N031 or CX2500-0031 246
Audio	CX2500-0020 249	CX2500-0020 249	CX2500-0020 249
Ethernet	in the basic CPU or CX2500-0060 246	in the basic CPU or CX2500-0060 246	in the basic CPU or CX2500-0060 246
Power over Ethernet	CX2500-0061 249	CX2500-0061 249	CX2500-0061 249
4-port USB hub	in the basic CPU or CX2500-0070 246	in the basic CPU or CX2500-0070 246	in the basic CPU or CX2500-0070 246
Memory medium	in the basic CPU or CX2550-0010/ CX2550-0020 246	in the basic CPU or CX2550-0010/ CX2550-0020 246	in the basic CPU or CX2550-0010/ CX2550-0020 246
USB extension	CX2550-0179 (USB 1.1) or CX2550-0279 (USB 2.0) 251	CX2550-0179 (USB 1.1) or CX2550-0279 (USB 2.0) 251	CX2550-0179 (USB 1.1) or CX2550-0279 (USB 2.0) 251
Fieldbus interfaces	**optionally integrated or via EtherCAT Terminals**	**optionally integrated or via EtherCAT Terminals**	**optionally integrated or via EtherCAT Terminals**
EtherCAT	CX2020-B110 slave 246	CX2030-B110 slave 246	CX2040-B110 slave 246
Lightbus	EL6720 master 432	EL6720 master 432	EL6720 master 432
PROFIBUS	CX2020-M310 or CX2500-M310 master 246	CX2030-M310 or CX2500-M310 master 246	CX2040-M310 or CX2500-M310 master 246
	CX2020-B310 or CX2500-B310 slave 246	CX2030-B310 or CX2500-B310 slave 246	CX2040-B310 or CX2500-B310 slave 246
CANopen	CX2020-M510 or CX2500-M510 master 246	CX2030-M510 or CX2500-M510 master 246	CX2040-M510 or CX2500-M510 master 246
	CX2020-B510 or CX2500-B510 slave 246	CX2030-B510 or CX2500-B510 slave 246	CX2040-B510 or CX2500-B510 slave 246
DeviceNet	EL6752 master 431	EL6752 master 431	EL6752 master 431
	EL6752-0010 slave 431	EL6752-0010 slave 431	EL6752-0010 slave 431
PROFINET RT	CX2020-M930 controller 246	CX2030-M930 controller 246	CX2040-M510 controller 246
	CX2020-B930 device 246	CX2030-B930 device 246	CX2040-B510 device 246
EtherNet/IP	CX2020-B950 slave 246	CX2030-B950 slave 246	CX2040-B950 slave 246
UPS	**CX2100-0904, CX2100-0914** 248	**CX2100-0904, CX2100-0914** 248	**CX2100-0904, CX2100-0914** 248

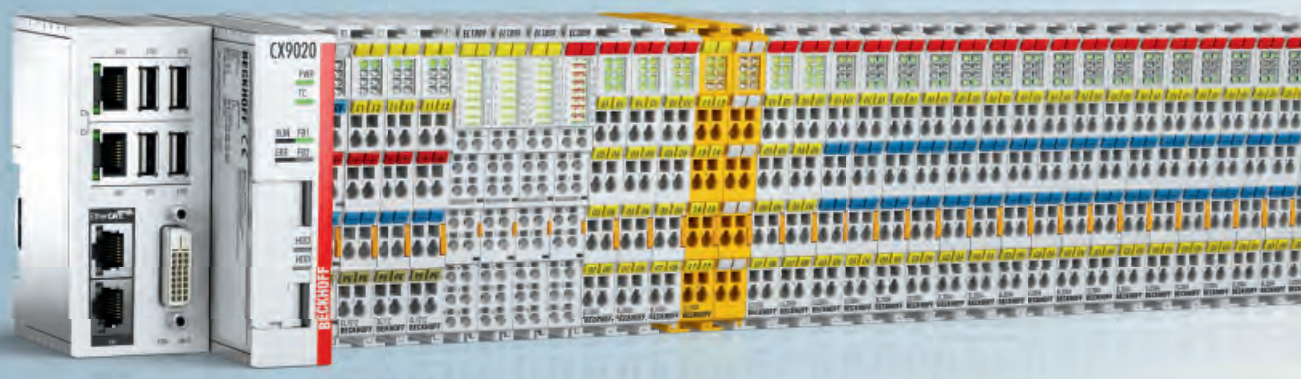
We reserve the right to make technical changes.

Product overview Industrial Motherboards

	ATX		3½-inch			
	CB1056 256	CB1061 257	CB3056 258	CB3060 259	CB3063 260	CB3064 261
CPU type						
CPU	Intel® Celeron®, Intel® Core™ i3/i5/i7	Intel® Core™ i3/i5/i7	Intel® Celeron®, Intel® Core™ i3/i5/i7	Intel® Core™ i3/i5/i7	Intel® Atom™ E38xx	Intel® Core™ i3/i5/i7 6th generation
Performance	1.1…2.5 GHz	depending on selected CPU	1.1…2.5 GHz	depending on selected CPU	1.46…1.91 GHz	depending on selected CPU
Chipset	Intel® QM67	Intel® Q87	Intel® QM67	Intel® QM87	Intel® Atom™ E38xx	Intel® Q170
Memory						
Type	2 x SODIMM204– 1.5 V/DDR3	4 x SODIMM204– 1.35 V/DDR3L	2 x SODIMM204– 1.5 V/DDR3	2 x SODIMM204– 1.35 V/DDR3L	SODIMM204– 1.35 V/DDR3L	2 x SODIMM260– 1.2 V/DDR4
Speed max.	DDR3 1600	DDR3L 1600	DDR3 1600	DDR3L 1600	DDR3L 1333	DDR4 2133
Slots						
ISA/PCI	–/3 x PCI32 slot	–/3 x PCI32 slot	–/Mini PCI	–/Mini PCI	–	–
PCIe x1/x4/x16	2x/1x/1x (PCIe V 2.0)	2 x PCIe x1(2.0) + 1 x PCIe x16(3.0)	4 x 1 or 1 x 4	4 x PCIe x1(2.0) or 1 x PCIe x4(2.0)	1 x PCIe x1	4 x PCIe x1(3.0) or 1 x PCIe x4(3.0)

Embedded PCs

▶ Embedded-PC



CX9020 | **Ethernet controller**
- ARM Cortex™-A8 with 1 GHz
- 1 GB DDR3 RAM internal
- 512 MB microSD (expandable)
- Windows Embedded Compact 7

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CX5000 | **Embedded PC series with Intel® Atom™ processor**
- fanless and very compact
- 1.1 or 1.6 GHz
- 512 MB internal RAM
- Compact Flash card
- Windows Embedded CE 6, Windows Embedded Standard 2009

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CX8100 | **Embedded PC with fieldbus interface**
- ARM9 CPU with 600 MHz
- 512 MB DDR3 RAM
- microSD card
- programmable fieldbus slave
- Windows Embedded Compact 7

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We reserve the right to make technical changes.

CX8000 | **Embedded PC with fieldbus interface**
- ARM9 CPU with 400 MHz
- 64 MB internal RAM
- microSD card
- programmable fieldbus slave
- Windows Embedded CE 6

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CX9000 | **Ethernet controller**
- Intel® IXP420 CPU with 266/533 MHz with XScale® technology
- 128 MB internal RAM
- 16/32 MB internal flash
- Windows CE 5

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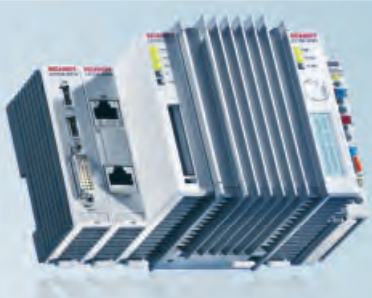
CX1010 | **Basic CX**
- Pentium® MMX-compatible CPU, 500 MHz
- 256 MB internal DDR RAM
- Compact Flash card
- Windows Embedded CE 6, Windows Embedded Standard 2009

See page 216



CX1020, CX1030 | **High-performance CX**
- Intel® Celeron® M ULV CPU with 1 GHz/Intel® Pentium® M CPU with 1.8 GHz
- 256 MB internal DDR RAM (expandable)
- Compact Flash card
- Windows Embedded CE 6, Windows Embedded Standard 2009

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CX5100 | **Embedded PC series with Intel® Atom™ processor**
- fanless and very compact
- CPU: Intel® Atom™ 1.46, 1 core/ Intel® Atom™ 1.75, 2 cores/ Intel® Atom™ 1.91, 4 cores
- 2 GB DDR3 RAM/4 GB DDR3 RAM internally
- slot for CFast and MicroSD card
- Windows Embedded Standard 7 P

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CX2020, CX2030, CX2040 | **Multi-core CX**
- CPU: Intel® Celeron® 1.4 GHz, 1 core/ Intel® Core™ i7 1.5 GHz, 2 cores/ Intel® Core™ i7 2.1 GHz, 4 cores
- 2 GB DDR3 RAM/4 GB DDR3 RAM
- 8 GB CFast flash card (expandable)
- Windows Embedded Standard 7 P or Windows Embedded Compact 7

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Beckhoff Embedded PC

Modular DIN rail Industrial PCs
With the Embedded PCs of the CX series, Beckhoff has combined PC technology and modular I/O level on a DIN rail unit in the control cabinet. The CX device series combines the worlds of Industrial PC and hardware PLC and is suitable for all performance control tasks. The modular system of the CX series can be configured to match the task in hand: by adding or omitting units and interfaces, only those components that the system actually requires are installed on the DIN rail in the control cabinet or terminal box. Installation space and costs are reduced.

The CX family covers the whole range of Beckhoff control technology in terms of both price and performance. This product range is designed for tasks requiring the characteristics and computing capacity of Industrial PCs, but whose budget does not stretch to full-blown Industrial PCs.

Scalable performance classes
The CX family includes several basic CPU modules with different processors for optimum adaptation to the respective control task. The following list gives an overview, sorted by CPU type and, within the group, in descending order of computing performance:

Devices with x86 CPU:
CX2040: multi-core CX with Intel® Core™ i7 CPU, 2.1 GHz, 4 cores
CX2030: multi-core CX with Intel® Core™ i7 CPU, 1.5 GHz, 2 cores
CX2020: high-performance CX with Intel® Celeron® CPU, 1.4 GHz
CX1030: high-performance CX with Intel® Pentium® M CPU, 1.8 GHz
CX1020: high-performance CX with Intel® Celeron® M ULV CPU, 1 GHz
CX5140: multi-core CX with Intel® Atom™ CPU, 1.91 GHz, 4 cores
CX5130: multi-core CX with Intel® Atom™ CPU, 1.75 GHz, 2 cores
CX5120: compact CX with Intel® Atom™ CPU, 1.46 GHz
CX5020: compact CX with Intel® Atom™ CPU, 1.6 GHz
CX5010: compact CX with Intel® Atom™ CPU, 1.1 GHz
CX1010: basic CX with Pentium® MMX-compatible CPU, 500 MHz

Devices with ARM CPU:
CX9020: Ethernet controller with ARM Cortex™-A8 CPU, 1 GHz
CX9010: Ethernet controller with Intel® IXP420 XScale® technology, 533 MHz
CX9000: Ethernet controller with Intel® IXP420 XScale® technology, 266 MHz
CX8100: basic CX with ARM Cortex™-A9 CPU, 600 MHz, and integrated fieldbus interface
CX8000: basic CX with ARM9 CPU, 400 MHz, and integrated fieldbus interface

Apart from various CPUs, the individual CX types also have different system interfaces and power supply units. Via the associated I/O interfaces the Embedded PCs support Beckhoff Bus Terminals and also EtherCAT Terminals as I/O system.

A suitable CX controller is selected on the basis of the expected complexity and scope of the automation program. Decisive here is not just the clock frequency of the CPU, but a combination of many criteria. The main criteria apart from the clock frequency are the CPU architecture, the cache sizes, the type and size of the RAM, graphic controller etc. Changing from one CX CPU to another with a higher performance is, however, still possible even at a very late stage in the course of the project and can usually take place without any program modification.

The components
The individual system components of the CX series come as modules in standard widths of 19 mm or 22 mm, that can be connected in series. The basic unit for the CX2000 and CX10x0 series consists of a CPU module and a separate power supply module. The CX8000, CX8100, CX9000, CX9010, CX9020, CX5000 and CX5100 Embedded PCs integrate CPU and power supply in a single unit. Depending on the CX type, the controllers can be expanded through further system interfaces. The range of optional modules is complemented by fieldbus connections for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Lightbus, both as master or slave versions.

In contrast to the other CX device families, the CX8000, CX8100, CX9020, CX5100 and CX5000 series have a fixed, non-expandable number of system interfaces. The devices from the CX8000 and CX8100 series are mainly used as programmable fieldbus slaves, while both the CX9020 and CX5000/CX5100 offer an optional fieldbus master or slave interface in the multi-option interface.

The multi-option interface, a common feature of all second-generation CX devices (CX9020, CX5010, CX5020, CX5120, CX5130, CX5140, CX2020, CX2030 and CX2040), is an interface that can be configured ex factory with various signal types. These devices are also characterised by a further important feature: the automatic K-bus/E-bus detection enables the use of both types of I/O terminals without additional expenditure.

EtherCAT integration offers a wide range of expansion capability. Further master/slave fieldbus connections or communication interfaces and all other signal types accessible via EtherCAT can be directly connected as EtherCAT Terminals.

The software
In combination with the TwinCAT 2 or TwinCAT 3 automation software, the CX Embedded PC becomes a powerful IEC 61131-3 PLC. Additionally, Motion Control tasks can also be executed. Depending on the required cycle time, it may be used to control several servo axes. With the CX1010, CX5000, CX5100, CX1020, CX1030 and CX2000 even special functions such as "flying saw", "electronic gearbox" or "cam plate" can be realised. The CX thus becomes a controller that covers PLC, Motion Control and visualisation tasks with a single hardware. Under Windows Embedded CE, thanks to the real-time capability of the operating system, user tasks written in high-level languages can be processed in real-time in parallel with TwinCAT.

Wide range of applications
Due to the design and the features of an industrial PC control, the Embedded PCs can be used in a wide range of applications. Existing applications include mechanical engineering, process technology, building services and many more.

We reserve the right to make technical changes.

CX8000

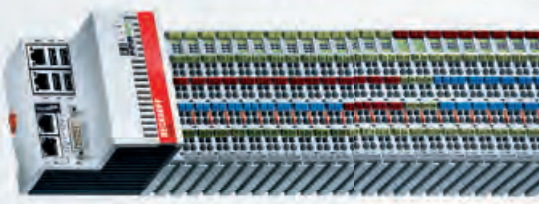
CX8100

CX9000, CX9010

CX9020

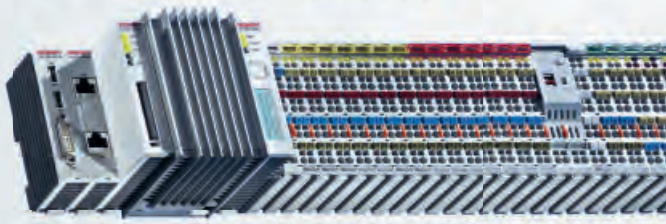
CX1010

CX5010, CX5020



CX5100

CX1020, CX1030

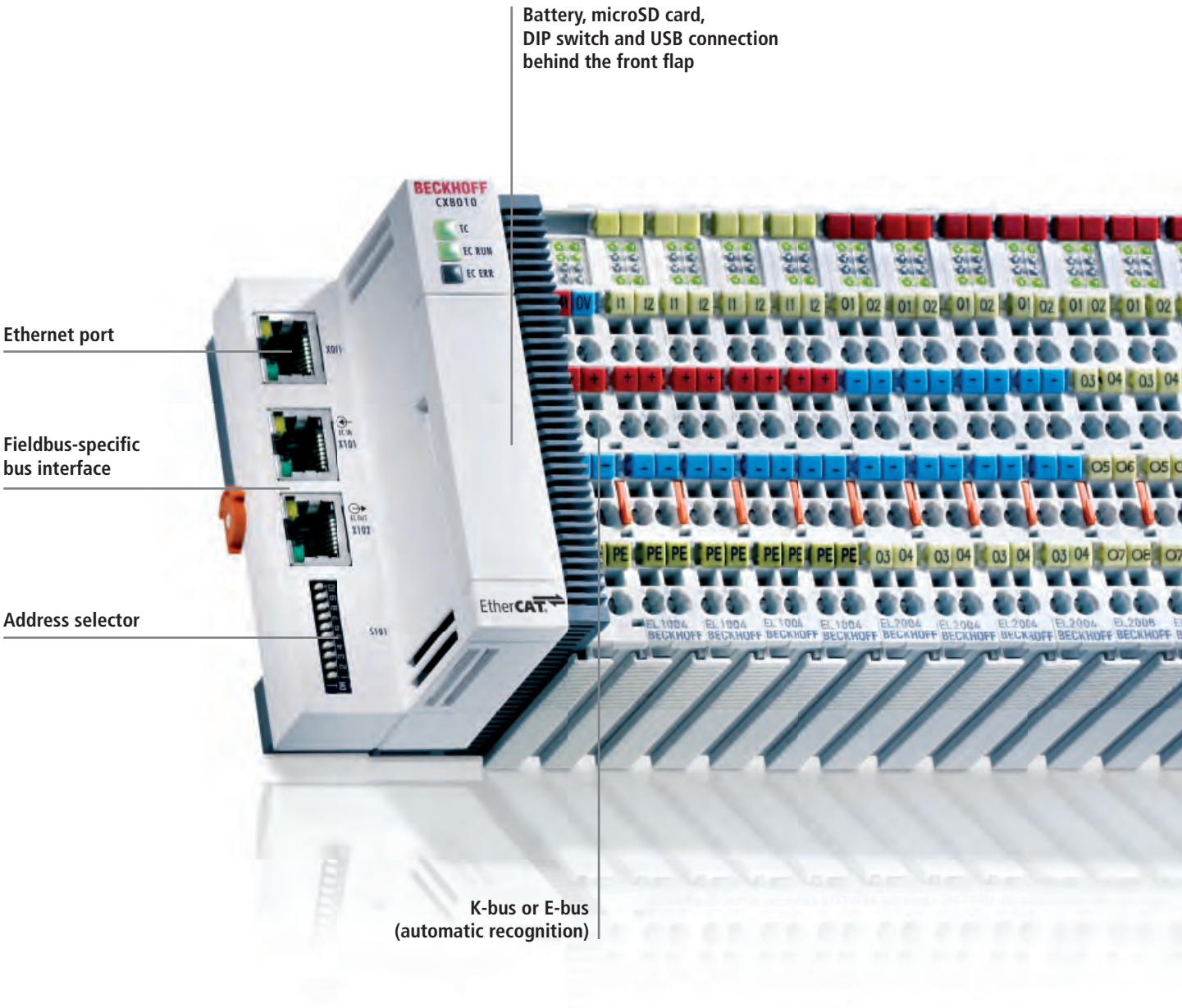


CX2020, CX2030, CX2040

We reserve the right to make technical changes.

CX8000 | Embedded PCs with fieldbus interface

▶ CX8000



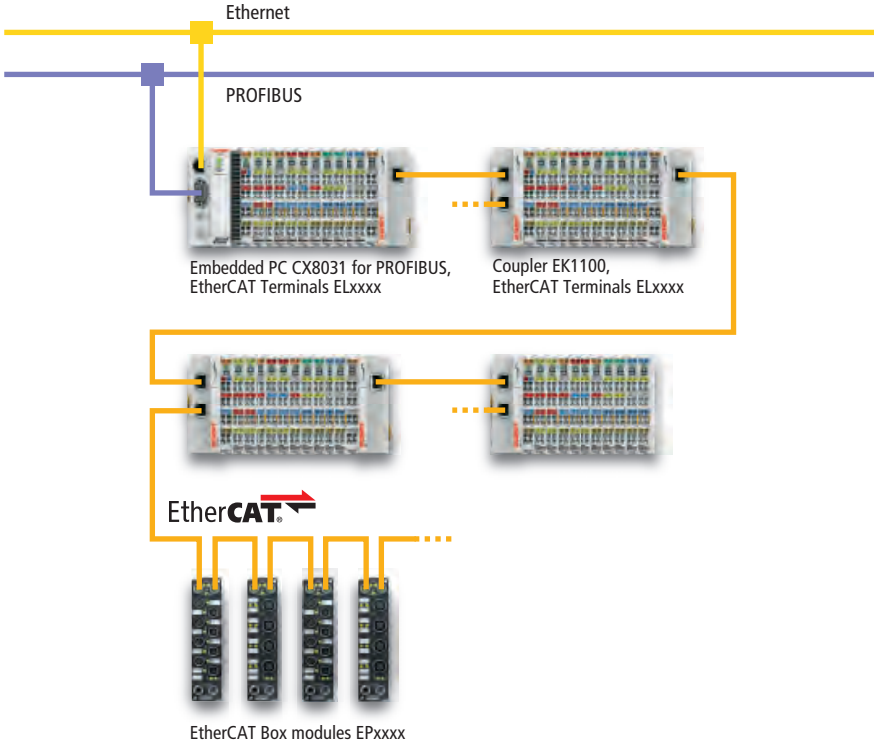
For further information on the individual fieldbuses see page 262

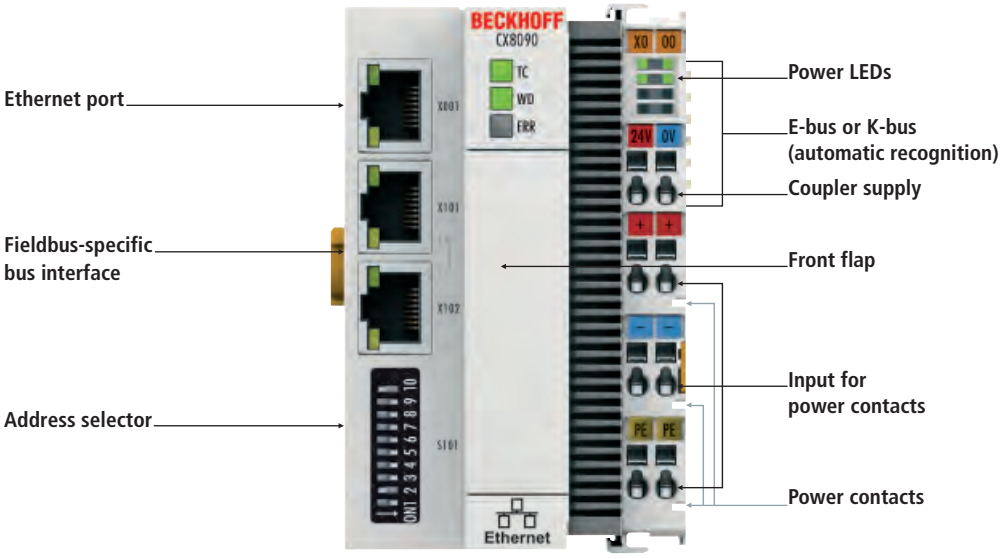
We reserve the right to make technical changes.

CX8000 is a device family of programmable controllers with 32-bit ARM CPU, which can be used for processing of PLC programs or as intelligent slave devices for higher-level fieldbus systems. Unlike with the non-programmable Bus Couplers of the EK series (EtherCAT Coupler), which only act as gateway between the associated fieldbus system and the connected EtherCAT terminals, the CX8000 is programmable and able to run its own control program. The CX8000 devices can therefore be used as local controllers. Bus Terminals (K-bus) or EtherCAT Terminals (E-bus) can alternatively be connected; the CX8000 automatically recognises the type of I/O system connected during the start-up phase. The use of EtherCAT gives rise to further options, such as the realisation of different topologies, the integration of further bus systems such as CANopen, PROFIBUS and PROFINET and – with the EtherCAT Box modules – connection to the IP 67 world.

Like all CX products, the CX8000 devices are programmed and commissioned via the Ethernet interface, which can also be used for connection of the control system with a regular network. Some of the Embedded PCs have further Ethernet interfaces with switch functions, so that a linear "daisy chain" topology can be constructed inexpensively without additional hardware. The other connections on the lower plug level are fieldbus-specific. Thanks to their low power consumption, the devices are fanless. Microsoft Windows Embedded CE 6 is used as the operating system. TwinCAT 2 software is used for system configuration and the programming of the PLC functionality. The CX8000 target device features a pre-installed TwinCAT 2 PLC runtime environment. All software required for operating the device, including the operating system, the TwinCAT files and user files and data, is stored on the microSD flash card. This simplifies exchange in the case of service. Commercial card readers can be used to access the card data. The size of the microSD flash card (e.g. 256 MB) can be chosen depending on the application and the quantity of data to be stored. The CX8000 device family features an integrated, capacitive 1-second UPS, which in the event of a failure of the supply voltage provides sufficient energy for saving persistent data. Important data are thus retained without battery back-up in the event of a loss of power.

With a high-performance but nevertheless energy-saving 32-bit ARM processor, EtherCAT as I/O bus and TwinCAT 2 PLC with extensive PLC libraries, the Embedded Controllers from the CX8000 series represent very compact, high-performance and versatile controllers with slave fieldbus connection.





CX80xx | Basic CPU module

The devices from this series represent a further development of the well-known and proven 16-bit controllers from the Bus Terminal Controller series – through to the more powerful 32-bit ARM processors.

The CX8000 device series was developed for two different usage scenarios:

– as a local, independent PLC that can be integrated into data networks thanks to its existing Ethernet interface;
– as a local PLC that features a slave interface to a fieldbus system in addition to the Ethernet connection.

Taking the CX8010 as an example, there are two EtherCAT slave connections (IN and OUT) on the left-hand side; on the right-hand side it acts again as an independent EtherCAT master or K-bus master for the locally connected terminals.

As with the BC Bus Terminal Controller series, it is also ensured in the case of the CX8000 that the control and the local program continue to be executed in the case of interruption or loss of the higher-level fieldbus system.

The compact, fanless housing makes highly space-saving structures possible for the control of machines or for use in building automation.

Under the cover at the upper housing level there is an exchangeable coin cell for date and time, a set of DIP switches for setting function modes, a slot for microSD flash memory cards and a USB B connection. Thanks to their low power consumption, the devices are fanless.

The very compact, small design facilitates installation in confined control cabinets, but it can nevertheless serve a large number of I/O points over EtherCAT or K-bus.

Although there is no monitor connection, the Windows Embedded CE 6 operating system and its "virtual" display can be accessed via the network. This is not absolutely necessary for the programming of the automation function: any PC or laptop equipped with TwinCAT 2 can be used for PLC programming or online faultfinding via a network connection with the CX8000. All system software is located on the industrially-compatible microSD card. Hardware and software can thus be exchanged simply and quickly in the case of service. In addition, the microSD card can be used in any commercial card reader. The installation and execution of proprietary Windows Embedded CE 6 applications (e.g. parts tracking, data acquisition, Web operating interfaces) is also possible. Access to the microSD card is also possible via the USB connection: if the CX8000 is connected to another PC, then the microSD card becomes visible on this PC as a mass storage device.

The order numbers and the equipment of the CX8000 devices are derived as follows:

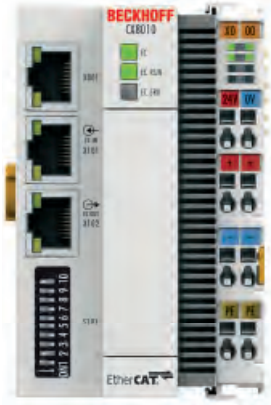
CX80xx

- 10 = EtherCAT slave
- 30 = PROFIBUS master
- 31 = PROFIBUS slave
- 50 = CANopen master
- 51 = CANopen slave
- 80 = RS232/RS485
- 90 = Ethernet
- 91 = BACnet/IP and OPC UA
- 93 = PROFINET RT device
- 95 = EtherNet/IP slave

We reserve the right to make technical changes.

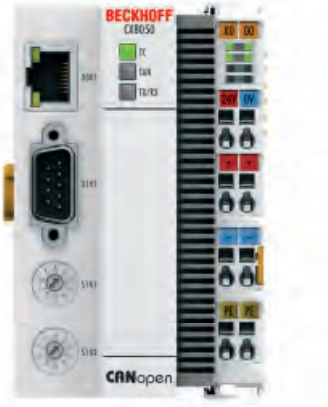
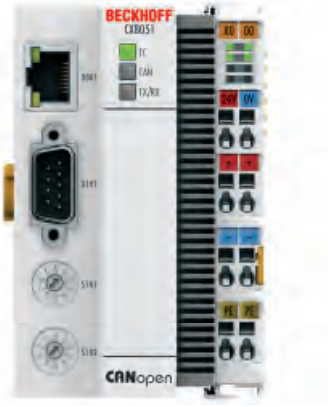
Technical data	CX80xx
Processor	32 bit, 400 MHz
Flash memory	512 MB microSD (optionally 1 GB, 2 GB or 4 GB)
Internal main memory	64 MB RAM (internal, not expandable)
Programming	TwinCAT 2 PLC
Programming languages	IEC 61131-3
Web visualisation	yes
Online change	yes
Up/down load code	yes/yes
Interfaces	1 x USB device (behind the front flap), 1 x RJ45 Ethernet 10/100 Mbit/s (ADS or TCP/IP), 2 x RJ45 (switched) 10/100 Mbit/s (PROFINET)
I/O connection	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)
UPS	1-second UPS (for 1 MB of persistent data)
Operating system	Microsoft Windows Embedded CE 6
Web-based management	yes
Current supply E-bus/K-bus	2 A
Max. power loss	3 W
Dimensions (W x H x D)	64 mm x 100 mm x 73 mm
Weight	approx. 170 g
Operating/storage temperature	0…+55 °C/-25…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Further information	CX8000

CX80xx | Embedded PCs with fieldbus interface

	EtherCAT	PROFIBUS
	Embedded PC for EtherCAT	Embedded PC for PROFIBUS
Technical data	**CX8010**	**CX8030**
Protocol	EtherCAT (slave)	PROFIBUS-DP (master)
Max. number of bytes fieldbus	512 byte input and 512 byte output	only limited by memory
Data transfer rates	100 Mbaud	up to 12 Mbaud (automatic detection)
Bus interface	EtherCAT IN and OUT (2 x RJ45)	1 x D-sub 9-pin socket with shielding
	 The DIP switch enables the fixed addressing of a hot plug group. Automatic addressing in the EtherCAT network is also possible.	 The CX8030 is a PROFIBUS master device. Optionally it can be operated as a PROFIBUS slave device.
I/O connection	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition
Type/number of peripheral signals	K-bus 2 kByte IN/OUT, E-bus only limited by memory	K-bus 2 kByte IN/OUT, E-bus only limited by memory
Approvals	CE, UL, Ex	CE, UL, Ex
Further information	CX8010	CX8030

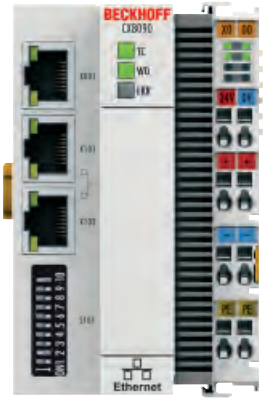
We reserve the right to make technical changes.

CANopen

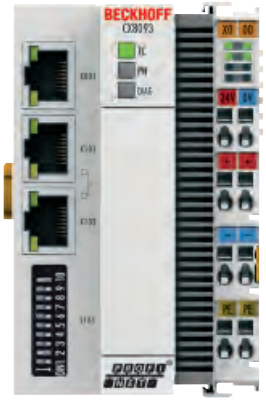
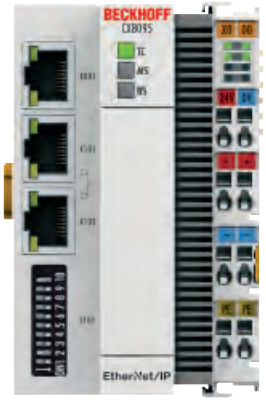
	Embedded PC for PROFIBUS	Embedded PC for CANopen	Embedded PC for CANopen
	CX8031	**CX8050**	**CX8051**
	PROFIBUS-DP (slave)	CANopen (master)	CANopen (slave)
	240 byte input and 240 byte output + 3 virtual slaves	only limited by memory	16 Tx/Rx PDOs + 3 virtual slaves
	up to 12 Mbaud (automatic detection)	up to 1 Mbaud (automatic detection)	up to 1 Mbaud (automatic detection)
	1 x D-sub 9-pin socket with shielding	D-sub connector, 9-pin according to CANopen specification, galvanically decoupled	D-sub connector, 9-pin according to CANopen specification, galvanically decoupled
			
	The PROFIBUS address is set via two rotary selection switches. The CX8031 offers automatic baud rate detection. The CX8031 offers three virtual slaves, so that the amount of data can be tripled.	The CX8050 controller is equipped with a CANopen master interface. Apart from offering the CANopen master functionality, it can optionally be used to support CAN layer 2 communication.	The CANopen address is set via two rotary selection switches. The CX8051 offers automatic baud rate detection.
	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition
	K-bus 2 kByte IN/OUT, E-bus only limited by memory	K-bus 2 kByte IN/OUT, E-bus only limited by memory	K-bus 2 kByte IN/OUT, E-bus only limited by memory
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	CX8031	CX8050	CX8051

EtherCAT Terminals see page 342, EtherCAT Box modules see page 470, Bus Terminals see page 616

CX80xx | Embedded PCs with fieldbus interface

	RS232 RS485	Ethernet
	Embedded PC for RS232/RS485	Embedded PC for different Ethernet protocols
Technical data	**CX8080**	**CX8090**
Protocol	serial communication	real-time Ethernet, ADS TCP, Modbus TCP, TCP/IP, UDP/IP, EAP (EtherCAT Automation Protocol)
Max. number of bytes fieldbus	512 byte input and 512 byte output	protocol dependency
Data transfer rates	300 baud…115 kbaud	100 Mbaud
Bus interface	D-sub socket, 9-pin, 1 x RS232, 1 x RS485	2 x RJ45 (switched)
	 The CX8080 has two serial interfaces: one with RS232 and one with RS485 physics. Both serial interfaces are on the D-sub socket. The interface is not bound to a particular protocol and can be expanded with the appropriate TwinCAT supplements for the different serial communication protocols.	 It supports protocols such as realtime Ethernet, ADS UDP/TCP, Modbus TCP client/server or open TCP/IP-UDP/IP communication.
I/O connection	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition
Type/number of peripheral signals	K-bus 2 kByte IN/OUT, E-bus only limited by memory	K-bus 2 kByte IN/OUT, E-bus only limited by memory
Approvals	CE, UL, Ex	CE, UL, Ex
Further information	CX8080	CX8090

We reserve the right to make technical changes.

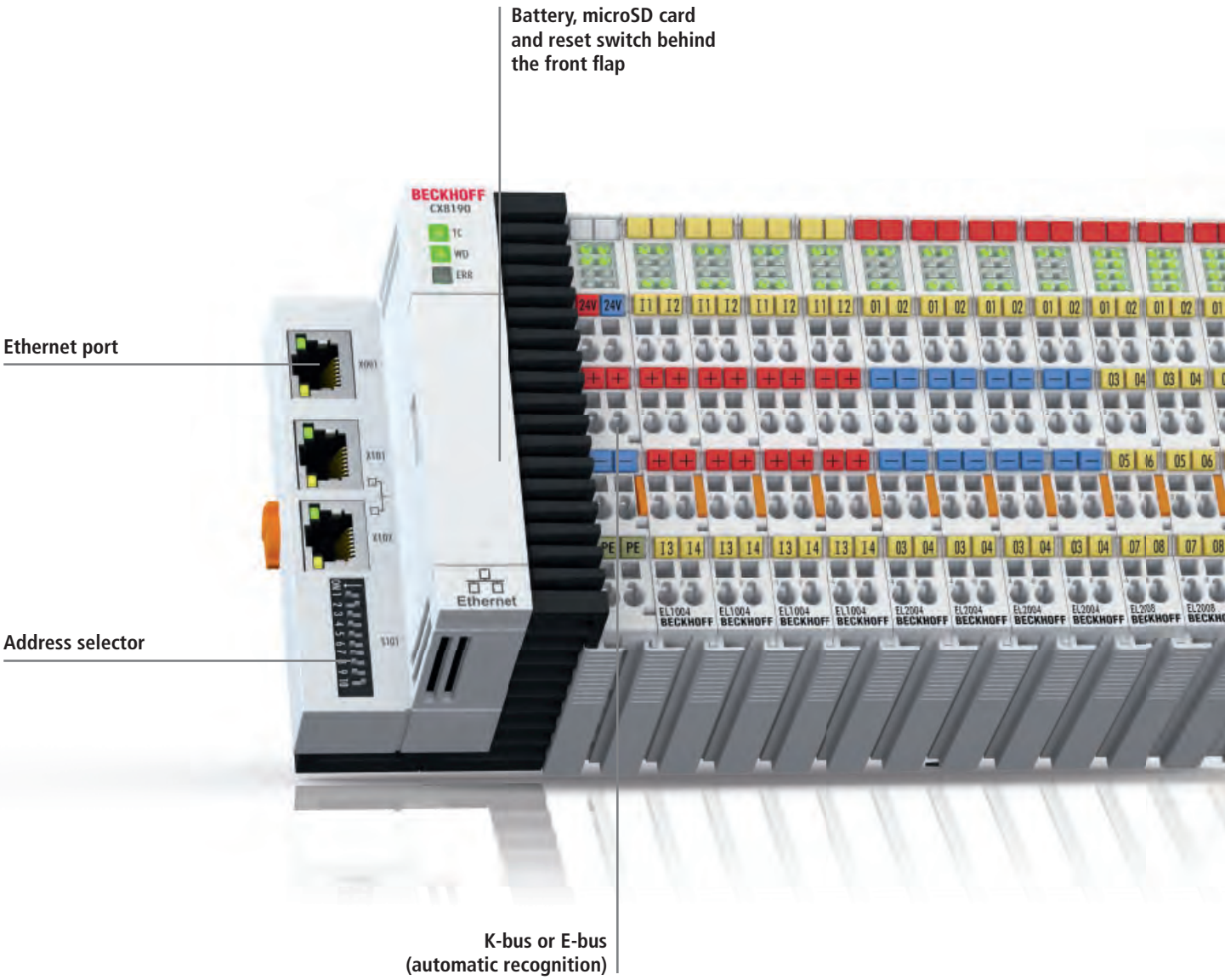
	BACnet/IP OPC UA	PROFINET	EtherNet/IP
	Embedded PC for BACnet/IP and OPC UA	Embedded PC for PROFINET RT	Embedded PC for EtherNet/IP
	CX8091	**CX8093**	**CX8095**
	BACnet/IP or OPC UA	PROFINET RT device	EtherNet/IP (slave)
	protocol dependency	1024 byte input and 1024 byte output + 1 virtual slave	1024 byte input and 1024 byte output + 1 virtual slave
	100 Mbaud	100 Mbaud	100 Mbaud
	2 x RJ45 (switched)	2 x RJ45 (switched)	2 x RJ45 (switched)
			
	It supports the BACnet/IP and OPC UA protocols.	The PROFINET interface is designed as a 2-port switch for realisation of daisy-chain cabling.	The EtherNet/IP interface is designed as a 2-port switch for realisation of daisy-chain cabling.
	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition	E-bus (EtherCAT Terminals) or K-bus (Bus Terminals), automatic recognition
	K-bus 2 kByte IN/OUT, E-bus only limited by memory	K-bus 2 kByte IN/OUT, E-bus only limited by memory	K-bus 2 kByte IN/OUT, E-bus only limited by memory
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	CX8091	CX8093	CX8095

EtherCAT Terminals see page 342, EtherCAT Box modules see page 470, Bus Terminals see page 616

We reserve the right to make technical changes.

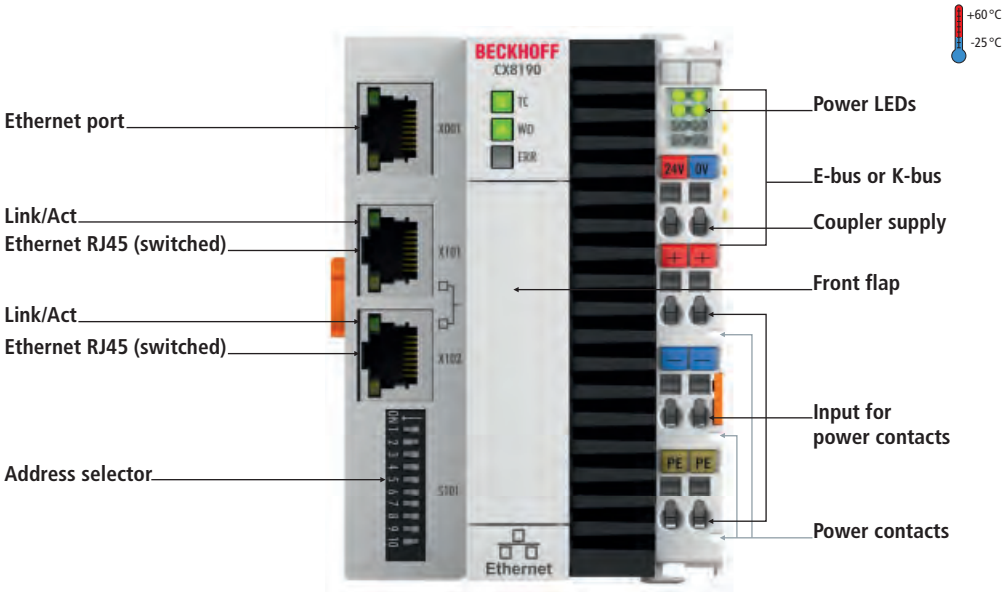
CX8100 | Embedded PCs with fieldbus interface

▶ CX8100



For further information on the individual fieldbuses see page 262

We reserve the right to make technical changes.



CX8190 | Embedded PC for different Ethernet protocols

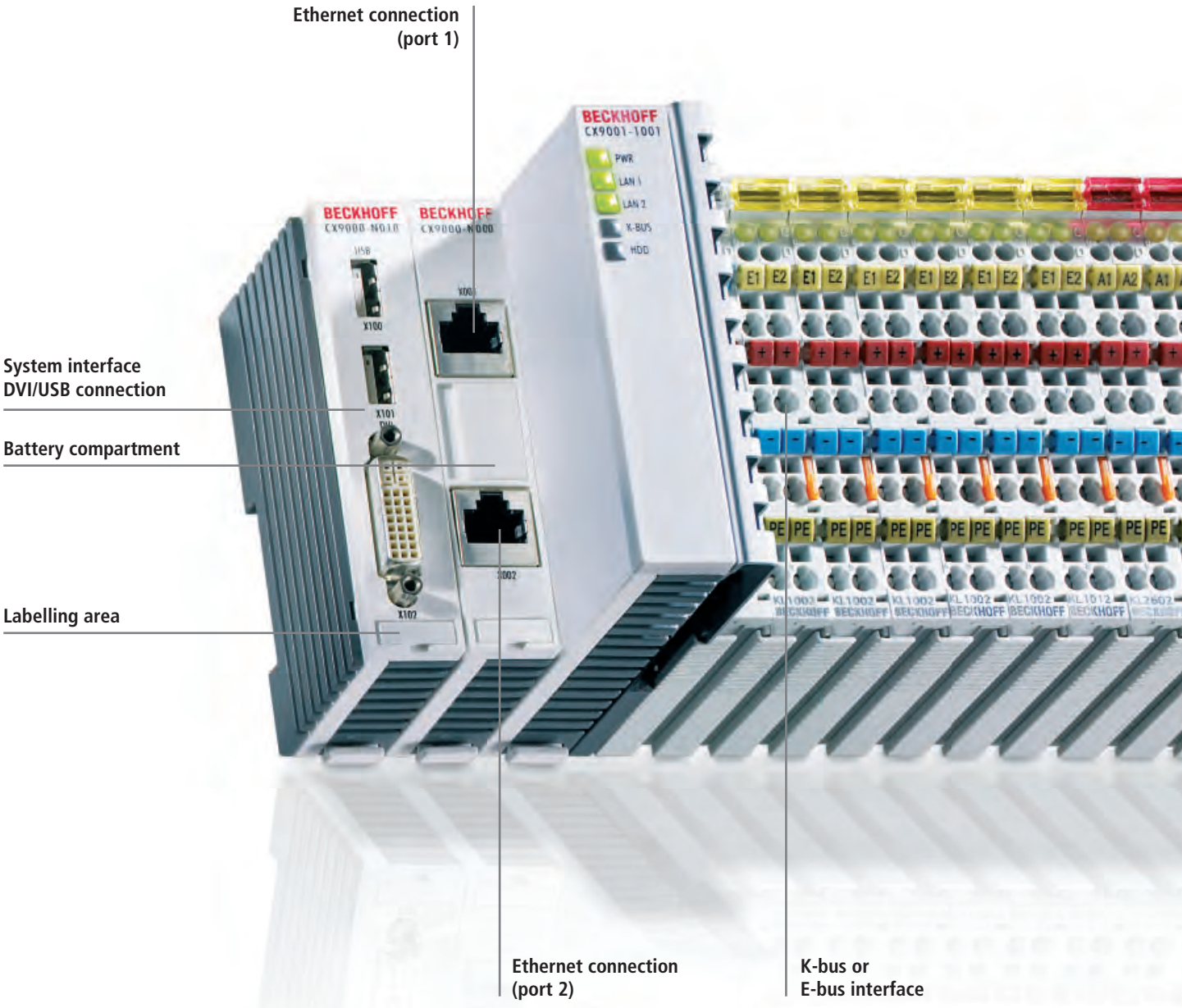
Ethernet

The CX8190 is a controller with two Ethernet ports, one of which is switched to two RJ45 sockets. It supports protocols such as real-time Ethernet, ADS UDP/TCP or EAP (EtherCAT Automation Protocol). K-bus or E-bus terminals can be attached as required; the CX8190 automatically recognises the type of I/O system connected during the start-up phase. The control system is programmed with TwinCAT 3 via the fieldbus interface or the additional Ethernet interface. TwinCAT 3 licenses must be ordered via the TwinCAT 3 price list.

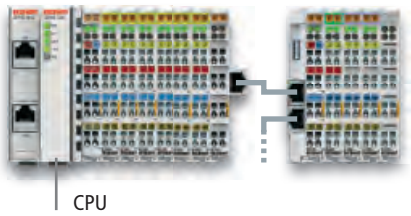
Technical data	CX8190
Processor	ARM Cortex™-A9, 600 MHz (TC3: 20)
Flash memory	512 MB microSD (optionally expandable), 1 x microSD card slot
Internal main memory	512 MB DDR3 RAM
Protocol	real-time Ethernet, ADS UDP, ADS TCP, EAP (EtherCAT Automation Protocol)
Programming	TwinCAT 3
Interfaces	1 x RJ45 (Ethernet), 2 x RJ45 (RT Ethernet, internal switch), 100 Mbit/s
Bus interface	2 x RJ45 (switched)
I/O connection	E-bus or K-bus, automatic recognition
Power supply	24 V DC (-15 %/+20 %)
Clock	internal battery-backed clock for time and date (battery behind the front flap, exchangeable)
UPS	1-second UPS
Operating system	Microsoft Windows Embedded Compact 7
Current supply E-bus/K-bus	2 A
Max. power loss	3.5 W (including the system interfaces)
Dimensions (W x H x D)	71 mm x 100 mm x 73 mm
Operating/storage temperature	-25…+60 °C/-40…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Approvals	CE
TC3 performance class	economy (20); for further information on TwinCAT 3 see page 974
Further information	CX8190

CX9000, CX9010 | Embedded PCs

▶ CX9000



We reserve the right to make technical changes.



Application example
"Headless" PLC system
– PLC system without control panel
– Windows CE 5 and TwinCAT 2 PLC

Components
– CPU CX9010-1001

The CX9000 and CX9010 Embedded PCs offer a compact and high-performance yet cost-effective PLC and Motion Control system for DIN rail installation. Within the Beckhoff control world they are positioned between the BX Bus Terminal Controller series and the CX1010 Embedded PC.

The main feature of these units is the energy-saving Intel®-IXP420 CPU with XScale®technology and the Microsoft Windows CE 5 operating system.

Two controllers with different processors are available:
– CX9010: Intel® IXP420, 533 MHz
– CX9000: Intel® IXP420, 266 MHz

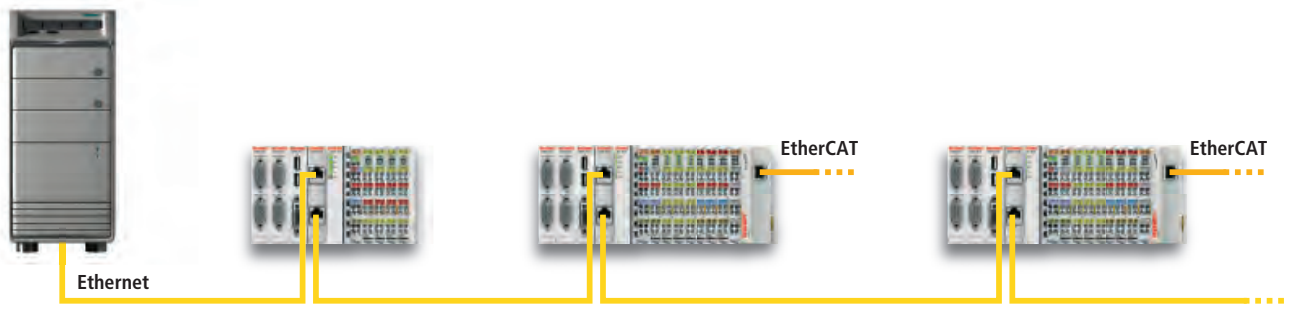
The CX9000 family requires no external storage media – the device boots the operating system from the internal flash. The CX9000/CX9010 Embedded PCs are passively cooled and therefore do without rotating components. As usual for the CX series, the device features a modular mechanical design. In its basic configuration, the compact device only measures 58 x 100 x 91 mm.

The CX9000/CX9010 controllers are available in two versions: with K-bus for direct connection of Bus Terminals, and as an E-bus version for direct connection of EtherCAT Terminals. In the basic configuration, two RJ45 sockets that are internally connected to an integrated switch are available as interfaces. This simplifies wiring of several CX9000/CX9010 within a line topology. No separate switch hardware is required. The two externally accessible Ethernet ports are independent of the EtherCAT interface, which is served by a second MAC (Media Access Controller) provided by the CPU.

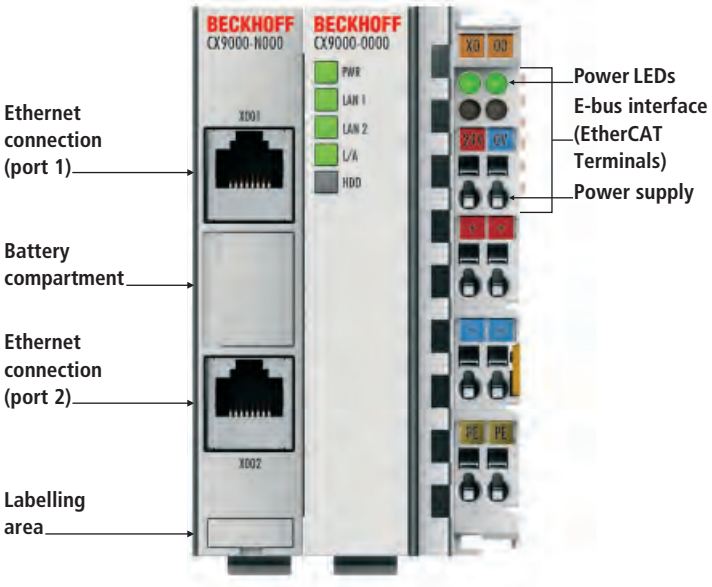
Further interfaces may be added ex works as required. If a screen display is desired, this is realised by a CX90x0-N010 – a combined DVI/VGA + 2 x USB 2.0 module. The combination of DVI and USB enables all types of Beckhoff Control Panels with DVI/USB interface to be used. Touch functionality is connected via USB. As further optional interfaces, two RS232 modules or two RS422/RS485 modules can be configured as – opto-decoupled – COM1 and COM2. Mass storage devices, in the form of a Compact Flash card, can be used with the aid of the CX9000-A001 module.

Programming as an automation device takes place using TwinCAT 2; the runtime environment for PLC (CX9000/CX9010) and Motion Control (CX9010) is located on the device itself. One of the two Ethernet interfaces is used as programming interface.

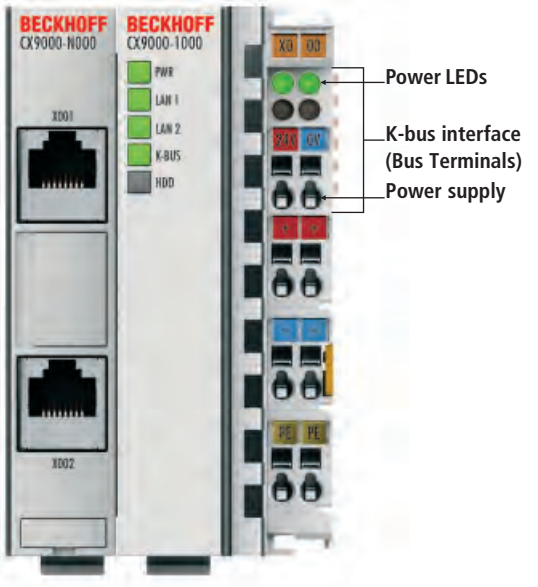
Microsoft Windows CE 5 enables the creation of fully graphic user programs, which are able to satisfy high expectations thanks to the graphics chip integrated in the CX9000/CX9010. The result is a compact Ethernet controller that enables short I/O cycle times in conjunction with EtherCAT Terminals and offers high-performance software with Windows CE 5 and TwinCAT 2.



The CX9000 and the CX9010 enable configuration of an IT line topology with subordinate EtherCAT devices.



CX900x-0x0x



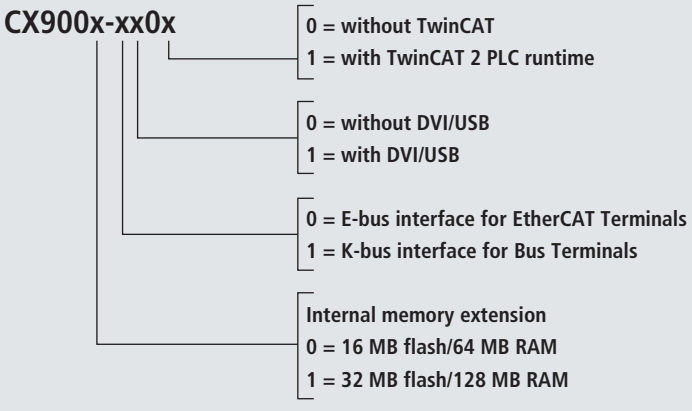
CX900x-1x0x

CX9000 | Basic CPU module

The CX9000 is a compact, DIN rail-mountable Ethernet controller with Intel® IXP420 with XScale® technology and 266 MHz clock frequency. The connection for the Beckhoff I/O systems is directly integrated in the CPU module. The CX9000 is available in two basic versions: one version for Bus Terminals with K-bus, the other one for EtherCAT Terminals with E-bus. The CX9000 comprises the CPU, the internal flash memory with two configuration options, the main memory (RAM) (available in two different sizes), and NOVRAM as non-volatile memory. Two Ethernet RJ45 interfaces are also part of the basic configuration. These interfaces are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet switches.

A memory medium in Compact Flash format I and II is available as an optional module. The operating system is Microsoft Windows CE 5. The TwinCAT 2 automation software transforms a CX9000 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. Further system interfaces can be connected to the CPU module ex factory. The CX9000-N010 option can be connected to Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI and USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, etc. can be connected via the USB 2.0 interfaces. The module CX9000-N030 offers two serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These two interfaces can be implemented as RS422/RS485, in which case they are identified as CX9000-N031.

The order identifier of the basic CPU module is derived as follows:

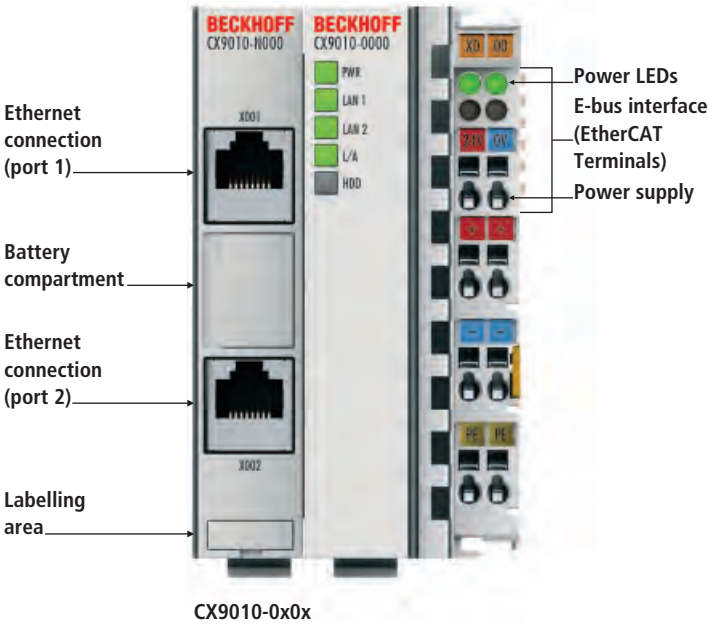


Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

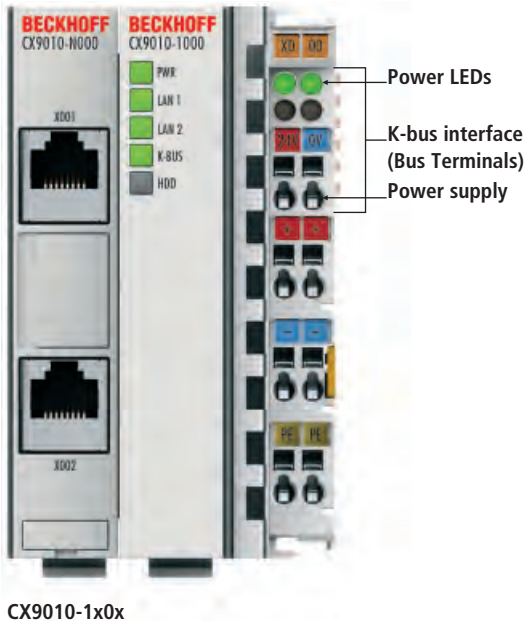
We reserve the right to make technical changes.

Technical data	CX900x-0x0x	CX900x-1x0x
Processor	266 MHz Intel® IXP420 with XScale® technology	
Flash memory	16 MB flash (internal, optionally 32 MB)	
Internal main memory	64 MB RAM (internal, optionally 128 MB)	
Interfaces	2 x RJ45 (Ethernet, internal switch), 10/100 Mbit/s	
Diagnostics LED	1 x power, 2 x LAN, 1 x L/A, 1 x flash access	1 x power, 2 x LAN, 1 x K-bus, 1 x flash access
Clock	internal battery-backed clock for time and date (battery exchangeable)	
Operating system	Microsoft Windows CE 5	
Control software	TwinCAT 2 CE PLC runtime	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Power supply	24 V DC (-15 %/+20 %)	
NOVRAM	128 kbytes	
I/O-DPRAM	–	4 kbytes
Current supply E-bus/K-bus	2 A	
Max. power loss	6 W (including the system interfaces CX9000-xxxx)	
Dimensions (W x H x D)	59 mm x 100 mm x 91 mm	
Weight	approx. 250 g (without heat sink), approx. 375 g (with heat sink for variants with DVI/USB interface)	
Operating/storage temperature	0…+55 °C/-25…+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Approvals	CE, UL	
Further information	CX9000	

Ordering information	16 MB flash 64 MB RAM	32 MB flash 128 MB RAM	E-bus	K-bus	DVI/USB	no TwinCAT	TwinCAT 2 PLC runtime
CX9000-0000	x	–	x	–	–	x	–
CX9000-0001	x	–	x	–	–	–	x
CX9001-0000	–	x	x	–	–	x	–
CX9001-0001	–	x	x	–	–	–	x
CX9001-0100	–	x	x	–	x	x	–
CX9001-0101	–	x	x	–	x	–	x
CX9000-1000	x	–	–	x	–	x	–
CX9000-1001	x	–	–	x	–	–	x
CX9001-1000	–	x	–	x	–	x	–
CX9001-1001	–	x	–	x	–	–	x
CX9001-1100	–	x	–	x	x	x	–
CX9001-1101	–	x	–	x	x	–	x



CX9010-0x0x



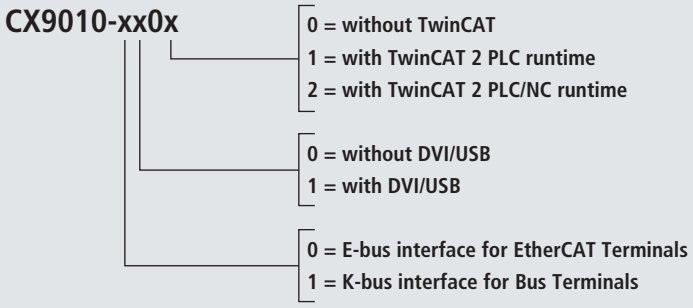
CX9010-1x0x

CX9010 | Basic CPU module

The CX9010 is a compact, DIN rail-mountable Ethernet controller with Intel® IXP420 with XScale® technology and 533 MHz clock frequency. The connection for the Beckhoff I/O systems is directly integrated in the CPU module. The CX9010 is available in two basic versions: one version for Bus Terminals with K-bus, the other one for EtherCAT Terminals with E-bus. The CX9010 comprises the CPU, the internal flash memory, the main memory (RAM) and NOVRAM as non-volatile memory. Two Ethernet RJ45 interfaces are also part of the basic configuration. These interfaces are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet switches.

A memory medium in Compact Flash format I and II is available as an optional module. The operating system is Microsoft Windows CE 5. The TwinCAT 2 automation software transforms a CX9010 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. Further system interfaces can be connected to the CPU module ex factory. The CX9010-N010 option can be connected to Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, etc. can be connected via the USB 2.0 interfaces. The module CX9010-N030 offers two serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These two interfaces can be implemented as RS422/RS485, in which case they are identified as CX9010-N031.

The order identifier of the basic CPU module is derived as follows:



Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

We reserve the right to make technical changes.

Technical data	CX9010-0x0x	CX9010-1x0x
Processor	Intel® IXP420 with XScale® technology, clock frequency 533 MHz	
Flash memory	32 MB Flash (internal, not expandable)	
Internal main memory	128 MB RAM (internal, not expandable)	
Interfaces	2 x RJ45 (Ethernet, internal switch), 10/100 Mbit/s	
Diagnostics LED	1 x power, 2 x LAN, 1 x L/A, 1 x flash access	1 x power, 2 x LAN, 1 x K-bus, 1 x flash access
Clock	internal battery-backed clock for time and date (battery exchangeable)	
Operating system	Microsoft Windows CE 5	
Control software	TwinCAT 2 CE PLC runtime or TwinCAT 2 CE NC PTP runtime	
I/O connection	E-bus (EtherCAT Terminals)	K-bus (Bus Terminals)
Power supply	24 V DC (-15 %/+20 %)	
NOVRAM	128 kbytes	
I/O-DPRAM	–	4 kbytes
Current supply E-bus/K-bus	2 A	
Max. power loss	6.5 W (including the system interfaces CX9010-xxxx)	
Dimensions (W x H x D)	59 mm x 100 mm x 91 mm	
Weight	approx. 250 g	
Operating/storage temperature	0…+50 °C/-25…+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Approvals	CE, UL	
Further information	CX9010	

Ordering information	E-bus	K-bus	DVI/USB	no TwinCAT	TwinCAT 2 PLC runtime	TwinCAT 2 NC runtime
CX9010-0000	x	–	–	x	–	–
CX9010-0001	x	–	–	–	x	–
CX9010-0002	x	–	–	–	x	x
CX9010-0100	x	–	x	x	–	–
CX9010-0101	x	–	x	–	x	–
CX9010-0102	x	–	x	–	x	x
CX9010-1000	–	x	–	x	–	–
CX9010-1001	–	x	–	–	x	–
CX9010-1002	–	x	–	–	x	x
CX9010-1100	–	x	x	x	–	–
CX9010-1101	–	x	x	–	x	–
CX9010-1102	–	x	x	–	x	x

Compact Flash module

DVI/USB interface

RS232 interface

RS422/RS485 interface

4-port USB hub

CX9000/CX9010-A001/N0xx | System interfaces

A number of optional interface modules are available for the CX9000/CX9010 Embedded PCs that can be connected to the basic module ex factory. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The power supply of the system interface modules is ensured via the internal bus.

The CX90x0-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, etc. can be connected via the USB 2.0 interfaces. The CX90x0-N030 module offers two additional serial RS232 interfaces with a maximum transmission speed of 115 kbaud. Alternatively, the two serial interfaces are also available as RS422/RS485 signal types (CX90x0-N031). The CX90x0-N070 4-port USB hub extends the number of available USB 2.0 ports, whereby each port can handle a load of max. 500 mA (however, not all four at the same time). In this way, a total of six USB interfaces per CX are available to the user.

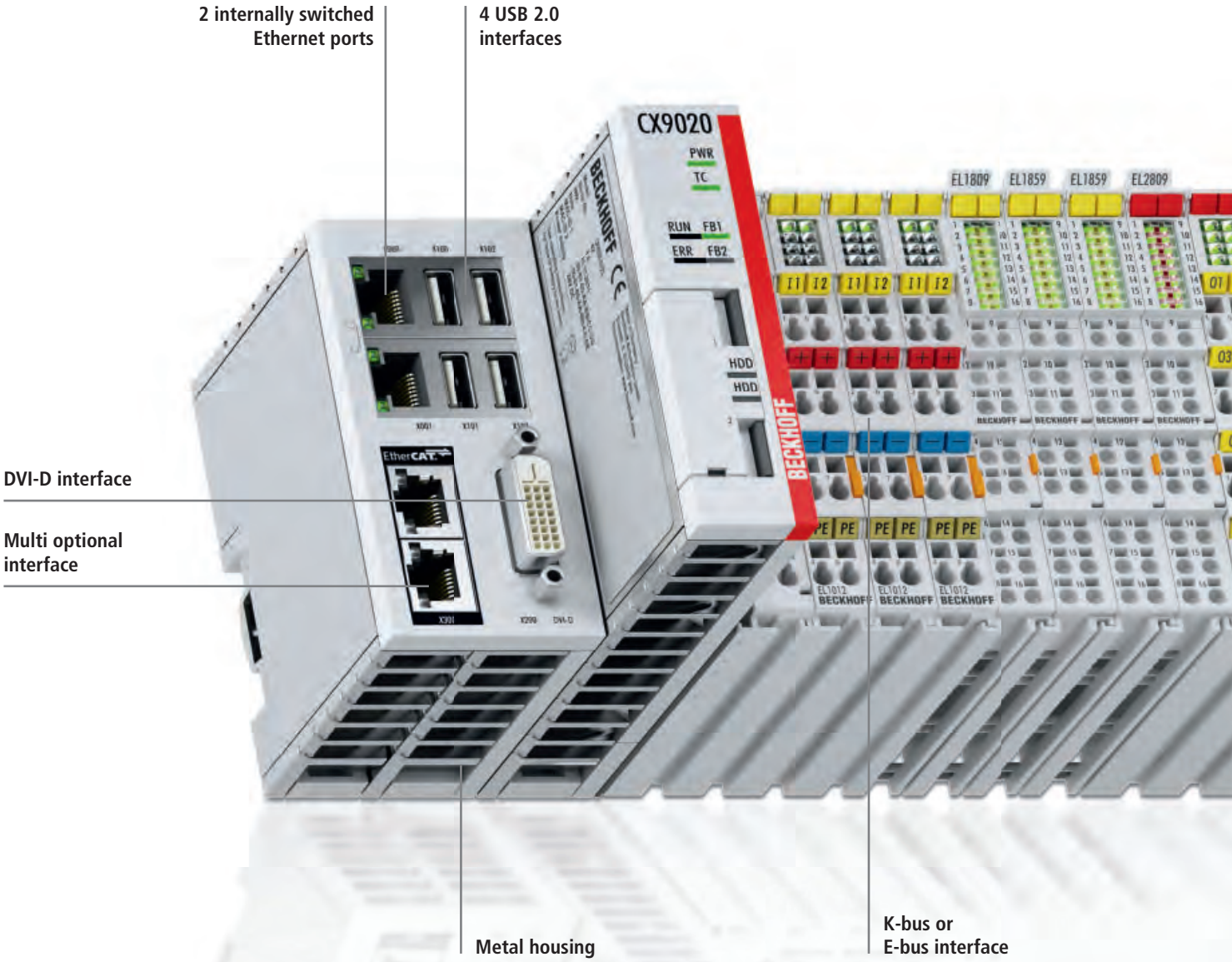
If additional mass storage is required, the CX90x0-A001 extension module provides a Compact Flash interface for type I or II CF cards. Unlike other system interfaces, this module can be upgraded in the field. Cards may only be inserted or removed when the system is switched off.

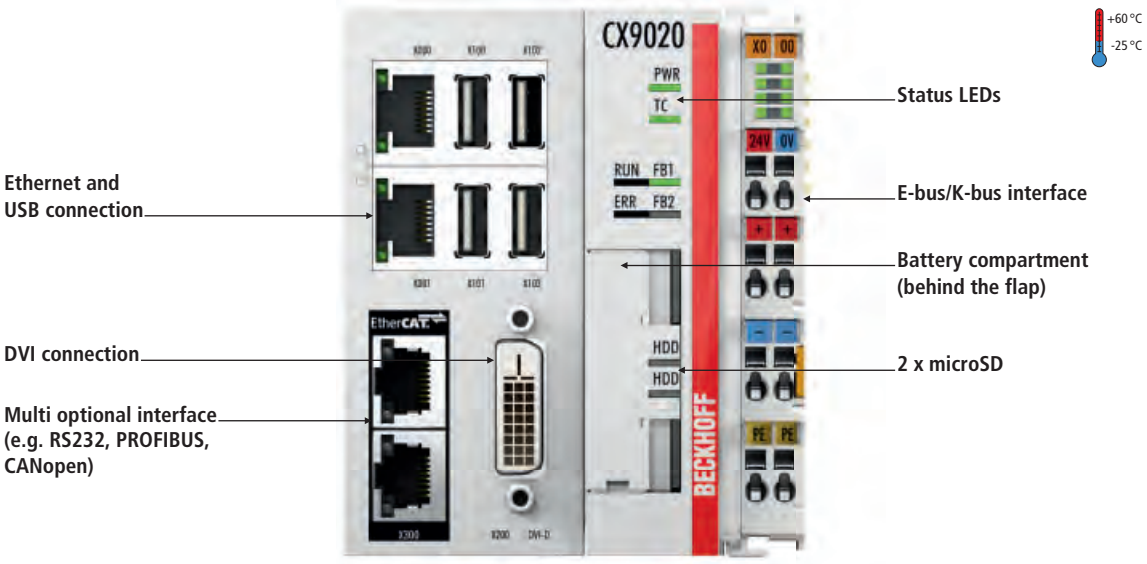
Technical data	CX9000-A001 CX9010-A001	CX9000-N010 CX9010-N010	CX9000-N030 CX9010-N030	CX9000-N031 CX9010-N031	CX9000-N070 CX9010-N070
Interfaces	Compact Flash module	1 x DVI + 2 x USB 2.0 (max. 500 mA per port)	1 x COM1 + 1 x COM2, RS232	1 x COM1 + 1 x COM2, RS422/RS485	4 x USB 2.0
Type of connection	Compact Flash slot for type I + II cards	DVI-I 29-pin socket + 2 USB ports type A	2 x D-sub plug, 9-pin	2 x D-sub socket, 9-pin	4 x USB ports type A
Properties	Compact Flash mass storage	DVI-I interface also carries out VGA signals (DVI-A)	max. baud rate 115 kbaud, cannot be used simultaneously with N031	max. baud rate 115 kbaud, cannot be used simultaneously with N030	max. baud rate 480 Mbit/s, max. output current per port 500 mA, max. total current 500 mA
Power supply	via system bus (through power supply unit in the CX9000/CX9010)				
Dimensions (W x H x D)	19 mm x 100 mm x 51 mm				
Weight	approx. 80 g				
Operating/storage temperature	0…+55 °C/-25…+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Approvals	CE, UL				
Further information	CX9000-A001				

We reserve the right to make technical changes.

CX9020 | Embedded PCs

▶ CX9020





CX9020 | Basic CPU module

The CX9020 is a compact, DIN rail-mountable Ethernet control system with 1 GHz ARM Cortex™-A8 CPU. The connection for the Beckhoff I/O systems is directly integrated into the CPU module. The unit offers automatic bus system identification (K-bus or E-bus) and independently switches in the corresponding mode. The CX9020 comprises the CPU with two microSD card slots, the internal RAM and 128 kB NOVRAM as non-volatile memory. The basic configuration also includes two switched Ethernet RJ45 interfaces, four USB 2.0 interfaces and a DVI-D interface. The RJ45 interfaces are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet switches. The operating system is Microsoft Windows Embedded Compact 7. TwinCAT automation software transforms a CX9020 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. Optionally, the unit can be ordered with a fieldbus, serial or audio interface.

The extended operating temperature range between -25 and +60 °C enables application in climatically demanding situations.

The order identifier of the basic CPU module is derived as follows:

CX9020-01ST

- 0 = no TwinCAT
- 1 = with TwinCAT 2 PLC runtime
- 2 = with TwinCAT 2 PLC/NC PTP runtime
- 5 = TwinCAT 3 runtime (XAR)

- 0 = no operating system
- 1 = operating system Windows Embedded Compact 7

Optional interfaces:

CX9020-N020 = audio interface
CX9020-N030 = RS232, D-sub plug
CX9020-N031 = RS422/RS485, D-sub socket
CX9020-B110 = EtherCAT slave, EtherCAT IN and OUT (2 x RJ45)
CX9020-M310 = PROFIBUS master, D-sub socket, 9-pin
CX9020-B310 = PROFIBUS slave, D-sub socket, 9-pin
CX9020-M510 = CANopen master, D-sub plug, 9-pin
CX9020-B510 = CANopen slave, D-sub plug, 9-pin
CX9020-M930 = PROFINET RT, controller
CX9020-B930 = PROFINET RT, device, Ethernet (2 x RJ45 switch)
CX9020-B950 = EtherNet/IP slave, Ethernet (2 x RJ45 switch)

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

We reserve the right to make technical changes.

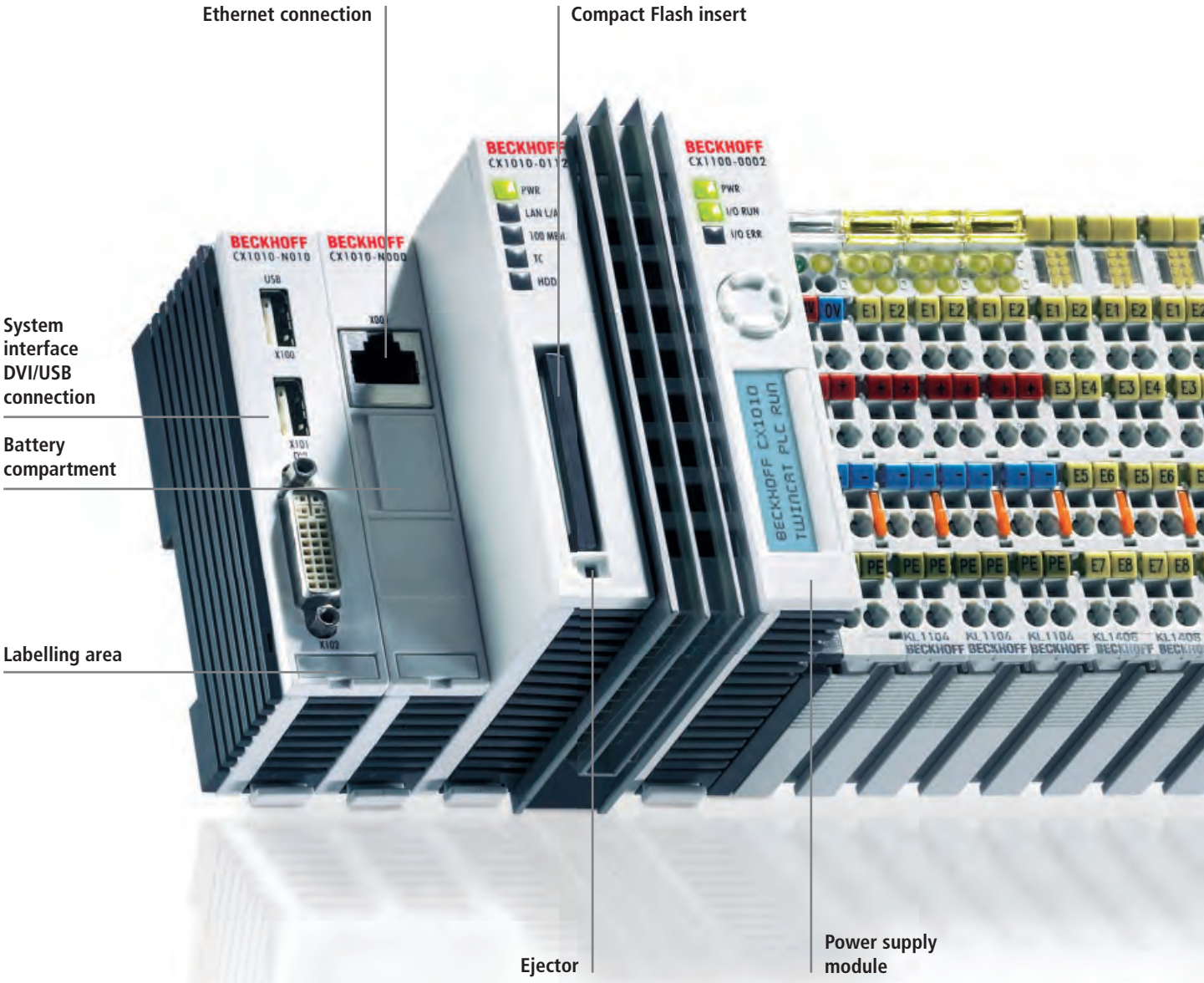
Technical data	CX9020
Processor	ARM Cortex™-A8, 1 GHz (TC3: 30)
Flash memory	512 MB microSD (optionally expandable), 2 x microSD card slot
Internal main memory	1 GB DDR3 RAM
Persistent memory	128 KB NOVRAM integrated
Interfaces	2 x RJ45 (Ethernet, internal switch), 10/100 Mbit/s, DVI-D, 4 x USB 2.0, 1 x optional interface
Diagnostics LED	1 x power, 1 x TC status, 2 x flash access, 2 x bus status
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows Embedded Compact 7, English
Control software	TwinCAT 2 PLC runtime or TwinCAT 2 NC PTP runtime | TwinCAT 3, see price list TwinCAT 3
I/O connection	E-bus or K-bus, automatic recognition
Power supply	24 V DC (-15 %/+20 %)
Current supply E-bus/K-bus	2 A
Max. power loss	5 W (including the system interfaces)
Dimensions (W x H x D)	84 mm x 99 mm x 91 mm
Weight	approx. 590 g
Operating/storage temperature	-25…+60 °C/-40…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Approvals	CE, UL, GL
TC3 performance class	economy plus (30); for further information on TwinCAT 3 see page 974
Further information	CX9020

Ordering information	no operating system	Windows Embedded Compact 7	no TwinCAT	TwinCAT 2 PLC runtime	TwinCAT 2 NC PTP runtime	TwinCAT 3 runtime (XAR)
CX9020-0100	x	–	x	–	–	–
CX9020-0110	–	x	x	–	–	–
CX9020-0111	–	x	–	x	–	–
CX9020-0112	–	x	–	–	x	–
CX9020-0115	–	x	–	–	–	x

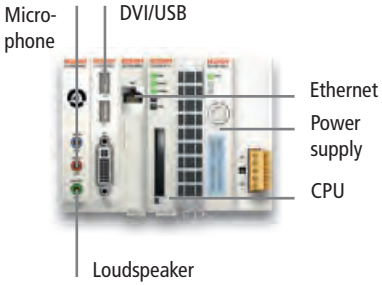
Option	
CX9020-U900	internal, capacitive 1-second UPS to ensure secure backup of persistent application data on the microSD card

CX1010 | Embedded PCs

▶ CX1010



We reserve the right to make technical changes.



Application example multimedia system with audio connection

– multimedia system (e.g. building automation)
– audio interface
– Windows Embedded Standard 2009 (no TwinCAT)

Components

– CPU CX1010-0120 (DVI/USB, audio interface)
– power supply CX1100-0001

The basic CX1010 module is the basic device of the CX family. With a 500 MHz Pentium® MMX-compatible processor it offers average CPU performance. Depending on the application the CX1010 can also be operated in "headless" mode, i.e. without display and keyboard. If local visualisation is required, this can be implemented via a DVI (digital video interface), to which all Beckhoff Control Panels and all commercially available monitors with DVI input or VGA input can be connected. The touch screen signal is read via one of the two available USB interfaces.

The components

The individual system components are modules with a width of 19 mm (single) or 38 mm (double) that can be arranged in series. The basic unit consists of a (CX1010) CPU module and a power supply module (CX1100-000x).

The CPU module is available in several variants, e.g.

– System interfaces: as an option, a DVI and two USB interfaces can be added to the existing Ethernet interface. Further system interfaces for serial communication (2 x RS232 or 2 x RS422/485) or audio signals can be ordered separately.
– Operating system: There is a choice of no operating system, Microsoft Windows Embedded CE 6 or Microsoft Windows Embedded Standard 2009.
– TwinCAT 2 software (pre-installed): without a TwinCAT 2 system, with TwinCAT 2 CE PLC or with TwinCAT 2 CE NC PTP, or with the associated full version of the individual TwinCAT 2 levels for PLC and NC PTP

Power supply unit with integrated I/O interface

For the 24 V DC power supply unit there is a choice of four different versions:

– CX1100-0001: without I/O interface
– CX1100-0002: with terminal bus interface for Beckhoff Bus Terminals
– CX1100-0003: with terminal bus interface for Beckhoff Bus Terminals and IP-Link interface for Beckhoff Fieldbus Box modules
– CX1100-0004: with terminal bus interface for Beckhoff EtherCAT Terminals

All power supply variants have an illuminated, low-glare LC-display with FSTN technology and two rows with 16 characters each for displaying status messages. The application programs can also use the display for displaying application-specific texts. 8 kB of non-volatile memory for remanent data are also included.

The range of optional modules is complemented by fieldbus connections for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Lightbus, both as master or slave versions.

PLC, Motion Control and visualisation

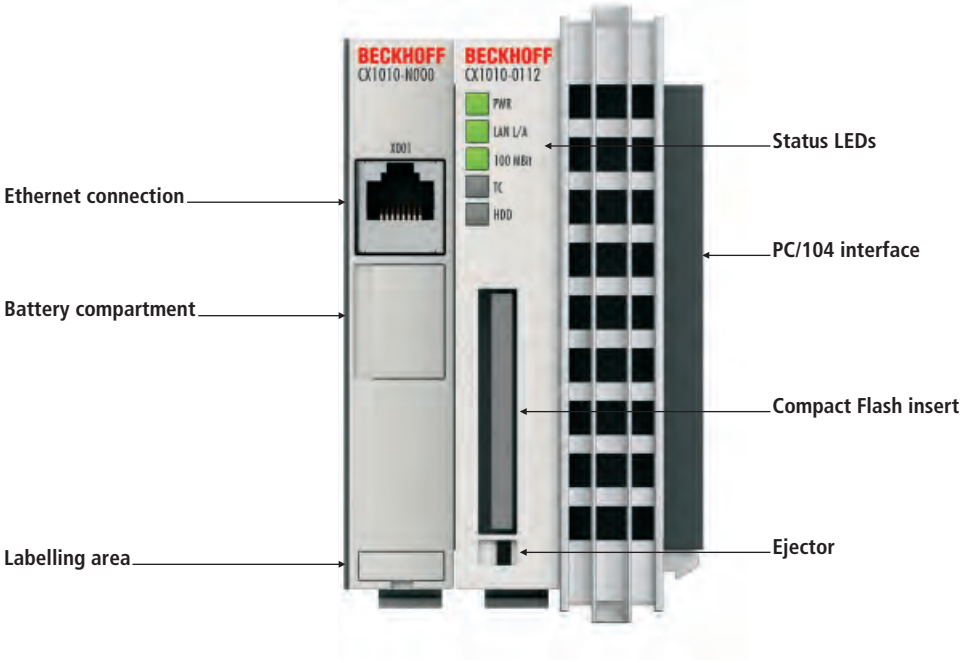
In combination with TwinCAT 2 automation software, the CX1010 Embedded PC becomes a powerful IEC 61131-3 PLC with up to four user tasks. Additionally, Motion Control tasks can also be executed. Depending on the required cycle time, several servo axes can be controlled. Even special functions such as "flying saw", "electronic gearbox" and "cam plate" can be realised. Under Windows Embedded CE 6, thanks to the real-time capability of the operating system, user tasks written in high-level languages can be processed in real-time in parallel with TwinCAT 2.

Remote programming via Ethernet

The CX1010 units are programmed via a laptop or a desktop PC that is connected with the CX1010 via Ethernet (network or crossover cable). The programs are developed on the lap top with a standard TwinCAT 2 software license and then loaded into the target device.

Operating systems

Both Windows Embedded Standard 2009 and Windows Embedded CE 6 are available as operating system. The latter has the advantages of faster boot up and lower license costs. The Beckhoff OPC server for connection to SCADA packages is available for both operating systems variants. The same applies to the CX1010: easy visualisation and at the same time real-time control on one system.



CX1010 | Basic CPU module

The CX1010 CPU module is the basic module of the CX system. It comprises the CPU and the internal flash memory in two implementation levels and offers the option to operate an additional memory medium in Compact Flash format II. An Ethernet interface is part of the basic configuration. All other CX family components can be connected via the PC/104 interface that is available on both sides. The CPU module can be equipped with different hardware and software options: the operating system can be Windows Embedded CE 6 or Windows Embedded Standard 2009.

The basic configuration of the CX1010 includes a 128 MB Compact Flash card. The TwinCAT 2 automation software transforms a CX1010 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. Further system interfaces or fieldbus connections can be added to the basic CPU module. The passive cooling module is included in the scope of supply. The CPU module requires a CX1100 type power supply module.

The order identifier of the basic CPU module is derived as follows:

CX1010-0CST

- 0 = no TwinCAT
- 1 = with TwinCAT 2 PLC runtime
- 2 = with TwinCAT 2 PLC/NC PTP runtime

- 0 = no operating system
- 1 = operating system Windows Embedded CE 6
- 2 = operating system Windows Embedded Standard 2009

- 0 = CPU with Ethernet
- 1 = CPU with Ethernet + 2 x USB + DVI

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Embedded PC interfaces for CX1010
see page 238

We reserve the right to make technical changes.

Technical data	CX1010-0xxx
Processor	compatible with Pentium® MMX, clock frequency 500 MHz
Flash memory	128 MB Compact Flash card (optionally expandable)
Internal main memory	256 MB DDR RAM (not expandable)
Interfaces	1 x RJ45 (Ethernet), 10/100 Mbit/s
Diagnostics LED	1 x power, 1 x LAN speed, 1 x LAN activity, TC status, 1 x flash access
Expansion slot	1 x Compact Flash type II insert with ejector
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows Embedded CE 6 or Microsoft Windows Embedded Standard 2009
Control software	TwinCAT 2 PLC runtime or TwinCAT 2 NC PTP runtime
System bus	16 bit ISA (PC/104)
I/O connection	via power supply module (E-bus, K-bus, K-bus/IP-Link)
Power supply	via system bus (through CX1100-xxxx power supply modules)
Max. power loss	8 W (including the system interfaces CX1010-N0xx)
Dimensions (W x H x D)	58 mm x 120 mm x 91 mm
Weight	approx. 355 g
Operating/storage temperature	0…+50 °C/-25…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Approvals	CE, UL
Further information	CX1010

Ordering information	DVI/USB	no operating system	Windows Embedded CE 6	Windows Embedded Standard 2009	no TwinCAT	TwinCAT 2 PLC runtime	TwinCAT 2 NC PTP runtime
CX1010-0000	–	x	–	–	x	–	–
CX1010-0010	–	–	x	–	x	–	–
CX1010-0011	–	–	x	–	–	x	–
CX1010-0012	–	–	x	–	–	x	x
CX1010-0020	–	–	–	x*	x	–	–
CX1010-0021	–	–	–	x*	–	x	–
CX1010-0022	–	–	–	x*	–	x	x
CX1010-0100	x	x	–	–	x	–	–
CX1010-0110	x	–	x	–	x	–	–
CX1010-0111	x	–	x	–	–	x	–
CX1010-0112	x	–	x	–	–	x	x
CX1010-0120	x	–	–	x*	x	–	–
CX1010-0121	x	–	–	x*	–	x	–
CX1010-0122	x	–	–	x*	–	x	x

*CX1010 systems with Microsoft Embedded Standard 2009 require Compact Flash with a capacity of at least 2 GB (must be ordered separately).

DVI/USB interface

Audio interface

RS232 interface

RS422/RS485 interface

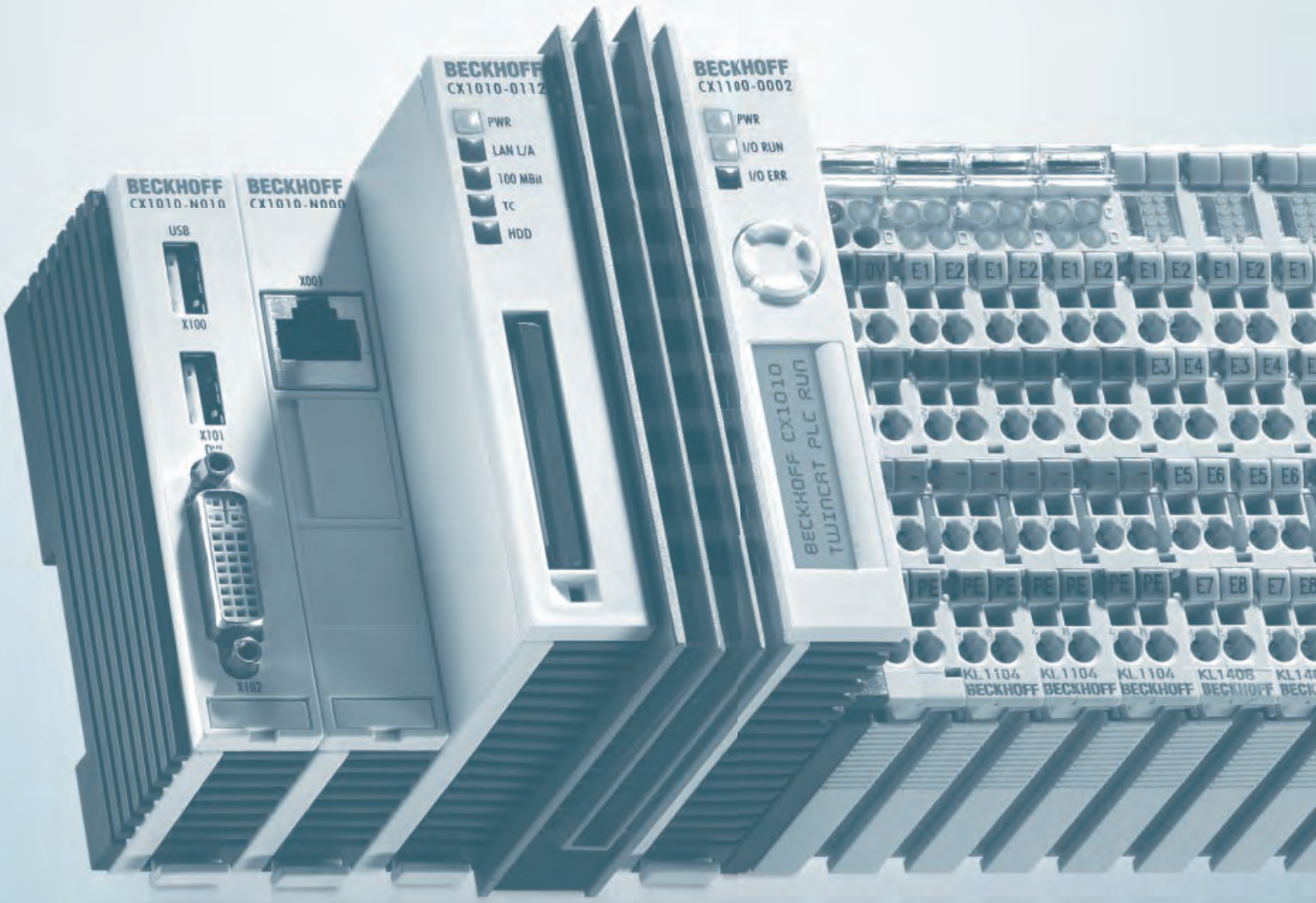
Ethernet interface

CX1010-N0xx | System interfaces

A number of optional interface modules are available for the basic CX1010 CPU module that can be installed ex factory. The CX1010-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, etc. can be connected via the USB 2.0 interfaces. Multimedia capability is realised via the CX1010-N020 audio interface. The modules CX1010-N030 and CX1010-N040 offer a total of four serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These four interfaces can be implemented in pairs as RS422/RS485, in which case they are identified as CX1010-N031 and CX1010-N041 respectively. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The internal PC/104 bus runs through the system interfaces, so that further CX components can be connected. The power supply of the system interface modules is ensured via the internal PC/104 bus.

Technical data	CX1010-N010	CX1010-N020	CX1010-N030 CX1010-N040	CX1010-N031 CX1010-N041	CX1010-N060
Interfaces	1 x DVI + 2 x USB 2.0 (max. 500 mA per port)	Line IN, Line Mic IN, Line OUT	1 x COM1+2, RS232, 1 x COM3+4, RS232	1 x COM1+2, RS422/ RS485, 1 x COM3+4, RS422/RS485	1 x Ethernet, 10/100 Mbit/s
Type of connection	DVI-I 29-pin socket + 2 USB ports type A	3.5 mm socket for jack plug	2 x D-sub plug, 9-pin	2 x D-sub socket, 9-pin	1 x RJ45
Properties	DVI-I interface also carries out VGA signals (DVI-A)	built-in PC beeper, Line OUT output, max. 200 mW, suitable for ear-phones	max. baud rate 115 kbaud, cannot be used simultaneously with N031/N041	max. baud rate 115 kbaud, cannot be used simultaneously with N030/N040	max. baud rate 100 Mbit/s, max. 20 m cable length Cat.5, cannot be used simultaneously with CX1100-0004
Power supply	via system bus (through CX1100-xxxx power supply modules)				
Dimensions (W x H x D)	19 mm x 100 mm x 51 mm				
Weight	approx. 80 g				
Operating/storage temperature	0…+55 °C/-25…+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Approvals	CE, UL				
Further information	CX1010-N010				

We reserve the right to make technical changes.


BECKHOFF
CX1010-N010
BECKHOFF
CX1010-N000
USB
X100
X101
X102
X001
BECKHOFF
CX1010-0112
PWR
LAN L/A
100 MBit
TC
HDD
BECKHOFF
CX1100-0002
PWR
I/O RUN
I/O ERR
BECKHOFF CX1010
TWINCAT PLC RUN
0V
E1
E2
E3
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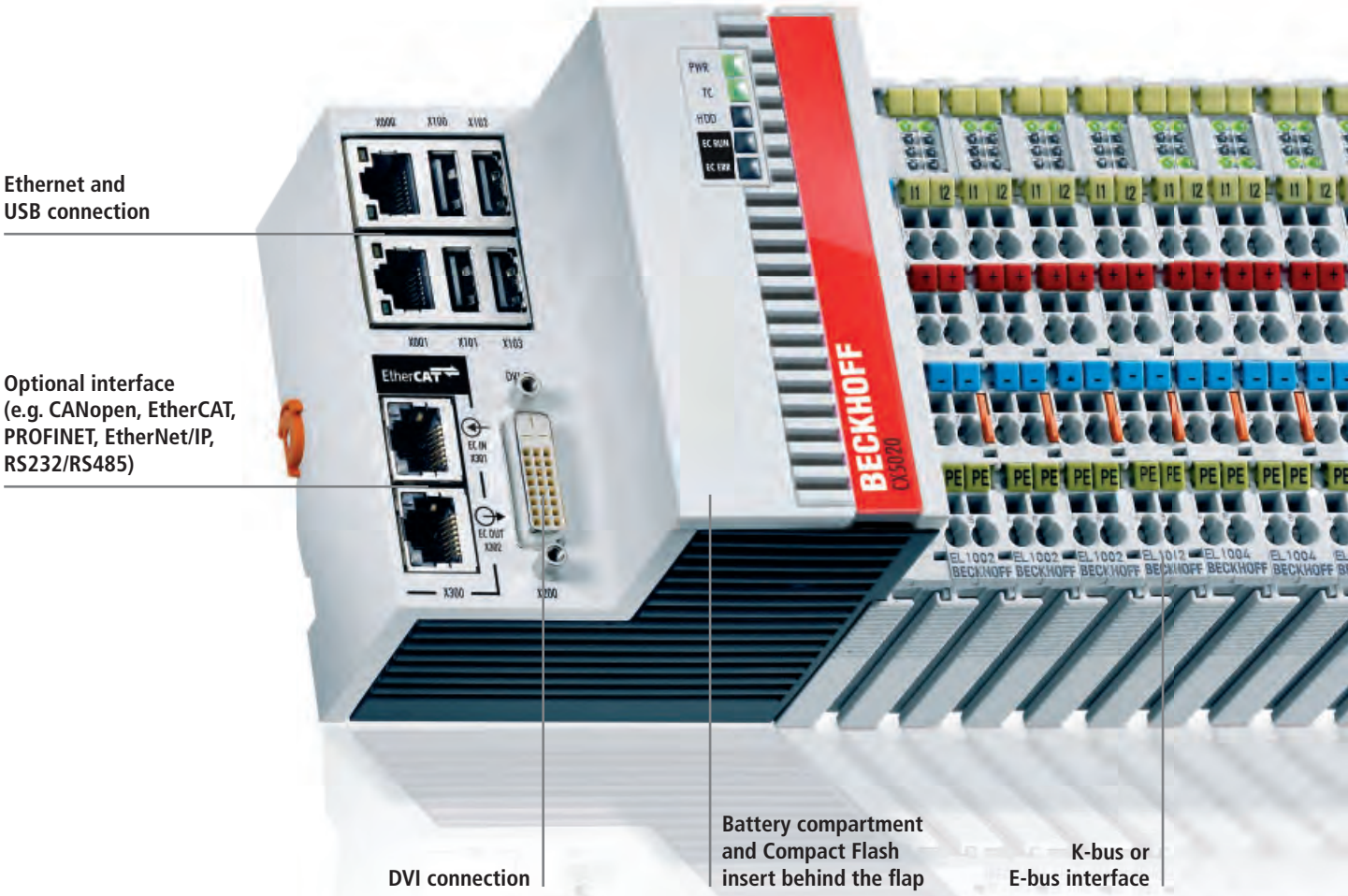
BECKHOFF

CX5000 | Embedded PC series with Intel® Atom™ processor

▶ **CX5000**



We reserve the right to make technical changes.

CX5020 with optional PROFINET interfaces

CX5020 with D-sub plug, 9-pin

CX5020 with audio interface

The CX5000 series devices are DIN rail-mountable, fanless Embedded PCs with direct connection for Beckhoff Bus Terminals or EtherCAT Terminals.

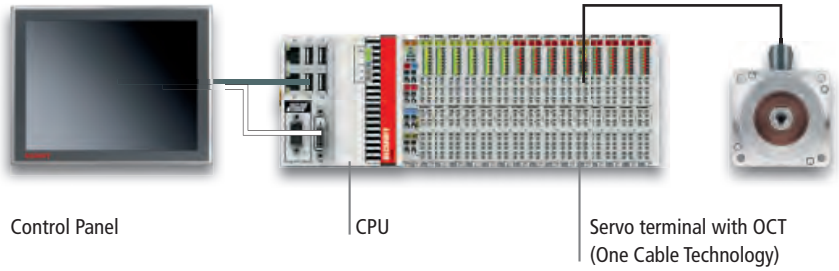
The housing concept of this series is optimised for sturdiness and compactness; the individual housing parts are made of metal (magnesium). Apart from the electrical advantages of better screening and ESD protection, the user also benefits from the weight-saving magnesium construction.

The I/O level can be implemented both with Bus Terminals and with EtherCAT Terminals. The connection of EtherCAT gives rise to many different extension options. Further master/slave fieldbus connections (PROFIBUS, CANopen, DeviceNet) or communication interfaces (RS232, RS422/RS485) and all other signal types accessible via EtherCAT can be directly connected as EtherCAT Terminals.

Two independent Gigabit Ethernet ports and four USB 2.0 interfaces are available. A Beckhoff Control Panel or a commercially available DVI monitor can be connected to the DVI-D interface. Unlike the other CX device families, the CX5000 series has no option for expansion using attachable expansion modules to the left. There is, however, a factory-fitted option slot in the basic housing. For example, a serial port (RS232/RS422/RS485) or a fieldbus connection with master or slave function can be added here as an optional interface as required. Particularly worth mentioning is the function as an EtherCAT slave, as a result of which the CX5000 becomes a programmable local controller within an EtherCAT network.

The operating system can be Windows Embedded CE 6 or Windows Embedded Standard 2009. An exchangeable, industrially-compatible CF card, which can be accessed behind a panel, is used as boot and storage medium. The CF card serves as a substitute for a hard disk; i.e. the operating system as well as TwinCAT and user projects are stored on it. This way, in the case of service, hardware can be exchanged quickly or a software update can be performed on site by simply exchanging the CF card. The builtin capacitive 1-second UPS ensures secure backup of persistent application data on the CF card. The date and time are buffered via a replaceable battery.

TwinCAT automation software transforms a CX5000 system into a powerful PLC and Motion Control system that can be operated with or without visualisation.

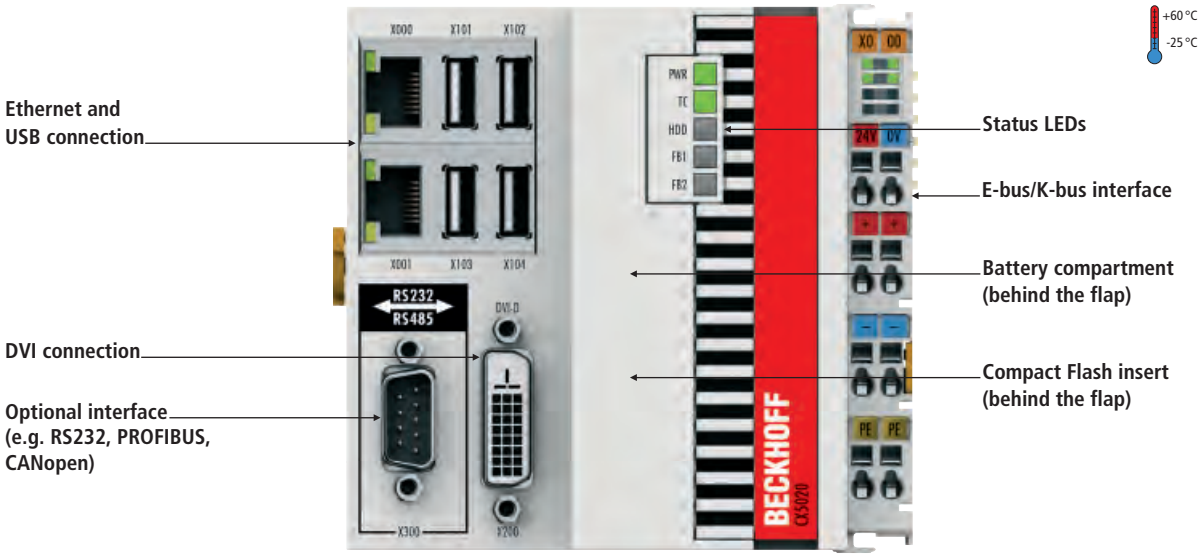


Application example: PLC and Motion Control system with DVI/USB interface

- PLC and Motion Control software
- Control Panel connection via DVI/USB
- Windows Embedded CE 6 and TwinCAT NC

Components

- CPU CX5020-0112
- display CP39xx
- drive: EL7211-0010 servo terminal and AM8131-wF1z motor



CX5000 | Embedded PC series with Intel® Atom™ processor

The CX5010 and CX5020 are Embedded PCs from the CX5000 series based on Intel® Atom™ processors and differ only by the CPU version. The CX5010 has a 1.1 GHz Intel® Atom™ Z510 processor, while the CX5020 has a 1.6 GHz Intel® Atom™ Z530 processor. Apart from the clock speed, the two processors also differ by the fact that the Z530 features hyperthreading technology, i.e. it has two virtual CPU cores for more effective execution of software.

Depending on the installed TwinCAT runtime environment, the CX5010/CX5020 can be used for the implementation of PLC or PLC/Motion Control projects (with or without visualisation).

+60 °C
-25 °C

The extended operating temperature range between -25 and +60 °C enables application in climatically demanding situations.

The order identifier of the CX5000 devices is derived as follows:

CX50x0-U1ST

- 0 = no TwinCAT
- 1 = with TwinCAT 2 PLC runtime
- 2 = with TwinCAT 2 NC PTP runtime
- 5 = TwinCAT 3 runtime (XAR)

- 0 = no operating system
- 1 = operating system Windows Embedded CE 6
- 2 = operating system Windows Embedded Standard 2009

- 0 = E-bus interface for EtherCAT Terminals
- 1 = K-bus interface for Bus Terminals

- 1 = Intel® Atom™ processor 1.1 GHz
- 2 = Intel® Atom™ processor 1.6 GHz

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Optional interfaces:

CX50x0-N020	=	audio interface
CX50x0-N030	=	RS232, D-sub plug
CX50x0-N031	=	RS422/RS485, D-sub socket
CX50x0-M310	=	PROFIBUS master, D-sub socket, 9-pin
CX50x0-B310	=	PROFIBUS slave, D-sub socket, 9-pin
CX50x0-M510	=	CANopen master, D-sub plug, 9-pin
CX50x0-B510	=	CANopen slave, D-sub plug, 9-pin
CX50x0-M930	=	PROFINET RT, controller
CX50x0-B930	=	PROFINET RT, device, Ethernet (2 x RJ45 switch)
CX50x0-B950	=	EtherNet/IP slave, Ethernet (2 x RJ45 switch)
CX50x0-B110	=	EtherCAT slave, EtherCAT IN and OUT (2 x RJ45)

We reserve the right to make technical changes.

Technical data	CX5010	CX5020
Processor	Intel® Atom™ Z510, 1.1 GHz clock frequency (TC3: 40)	Intel® Atom™ Z530, 1.6 GHz clock frequency (TC3: 40)
Flash memory	128 MB Compact Flash card (optionally expandable)	
Internal main memory	512 MB RAM (internal, not expandable)	512 MB RAM (optionally 1 GB installed ex factory)
Persistent memory	integrated 1-second UPS (1 MB on Compact Flash card)	
Interfaces	2 x RJ45, 10/100/1000 Mbit/s, DVI-D, 4 x USB 2.0, 1 x optional interface	
Diagnostics LED	1 x power, 1 x TC status, 1 x flash access, 2 x bus status	
Clock	internal battery-backed clock for time and date (battery exchangeable)	
Operating system	Microsoft Windows Embedded CE 6 or Microsoft Windows Embedded Standard 2009	
Control software	TwinCAT 2 PLC runtime or TwinCAT 2 NC PTP runtime | TwinCAT 3, see price list TwinCAT 3	
I/O connection	E-bus or K-bus, automatic recognition	
Power supply	24 V DC (-15 %/+20 %)	
Current supply E-bus/K-bus	2 A	
Max. power loss	12 W (including the system interfaces)	12.5 W (including the system interfaces)
Dimensions (W x H x D)	100 mm x 106 mm x 92 mm	
Weight	approx. 575 g	
Operating/storage temperature	-25…+60 °C/-40…+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Approvals	CE, UL, Ex, GL	
TC3 performance class	performance (40); for further information on TwinCAT 3 see page 974	
Further information	CX5010	

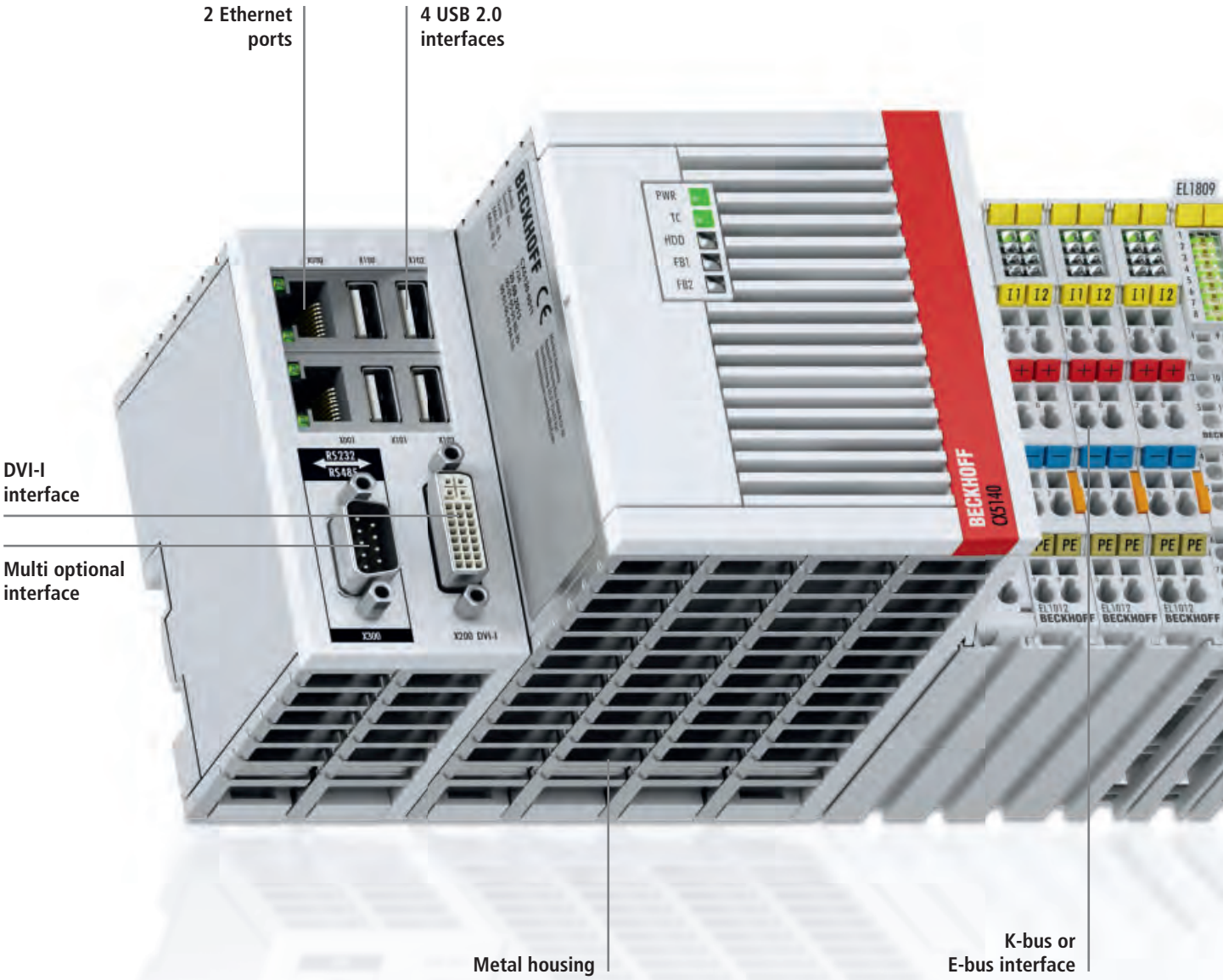
Ordering information	E-bus	K-bus	no operating system	Windows Embedded CE 6	Windows Embedded Standard 2009	no TwinCAT	TwinCAT 2 PLC runtime	TwinCAT 2 NC PTP runtime	TwinCAT 3 runtime (XAR)
CX50x0-0100	x	–	x	–	–	x	–	–	–
CX50x0-0110	x	–	–	x	–	x	–	–	–
CX50x0-0111	x	–	–	x	–	–	x	–	–
CX50x0-0112	x	–	–	x	–	–	x	x	–
CX50x0-0115	x	–	–	x	–	–	–	–	x
CX50x0-0120	x	–	–	–	x*	x	–	–	–
CX50x0-0121	x	–	–	–	x*	–	x	–	–
CX50x0-0122	x	–	–	–	x*	–	x	x	–
CX50x0-0125	x	–	–	–	x*	–	–	–	x
CX50x0-1100	–	x	x	–	–	x	–	–	–
CX50x0-1110	–	x	–	x	–	x	–	–	–
CX50x0-1111	–	x	–	x	–	–	x	–	–
CX50x0-1112	–	x	–	x	–	–	x	x	–
CX50x0-1115	–	x	–	x	–	–	–	–	x
CX50x0-1120	–	x	–	–	x*	x	–	–	–
CX50x0-1121	–	x	–	–	x*	–	x	–	–
CX50x0-1122	–	x	–	–	x*	–	x	x	–
CX50x0-1125	–	x	–	–	x*	–	–	–	x

Options	
CX1900-0204	1 GB DDR2 RAM for CX5020, instead of 512 MB DDR2 RAM; pre-assembled ex factory
CX1800-0401	Microsoft Windows Embedded Standard 7 P 32 bit instead of Microsoft Windows Embedded Standard 2009
CX1900-0105	Device modification for fulfillment of ATEX Certification II 3 G Ex nA II T4 for CX5010 and CX5020: This option includes the modification and repositioning of the device label as well as a pre-mounted wire bow. The modification is a mandatory prerequisite for usage of CX5010 or CX5020 in hazardous areas as covered by the before mentioned certificate for ATEX Zone 2. Please also read the device documentation carefully.

*CX50x0 systems with Microsoft Embedded Standard 2009 require Compact Flash with a capacity of at least 2 GB (must be ordered separately).

CX5100 | Embedded PCs

▶ CX5100



We reserve the right to make technical changes.

CX5120

CX5130

CX5140

The DIN-rail-mountable, fanless Embedded PCs from the CX5100 series are equipped with Intel® Atom™ multi-core processors. The series encompasses three devices that differ from each other by processor type, RAM size and housing size. The new CX5100 PCs supplement the existing devices of the CX5000 series which are equipped with processors of the first Intel® Atom™ generation. In direct comparison the new processors are considerably more efficient: the out-of-order architecture and the modern 22-nm technology enable higher clock rates combined with reduced power losses.

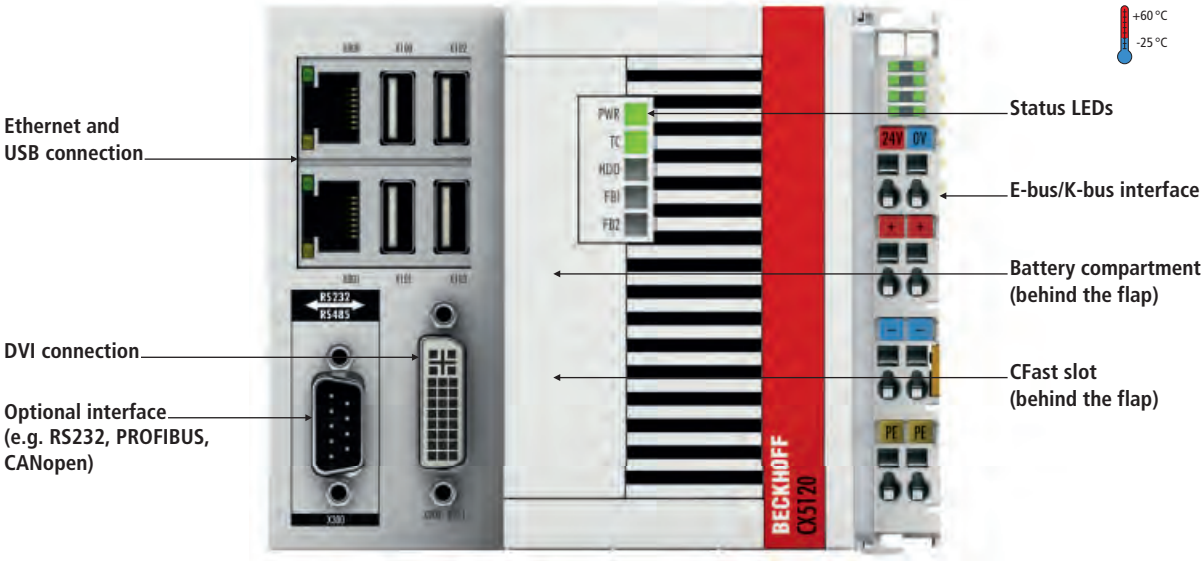
– CX5120: Intel® Atom™ CPU, 1.46 GHz, 1 core
– CX5130: Intel® Atom™ CPU, 1.75 GHz, 2 cores
– CX5140: Intel® Atom™ CPU, 1.91 GHz, 4 cores

The CX5100 has a fixed number of system interfaces, which in the basic version is identical to previous CX5000 devices. Two independent Gigabit Ethernet ports and four USB 2.0 interfaces are available. To the DVI-I interface either a Beckhoff Control Panel or a commercially available DVI or VGA monitor can be connected. Like the CX5000 the CX5100 series has a compact design; a modular device with extension modules like in the CX2000 series is not available. The option interface of the CX5100 can be factory-fitted with various interfaces depending on needs: e.g. with a serial port (RS232/RS422/RS485) or a fieldbus connection for master or slave function. If the EtherCAT Slave option is selected, the CX5100 becomes a programmable, decentralised controller within an EtherCAT network.

At I/O level either Bus Terminals or EtherCAT Terminals can be used. Like all Embedded PCs of the second generation, the CX5100 automatically recognises the I/O type that is plugged-in. With EtherCAT many different extension options are available: further master/slave fieldbus connections (PROFIBUS, CANopen, DeviceNet, etc.) and communication interfaces (RS232, RS422/RS485) as well as all other signal types supported by EtherCAT can be directly connected as EtherCAT Terminals.

The operating system is Windows Embedded Standard 7 P, optionally in a 32-bit or 64-bit version. The boot and storage medium is an interchangeable, industrially compatible CFast card with a slot that is accessible behind a cover. The CFast card serves as a substitute for a hard disk; i.e. the operating system as well as TwinCAT and user projects are stored on it. Fast hardware exchange is thus possible if service is required; a software update can be performed simply by replacing the card on site. The built-in capacitive 1-second UPS ensures secure backup of persistent application data on the CFast card. Date and time are buffered via a replaceable battery.

The new CX5100 Embedded PCs are positioned in terms of both price and performance below the CX2000 series with multi-core-i CPU. If the machine and plant programmer uses the CX5100 in combination with the TwinCAT 3 automation suite, he now benefits from the availability of genuine multi-core processors and the optimised allocation of different program sections to individual cores, even with Intel® Atom™-based devices.



CX5100 | Embedded PC series with Intel® Atom™ processor

CX5120, CX5130 and CX5140 are Embedded PCs from the CX5100 series based on the Intel® Atom™ multi-core processors. They differ from one another in housing width and CPU type. What is new is that the available Atom™ CPUs now also introduce genuine multi-core technology, extending up to quad-core, into the compact Embedded PC segment. Since the new devices are an extension of the existing CX5000 series, they are equipped with identical hardware interfaces. Two independent Gigabit-capable Ethernet interfaces as well as four USB 2.0 and one DVI-I interface are available. A multitude of further connection options and gateway functions is created by the multi-option interface, which can be pre-equipped ex factory, as well as the I/O level, which can optionally consist of either E-Bus or K-Bus Terminals.

All devices in the series are characterised by low power consumption and fanless design.

Depending on the installed TwinCAT runtime environment, the CX5100 can be used for implementing PLC or PLC/Motion Control projects with or without visualisation. The execution of Motion Control applications with interpolating axis movements is also possible.

The extended operating temperature range from -25 to +60 °C enables the use of the CX5100 Embedded PCs in climatically demanding environments.

Like the CX5000, the CX5100 series has a compact design; a modular device with extension modules like in the CX2000 series is not available.

The order number can be derived as follows:

CX51x0-01ST

- 0 = no TwinCAT
- 1 = with TwinCAT 2 PLC runtime
- 2 = with TwinCAT 2 NC PTP runtime
- 3 = with TwinCAT 2 NC I runtime
- 5 = TwinCAT 3 runtime (XAR)

- 0 = no operating system
- 2 = operating system Windows Embedded Standard 7 P 32 bit
- 3 = operating system Windows Embedded Standard 7 P 64 bit

- 2 = Intel® Atom™ processor 1.46 GHz, 1 core
- 3 = Intel® Atom™ processor 1.75 GHz, 2 cores
- 4 = Intel® Atom™ processor 1.91 GHz, 4 cores

Optional interfaces:

CX51x0-N020	=	audio interface
CX51x0-N030	=	RS232, D-sub plug
CX51x0-N031	=	RS422/RS485, D-sub socket
CX51x0-M310	=	PROFIBUS master, D-sub socket, 9-pin
CX51x0-B310	=	PROFIBUS slave, D-sub socket, 9-pin
CX51x0-M510	=	CANopen master, D-sub plug, 9-pin
CX51x0-B510	=	CANopen slave, D-sub plug, 9-pin
CX51x0-M930	=	PROFINET RT, controller
CX51x0-B930	=	PROFINET RT, device, Ethernet (2 x RJ45 switch)
CX51x0-B950	=	EtherNet/IP slave, Ethernet (2 x RJ45 switch)
CX51x0-B110	=	EtherCAT slave, EtherCAT IN and OUT (2 x RJ45)

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

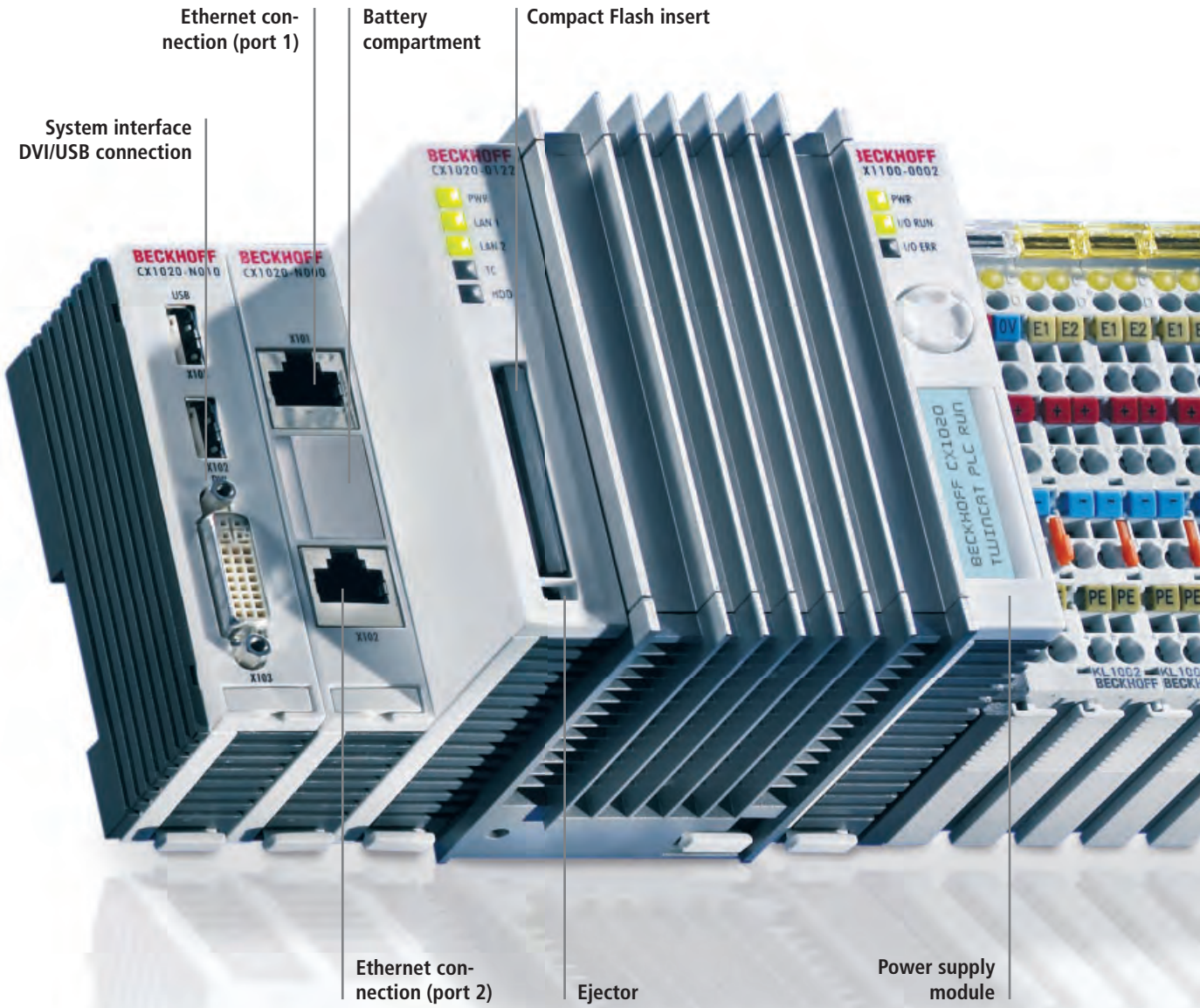
We reserve the right to make technical changes.

Technical data	CX5120	CX5130	CX5140
Processor	Intel® Atom™ E3815, 1.46 GHz, 1 core (TC3: 40)	Intel® Atom™ E3827, 1.75 GHz, 2 cores (TC3: 40)	Intel® Atom™ E3845, 1.91 GHz, 4 cores (TC3: 50)
Flash memory	slot for CFast card (card not included), slot for microSD card		
Internal main memory	2 GB DDR3 RAM (not expandable)	4 GB DDR3 RAM (not expandable)	4 GB DDR3 RAM (not expandable)
Persistent memory	integrated 1-second UPS (1 MB on CFast card)		
Interfaces	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface		
Diagnostics LED	1 x power, 1 x TC status, 1 x flash access, 2 x bus status		
Clock	internal battery-backed clock for time and date (battery exchangeable)		
Operating system	Microsoft Windows Embedded Standard 7 P		
Control software	TwinCAT 2 PLC runtime or TwinCAT 2 NC PTP runtime | TwinCAT 3, see price list TwinCAT 3		
I/O connection	E-bus or K-bus, automatic recognition		
Power supply	24 V DC (-15 %/+20 %)		
Current supply E-bus/K-bus	2 A		
Max. power loss	9 W (including the system interfaces)	11 W (including the system interfaces)	12 W (including the system interfaces)
Dimensions (W x H x D)	124 mm x 100 mm x 92 mm	142 mm x 100 mm x 92 mm	142 mm x 100 mm x 92 mm
Weight	approx. 860 g	approx. 960 g	approx. 960 g
Operating/storage temperature	-25…+60 °C/-40…+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 20		
Approvals	CE, UL		
TC3 performance class	performance (40); for further information on TwinCAT 3 see page 974	performance (40); for further information on TwinCAT 3 see page 974	performance plus (50); for further information on TwinCAT 3 see page 974
Further information	CX5100		

Ordering information	no operating system	Windows Embedded Standard 7 P 32 bit	Windows Embedded Standard 7 P 64 bit	no TwinCAT	TwinCAT 2 runtime PLC	TwinCAT 2 runtime NC PTP	TwinCAT 2 runtime NC I	TwinCAT 3 runtime (XAR)
CX5120-0100	x	–	–	x	–	–	–	–
CX5120-0120	–	x	–	x	–	–	–	–
CX5120-0121	–	x	–	–	x	–	–	–
CX5120-0122	–	x	–	–	–	x	–	–
CX5120-0123	–	x	–	–	–	–	x	–
CX5120-0125	–	x	–	–	–	–	–	x
CX5120-0130	–	–	x	x	–	–	–	–
CX5120-0135	–	–	x	–	–	–	–	x
CX5130-0100	x	–	–	x	–	–	–	–
CX5130-0120	–	x	–	x	–	–	–	–
CX5130-0121	–	x	–	–	x	–	–	–
CX5130-0122	–	x	–	–	–	x	–	–
CX5130-0123	–	x	–	–	–	–	x	–
CX5130-0125	–	x	–	–	–	–	–	x
CX5130-0130	–	–	x	x	–	–	–	–
CX5130-0135	–	–	x	–	–	–	–	x
CX5140-0100	x	–	–	x	–	–	–	–
CX5140-0120	–	x	–	x	–	–	–	–
CX5140-0121	–	x	–	–	x	–	–	–
CX5140-0122	–	x	–	–	–	x	–	–
CX5140-0123	–	x	–	–	–	–	x	–
CX5140-0125	–	x	–	–	–	–	–	x
CX5140-0130	–	–	x	x	–	–	–	–
CX5140-0135	–	–	x	–	–	–	–	x

CX1020, CX1030 | Embedded PCs

▶ CX1020



We reserve the right to make technical changes.

CX1020

CX1030

The CX1020 and CX1030 Embedded PCs extend the CX product family by versions with high CPU performance and enable the direct connection of Bus Terminals and EtherCAT Terminals. The CX1020 is equipped with a 1 GHz Intel® Celeron® M CPU. It is an energy-saving device that operates with ultra-low core voltage and features low thermal power dissipation of only 7 W TDP (thermal design power). This means that a fan can be dispensed with even in the small form factor of the CX1020 Embedded PCs. Since Compact Flash is used as the boot and storage medium, the controller contains no rotating media.

The CX1030 is equipped with a 1.8 GHz Intel® Pentium® M processor. Apart from the CPU and the fan cartridge required with this level of CPU performance, neither the hardware nor the software of the CX1030 differs from that of the CX1020. The high-quality fan is supported by dual ball bearings and mounted in a tray so that it can be replaced in the field without tools or wiring, if required. The fan speed is monitored and can be queried via software. The combination of CX1030, EtherCAT and TwinCAT 2 enables very fast control processes in the sub-millisecond range (eXtreme Fast Control Technology).

The basic CPU modules come with two RJ45 sockets, behind which there is an integrated 3-port switch in order to enable the construction of a line topology without additional switches.

The components

The individual system components are modules with a width of 19 mm (single) or 38 mm (double) that can be arranged in series. The basic unit consists of a CPU module CX1020/CX1030 and a power supply module (CX1100-00xx).

The range of modules is complemented by fieldbus connections for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Lightbus, both as master or slave versions.

Power supply unit with integrated I/O interface

For the 24 V DC power supply unit there is a choice of three or four different versions:

– CX1100-0001: without I/O interface, CX1020 only
– CX1100-00x2: with terminal bus interface for Beckhoff Bus Terminals
– CX1100-00x3: with terminal bus interface for Beckhoff Bus Terminals and IP-Link interface for Beckhoff Fieldbus Box modules
– CX1100-00x4: with terminal bus interface for Beckhoff EtherCAT Terminals

All power supply variants have an illuminated, low-glare LC-display with FSTN technology and two rows with 16 characters each for displaying status messages. The application programs can also use the display for displaying application-specific texts. 8 kB of non-volatile memory for remanent data are also included.

EtherCAT as a fast I/O system

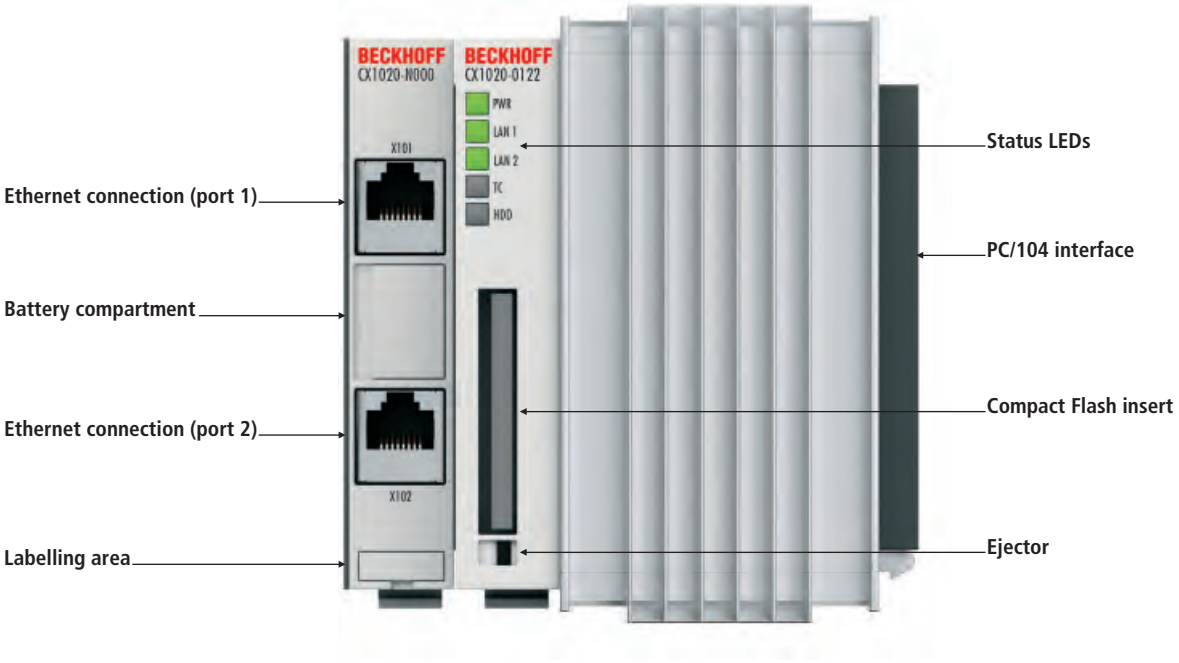
The CX1020 and CX1030 Embedded PCs were developed with a view towards optimised interaction with EtherCAT. The use of EtherCAT gives rise to several options for connecting classic fieldbus systems to the CX1020/CX1030: either as a CX1500 module directly at the CPU or as an EtherCAT device in terminal form. The PROFIBUS master is available either as a CX1500-M310 or as a EL6731 EtherCAT Terminal.

PLC, Motion Control, interpolation and visualisation

As a DIN rail IPC and in conjunction with TwinCAT 2 software from Beckhoff, the CX1020/CX1030 offers the same functionality as large Industrial PCs. In terms of PLC, up to four virtual IEC 61131-3 CPUs can be programmed with up to four tasks each.

Moreover, all TwinCAT 2 functionalities are available for Motion Control applications. In theory, up to 256 axes can be controlled. In addition to simple point-to-point movements, more complex multi-axis functions such as "electronic gearbox", "cam plates" and "flying saw" can be implemented. Due to the higher-performance CPU in the CX1020 and the CX1030, interpolating 3-D path movements can also be implemented and DIN 66025 programs executed.

In addition to real-time execution of control tasks, the TwinCAT 2 real-time kernel ensures that enough time remains for the user interface (HMI), to communicate with the real-time components via software interfaces such as ADS or OPC.



CX1020 | Basic CPU module

The basic CX1020 CPU module has a 1 GHz Intel® CPU. The controller does not require a fan or other rotating components. In addition to the CPU and the chipset, the CX1020 module also contains the main memory, which is available in different sizes. The controller boots from the Compact Flash.

The basic configuration of the CX1020 includes a 128 MB Compact Flash card and two Ethernet RJ45 interfaces. These interfaces are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet switches. All other CX family components can be connected via the PC/104 interface that is available on both sides. The passive cooling module is included in the scope of supply. The operating system can be Windows Embedded CE 6 or Windows Embedded Standard 2009. The TwinCAT 2 automation software transforms a CX1020 system into a powerful PLC and Motion Control system that can be operated with or without visualisation. In contrast to the CX1010, the CX1020 can also be used for interpolating axis movements with TwinCAT 2 NC I.

Further system interfaces or fieldbus connections can be added to the basic CPU module. The CPU module requires a CX1100 type power supply module. All CX1500 fieldbus modules and all CX1100 power supplies from the CX series can be used in combination with the CX1020.

The Embedded PC CX1020 is also available as the ordering option CX1900-0320 with zero second level cache. Instead of the 1 GHz processor with 512 kB second level cache (L2), a less expensive variant of the processor without a second level cache (L2 = 0 kB) is used. Since the CX1900-0320 has the same 855GME chipset as the CX1020, none of the basic characteristics of the CX1020 are changed, apart from the slightly lower CPU power.

The order identifier of the basic CPU module is derived as follows:

CX1020-0CST

- **0CST**
  - 0 = no TwinCAT
  - 1 = with TwinCAT 2 PLC runtime
  - 2 = with TwinCAT 2 PLC/NC PTP runtime
  - 3 = with TwinCAT 2 PLC/NC I runtime
- **0CST**
  - 0 = no operating system
  - 1 = operating system Windows Embedded CE 6
  - 2 = operating system Windows Embedded Standard 2009
- **0CST**
  - 0 = CPU with 2 Ethernet ports
  - 1 = CPU with 2 Ethernet ports + 2 x USB + DVI

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Embedded PC interfaces for CX10x0
see page 238

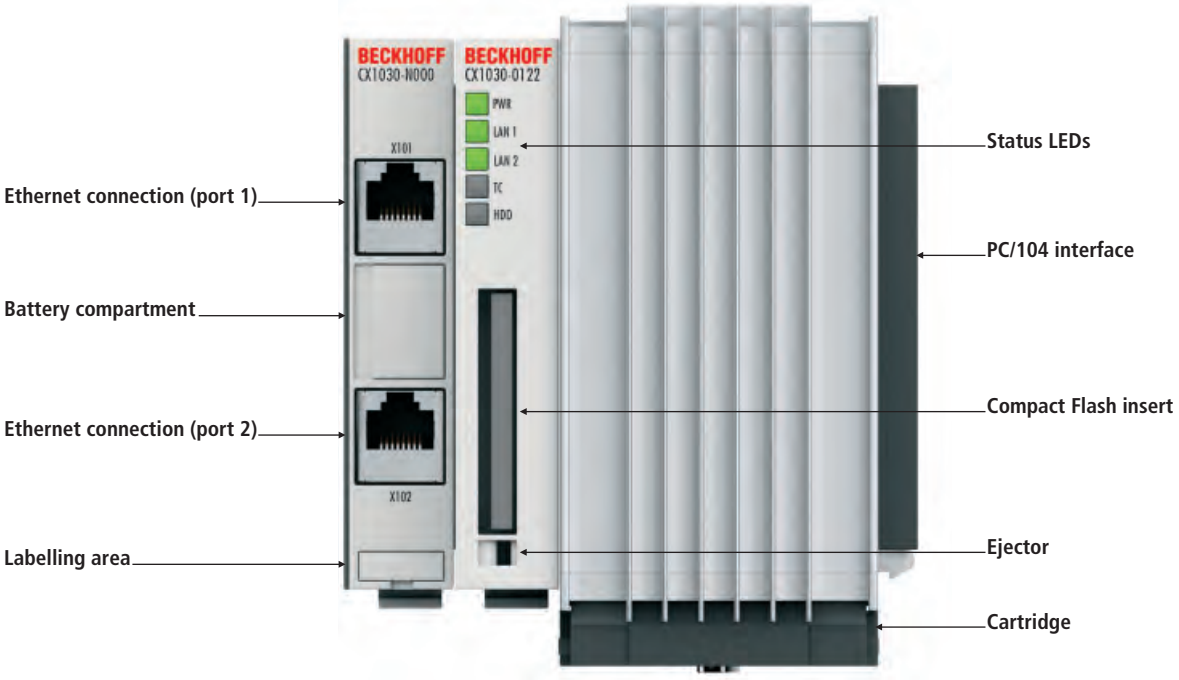
We reserve the right to make technical changes.

Technical data	CX1020-0xxx
Processor	Intel® Celeron® M ULV, 1 GHz clock frequency
Flash memory	128 MB Compact Flash card (optionally expandable)
Internal main memory	256 MB DDR RAM (expandable to 512 MB, 1 GB)
Interfaces	2 x RJ45 (Ethernet, internal switch)
Diagnostics LED	1 x power, 2 x LAN link/activity, TC status, 1 x flash access
Expansion slot	1 x Compact Flash type I+II insert with eject mechanism
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows Embedded CE 6 or Microsoft Windows Embedded Standard 2009
Control software	TwinCAT 2 PLC runtime, NC PTP runtime, NC I runtime
System bus	16 bit ISA (PC/104)
I/O connection	via power supply module (E-bus, K-bus, K-bus/IP-Link)
Power supply	via system bus (through CX1100-xxxx power supply modules)
Max. power loss	11 W (including CX1020-N0xx system interfaces)
Dimensions (W x H x D)	96 mm x 112 mm x 99 mm
Weight	approx. 550 g
Operating/storage temperature	0…+50 °C/-25…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Approvals	CE, UL
Further information	CX1020

Ordering information	DVI/USB	no operating system	Windows Embedded CE 6	Windows Embedded Standard 2009	no TwinCAT	TwinCAT 2 PLC runtime	TwinCAT 2 NC PTP runtime	TwinCAT 2 NC I runtime
CX1020-0000	–	x	–	–	x	–	–	–
CX1020-0010	–	–	x	–	x	–	–	–
CX1020-0011	–	–	x	–	–	x	–	–
CX1020-0012	–	–	x	–	–	x	x	–
CX1020-0013	–	–	x	–	–	x	x	x
CX1020-0100	x	x	–	–	x	–	–	–
CX1020-0110	x	–	x	–	x	–	–	–
CX1020-0111	x	–	x	–	–	x	–	–
CX1020-0112	x	–	x	–	–	x	x	–
CX1020-0113	x	–	x	–	–	x	x	x
CX1020-0020	–	–	–	x*	x	–	–	–
CX1020-0021	–	–	–	x*	–	x	–	–
CX1020-0022	–	–	–	x*	–	x	x	–
CX1020-0023	–	–	–	x*	–	x	x	x
CX1020-0120	x	–	–	x*	x	–	–	–
CX1020-0121	x	–	–	x*	–	x	–	–
CX1020-0122	x	–	–	x*	–	x	x	–
CX1020-0123	x	–	–	x*	–	x	x	x

Options	
CX1900-0320	option for basic CPU module: Intel® Celeron® M processor 1 GHz, zero second level cache
CX1900-0120	"Active cooling": factory conversion of the CX1020 CPU module for active cooling in order to enable flexible installation positions (see documentation). Active cooling takes place via a fan cartridge. This option requires the use of a power supply unit type CX1100-001x.

*CX1020 systems with Microsoft Embedded Standard require Compact Flash with a capacity of at least 2 GB (must be ordered separately).



CX1030 | Basic CPU module

The CX1030 basic CPU module offers Pentium® M power on the DIN rail. The CX1030 has a 1.8 GHz Intel® Pentium® M CPU. The CPU is cooled via the cooling module and an easily exchangeable fan cartridge located on the underside of the housing. The fan speed can be read via software and can therefore be monitored.

In addition to the CPU and the chipset, the CX1030 module also contains the RAM, which is available in different sizes. The controller boots from the Compact Flash. The basic configuration of the CX1030 includes a 128 MB Compact Flash card and two Ethernet RJ45 interfaces. These are connected to an internal switch and offer a simple option for creating a line topology without the need for additional Ethernet Switches. All other CX family components can be connected via the PC/104 interface that is available on both sides. The passive cooling module is included in the scope of supply.

The operating system can be Windows Embedded CE 6 or Windows Embedded Standard 2009. The TwinCAT 2 automation software transforms a CX1030 system into a powerful PLC and Motion Control system that can be used with or without visualisation. In contrast to the CX1010, the CX1030 can also be used for interpolating axis movements with TwinCAT 2 NC I.

Further system interfaces or fieldbus connections can be added to the basic CPU module. The CPU module requires a CX1100-001x type power supply module. All CX1500 fieldbus modules and all CX1100-001x power supply units from the CX series can be used in combination with the CX1030.

The order identifier of the basic CPU module is derived as follows:

CX1030-0CST

- 0 = no TwinCAT
- 1 = with TwinCAT 2 PLC runtime
- 2 = with TwinCAT 2 PLC/NC PTP runtime
- 3 = with TwinCAT 2 PLC/NC I runtime

- 0 = no operating system
- 1 = operating system Windows Embedded CE 6
- 2 = operating system Windows Embedded Standard 2009

- 0 = CPU with 2 Ethernet ports
- 1 = CPU with 2 Ethernet ports + 2 x USB + DVI

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

Embedded PC interfaces for CX10x0
see page 238

We reserve the right to make technical changes.

Technical data	CX1030-0xxx
Processor	Intel® Pentium® M, 1.8 GHz clock frequency
Flash memory	128 MB Compact Flash card (optionally expandable)
Internal main memory	256 MB DDR RAM (expandable to 512 MB, 1 GB)
Interfaces	2 x RJ45 (Ethernet, internal switch), 10/100 Mbit/s
Cooling	cooling module + fan cartridge featuring speed control with double ball bearing fans, easily replaceable
Diagnostics LED	1 x power, 2 x LAN link/activity, TC status, 1 x flash access
Expansion slot	1 x Compact Flash type I+II insert with eject mechanism
Clock	internal battery-backed clock for time and date (battery exchangeable)
Operating system	Microsoft Windows Embedded CE 6 or Microsoft Windows Embedded Standard 2009
Control software	TwinCAT 2 PLC runtime, NC PTP runtime, NC I runtime
System bus	16 bit ISA (PC/104)
I/O connection	via power supply module (E-bus, K-bus, K-bus/IP-Link)
Power supply	via system bus (through CX1100-0012 [K-bus], CX1100-0013 [K-bus, IP-Link], CX1100-014 [E-bus] power supply module)
Max. power loss	32 W (including CX1030-N0xx system interfaces)
Dimensions (W x H x D)	96 mm x 112 mm x 99 mm
Weight	approx. 580 g
Operating/storage temperature	0…+50 °C/-25…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protection class	IP 20
Approvals	CE, UL
Further information	CX1030

Ordering information	DVI/USB	no operating system	Windows Embedded CE 6	Windows Embedded Standard 2009	no TwinCAT	TwinCAT 2 PLC runtime	TwinCAT 2 NC PTP runtime	TwinCAT 2 NC I runtime
CX1030-0000	–	x	–	–	x	–	–	–
CX1030-0010	–	–	x	–	x	–	–	–
CX1030-0011	–	–	x	–	–	x	–	–
CX1030-0012	–	–	x	–	–	x	x	–
CX1030-0013	–	–	x	–	–	x	x	x
CX1030-0100	x	x	–	–	x	–	–	–
CX1030-0110	x	–	x	–	x	–	–	–
CX1030-0111	x	–	x	–	–	x	–	–
CX1030-0112	x	–	x	–	–	x	x	–
CX1030-0113	x	–	x	–	–	x	x	x
CX1030-0020	–	–	–	x*	x	–	–	–
CX1030-0021	–	–	–	x*	–	x	–	–
CX1030-0022	–	–	–	x*	–	x	x	–
CX1030-0023	–	–	–	x*	–	x	x	x
CX1030-0120	x	–	–	x*	x	–	–	–
CX1030-0121	x	–	–	x*	–	x	–	–
CX1030-0122	x	–	–	x*	–	x	x	–
CX1030-0123	x	–	–	x*	–	x	x	x

*CX1030 systems with Microsoft Embedded Standard 2009 require Compact Flash with a capacity of at least 2 GB (must be ordered separately).

DVI/USB interface

Audio interface

RS232 interface

RS422/RS485 interface

Ethernet interface

CX1020-N0xx | System interfaces

A number of optional interface modules are available for the basic CX1020 CPU module that can be installed ex factory. The CX1020-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, etc. can be connected via the USB 2.0 interfaces. Multimedia capability is realised via the CX1020-N020 audio interface. The modules CX1020-N030 and CX1020-N040 offer a total of four serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These four interfaces can be implemented in pairs as RS422/RS485, in which case they are identified as CX1020-N031 and CX1020-N041 respectively. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The internal PC/104 bus runs through the system interfaces, so that further CX components can be connected. The power supply of the system interface modules is ensured via the internal PC/104 bus.

Technical data	CX1020-N010	CX1020-N020	CX1020-N030 CX1020-N040	CX1020-N031 CX1020-N041	CX1020-N060
Interfaces	1 x DVI + 2 x USB 2.0 (max. 500 mA per port)	Line IN, Line Mic IN, Line OUT	1 x COM1+2, RS232, 1 x COM3+4, RS232	1 x COM1+2, RS422/ RS485, 1 x COM3+4, RS422/RS485	1 x Ethernet, 10/100 Mbit/s
Type of connection	DVI-I 29-pin socket + 2 USB ports type A	3.5 mm socket for jack plug	2 x D-sub plug, 9-pin	2 x D-sub socket, 9-pin	1 x RJ45
Properties	DVI-I interface also carries out VGA signals (DVI-A)	built-in PC beeper, Line OUT output, max. 200 mW, suitable for ear-phones	max. baud rate 115 kbaud, cannot be used simultaneously with N031/N041	max. baud rate 115 kbaud, cannot be used simultaneously with N030/N040	max. baud rate 100 Mbit/s, max. 20 m cable length Cat.5, cannot be used simultaneously with CX1100-0004
Power supply	via system bus (through CX1100-xxxx power supply modules)				
Dimensions (W x H x D)	19 mm x 100 mm x 51 mm				
Weight	approx. 80 g				
Operating/storage temperature	0…+55 °C/-25…+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Approvals	CE, UL				
Further information	CX1020-N010				

We reserve the right to make technical changes.

DVI/USB interface

Audio interface

RS232 interface

RS422/RS485 interface

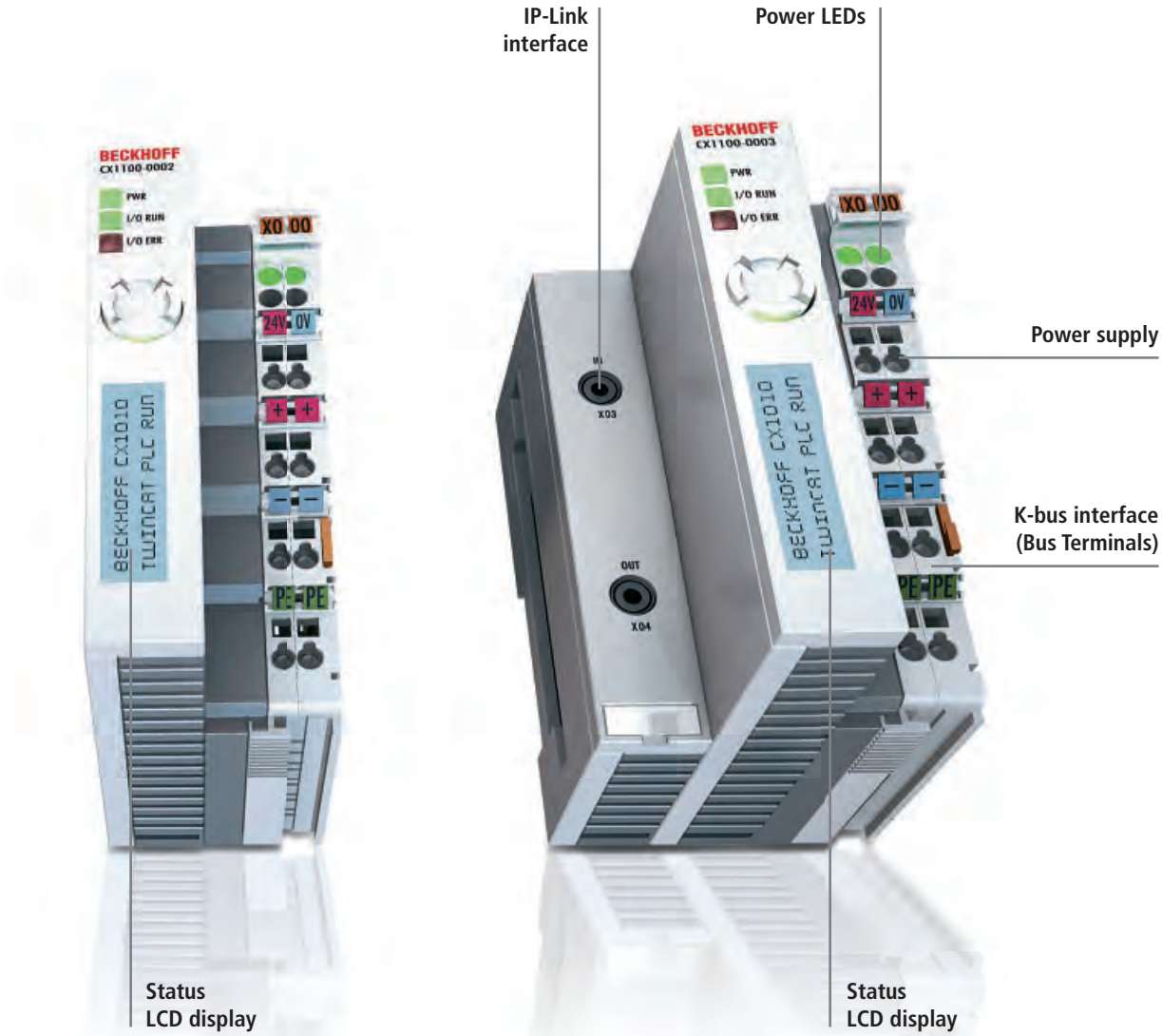
Ethernet interface

CX1030-N0xx | System interfaces

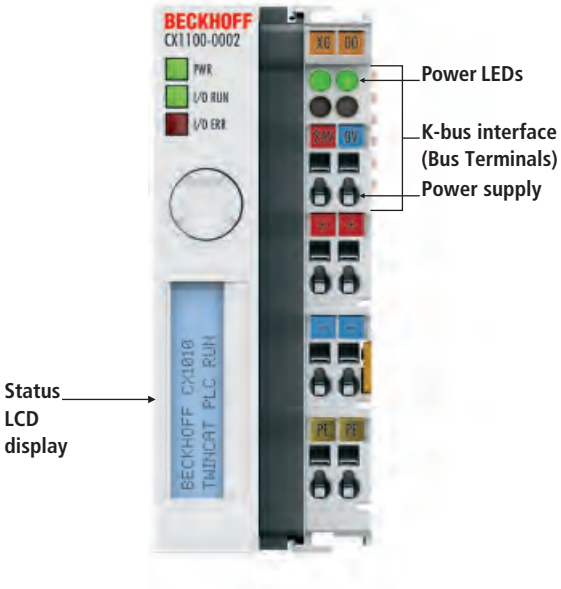
A number of optional interface modules are available for the basic CX1030 CPU module that can be installed ex factory. The CX1030-N010 option connects Beckhoff Control Panels or standard monitors with DVI or VGA input via the DVI or USB interfaces. Devices such as printer, scanner, mouse, keyboard, mass storage, etc. can be connected via the USB 2.0 interfaces. Multimedia capability is realised via the CX1030-N020 audio interface. The modules CX1030-N030 and CX1030-N040 offer a total of four serial RS232 interfaces with a maximum transfer speed of 115 kbaud. These four interfaces can be implemented in pairs as RS422/RS485, in which case they are identified as CX1030-N031 and CX1030-N041 respectively. The system interfaces cannot be retrofitted or expanded in the field. They are supplied ex factory in the specified configuration and cannot be separated from the CPU module. The internal PC/104 bus runs through the system interfaces, so that further CX components can be connected. The power supply of the system interface modules is ensured via the internal PC/104 bus.

Technical data	CX1030-N010	CX1030-N020	CX1030-N030 CX1030-N040	CX1030-N031 CX1030-N041	CX1030-N060
Interfaces	1 x DVI + 2 x USB 2.0 (max. 500 mA per port)	Line IN, Line Mic IN, Line OUT	1 x COM1+2, RS232, 1 x COM3+4, RS232	1 x COM1+2, RS422/ RS485, 1 x COM3+4, RS422/RS485	1 x Ethernet, 10/100 Mbit/s
Type of connection	DVI-I 29-pin socket + 2 USB ports type A	3.5 mm socket for jack plug	2 x D-sub plug, 9-pin	2 x D-sub plug, 9-pin	1 x RJ45
Properties	DVI-I interface also carries out VGA signals (DVI-A)	built-in PC beeper, Line OUT output, max. 200 mW, suitable for ear-phones	max. baud rate 115 kbaud, cannot be used simultaneously with N031/N041	max. baud rate 115 kbaud, cannot be used simultaneously with N030/N040	max. baud rate 100 Mbit/s, max. 20 m cable length Cat.5, cannot be used simultaneously with CX1100-0004
Power supply	via system bus (through CX1100-xxxx power supply modules)				
Dimensions (W x H x D)	19 mm x 100 mm x 51 mm				
Weight	approx. 80 g				
Operating/storage temperature	0…+55 °C/-25…+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Approvals	CE, UL				
Further information	CX1030-N010				

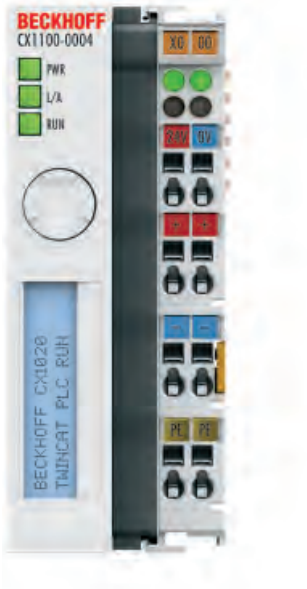
CX1100-, CX1500-xxxx | Embedded PC interfaces for CX10xx



We reserve the right to make technical changes.



Power supply
with K-bus interface



Power supply
with E-bus interface

Power supply

Power supply
with K-bus/IP-Link interface

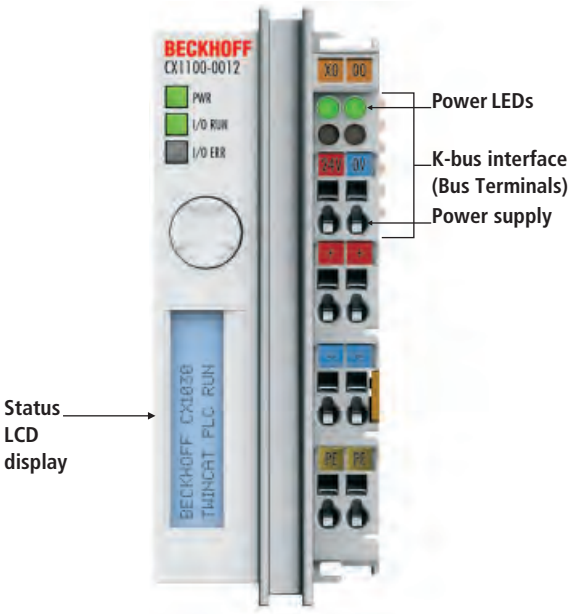
CX1100-000x | Power supply units and I/O interfaces for CX1010/CX1020

Four power supplies are optionally available for CX1010/CX1020 systems; all other system components are powered via the internal PC/104 bus. Each CX1100-000x power supply module contains an integrated NOVRAM for the non-volatile storage of process data and a LC display (two lines of 16 characters). The CX1100-0002 version is suitable for the direct connection of Beckhoff Bus Terminals (KLxxxx); the Extension Box modules (IExxxx) from the Fieldbus Box range can be connected to the CX1100-0003 in addition to the Bus Terminals. The CX1100-0004 power supply unit is available for the connection of EtherCAT Terminals (ELxxxx). All power supply units for the CX1100-000x system can be exchanged in the field.

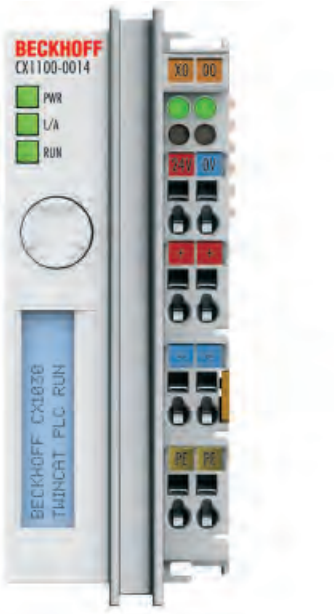
Technical data	CX1100-0002	CX1100-0004	CX1100-0001	CX1100-0003
Power supply	24 V DC (-15 %/+20 %)			
E-bus connection	–	yes (adapter terminal)	–	–
K-bus connection	yes (adapter terminal)	–	–	yes (adapter terminal)
IP-Link connection	–	–	–	yes
Current supply K-bus	up to max. 1.75 A	2 A	–	1.75 A
Type of connection	spring-loaded technique (adapter terminal)	spring-loaded technique (adapter terminal)	1 x open style connector, 5-pin	spring-loaded technique (adapter terminal)
NOVRAM	8 kbytes			
Display	FSTN display 2 lines x 16 characters of text, illuminated			
I/O-DPRAM	4 kbytes	–	–	4 kbytes
Diagnostics LED	1 x PWR, 1 x I/O Run, 1 x I/O Err	1 x PWR, 1 x L/A, 1 x Run	1 x PWR	1 x PWR, 1 x I/O Run, 1 x I/O Err
Max. power consumption	3.5 W	3.5 W	2.5 W	4 W
Dimensions (W x H x D)	40 mm x 100 mm x 91 mm	40 mm x 100 mm x 91 mm	45 mm x 100 mm x 91 mm	58 mm x 100 mm x 91 mm
Weight	approx. 250 g	approx. 250 g	approx. 180 g	approx. 350 g
Operating/storage temperature	0…+55 °C/-25…+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protection class	IP 20			
Approvals	CE, UL			
Further information	CX1100-0001			

EtherCAT Terminals see page 342, Bus Terminals see page 616, Fieldbus Box modules see page 744

We reserve the right to make technical changes.



Power supply
with K-bus interface



Power supply
with E-bus interface

Power supply
with K-bus/IP-Link interface

CX1100-001x | Power supply units and I/O interfaces for CX1030

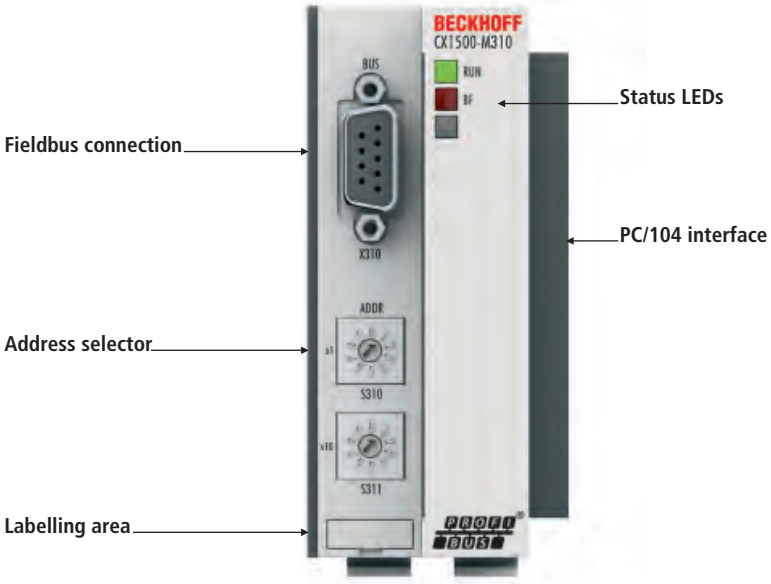
Three power supplies are optionally available for CX1030 systems; all other system components are powered via the internal PC/104 bus. Each CX1100-001x power supply module contains an integrated NOVRAM for the non-volatile storage of process data and an LC display (two lines of 16 characters). The CX1100-0012 version is suitable for the direct connection of Beckhoff Bus Terminals (KLxxxx); the Extension Box modules (IExxxx) from the Fieldbus Box range can be connected to the CX1100-0013 in addition to the Bus Terminals. The CX1100-0014 power supply unit is available for EtherCAT Terminals (ELxxxx). The power supply units of the CX system can be changed in the field.

The CX1100-001x power supply units are electronically identical to the CX1100-000x series, but have an internal heat sink and additional ventilation slits. The CX1100-001x series is suitable for non-standard assembly directions, even when using a CX1020 or a CX1010 (see documentation).

Technical data	CX1100-0012	CX1100-0014	CX1100-0013
Power supply	24 V DC (-15 %/+20 %)		
E-bus connection	–	yes (adapter terminal)	–
K-bus connection	yes (adapter terminal)	–	yes (adapter terminal)
IP-Link connection	–	–	yes
Current supply K-bus	up to max. 1.75 A		
Type of connection	spring-loaded technique (adapter terminal)		
NOVRAM	8 kbytes		
Display	FSTN display 2 lines x 16 characters of text, illuminated		
I/O-DPRAM	4 kbytes	–	4 kbytes
Diagnostics LED	1 x PWR, 1 x I/O Run, 1 x I/O Err	1 x PWR, 1 x L/A, 1 x Run	1 x PWR, 1 x I/O Run, 1 x I/O Err
Dimensions (W x H x D)	42 mm x 109 mm x 92 mm	42 mm x 109 mm x 92 mm	58 mm x 109 mm x 92 mm
Weight	approx. 240 g	approx. 235 g	approx. 325 g
Operating/storage temperature	0…+55 °C/-25…+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 20		
Approvals	CE, UL		
Further information	CX1100-0012		

EtherCAT Terminals see page 342, Bus Terminals see page 616, Fieldbus Box modules see page 744

We reserve the right to make technical changes.



PROFIBUS master

Lightbus master

CANopen master

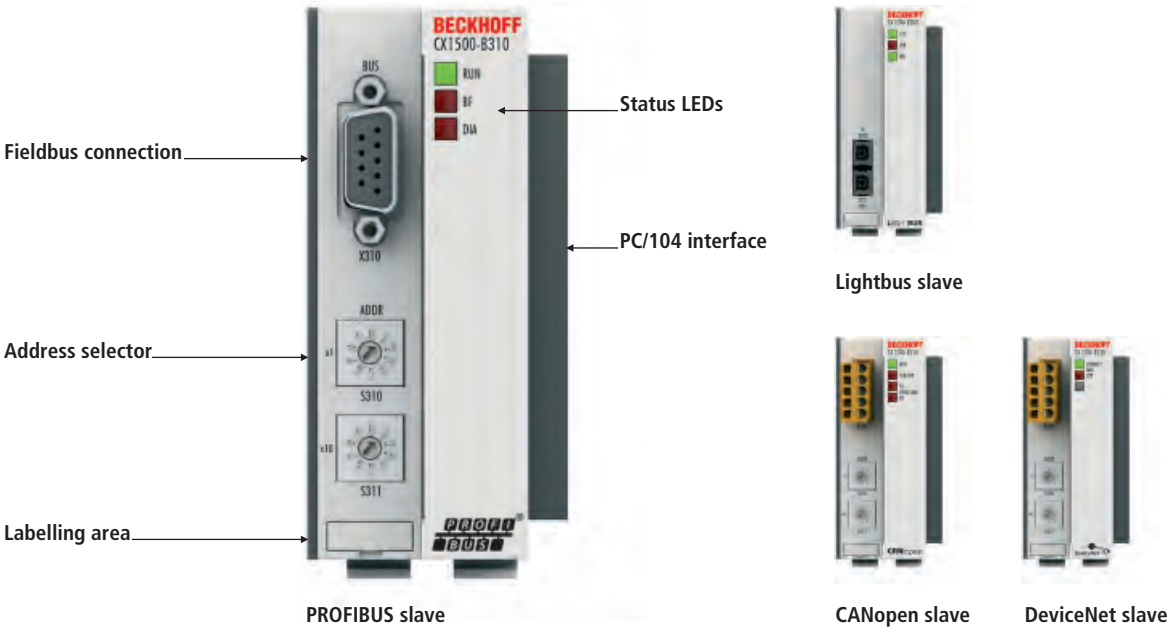
DeviceNet master

SERCOS II master

CX1500-Mxx0 | Master fieldbus connections for CX10x0

The use of CX1010, CX1020 or CX1030 systems with fieldbus master modules enables the segment-like construction of control structures in extensive plants and machines using all Beckhoff fieldbus components (Bus Couplers, Bus Terminal Controllers, Drive Technology, etc.). The parallel operation of several identical or different masters is possible, e.g. two PROFIBUS masters or a PROFIBUS master and a SERCOS II master simultaneously in a system. In the case of mixed operation of master and slave connections, CX systems act as intelligent gateways between different fieldbuses: data are received, processed and fed into other fieldbuses. Compared with the Beckhoff PC Fieldbus Cards, the performance data of the fieldbus master modules are almost identical; CX variants are single-channel, however. Master or slave connections network several CX systems with one another strictly deterministically via the fieldbus level. CX fieldbus modules can be retrofitted/exchanged by adding them to existing CX systems. The fieldbus connections are powered via the PC/104 bus. The scanning and recognising of the modules, the parameterisation, the configuration of the connected I/O components and the online diagnosis of the process/fieldbus status take place in the TwinCAT System Manager.

Technical data	CX1500-M200	CX1500-M310	CX1500-M510	CX1500-M520	CX1500-M750
Fieldbus	Lightbus	PROFIBUS DP, DP-V1, DP-V2 (MC)	CANopen	DeviceNet	SERCOS II
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	9.6 kbaud… 12 Mbaud	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbaud	125, 250, 500 kbaud	2, 4, 8, 16 Mbaud
Bus interface	2 x fibre optic	1 x D-sub socket, 9-pin	open style connector, 5-pin	open style connector, 5-pin	F-SMA standard, IEC 872-2
Bus device	max. 254 nodes with a max. of 65,280 I/O points	max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	max. 127 slaves	max. 63 slaves	max. 254 slaves
Interface to the CPU	ISA plug and play, 2 kbyte DPRAM				
Max. power loss	2 W	1.8 W	1.8 W	1.8 W	1.3 W
Dimensions (W x H x D)	38 mm x 100 mm x 91 mm				
Weight	approx. 190 g				
Operating/storage temperature	0…+55 °C/-25…+85 °C				
Relative humidity	95 %, no condensation				
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				
Protection class	IP 20				
Approvals	CE, UL				
Further information	CX1500-M200				

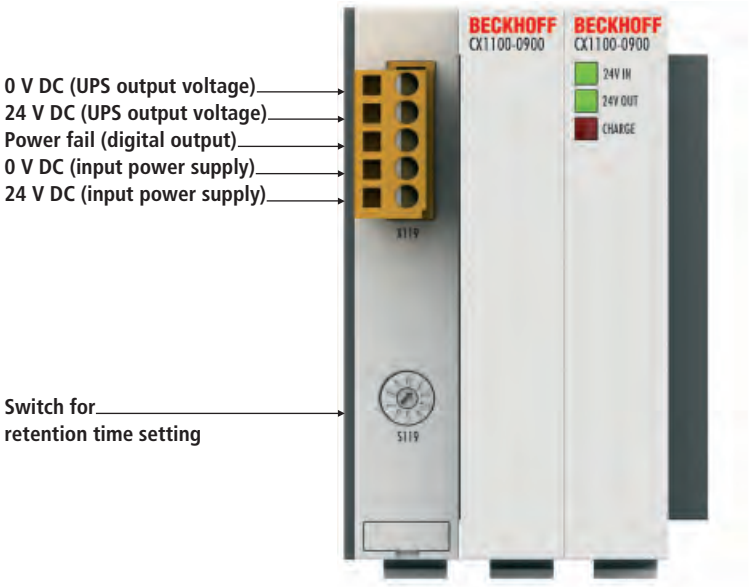


CX1500-Bxx0 | Slave fieldbus connections for CX10x0

Fieldbus slave modules enable the use of a CX1010, CX1020 or CX1030 system as a subordinate local controller for the construction of complex or modular systems. External process data are received from the master and processed, or data from its own process peripherals are returned to the master controller directly or processed. The interface between the respective bus system and the CX CPU module is the DPRAM, which is addressed by the CPU module via the internal ISA bus. The parallel operation of several identical or different slave connections is possible, e.g. two PROFIBUS slaves or a PROFIBUS slave and a SERCOS interface slave simultaneously in a system. In the case of mixed operation of master and slave connections, CX systems act as intelligent gateways between different fieldbuses: data are received, processed and fed into other fieldbuses. The CX fieldbus modules are single-channel. Master or slave connections network several CX systems with one another strictly deterministically via the fieldbus level. CX fieldbus modules can be retrofitted/exchanged by adding them to existing CX systems. The fieldbus connections are powered via the PC/104 bus. The integration of the fieldbus connections in TwinCAT 2 automation software is simple, as usual. The scanning and recognising of the modules, the parameterisation, the configuration of the connected I/O components and the online diagnosis of the process/fieldbus status take place in the TwinCAT 2 System Manager.

Technical data	CX1500-B200	CX1500-B310	CX1500-B510	CX1500-B520
Fieldbus	Lightbus	PROFIBUS DP, DP-V1, DP-V2 (MC)	CANopen	DeviceNet
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	9.6 kbaud…12 Mbaud	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbaud	125, 250, 500 kbaud
Bus interface	2 x fibre optic	1 x D-sub socket, 9-pin	open style connector, 5-pin	open style connector, 5-pin
Bus device	max. 255 slaves	max. 125 slaves	max. 127 slaves	max. 63 slaves
Max. number of bytes	max. 512 byte input/ 512 byte output	max. 244 byte input/ 244 byte output	max. 1536 byte input/ 1536 byte output	max. 255 byte input/ 255 byte output
Max. power loss	1.8 W			
Dimensions (W x H x D)	38 mm x 100 mm x 91 mm			
Weight	approx. 190 g			
Operating/storage temperature	0…+55 °C/-25…+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protection class	IP 20			
Approvals	CE, UL			
Further information	CX1500-B200			

We reserve the right to make technical changes.



UPS CX1100-0900

UPS CX1100-0910

UPS CX1100-0920, CX1100-0930

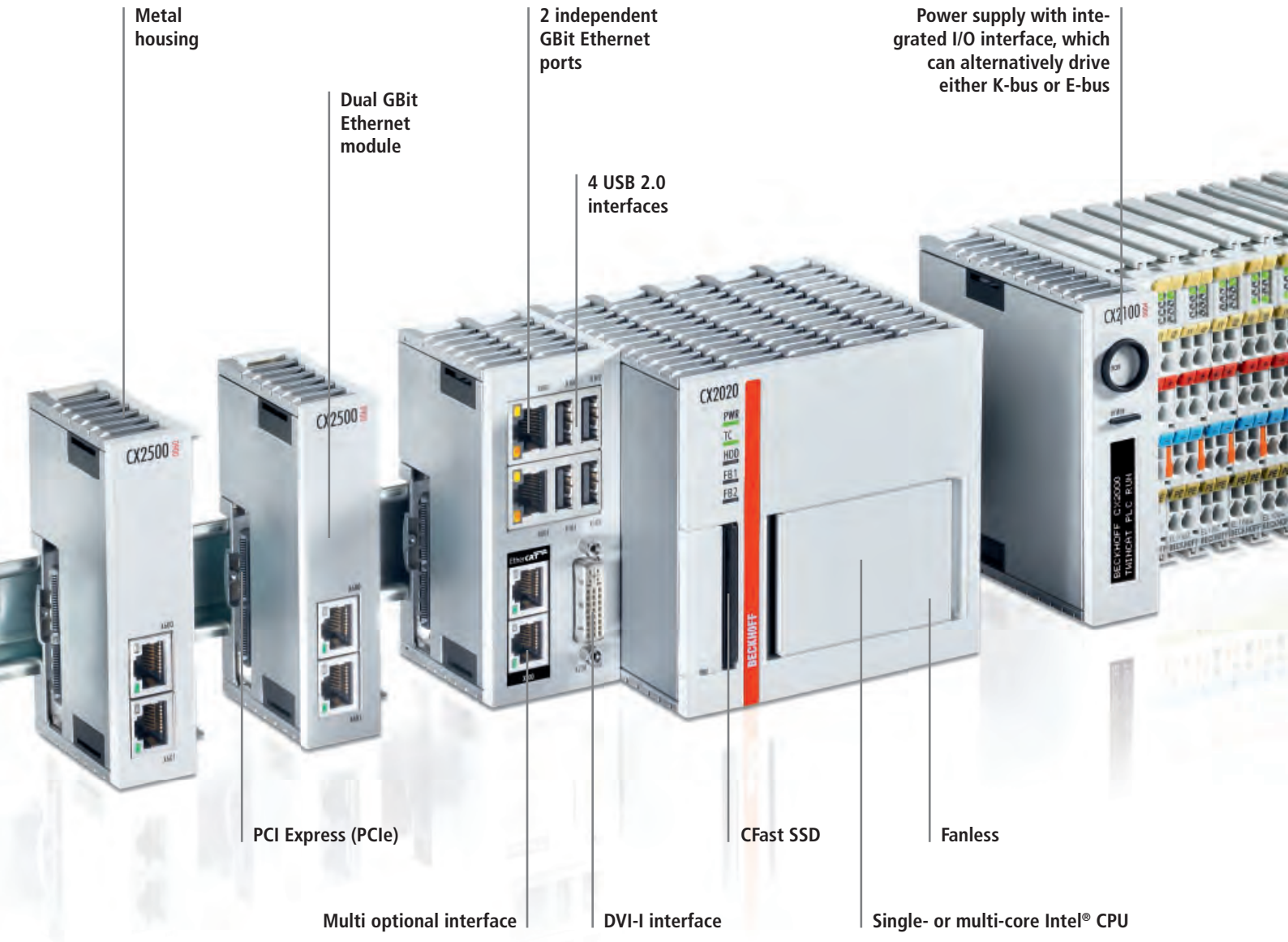
CX1100-09x0 | UPS modules for CX10x0

The CX1100-09x0 UPS module (uninterruptible power supply) for CX1010, CX1020 or CX1030 CPUs and the connected CX components ensures that important data are stored safely by the user software if the external voltage fails. As opposed to battery operated methods, the use of the latest capacitor technologies enables absolute freedom from maintenance and fast charging. By storing the data, for example on a Compact Flash card, in NOVRAM or via the network in a database, the machine or the process can be placed in a defined condition during the retention time of the UPS and the operating system can be shut down. The retention time can be set via a rotary switch or via software. UPS settings are made and its status messages are output via a DPRAM interface. The functionality of the UPS is therefore independent of the operating system to be used. No driver software is required. The TwinCAT System Manager recognises the UPS module automatically, and the signals are available to the PLC programmer. The module is installed by simply adding it to a CX system in addition to wiring a 24 V DC supply line, and it can also be retrofitted on site. The 24 V DC output voltage of the UPS is protected against short circuit and overload. When dimensioning the UPS, the power consumption of the CX device being powered must be considered. For the supply, a regulated 24 V DC power supply unit with an output current of at least 4 A is required. The CX1100-0920 UPS is recommended for UPS use with a CX1020 and the CX1100-0930 UPS for use with a CX1030.

Technical data	CX1100-0900	CX1100-0910	CX1100-0920	CX1100-0930
Power supply	24 V DC (-15 %/+20 %)			
Storage technology	capacitive			
Charge	20 As	20 As	40 As	40 As
Retention time	adjustable, load-dependent			
Max. output current	550 mA (24 V DC)	1.1 A (24 V DC)	1.1 A (24 V DC)	2.0 A (24 V DC)
Charging current	max. 4 A			
Diagnostics LED	24 V DC input, 24 V DC output, Charge			
Interface to the CPU	16 bit ISA (PC/104 standard)			
Max. power loss	2 W			
Dimensions (W x H x D)	57 mm x 100 mm x 91 mm	76 mm x 100 mm x 91 mm	95 mm x 100 mm x 91 mm	95 mm x 100 mm x 91 mm
Weight	approx. 346 g	approx. 465 g	approx. 617 g	approx. 650 g
Operating/storage temperature	0…+55 °C/-25…+85 °C			
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protection class	IP 20			
Approvals	CE, UL			
Further information	CX1100-0900			

CX2000 | Embedded PCs

▶ CX2000



We reserve the right to make technical changes.

CX2020

CX2030

CX2040

The CX2020, CX2030 and CX2040 Embedded PCs extend the CX product family with versions with very high CPU power (optionally with multi-core) and enable direct connection of Bus Terminals or EtherCAT Terminals. The CX2000 in conjunction with EtherCAT and TwinCAT enables very fast control processes in the microsecond range (eXtreme Fast Control Technology).

The basic CPU modules have a CFast memory card, two independent Gbit Ethernet interfaces, four USB 2.0 interfaces and a DVI-I interface as standard. In addition there are fieldbus or serial connection options. Please note that these have to be specified with the order, i.e. retrospective installation is not possible. Other components from the CX2000 family can be connected via the multi-pin terminals on either side. The multi-pin terminal on the left-hand side enables the connection of up to four further optional modules.

The components

The individual system component are 22 mm wide or a multiple thereof. The basic unit consists of the CX20x0 CPU module and a power supply module (CX2100-0xxx).

Power supply unit with integrated I/O interface and optional UPS

The 24 V DC power supply unit is available in four different versions:

- CX2100-0004: E-bus/K-bus power supply unit with automatic switchover
- CX2100-0014: E-bus/K-bus power supply unit with automatic switchover and passive ventilation
- CX2100-0904: E-bus/K-bus power supply unit with automatic switchover and integrated capacitive UPS
- CX2100-0914: E-bus/K-bus power supply unit with automatic switchover and integrated electronic charging unit for external battery packs in order to maintain UPS functionality

All power supply units feature an illuminated anti-glare LC display with two rows of 16 characters each for displaying status messages.

The application programs can also use the display for displaying application-specific texts.

EtherCAT as a fast I/O system

The CX2020, CX2030 and CX2040 Embedded PCs were developed with a view towards optimised interaction with EtherCAT. EtherCAT offers a wide range of application options. The separate Gbit Ethernet interfaces enable EtherCAT to be used with cable redundancy by using one of the Ethernet interfaces as redundancy port. In addition, devices with EtherCAT slave interface can be operated such that several intelligent controllers can be synchronised via an EtherCAT network.

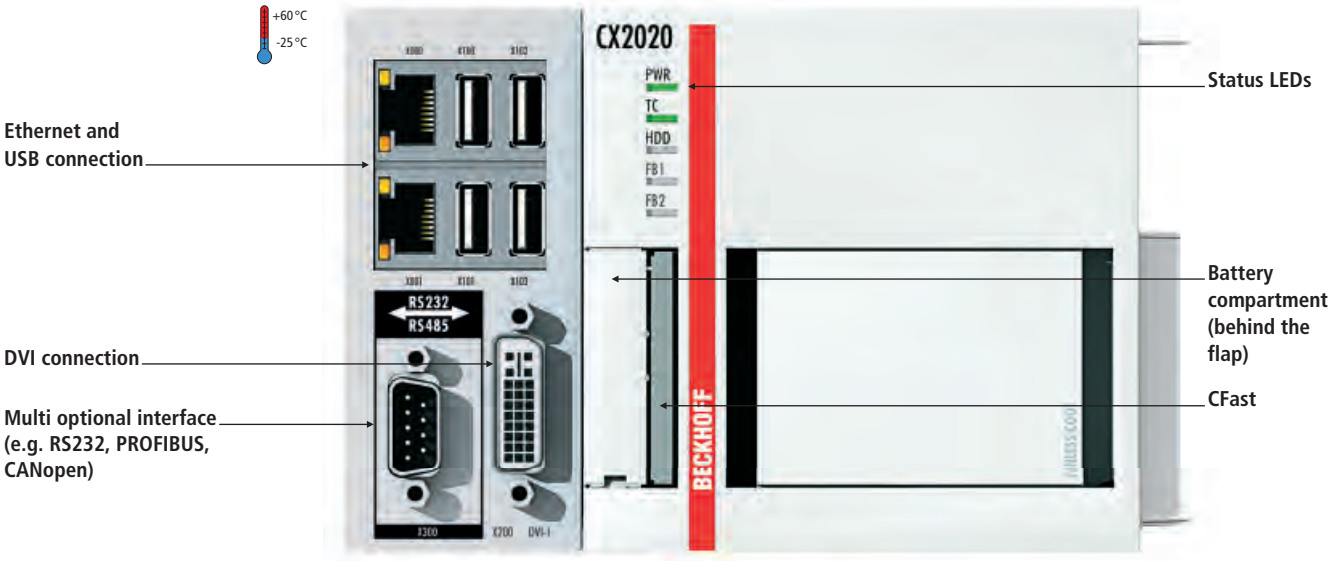
PLC, Motion Control, interpolation and visualisation

As IPC on a DIN rail the CX2000 in conjunction with TwinCAT offers the functionality of large Industrial PCs. Multi-core CPUs in conjunction with TwinCAT 3 enable PLC projects to be distributed to several cores, resulting in significant performance gains.

Moreover, all TwinCAT functionalities are available for Motion Control applications: in theory, up to 256 axes can be controlled. In addition to simple point-to-point movements, more complex multi-axis functions ("electronic gearbox", "cam plates", "flying saw", etc.) can be implemented. Due to the high-performance CPUs in the CX2000, interpolating 3-D path movements can also be implemented and DIN 66025 programs executed.

In addition to handling real-time control tasks the TwinCAT real-time kernel leaves enough time for the user interface (HMI). The high performance of the graphics kernel integrated in the CPU enables demanding visualisations with advanced user interfaces to be realised.

The extended operating temperature range between -25…+60 °C enables application in climatically demanding situations.



CX2020, CX2030, CX2040 | **Basic CPU module**

The CX2020 has a 1.4 GHz Intel® Celeron® CPU, the CX2030 has a 1.5 GHz Intel® Core™ i7 dual-core CPU and the CX2040 has a 2.1 GHz Intel® Core™ i7 quad-core CPU. In the CX2020 and CX2030 the controller is fanless and has no rotating components. Due to its high power, the CX2040 has a fan with ball bearings and speed monitoring. In addition to the CPU and chipset the basic modules also contain the main memory. For the CX2020 and CX2030 the size is 2 GB. 4 GB is possible as option. The CX2040 has 4 GB of RAM as standard. The controller boots from the CFast flash memory card. The CPU has a 128 kB NOVRAM persistent data memory for situations where no UPS is used.

The operating system is Microsoft Windows Embedded Compact 7 or Windows Embedded Standard 7 P.

Up to four modules can be connected to the basic CPU module. The connection order is irrelevant. Internally the modules are connected via PCI Express and can be connected subsequently to the CPU in the field.

The power supply for the CPU module comes from a CX2100 power supply module, which is connected on the right-hand side of the CPU. Two further CFast memory card modules (CX2550-0010) can be connected between the power supply unit and the CPU, so that a total of up to three CFast cards can be used. RAID can be used in situations where more than one CFast card is used.

The order identifier of the basic CPU module is derived as follows:

CX20x0-01ST

- 0 = no TwinCAT
- 1 = with TwinCAT 2 PLC runtime
- 2 = with TwinCAT 2 NC PTP runtime
- 3 = with TwinCAT 2 NC I runtime
- 5 = TwinCAT 3 runtime (XAR)

- 0 = no operating system
- 1 = operating system Microsoft Windows Embedded Compact 7
- 2 = operating system Microsoft Windows Embedded Standard 7 P 32 bit
- 3 = operating system Microsoft Windows Embedded Standard 7 P 64 bit

- 2 = Intel® Celeron® processor 1.4 GHz, 1 core
- 3 = Intel® Core™ processor 1.5 GHz, 2 cores
- 4 = Intel® Core™ processor 2.1 GHz, 4 cores

Optional interfaces:

CX20x0-N010 = second DVI connection, DVI-D port
CX20x0-N030 = RS232, D-sub plug
CX20x0-N031 = RS422/RS485, D-sub socket
CX20x0-B110 = EtherCAT slave, EtherCAT IN and OUT (2 x RJ45)
CX20x0-M310 = PROFIBUS master, D-sub socket, 9-pin
CX20x0-B310 = PROFIBUS slave, D-sub socket, 9-pin
CX20x0-M510 = CANopen master, D-sub plug, 9-pin
CX20x0-B510 = CANopen slave, D-sub plug, 9-pin
CX20x0-M930 = PROFINET RT, controller
CX20x0-B930 = PROFINET RT, device, Ethernet (2 x RJ45 switch)
CX20x0-B950 = EtherNet/IP slave, Ethernet (2 x RJ45 switch)

Since not all combinations make sense, the table "Ordering information" contains a breakdown of the permissible combinations.

We reserve the right to make technical changes.

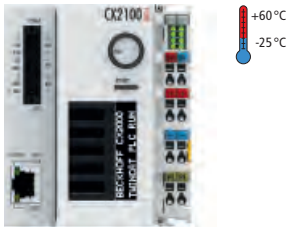
Technical data	CX2020	CX2030	CX2040
Processor	Intel® Celeron® 827E 1.4 GHz, 1 core (TC3: 50)	Intel® Core™ i7 2610UE 1.5 GHz, 2 cores (TC3: 60)	Intel® Core™ i7 2715QE 2.1 GHz, 4 cores (TC3: 70)
Flash memory	4 or 8 GB CFast flash card (optionally expandable)		
Internal main memory	2 GB DDR3 RAM	2 GB DDR3 RAM	4 GB DDR3 RAM
Persistent memory	128 KB NOVRAM integrated		
Interfaces	2 x RJ45, 10/100/1000 Mbit/s, DVI-I, 4 x USB 2.0, 1 x optional interface		
Diagnostics LED	1 x power, 1 x TC status, 1 x flash access, 2 x bus status		
Clock	internal battery-backed clock for time and date (battery exchangeable)		
Operating system	Microsoft Windows Embedded Compact 7 or Microsoft Windows Embedded Standard 7 P		
Control software	TwinCAT 2 PLC runtime, NC PTP runtime, NC I runtime | TwinCAT 3, see price list TwinCAT 3		
I/O connection	via power supply module (E-bus or K-bus, automatic recognition)		
Power supply	24 V DC (-15 %/+20 %)		
Max. power loss	15 W (including the system interfaces)	20 W (including the system interfaces)	42 W (including the system interfaces)
Dimensions (W x H x D)	144 mm x 100 mm x 91 mm		
Weight	approx. 1160 g	approx. 1165 g	approx. 1230 g
Operating/storage temperature	-25…+60 °C/-40…+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protection class	IP 20		
Approvals	CE, UL		
TC3 performance class	performance plus (50); for further information on TwinCAT 3 see page 974	mid performance (60); for further information on TwinCAT 3 see page 974	high performance (70); for further information on TwinCAT 3 see page 974
Further information	CX2020	CX2030	CX2040

Ordering information	no operating system	Windows Embedded Compact 7	Windows Embedded Standard 7 P 32 bit	Windows Embedded Standard 7 P 64 bit	no TwinCAT	TwinCAT 2 runtime PLC	TwinCAT 2 runtime NC PTP	TwinCAT 2 runtime NC I	TwinCAT 3 runtime (XAR)
CX20x0-0100	x	–	–	–	x	–	–	–	–
CX20x0-0110	–	x	–	–	x	–	–	–	–
CX20x0-0111	–	x	–	–	–	x	–	–	–
CX20x0-0112	–	x	–	–	–	–	x	–	–
CX20x0-0113	–	x	–	–	–	–	–	x	–
CX20x0-0115	–	x	–	–	–	–	–	–	x
CX20x0-0120	–	–	x	–	x	–	–	–	–
CX20x0-0121	–	–	x	–	–	x	–	–	–
CX20x0-0122	–	–	x	–	–	–	x	–	–
CX20x0-0123	–	–	x	–	–	–	–	x	–
CX20x0-0125	–	–	x	–	–	–	–	–	x
CX20x0-0130	–	–	–	x	x	–	–	–	–
CX20x0-0135	–	–	–	x	–	–	–	–	x

Power supply unit with E-bus/K-bus interface

Power supply unit with E-bus/K-bus interface and passive ventilation

Power supply unit with integrated capacitive UPS and E-bus/K-bus interface



Power supply unit with integrated Smart Battery charger and E-bus/K-bus interface

CX2100-0xxx | Power supply units and UPS modules for CX2000

Each of the four CX2100 power supply modules has an LC display with 2 x 16 characters. It is controlled via TwinCAT. All power supply modules feature automatic K-bus/E-bus detection and therefore support both I/O systems. The standard power supply CX2100-0004 provides a maximum output of 45 W. The more powerful CX2100-0014 power supply unit offers a maximum output of 90 W. It has to be used for CX2040 quad-core CPU systems. Thanks to its wider housing front the CX2100-0014 also allows passive ventilation through the front and is thus also suitable for horizontal mounting positions. Optionally it can be equipped with active ventilation (fan option) to provide the normally fanless CX2020/CX2030 with a better heat dissipation for operation in different ambient conditions. The CX2100-0904 module also features integrated capacitive UPS. In the event of a power failure this enables the system to save data on the storage medium and then shut down in an orderly manner. The CX2100-0914 module can be used to charge external battery packs in order to provide backup power for the system and external components such as Control Panels. All power supply units from the CX2000 series are in principle passively cooled and fanless.

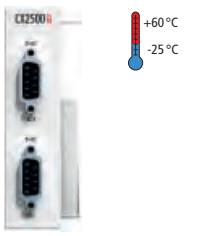
Technical data	CX2100-0004	CX2100-0014	CX2100-0904	CX2100-0914
Power supply	24 V DC (-15 %/+20 %)			
Max. output	45 W	90 W	45 W	90 W
I/O connection	E-bus or K-bus, automatic recognition			
Current supply E-bus/K-bus	2 A			
UPS	–	–	capacitively integrated	external Smart Battery
Charge	–	–	75 As	dependent on battery
Type of connection	spring-loaded technique (adapter terminal)			
Display	FSTN display 2 lines x 16 characters of text, illuminated			
Diagnostics LED	1 x PWR, 1 x I/O Run, 1 x I/O Err			
Max. power consumption	3.5 W			
Dimensions (W x H x D)	40 mm x 100 mm x 91 mm	60 mm x 100 mm x 91 mm	118 mm x 100 mm x 91 mm	84 mm x 100 mm x 91 mm
Weight	approx. 375 g	approx. 550 g	approx. 1025 g	approx. 695 g
Operating/storage temperature	-25…+60 °C/-40…+85 °C	-25…+60 °C/-40…+85 °C	-25…+50 °C/-25…+60 °C	-25…+60 °C/-25…+85 °C
Relative humidity	95 %, no condensation			
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			
Protection class	IP 20			
Approvals	CE, UL			
Further information	CX2100-0004			
Option				
CX2900-0192	battery pack for CX2100-0914			

EtherCAT Terminals see page 342, Bus Terminals see page 616

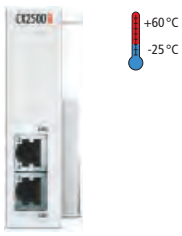
We reserve the right to make technical changes.

Audio interface

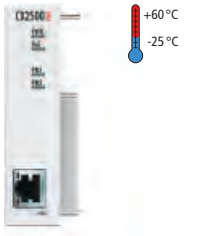
RS232 interface



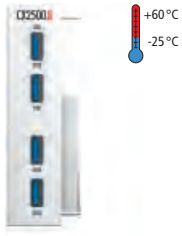
RS422/RS485 interface



Dual GBit Ethernet interface



Power over Ethernet interface



USB interface

CX2500-00xx | System modules for CX2000

The system modules for the CX2000 family are connected to the CPU on the left-hand side via a multi-pin connector. Internally they are connected via PCI Express. Up to four modules can be connected in any order.

The CX2500-0020 audio module has jack plug (5 x 3.5 mm) and cinch plug for digital signals (SPDIF). Up to 7.1 multi-channel audio can be used. Serial interfaces can be added with the modules CX2500-0030 (RS232) and CX2500-0031 (RS422/RS485). The CX2500-0060 module provides two further independent Gbit Ethernet interfaces.

The CX2500-0061 Power over Ethernet module supports devices with PoE class 0, 1, 2, 3 and 4 in accordance with the PoE standard IEEE 802.3af-2003. The maximum PoE power output is 15.4 W. The PoE supply voltage is generated internally, no external power supply is necessary. In the case of an overload of the CX2500-0061, the PoE supply shuts down for two seconds, then restarts. The diagnostic LEDs PWR, PoE, PM1 and PM2 provide information about the type of PoE supply (mode A or B) as well as about the PoE class reported by the powered device.

The CX2500-0070 module can be used to add up to four further USB 3.0 interfaces.

Technical data	CX2500-0020	CX2500-0030	CX2500-0031	CX2500-0060	CX2500-0061	CX2500-0070
Interfaces	Line IN, Line OUT, Mic IN, 7.1, SPDIF	RS232	RS422/RS485	2 x Ethernet, 10/100/ 1000 Mbit/s	1 x Ethernet, 10/100/ 1000 Mbit/s with Power over Ethernet (PoE)	4 x USB 3.0 (max. 2 A total current)
Type of connection	3.5 mm socket for jack plug, RCA socket	2 x D-sub plug, 9-pin	2 x D-sub plug, 9-pin	2 x RJ45	1 x RJ45	4 x USB 3.0, type A
Power supply	via system bus (through CX2100-0xxx power supply modules)					
Dimensions (W x H x D)	24 mm x 99 mm x 54.5 mm					
Weight	approx. 180 g	approx. 205 g	approx. 203 g	approx. 195 g	approx. 208 g	approx. 195 g
Operating/storage temperature	-25…+60 °C/-40…+85 °C					
Relative humidity	95 %, no condensation					
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27					
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4					
Protection class	IP 20					
Approvals	CE, UL	CE, UL	CE, UL	CE, UL	CE	CE, UL
Further information	CX2500-0020					

CFast slot

2½-inch HDD/SSD

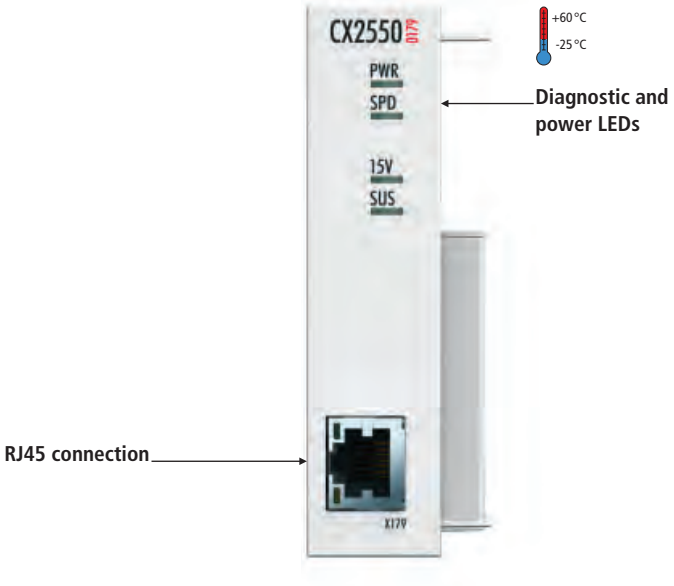
CX2550-00x0 | Extension modules for CX2000

The extension modules for the CX2000 family are connected to the CPU on the right-hand side via a multi-pin connector. Up to two CX2550-0010 CFast or CX2550-0020 HDD/SSD modules can be connected, so that a total of up to three storage media are available. The storage media can be mounted at the front without tools (CX2550-0010) or by means of a plug-in frame (CX2550-0020), enabling fast and uncomplicated exchange of the storage medium.

The CX2550-0020 module can accept 2½-inch storage media with a thickness of up to 9.5 mm. The internal SATA 6G port offers sufficient bandwidth even for the latest SSD storage media. The storage medium is protected by the attachable cap, which latches to the housing of the module.

Technical data	CX2550-0010	CX2550-0020
Interfaces	SATA	
Type of connection	CFast slot	2½-inch slot
Diagnostics LED	1 x RDY, 1 x HDD	–
Power supply	via system bus (through CX2100-0xxx power supply modules)	
Dimensions (W x H x D)	24 mm x 99 mm x 91 mm	24 mm x 99 mm x 125 mm
Weight	approx. 280 g (without medium)	approx. 290 g (without medium)
Operating/storage temperature	-25…+60 °C/-40…+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Approvals	CE, UL	
Further information	CX2550-0010	CX2550-0020

We reserve the right to make technical changes.



USB Extended 1.1 interface

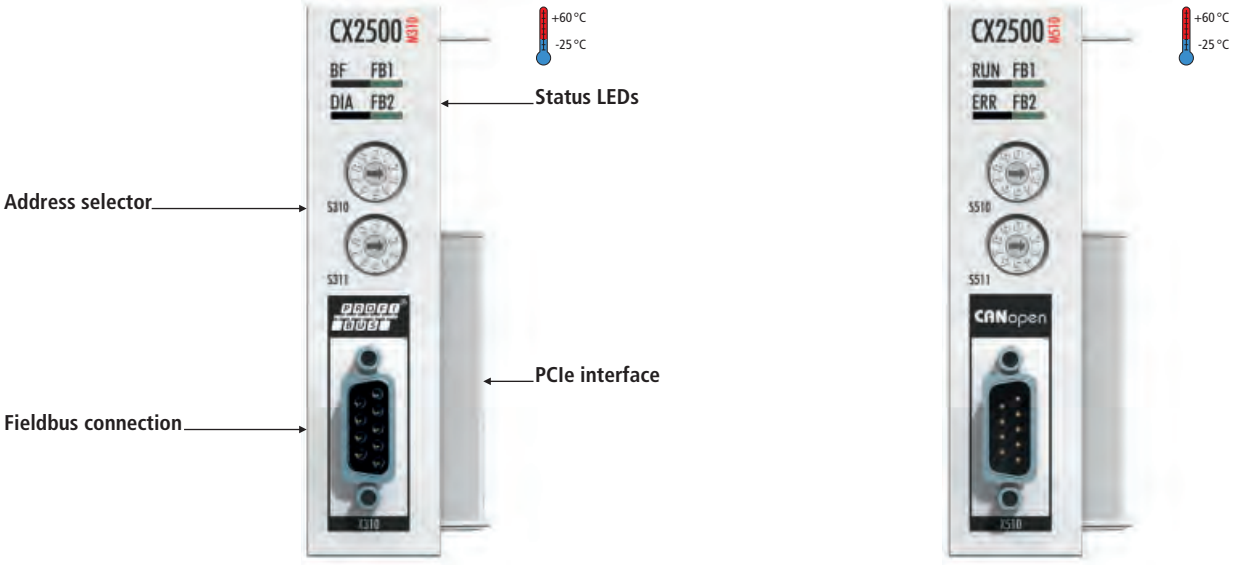
USB Extended 2.0 interface

CX2550-0x79 | System modules USB extension for CX2000

The CX2550-0x79 system modules are attachments for the CX2000 Embedded PC series. They transmit USB signals via a CAT.5E cable over distances of up to max. 50 m. The CX2550-0179 system module transmits USB signals according to the USB 1.1 standard (full speed, max. 12 Mbit/s) while the CX2550-0279 system module transmits USB signals according to the USB 2.0 standard (high speed, max. 480 Mbit/s). Both modules can be attached at the right-hand side of a CX20x0-CPU and are placed between the power supply unit and the CPU. The internal connection is made via a USB port of the CX20x0-CPU; this way, no PCI Express resources are required or used. No additional drivers are required for operation since signal transformation and forwarding of the USB signals take place at the electrical level and are completely transparent for the operating system. Each module has four diagnostic LEDs, which indicate the status of the transmission standard in addition to the power. For better visibility the LEDs of the RJ45 sockets are redundantly implemented on the lower diagnostic LEDs.

The CX2550-0179 and CX2550-0279 modules supplement the CX2000 series by the function of the CU8800 and CU8801 USB extension for Industrial PCs and enable the direct connection of Beckhoff Control Panels with USB Extended interface. The CX2550-0179 system module is suitable for the connection of the Beckhoff CP69xx and CP79xx Control Panel series with USB Extended 1.1 connection. The CX2550-0279 system module is suitable for the connection of the Beckhoff CP29xx and CP39xx Control Panel series with USB Extended 2.0 connection.

Technical data	CX2550-0179	CX2550-0279
Interfaces	1 x USB Extended 1.1	1 x USB Extended 2.0
Type of connection	RJ45 socket	
Properties	transmission of USB 1.1 up to max. 50 m via Cat.5E cable	transmission of USB 2.0 up to max. 50 m via Cat.5E cable
Diagnostics LED	1 x power, 1 x speed, 1 x +15 V, 1 x suspend	1 x power, 1 x host, 1 x activity, 1 x link
Power supply	via system bus (through CX2100-0xxx power supply modules)	
Dimensions (W x H x D)	24 mm x 99 mm x 54.5 mm	
Weight	approx. 190 g	
Operating/storage temperature	-25…+60 °C/-40…+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Approvals	CE, UL	
Further information	CX2550-0179	



PROFIBUS master

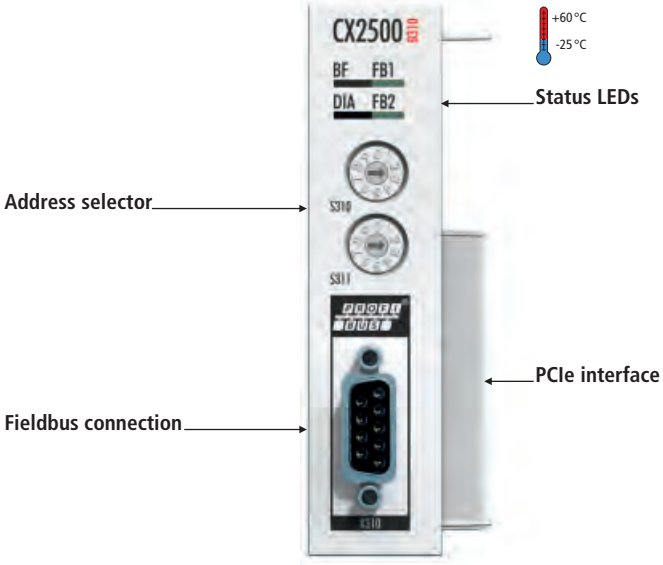
CANopen master

CX2500-Mxxx | Master fieldbus modules for CX2000

The CX2500-Mxxx fieldbus master modules are left-sided attachments for the CX2000 Embedded PC series. The use of CX2000 systems with fieldbus master modules enables the segment-like construction of control structures in extensive plants and machines using further fieldbus components (Bus Couplers, Bus Terminal Controllers, Drive Technology, etc.). The CX2500-M310 fieldbus master module assumes the function of a PROFIBUS master, while the CX2500-M510 is a CANopen master. Each of these modules occupies a PCI Express lane, so that a total of four modules can be connected in any desired combination to the left side of a CX2000 group. Compared with the Beckhoff PCIe Fieldbus Cards, the technical data of the fieldbus master modules are almost identical, but with single channels. The parallel operation of several identical or different masters is possible, e.g. two PROFIBUS masters or a PROFIBUS master and a CANopen master. In the case of mixed operation of master and slave connections, CX systems act as intelligent gateways between different fieldbuses: data are received, processed and fed into other fieldbuses. Master or slave connections network several CX systems with one another strictly deterministically via the fieldbus level. CX fieldbus modules can be retrofitted/exchanged by adding them to existing CX systems. The scanning and recognising of the modules, the parameterisation, the configuration of the connected I/O components and the online diagnosis of the process/fieldbus status take place in the TwinCAT System Manager.

Technical data	CX2500-M310	CX2500-M510
Fieldbus	PROFIBUS DP, DP-V1; DP-V2 (MC) in preparation	CANopen
Data transfer rates	9.6 kbaud…12 Mbaud	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbaud
Bus interface	1 x D-sub socket, 9-pin	
Bus device	max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	max. 127 slaves
Interface to the CPU	PCI Express	
Max. power loss	2.8 W	
Properties	PROFIBUS – different DP cycle times are possible for each slave. The error management for each user is freely configurable.	CANopen – supported PD communication types: event driven, time-controlled, synchronous, polling; emergency message handling, guarding and heartbeat, boot-up according to DS302, Online Bus Load Monitor and Bus Trace, the error management for each user is freely configurable.
Dimensions (W x H x D)	24 mm x 99 mm x 54.5 mm	
Weight	approx. 180 g	
Operating/storage temperature	-25…+60 °C/-40…+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Approvals	CE, UL	
Further information	CX2500-Mxxx	

We reserve the right to make technical changes.



PROFIBUS slave

CANopen slave

CX2500-Bxxx | Slave fieldbus modules for CX2000

The CX2500-Bxxx fieldbus slave modules are left-sided attachments for the CX2000 Embedded PC series. The use of CX2000 systems with fieldbus slave modules enables the use of a CX system as a subordinate local controller for the construction of complex or modular systems. External process data are received from the master and processed, or data from its own process peripherals are returned to the master controller directly or processed.

The CX2500-B310 fieldbus slave module assumes the function of a PROFIBUS slave, while the CX2500-B510 is a CANopen slave. Each of these modules occupies a PCI Express lane, so that a total of four of these modules can be connected in any desired combination to the left side of a CX2000 group. The fieldbus slave modules are single-channel modules. The CX2500-B310 fieldbus slave module for PROFIBUS can present itself to the master as a multiple (max. quadruple) "virtual" slave station, resulting in a four-fold increase in the quantity of exchanged process data.

The parallel operation of several identical or different slaves is possible, e.g. two PROFIBUS slaves or a PROFIBUS slave and a CANopen slave. In the case of mixed operation of master and slave connections, CX systems act as intelligent gateways between different fieldbuses: data are received, processed and fed into other fieldbuses.

Master or slave connections network several CX systems with one another strictly deterministically via the fieldbus level. CX fieldbus modules can be retrofitted/exchanged by adding them to existing CX systems. The scanning and recognising of the modules, the parameterisation, the configuration of the connected I/O components and the online diagnosis of the process/fieldbus status take place in the TwinCAT System Manager.

Technical data	CX2500-B310	CX2500-B510
Fieldbus	PROFIBUS DP, DP-V1	CANopen
Data transfer rates	9.6 kbaud…12 Mbaud	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbaud
Bus interface	1 x D-sub socket, 9-pin	
Bus device	max. 125 slaves	max. 127 slaves
Interface to the CPU	PCI Express	
Max. number of bytes	max. 244 byte input/244 byte output	
Max. power loss	2.8 W	
Dimensions (W x H x D)	24 mm x 99 mm x 54.5 mm	
Weight	approx. 180 g	
Operating/storage temperature	-25…+60 °C/-40…+85 °C	
Relative humidity	95 %, no condensation	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protection class	IP 20	
Approvals	CE, UL	
Further information	CX2500-Bxxx	

CBxxxx | Industrial Motherboards

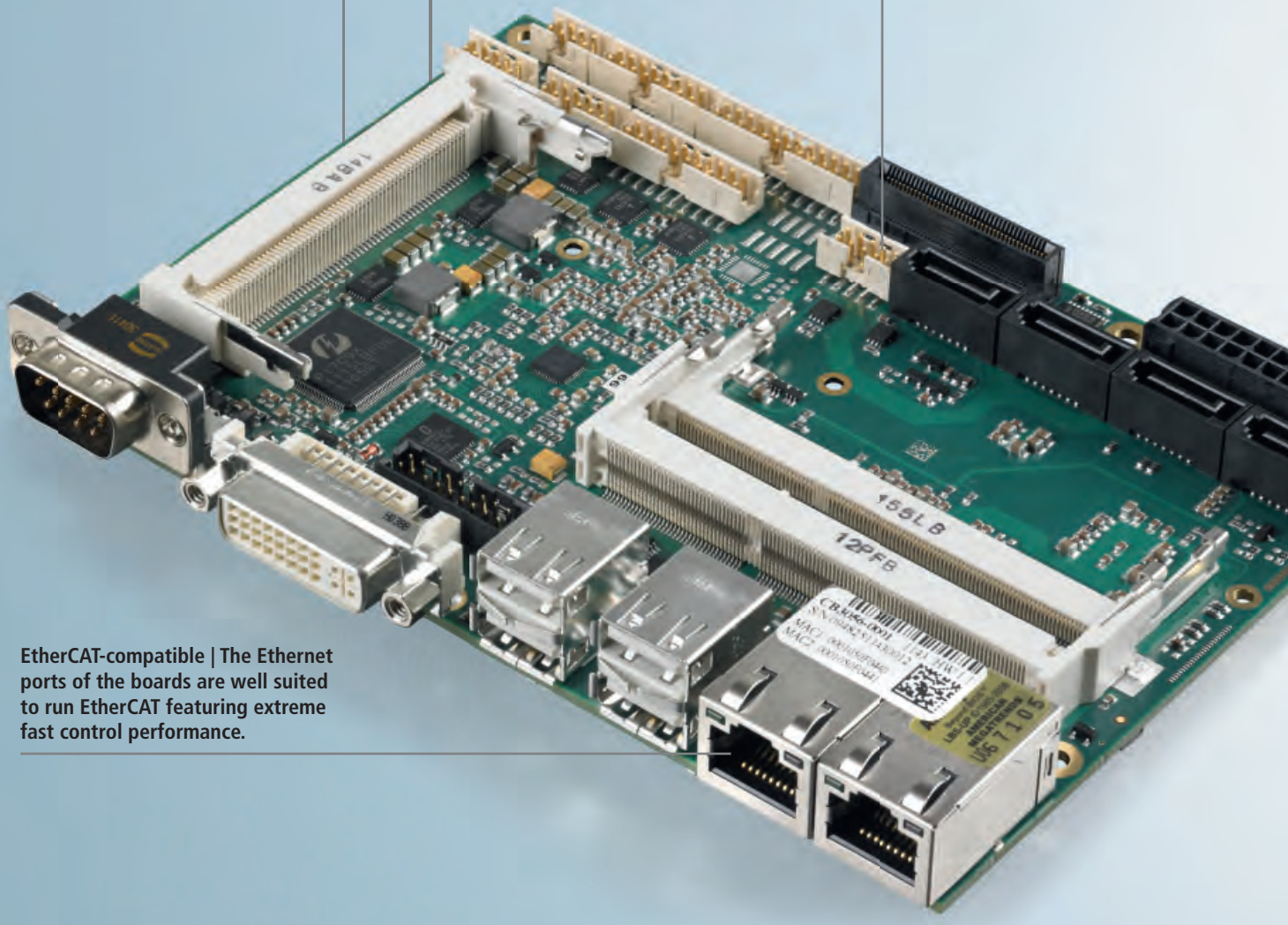
Motherboards with Intel® x86 and ARM architecture

▶ Motherboards

Simple cooling adaptation | The layout of the boards is optimised for simple and efficient cooling.

Operating system support | Beckhoff supports all Microsoft operating systems like Windows NT, 2000, XP, XP Embedded, Windows 7, 10 and CE.

Auxiliary on-board interfaces | On-board touch screen controller, I²C, SMB, and GPIO reduce the overall bill of material for a device.



EtherCAT-compatible | The Ethernet ports of the boards are well suited to run EtherCAT featuring extreme fast control performance.

We reserve the right to make technical changes.

Motherboard series ATX

Motherboard series 3½-inch

Motherboards with Intel® x86 and ARM architecture
Beckhoff has expanded the "Industrial Motherboards" line of business into an independent product segment, with in-house board development, design and production. In addition, the own motherboard and BIOS development initiatives enable Beckhoff to respond more quickly to new technologies in the PC market and to customer-specific requirements.

Flexible PC BIOS software
BIOS source code access for Phoenix and AMI BIOS makes it possible to adapt to special board functions or introduce specific customer requirements. BIOS functionality very much depends on the field of usage for a motherboard: commercial applications typically require a balance between power dissipation and program load, the industrial usage often requires full CPU availability at any time. For example, settings for speed stepping and thermal monitoring need to be adapted in the BIOS to reflect the different usage modes.

Standard form factors
Typical form factors such as 3½-inch and ATX are supported. The 3½-inch form factor is characterised by its compact dimensions and simple cooling adaptation. No specially adapted cables are required for fast commissioning. In general, Beckhoff provides all form factors with one chipset. This allows the construction of a family with architecture-identical devices.

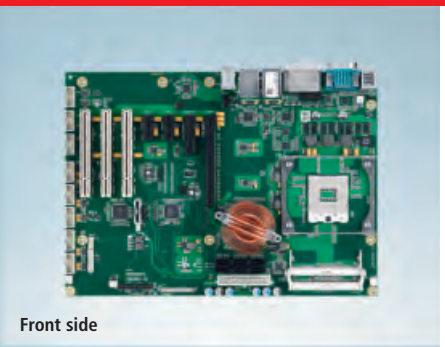
Long-term availability
Boards are made available for a minimum of five years, based on the general market availability of the components. All components are selected according to the longevity of supply. CPUs and chipsets, for example, are selected only if they are part of the embedded product line of the manufacturer.

Manufacturing quality
Since Beckhoff is using many of the motherboard products in their own PCs, quality is the number one goal. The focus is robustness and reliability; only high quality electronic components are used. All boards must pass a visual, electrical and functional inspection. The manufacturing date and serial number are clearly marked on the boards.

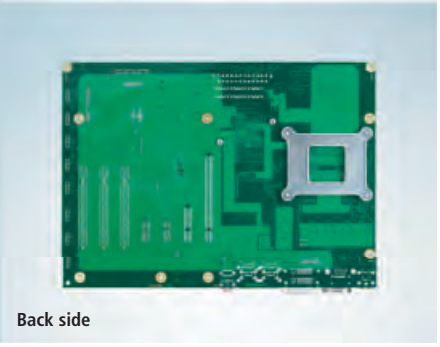
Customer-specific adaptation and integration services
Board and BIOS can be adapted to meet the needs of a customized device. Furthermore, Beckhoff is experienced in designing and producing complete embedded units, including the housing, display, various other electrical and mechanical interfaces, operating systems and application software.

Beckhoff Motherboards – Hightech from Westphalia, Germany
The complete engineering and design cycle as well as manufacturing of the boards takes place in Westphalia, Germany, at two locations: in Münster and at the Beckhoff headquarters in Verl. This local geographical context ensures short turnaround cycles between engineering, production and quality control. It also ensures that reaction time on customer feedback is the shortest possible.

ATX | CB1056



Front side



Back side

CB1056 | ATX Industrial Motherboard

CPU type, chipset	CPU	Intel® Celeron®, Intel® Core™ i3/i5/i7
	Socket	PGA988
	2nd level cache	max. 6 MB
	FSB	–
	Performance	1.1…2.5 GHz
	Chipset	Intel® QM67

Memory	Type	2 x SODIMM204–1.5 V/DDR3
	Max. memory/speed	8192 MB/DDR3 1600
	On-board flash	–

Interfaces	ATA primary/secondary	–
	ATA RAID	–
	PIO	–
	DMA	–
	SATA	2 x 6 G, 4 x 3 G
	SATA RAID	0/1/5/10
	1.5 Gbs/3.0 Gbs	yes/yes/yes
	Boot	HD/FDD/CD-ROM/FD/ZIP
	USB channels	14
	USB	1.0/2.0/host
	Specials/options	–
	COM1/2	(TTL)/RS232
	COM3/4	(TTL)/RS232
	LPT1	–
	LPT2	–
	PS/2 keyboard/mouse	yes/yes
	Floppy interface FCC/LPT	–
	Touch controller ELO resistive	–
	TPM/Watchdog	–/yes
	Supply voltage	ATX

Audio	Controller and codec	Intel® QM67/Realtek ALC889 (HDA)
	Support for 2.0/5.1/7.1	yes/yes/yes
	Analog input	Line/CD/Mic1/Mic2/PCBeep
	Analog output Line/Mono out	yes/–
	Digital input/output	yes/yes

LAN	LAN1 controller	Intel® QM67/82579L Phy
	LAN1	10/100/1000
	LAN1 boot option	RPL/PXE/WOL
	LAN2 controller	Intel® 82574L
	LAN2	10/100/1000
	LAN2 boot option	RPL/PXE/WOL

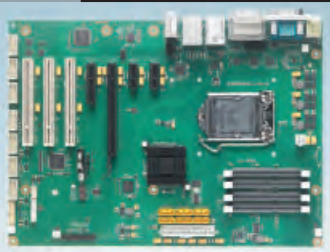
Graphic	Controller	CPU integrated
	Video BIOS	Intel® Extreme
	Memory	512 MB DVMT
	CRT/CRT resolution	yes/2048 x 1536
	DVI	2 x DVI, 1 x DisplayPort
	LCD TTL	–
	LCD LVDS	–
	LCD resolution	1920 x 1200 (DVI)

BIOS	Manufacturer/BIOS chip	AMI Aptio/2 x FWH (SPI-Flash)
	Power management APM/ACPI	yes/yes
	SpeedStep®/ATM	yes/(yes)
	Selectable fixed frequency	yes
	Power states	S0/S3/S4/S5

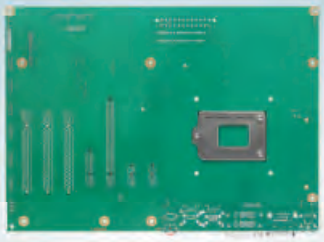
Buses	ISA/PCI	–/3 x PCI32 slot
	AGP 3.3 V/1.5 V	–
	PCIe x1/x4/x16	2x/1x/1x (PCIe V 2.0)

Dimen.	Format	ATX
	Dimensions (W x H x D)	305 mm x 41 mm x 220 mm
	Further information	CB1056

We reserve the right to make technical changes.



Front side



Back side

CB1061 | ATX Industrial Motherboard

CPU type, chipset	CPU	Intel® Core™ i3/i5/i7
	Chipset	Intel® Q87
	Super IO1	SMSC SCH3114
	Super IO2	–
	Hardware monitoring	Super IO1

Memory	Type	4 x SODIMM204–1.35 V/DDR3L
	Max. memory/speed	32 GB/DDR3L 1600
	On-board flash	–

Interfaces	SATA	6 x SATA 6 G
	SATA RAID	0/1/5/10
	Boot	HD/FDD/CD-ROM/FD/ZIP
	USB channels	14
	USB	1.0/2.0/4 x USB 3.0
	COM1/2	RS232/RS232
	COM3/4	RS232/RS232
	PS/2 keyboard/mouse	yes/yes
	Touch controller ELO resistive	–
	TPM/Watchdog	yes/yes
	Supply voltage	ATX 24

Audio	Controller and codec	Intel® Q87/Realtek ALC889 (HDA)
	Support for 2.0/5.1/7.1	yes/yes/–
	Analog input	Line/CD/Mic1/Mic2/PCBeep
	Analog output Line/Mono out	yes/–
	Digital input/output	yes/yes

LAN	LAN1 controller	Intel® Q87/i218 Phy
	LAN1	10/100/1000
	LAN1 boot option	PXE/WOL
	LAN2 controller	Intel® i210
	LAN2	10/100/1000
	LAN2 boot option	–

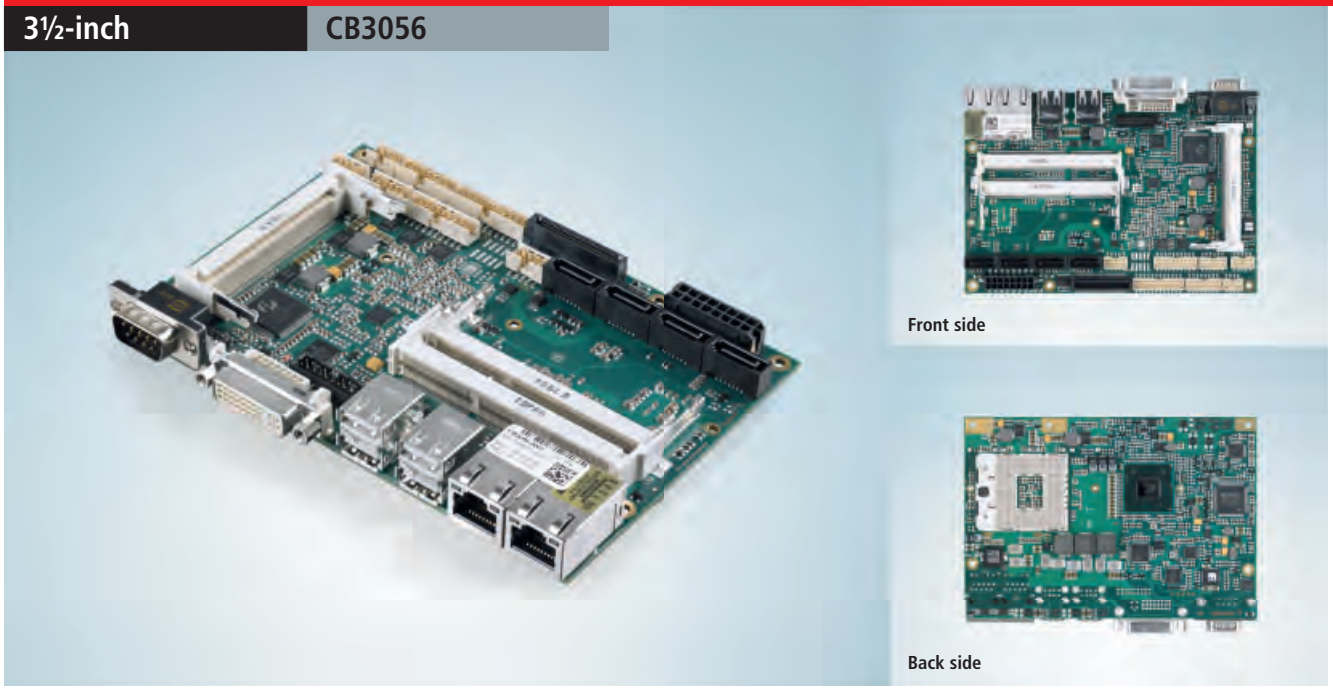
Graphic	Controller	CPU integrated
	Video BIOS	Intel® Extreme
	Memory	512 MB DVMT
	CRT/CRT resolution	yes/–
	DVI	2 x DVI, 1 x DisplayPort
	LCD TTL	–
	LCD LVDS	–
	LCD resolution	1920 x 1200 (DVI, HDMI)

BIOS	Manufacturer/BIOS chip	AMI Aptio/128 Mbit SPI-Flash
	Power management APM/ACPI	yes/yes
	SpeedStep®/ATM	yes/yes
	Selectable fixed frequency	yes
	Power states	S0/S1/(S3)/S4/S5

Buses	ISA/PCI	–/3 x PCI32 slot
	AGP 3.3 V/1.5 V	–
	PCIe x1/x4/x16	2 x PCIe x1(2.0) + 1 x PCIe x4(2.0) + 1 x PCIe x16(3.0)

Dimen.	Format	ATX
	Dimensions (W x H x D)	305 mm x 41 mm x 220 mm
	Further information	CB1061

3½-inch | CB3056



Front side

Back side

CB3056 | 3½-inch Industrial Motherboard

CPU type, chipset	CPU	Intel® Celeron®, Intel® Core™ i3/i5/i7
	Socket	PGA988
	2nd level cache	max. 6 MB
	FSB	–
	Performance	1.1…2.5 GHz
	Chipset	Intel® QM67

Memory	Type	2 x SODIMM204–1.5 V/DDR3
	Max. memory/speed	8192 MB/DDR3 1600
	On-board flash	–

Interfaces	ATA primary/secondary	–
	ATA RAID	–
	PIO	–
	DMA	–
	SATA	4
	SATA RAID	0/1/5/10
	1.5 Gbs/3.0 Gbs	yes/yes/yes
	Boot	HD/FDD/CD-ROM/FD/ZIP
	USB channels	10
	USB	1.0/2.0/Host
	Specials/options	–
	COM1/2	RS232/RS232
	COM3/4	RS232/RS232
	LPT1	–
	LPT2	–
	PS/2 keyboard/mouse	(yes)/(yes)
	Floppy interface FCC/LPT	–
	Touch controller ELO resistive	–
	TPM/Watchdog	–/yes
	Supply voltage	5 V and 5 V standby (12 V for fans)

Audio	Controller and codec	Intel® QM67/Realtek ALC889 (HDA)
	Support for 2.0/5.1/7.1	yes/yes/–
	Analog input	Line/Mic1/Mic2/PCBeep
	Analog output Line/Mono out	yes/–
	Digital input/output	yes/yes

LAN	LAN1 controller	Intel® QM67/82579L Phy
	LAN1	10/100/1000
	LAN1 boot option	RPL/PXE/WOL
	LAN2 controller	Intel® 82574L
	LAN2	10/100/1000
	LAN2 boot option	RPL/PXE/WOL

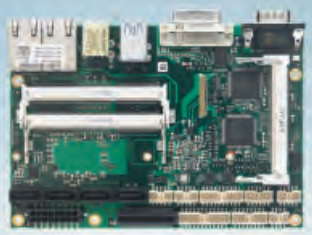
Graphic	Controller	CPU integrated
	Video BIOS	Intel® Extreme
	Memory	512 MB DVMT
	CRT/CRT resolution	yes/2048 x 1536
	DVI	2 x
	LCD TTL	–
	LCD LVDS	–
	LCD resolution	–

BIOS	Manufacturer/BIOS chip	AMI Aptio/SPI-Flash
	Power management APM/ACPI	yes/yes
	SpeedStep®/ATM	yes/–
	Selectable fixed frequency	yes
	Power states	S0/S1/(S3)/S4/S5

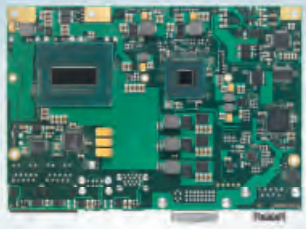
Buses	ISA/PCI	–/Mini PCI
	AGP 3.3 V/1.5 V	–
	PCIe x1/x4/x16	4 x 1 or 1 x 4

Dimen.	Format	3½-inch
	Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
	Further information	CB3056

We reserve the right to make technical changes.



Front side



Back side

CB3060 | 3½-inch Industrial Motherboard

CPU type, chipset	CPU	Intel® Core™ i3/i5/i7
	Chipset	Intel® QM87
	Super IO1	SMSC SCH3114
	Super IO2	–
	Hardware monitoring	Super IO1

Memory	Type	2 x SODIMM204–1.35 V/DDR3L
	Max. memory/speed	16 GB/DDR3L 1600
	On-board flash	–

Interfaces	SATA	2 x SATA 3G/2 x SATA 6G
	SATA RAID	0/1/5/10
	Boot	HD/FDD/CD-ROM/FD/ZIP
	USB channels	11
	USB	1.0/2.0/3 x USB 3.0
	COM1/2	RS232/RS232
	COM3/4	RS232/RS232
	PS/2 keyboard/mouse	yes/yes (replaces COM3)
	Touch controller ELO resistive	–
	TPM/Watchdog	–/yes
	Supply voltage	5 V and 5 V standby (12 V for fans)

Audio	Controller and codec	Intel® QM87/Realtek ALC889 (HDA)
	Support for 2.0/5.1/7.1	yes/yes/–
	Analog input	Line/Mic1/Mic2/PCBeep
	Analog output Line/Mono out	yes/–
	Digital input/output	yes/yes

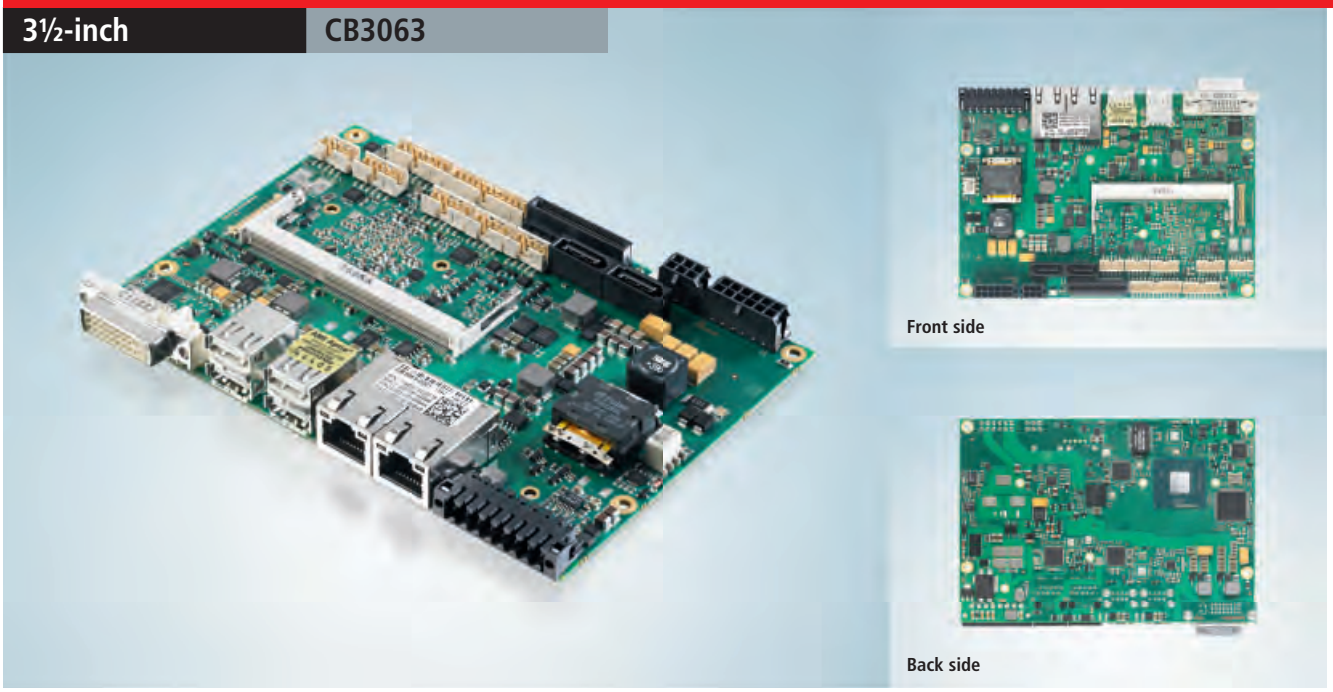
LAN	LAN1 controller	Intel® Q87/i218 Phy
	LAN1	10/100/1000
	LAN1 boot option	PXE/WOL
	LAN2 controller	Intel® i210
	LAN2	10/100/1000
	LAN2 boot option	–

Graphic	Controller	CPU integrated
	Video BIOS	Intel® Extreme
	Memory	512 MB DVMT
	CRT/CRT resolution	yes/–
	DVI	2 x DVI/HDMI
	LCD TTL	–
	LCD LVDS	–
	LCD resolution	1920 x 1200 (DVI, HDMI)

BIOS	Manufacturer/BIOS chip	AMI Aptio/128 Mbit SPI-Flash
	Power management APM/ACPI	yes/yes
	SpeedStep®/ATM	yes/yes
	Selectable fixed frequency	yes
	Power states	S0/S1/(S3)/S4/S5

Buses	ISA/PCI	–/Mini PCI
	AGP 3.3 V/1.5 V	–
	PCIe x1/x4	4 x PCIe x1(2.0) or 1 x PCIe x4(2.0)

Dimen.	Format	3½-inch
	Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
	Further information	CB3060



Front side

Back side

CB3063 | 3½-inch Industrial Motherboard

CPU type, chipset	CPU	Intel® Atom™ E38xx
	Chipset	Intel® Atom™ E38xx
	Super IO1	SMSC SCH3114
	Super IO2	–
	Hardware monitoring	Super IO1

Memory	Type	SODIMM204–1.35 V/DDR3L
	Max. memory/speed	8 GB/DDR3L 1333
	On-board flash	–

Interfaces	SATA	2 x SATA 3G
	SATA RAID	–
	Boot	HD/FDD/CD-ROM/FD/ZIP
	USB channels	9
	USB	8 x USB 2.0, 1 x USB 3.0
	COM1/2	RS232/–
	COM3/4	–
	PS/2 keyboard/mouse	yes/yes (replaces COM3)
	Touch controller ELO resistive	–
	TPM/Watchdog	–/yes
	Supply voltage	24 V

Audio	Controller and codec	–
	Support for 2.0/5.1/7.1	–
	Analog input	–
	Analog output Line/Mono out	–
	Digital input/output	–

LAN	LAN1 controller	Intel® i210
	LAN1	10/100/1000
	LAN1 boot option	PXE/WOL
	LAN2/3 controller	Intel® i210
	LAN2/3	10/100/1000
	LAN2/3 boot option	WOL

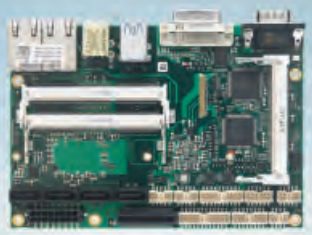
Graphic	Controller	CPU integrated
	Video BIOS	Intel® Extreme
	Memory	512 MB DVMT
	DVI-I: DVI resolution	1920 x 1080
	DVI-I: CRT resolution	2560 x 1600
	DVI internal: resolution	1920 x 1080
	DP internal: resolution	2560 x 1600

BIOS	Manufacturer/BIOS chip	AMI Aptio/128 Mbit SPI-Flash
	Power management APM/ACPI	yes/yes
	SpeedStep®/ATM	yes/yes
	Selectable fixed frequency	yes
	Power states	S0/S1/(S3)/S4/S5

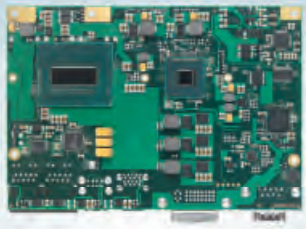
Buses	ISA/PCI	–
	AGP 3.3 V/1.5 V	–
	PCIe x1/x4/x16	1 x PCIe x1

Dimen.	Format	3½-inch
	Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
	Further information	CB3063

We reserve the right to make technical changes.



Front side



Back side

CB3064 | 3½-inch Industrial Motherboard

CPU type, chipset	CPU	Intel® Core™ i3/i5/i7 6th generation
	Chipset	Intel® Q170
Memory	Type	2 x SODIMM260–1.2 V/DDR4
	Max. memory/speed	32 GB/DDR4 2133
	On-board flash	–
Interfaces	SATA	4 x SATA 6G
	SATA RAID	0/1/5/10
	Boot	HD/FDD/CD-ROM/FD/ZIP
	USB	6 x USB 2.0 and 5 x USB 3.0 or 11 x USB 2.0
	COM1/2	RS232/–
	PS/2 keyboard/mouse	–
	Touch controller ELO resistive	–
	Supply voltage	3.3 V; 5 V and 5 V standby (12 V for fans)
Audio	Controller and codec	–
	Support for 2.0/5.1/7.1	–
	Analog input	–
	Analog output Line/Mono out	–
	Digital input/output	–

LAN	LAN1 controller	Intel® i219 Phy
	LAN1	10/100/1000
	LAN1 boot option	PXE/WOL
	LAN2 controller	Intel® i210
	LAN2	10/100/1000
	LAN2 boot option	–
Graphic	Controller	CPU integrated
	Video BIOS	Intel® Extreme
	DVI	DVI/HDMI 1.4
BIOS	Power management APM/ACPI	yes/yes
	SpeedStep®/ATM	yes/yes
	Selectable fixed frequency	yes
	Power states	S0/S1/(S3)/S4/S5
Buses	ISA/PCI	–
	AGP 3.3 V/1.5 V	–
	PCIe x1/x4/x16	4 x PCIe x1(3.0) or 1 x PCIe x4(3.0)
Dimen.	Format	3½-inch
	Dimensions (W x H x D)	147 mm x 20 mm x 102 mm
	Further information	CB3064

For availability status see Beckhoff website at: CB3064

Highlights

- Extensive range of fieldbus components for all common I/O and fieldbus systems
- Wide choice of I/O components
- Bus system suited to application

Fieldbus Components

I/Os for all common fieldbus systems

▸ FieldbusComponents

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Fieldbus Components

282 EtherCAT
314 EtherCAT Terminal
450 EtherCAT Box
550 EtherCAT Plug-in Modules
570 Bus Terminal
714 Fieldbus Box
778 Infrastructure Components
800 Accessories
842 KS2000
1022 TwinCAT PLC
1025 TwinCAT I/O
1044 TwinSAFE

Product overview fieldbus systems

Fieldbus	EtherCAT Terminal 314	EtherCAT Box 450	EtherCAT Plug-in Modules 550	Bus Terminal 570		Fieldbus Box	
	Couplers/ Gateways	Modules		Bus Couplers/Master terminals	PLC (IEC 61131-3)	Compact Box	Coupler Box
EtherCAT	EK1xxx 332	EPxxxx 466	EJxxxx 557	BK1120 592			IL230x-B110 727
	EL6695 bridge terminal 424	EQxxxx 542		BK1150 592			
		ERxxxx 468		BK1250 592			
EtherCAT P	EK13xx 338	EPPxxxx 510					
		EP1312 507					
LIGHTBUS	EL6720 master terminal 432			BK20x0 593		IPxxxx-B200 727	IL230x-B200 727
PROFIBUS	EK3100 340			BK3xx0 594	BC31x0 608	IPxxxx-B31x 728	IL230x-B31x 728
	EL6731 master/slave terminal 429			LC3100 595	BX3100 609		
INTERBUS	EL6740 slave terminal 432			BK40x0 596		IPxxxx-B400 729	IL230x-B400 729
CANopen	EL6751 master/slave terminal 430			BK51xx 596	BC5150 609	IPxxxx-B51x 730	IL230x-B51x 730
				LC5100 597	BX5100 609		
DeviceNet	EL6752 master/slave terminal 431			BK52x0 598	BC5250 610	IPxxxx-B52x 731	IL230x-B52x 731
				LC5200 599	BX5200 610		
ControlNet				BK7000 600			
CC-Link				BK7150 600			
Modbus				BK73x0 601	BC7300 611	IPxxxx-B730 732	IL230x-B730 732
sercos the automation bus	EK9700 341			BK75x0 602			
RS485	EL6021, EL6022 417	EP600x 500		BK8000 602	BC8050 611	IPxxxx-B800 732	IL230x-B800 733
		EPP600x 536		KL6021 687	BX8000 612		
				KL6041 687			
RS232	EL6001, EL6002 417	EP600x 500		BK8100 603	BC8150 612	IPxxxx-B810 733	IL230x-B810 733
		EPP600x 536		KL6001 686	BX8000 612		
				KL6031 686			
Ethernet TCP/IP	EK9000 340			BK9xx0 603	BC9xxx 613		IL230x-B90x 734
	EL6601, EL6614 422 switch port				BX9000 615		
PROFINET	EK9300 341	EP9300 509		BK9xx3 604			IL230x-B903 735
	EL6631 427 RT controller/device terminal						
	EL6632 427 IRT controller terminal						
EtherNet/IP	EK9500 341			BK9xx5 605			IL230x-B905 735
	EL6652 master/slave terminal 428						
USB				BK9500 605			

AS-Interface	EL6201 425			KL62x1 688			
IO-Link	EL6224 426	EP622x 501		KL6224 692			
EIB/KNX				KL6301 692			
LON				KL6401 693			
MP-Bus				KL6771 693			
M-Bus				KL6781 693			
DALI/DSI				KL6811 694			
DALI 2				KL6821 694			
IEEE 1588	EL6688 423						
DMX	EL6851 433						
EnOcean				KL658x 690			
SMI				KL68x1 694			

We reserve the right to make technical changes.

PLC Box (IEC 61131-3) 714	IO-Link box	Fieldbus Modules 774 For thermo-couples/mV	Infrastructure Components 778 Interfaces	Embedded PC 184 Master/Slave	Drive Technology 852 Servo Drives	Accessories 800 Connectors/ Cables
		FM33xx-B110 774	FC90xx, FC11xx 788	CXxxxx 186	AX8xxx 866	ZS1090-00xx 808
			CUxxxx 792		AX5xxx 872	ZK1090-9191 808
			EP9xxx 798			ZK1090-xxxx 809
						ZB7xxx 812
						ZK/ZS7xxx 812
			FC200x 781	CX1500-M/B200 241		Z1xxx 840
IL230x-C31x 729		FM33xx-B310 776	FC31xx 782	CXxxxx 186		ZB3xxx 837
				CX2500-M/B310 252		ZK/ZS1031 836
						ZB4200 840
			FC51xx 784	CXxxxx 186		ZB51xx 838
				CX2500-M/B510 252		ZK/ZS1052 838
			FC52xx 786	CX1500-M/B520 241		ZB52xx 838
						ZK/ZS1052 838
				CXxxxx 186		ZK/ZS1031 836
			FC75xx 787	CXxxxx 186		
				CXxxxx 186		ZK/ZS1031 836
IL230x-C810 733				CXxxxx 186		ZK/ZS1031 836
IL230x-C900 734			FC90xx 788	CXxxxx 186		ZS1090-00xx 808
			CU2xxx, CU2508 792 Ethernet Switch			ZB90x0 811 ZK1090-xxxx 809
			CU2508 794	CXxxxx 186		ZS1090-00xx 808
						ZB90x0 811
						ZK1090-xxxx 809
			CU2508 794	CXxxxx 186		ZS1090-00xx 808

	EPIxxxx, ERIxxxx 764					

Product overview signal types

Signal	EtherCAT Terminal		EtherCAT Box								EtherCAT P Box	
			Industrial housing		Zinc die-cast housing		Stainless steel housing				Industrial housing	
Digital input												
5/12/48/60 V DC	EL1xxx	351										
24 V DC	EL1xxx	344	EP1xxx	470	ER1xxx	470	EQ1xxx	544			EPP1xxx	512
120 V AC/DC	EL1712	351										
230 V AC	EL17x2	351										
Safety	EL19xx	353	EP19xx	476								
NAMUR												
Thermistor	EL1382	347										
Counter	EL15x2	352	EP1518	472	ER1518	472					EPP1518	514
Digital output												
5 V DC/12 V DC	EL2x24	361										
24 V DC	EL2xxx	354	EP2xxx	477	ER2xxx	477	EQ2xxx	545			EPP2xxx	518
30 V AC/DC	EL27xx	362	EP2624	483	ER2624	483					EPP2624	523
125 V AC/DC												
230 V AC	EL2xxx	368										
400 V AC												
Safety	EL29xx	371										
PWM	EL25xx	366										
Digital combi												
24 V DC	EL1859	345	EP23xx	484	ER23xx	484	EQ23xx	546			EPP23xx	524
	EL1259	349										
Safety												
Analog input												
Multi-function	EL3751	387										
±10 V, ±20 mA, NAMUR NE43	EL3174	386										
0…2 V, ±2 V												
0…10 V	EL3x6x	376	EP31xx	490	ER31x4	491	EQ3174	548			EPP31x4	530
±10 V	EL3x0x	372	EP31xx	491	ER31x4	491	EQ3174	548			EPP31x4	530
0…20 mA	EL3xxx	378	EP31xx	491	ER31x4	491	EQ3174	548			EPP31x4	530
4…20 mA	EL3xxx	382	EP31xx	491	ER31x4	491	EQ3174	548			EPP31x4	530
Resistance thermometer	EL32xx	389	EP32xx	492	ER3204	492	EQ3204	549			EPP3204	531
Thermocouple/mV	EL331x	392	EP3314	493	ER3314	493	EQ3314	549			EPP3314	531
Resistor bridge	EL335x	396	EP3356	494								
Potentiometer	EL3255	401										
Power measurement/ Condition Monitoring	EL3xxx	394										
Pressure measurement	EM37xx	402	EP3744	495							EPP3744	532
Analog output												
0…10 V	EL4x0x	406	EP4x74	496	ER4x74	496					EPP4x74	533
±10 V	EL4x3x	404	EP4x74	496	ER4x74	496					EPP4x74	533
0…20 mA	EL4x1x	408	EP4x74	496	ER4x74	496					EPP4x74	533
4…20 mA	EL4x2x	410	EP4x74	496	ER4x74	496					EPP4x74	533
Special functions												
SSI sensor interface	EL500x	412	EP5001	497								
EnDAT 2.2 interface	EL5032	413										
Incremental encoder interface	EL51xx	414	EP51x1	498	ER51x1	498					EPP51x1	534
RS232, RS485, TTY	EL60xx	417	EP600x	500	ER600x	500					EPP600x	536
Motion Control	EL7xxx	437	EP7xxx	502	ER7x4x	502					EPP7xxx	537
Manual operating modules												
Multi-functional			EP8309	505	ER8309	505						

We reserve the right to make technical changes.

EtherCAT Plug-in Modules 550		Bus Terminal 570				Fieldbus Box 714							
		Bus Terminal		Terminal Modules		Compact Box, Coupler/PLC Box		Extension Box		IO-Link box (industrial housing)		IO-Link box (zinc die-cast housing)	
EJ1128	559	KL1124	624										
EJ1xxx	558	KL1xxx	620	KM1xxx	626	IP10xx-Bxxx	746	IE10xx	746	EPI1xxx	766	ERI1xxx	766
		KL1712	625										
		KL17x2	625										
EJ19xx	560	KL1904	631										
		KL1352	629										
		KL1382	629										
		KL15xx	630			IP1502-Bxxx	747	IE1502	747				
		KL2124	637										
EJ2xxx	561	KL2xxx	634	KM20xx	635	IP20xx-Bxxx	748	IE2xxx	748	EPI2xxx	768	ERI2xxx	768
		KL27xx	639										
		KL2612	640										
		KL2xxx	640	KM2xxx	642								
		KL2631	641										
EJ29xx	562	KL2904	655										
		KL25xx	648			IP2512-Bxxx	751	IE2512	751				
EJ1859	558	KL1859	619			IP/IL23xx-Bxxx	738	IE23xx	752	EPI23xx	770	ERI23xx	770
						IL230x-Cxxx	740						
EJ1957	560												
		KL31x2	659										
		KL3x6x	658			IP3102-Bxxx	756	IE3102	756	EPI3174	772	ERI3174	772
EJ3x0x	563	KL3xxx	656			IP3102-Bxxx	756	IE3102	756	EPI3174	772	ERI3174	772
		KL3xxx	660			IP3112-Bxxx	757	IE3112	757	EPI3174	772	ERI3174	772
		KL3xxx	662			IP3112-Bxxx	757	IE3112	757	EPI3174	772	ERI3174	772
		KL32xx	665			IP3202-Bxxx	757	IE3202	757				
		KL331x	666			IP3312-Bxxx	757	IE3312	757				
		KL335x	668										
		KL3xxx	670										
		KM37xx	672										
EJ4002	564	KL4x0x	676	KM4602	677	IP4132-Bxxx	758	IE4132	758	EPI4374	773	ERI4374	773
EJ4134	564	KL4xxx	674			IP4132-Bxxx	758	IE4132	758	EPI4374	773	ERI4374	773
		KL4x1x	678			IP4112-Bxxx	758	IE4112	758	EPI4374	773	ERI4374	773
		KL402x	680			IP4112-Bxxx	758	IE4112	758	EPI4374	773	ERI4374	773
EJ5002	565	KL50x1	682			IP5009-Bxxx	760	IE5009	760				
		KL51xx	684			IP5109-Bxxx	761	IE5109	761				
		KL60x1	686			IP60x2-Bxxx	762	IE60x2	762				
EJ7xxx	567	KL2xxx	651										
		KL85xx	696										

The fieldbus toolkit

Beckhoff provides an extensive range of fieldbus components for all common I/O and fieldbus systems. The wide choice of I/O components means that the bus system best suited to the particular application can be chosen:

EtherCAT
EtherCAT (Ethernet Control Automation Technology) is the Ethernet solution for industrial automation, characterised by outstanding performance and particularly simple handling.

Ethernet
The advantages of Ethernet, such as high data transmission rates, easy methods of integration into existing networks, and a wide range of services and interfaces are also found in the Beckhoff Ethernet products.

Lightbus
This well proven fibre optics bus system from Beckhoff is characterised by particularly good immunity to EMI, easy installation and a very fast, cyclic and deterministic data flow.

PROFIBUS
PROFIBUS is widely used as a fast bus for decentralised peripheral components (PROFIBUS DP). In addition to PROFIBUS DP and FMS, Beckhoff also supports the standard for drive communication, PROFIBUS MC.

PROFINET
PROFINET is the open Industrial Ethernet standard of the PNO (PROFIBUS users organisation). Internationally established IT standards such as TCP/IP are used for communication.

EtherNet/IP
Ethernet/IP is the Industrial Ethernet standard of the ODVA (Open DeviceNet Vendor Association). Ethernet/IP is based on Ethernet TCP/IP and UDP/IP.

CANopen
The effective utilisation of the bus bandwidth allows CANopen to achieve a short system reaction time at comparatively low data rates. The typical advantages of CAN, such as high data security and multi-master capability are retained.

DeviceNet
DeviceNet is a sensor/actuator bus system that originated in the USA, but which meanwhile is increasingly being used in Europe and Asia. DeviceNet is CAN-based (Controller Area Network).

SERCOS interface
SERCOS was originally developed as a fast fibre optic bus system for drives. Thanks to the Beckhoff SERCOS Bus Coupler, the advantages such as high data rate and short cycle times can now be provided for the I/O peripherals too.

ControlNet
ControlNet is an open, standardised fieldbus system. The protocol allows both cyclic and acyclic data to be exchanged over the bus without affecting each other.

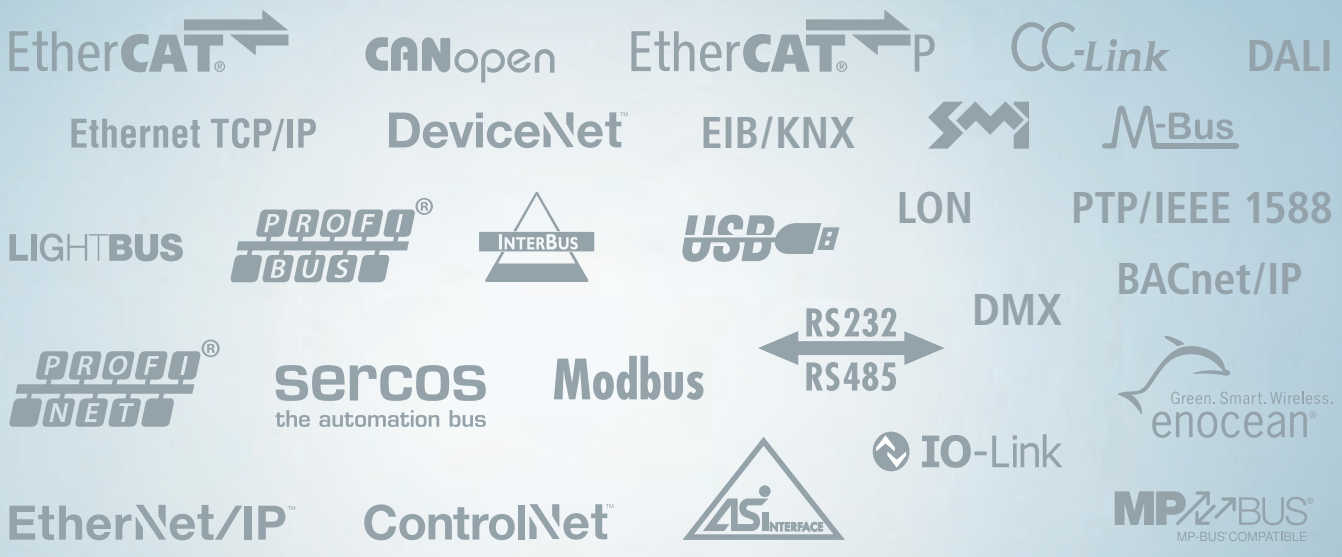
CC-Link
CC-Link (Control & Communication Link) is an open bus system for communication between the control and fieldbus level. It is predominately used in Asia.

USB
USB has grown into a standard interface for PC technology. Thanks to its high transmission rate, flexible topology through integrated hubs and the Beckhoff USB Bus Coupler, this system can be used as a substitute for a fieldbus when distances are small.

Modbus RTU
Modbus RTU is an open, serial communications protocol based on the master/slave architecture. Since it is extremely easy to implement on all kinds of serial interfaces, it has gained wide acceptance.

Modbus TCP
Due to its open standards Modbus TCP is common for the use of Ethernet in the fields of automation. Modbus TCP has a so called "Well known port (Port 502)", which makes it routable via the Internet.

We reserve the right to make technical changes.



RS232/RS485
The "classic" serial interfaces, RS232 and RS485, continue in wide use. The Beckhoff RS485/RS232 I/O modules use a simple, published serial communication protocol that is easy to implement.

AS-Interface
AS-Interface connects sensors and actuators with the higher control level via a simple and low-priced wiring method. AS-Interface is internationally standardised through EN 50295 and IEC 62026-2.

IO-Link
IO-Link serves to connect sensors and actuators to the control level by means of an inexpensive point-to-point connection. As an open interface, IO-Link can be integrated in all common fieldbus systems.

DALI
In building automation DALI is a standard for digital control of electronic ballasts for lighting.

EIB/KNX
The local two-wire bus system EIB/KNX for the connection of sensors and actuators has its main area of use in building automation, since it is well suited for implementation in various functionalities.

LON
LON (Local Operating Network) is a multi-network-capable communication system for distributed applications. It is predominately used for automation applications in commercial buildings.

EnOcean
EnOcean enables the battery-free transmission of switching signals and measured values and is mainly used in building automation.

DMX
As bus system for professional lighting equipment DMX (Digital Multiplexing) controls dynamic lighting in stage- and event-business as well as lighting of exclusive displays of light and color in high-profile buildings.

MP-Bus
As simple sensor/actuator bus for HVAC systems the MP-Bus (Multi Point Bus) serves to control flaps and volumetric flow rate controllers alongside valves and window ventilation systems.

SMI
Standard Motor Interface (SMI) is a standard interface for the control of electronic drives for sun blinds and roller shutters e.g. via bus topologies used in building automation.

M-Bus
The M-Bus (Metering Bus) is used as a standardised system for reading energy and consumption meters or other end devices in buildings and properties with a large number of end users (see EN 13757).

PTP/IEEE 1588
The Precision Time Protocol (PTP) secures the synchronicity of the time settings of several devices in a network and is defined in IEEE 1588 as the protocol standard for the synchronisation of distributed clocks in networks.

BACnet/IP
BACnet (Building Automation Control Network) is a standardised, manufacturer-independent communication protocol for building automation, based on Ethernet. Areas of application include HVAC, lighting control, safety and fire alarm technology.

System overview EtherCAT

Automation

TwinCAT
960

TwinCAT
– configuration with TwinCAT System Manager
– TwinCAT as EtherCAT master

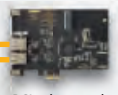
IPC

Industrial PC/ Embedded PC
28

EtherCAT master: IPC

EtherCAT master: Embedded PC

PCI slave card FC1100



PCIe slave card FC1121

I/O

Bus Terminals
570

EtherCAT slave: Bus Coupler BK1120, Bus Terminals

EtherCAT

EtherCAT slave: Embedded PC CX8010, Bus Terminals

EtherCAT slave: Embedded PC CX9020-B110, Bus Terminals

EtherCAT slave: Embedded PC CX50xx-B110, Bus Terminals

EtherCAT Terminals
314

EtherCAT slave: Coupler EK1100, 2-port junction EK1122, EtherCAT Terminals

EtherCAT slave: Embedded PC CX8010, EtherCAT Terminals

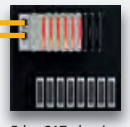
EtherCAT slave: Embedded PC CX9020-B110, EtherCAT Terminals

EtherCAT P

EtherCAT slave: Embedded PC CX50xx-B110, EtherCAT Terminals, 1-port EtherCAT P extension with feed-in EK1310

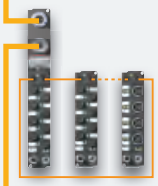
EtherCAT slave: EtherCAT P Coupler EK1300, EtherCAT Terminals

EtherCAT Plug-in Modules
550



EtherCAT plug-in modules EJxxxx

Fieldbus Box
714



IP-Link

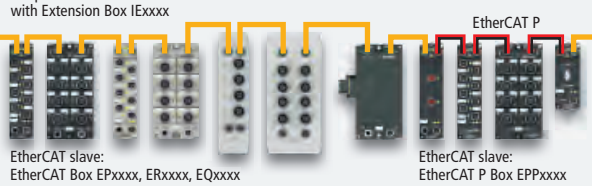
EtherCAT slave: Fieldbus Module FM33x2-B110

EtherCAT slave: Coupler Box IL230x-B110 with Extension Box IExxxx

EtherCAT Box
450

EtherCAT P

EtherCAT

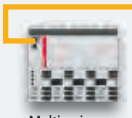


EtherCAT slave: EtherCAT Box EPxxxx, ERxxxx, EQxxxx

EtherCAT slave: EtherCAT P Box EPPxxxx

Motion

Drive Technology
852



Multi-axis servo system AX8000

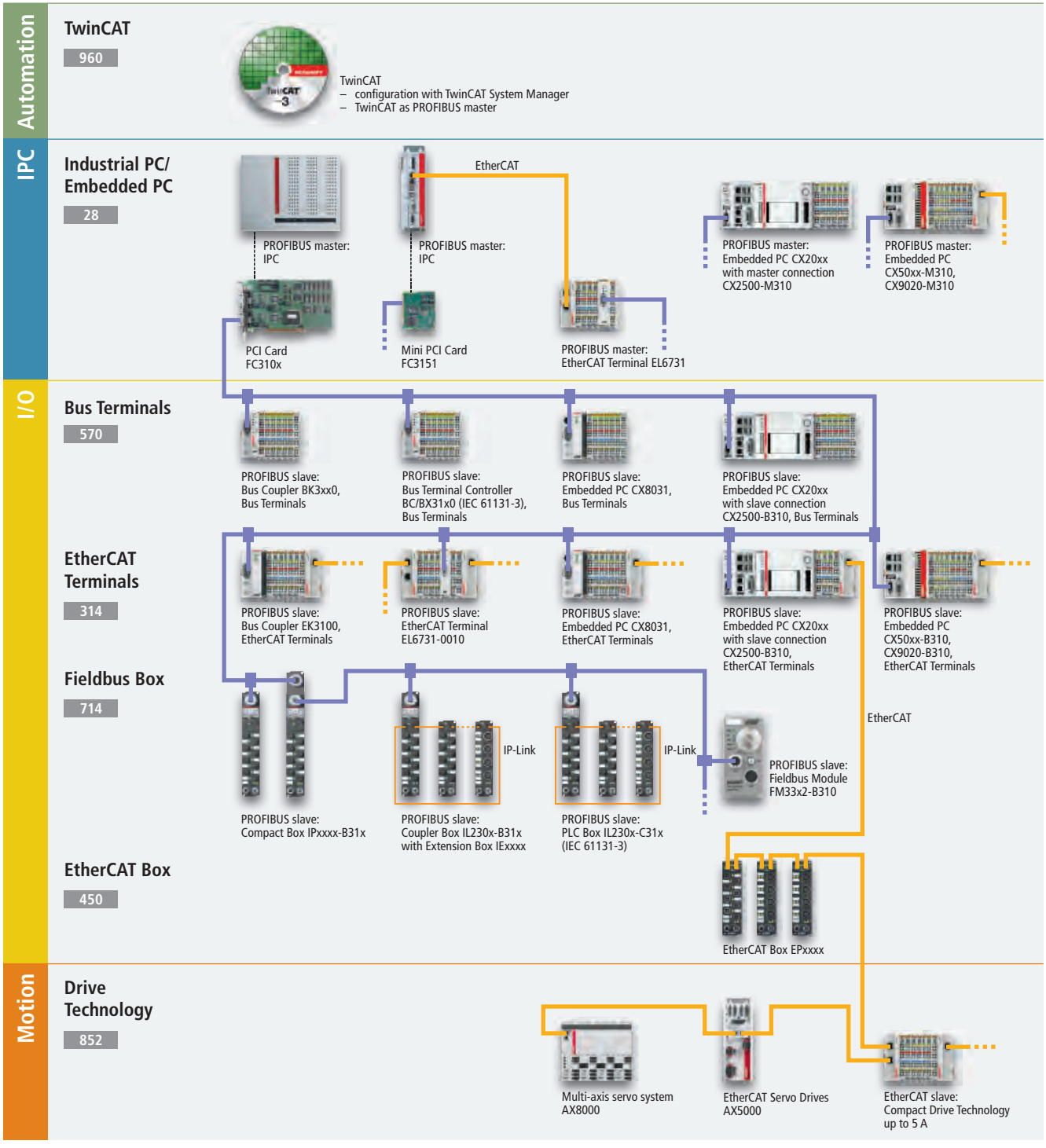
EtherCAT Servo Drives AX5000

EtherCAT slave: Compact Drive Technology up to 5 A

For further information see the EtherCAT chapter on page 284 or
▶EtherCAT

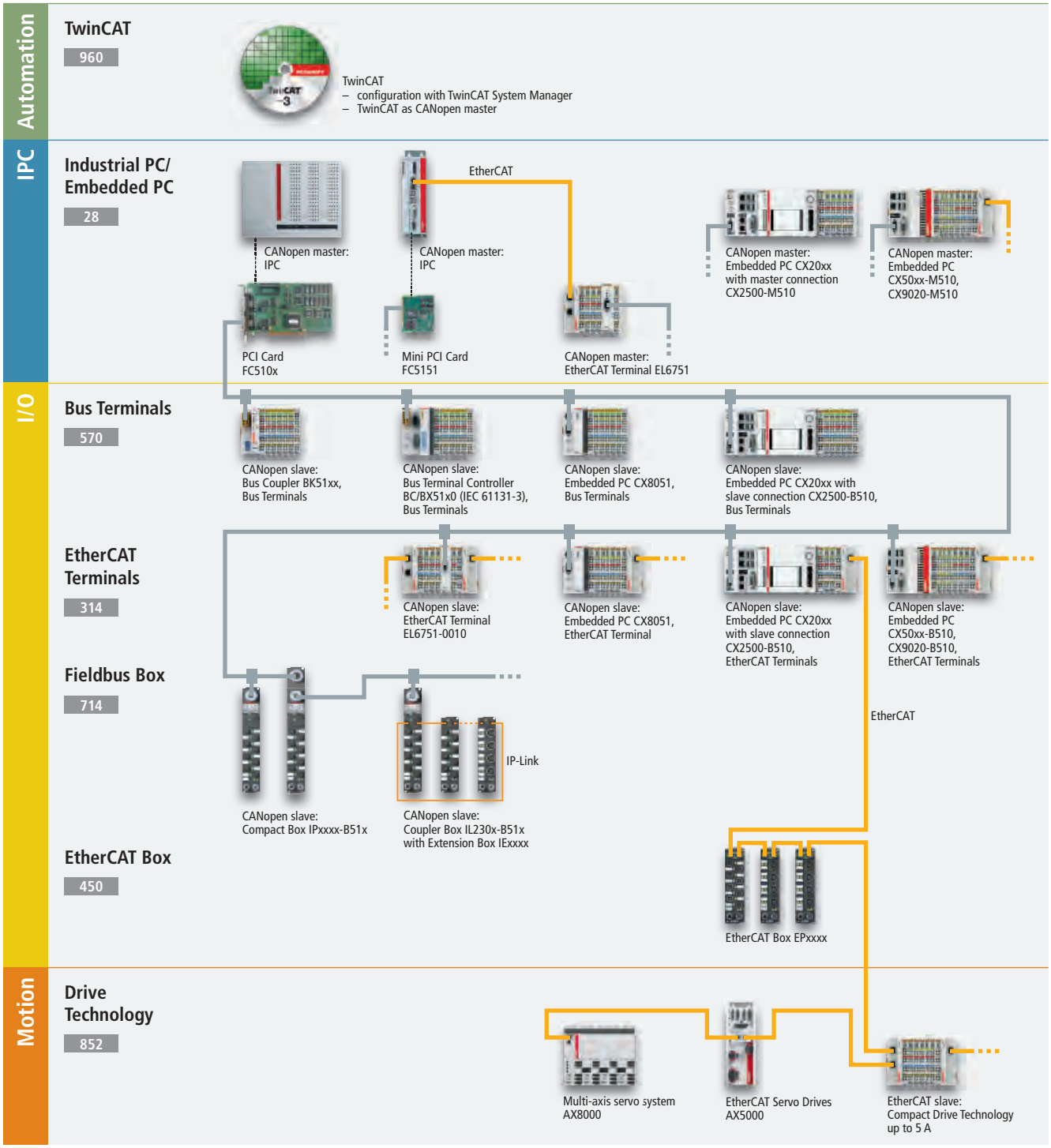
We reserve the right to make technical changes.

System overview PROFIBUS



▶profibus

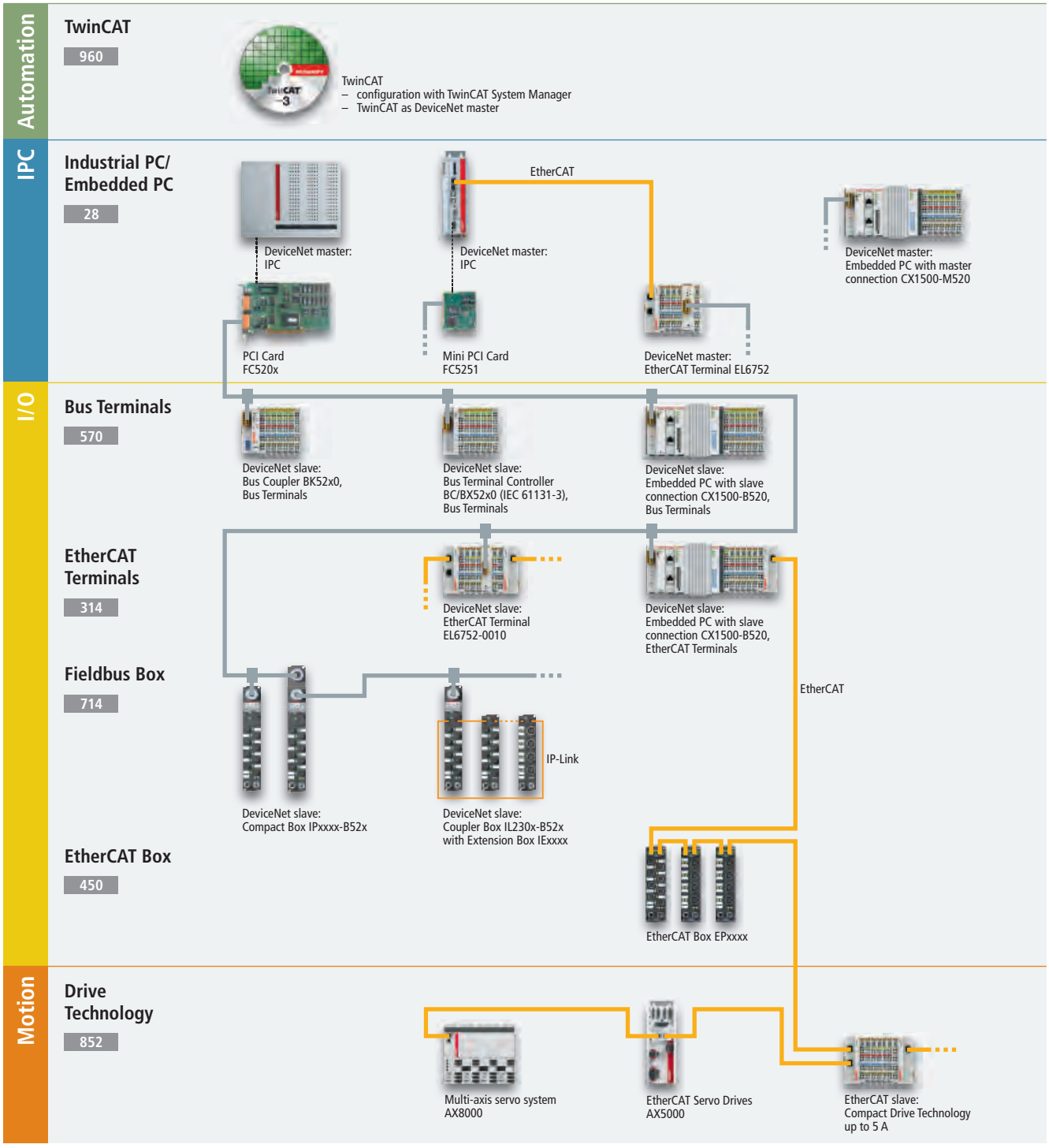
System overview CANopen



▶canopen

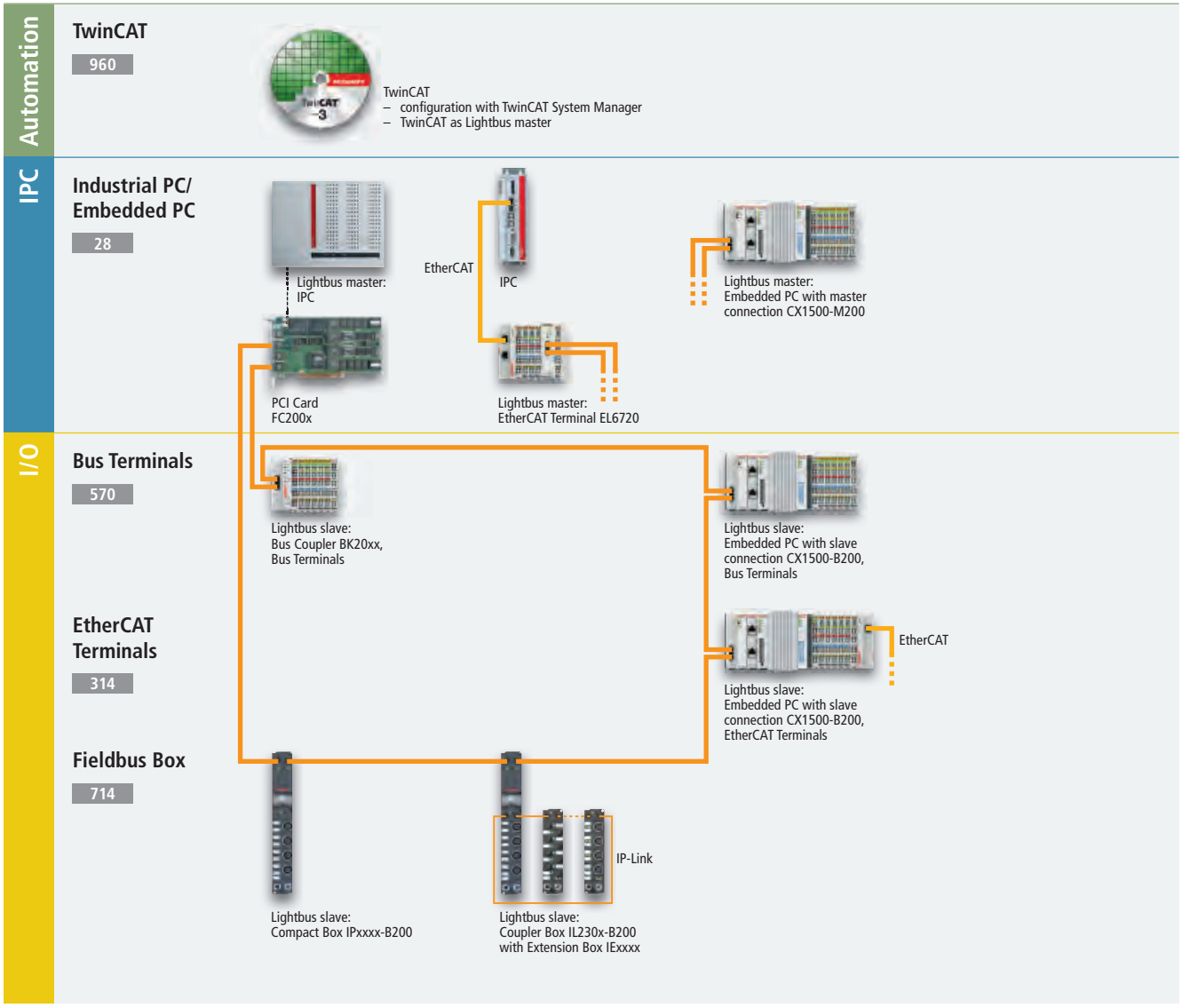
We reserve the right to make technical changes.

System overview DeviceNet



▶devicenet

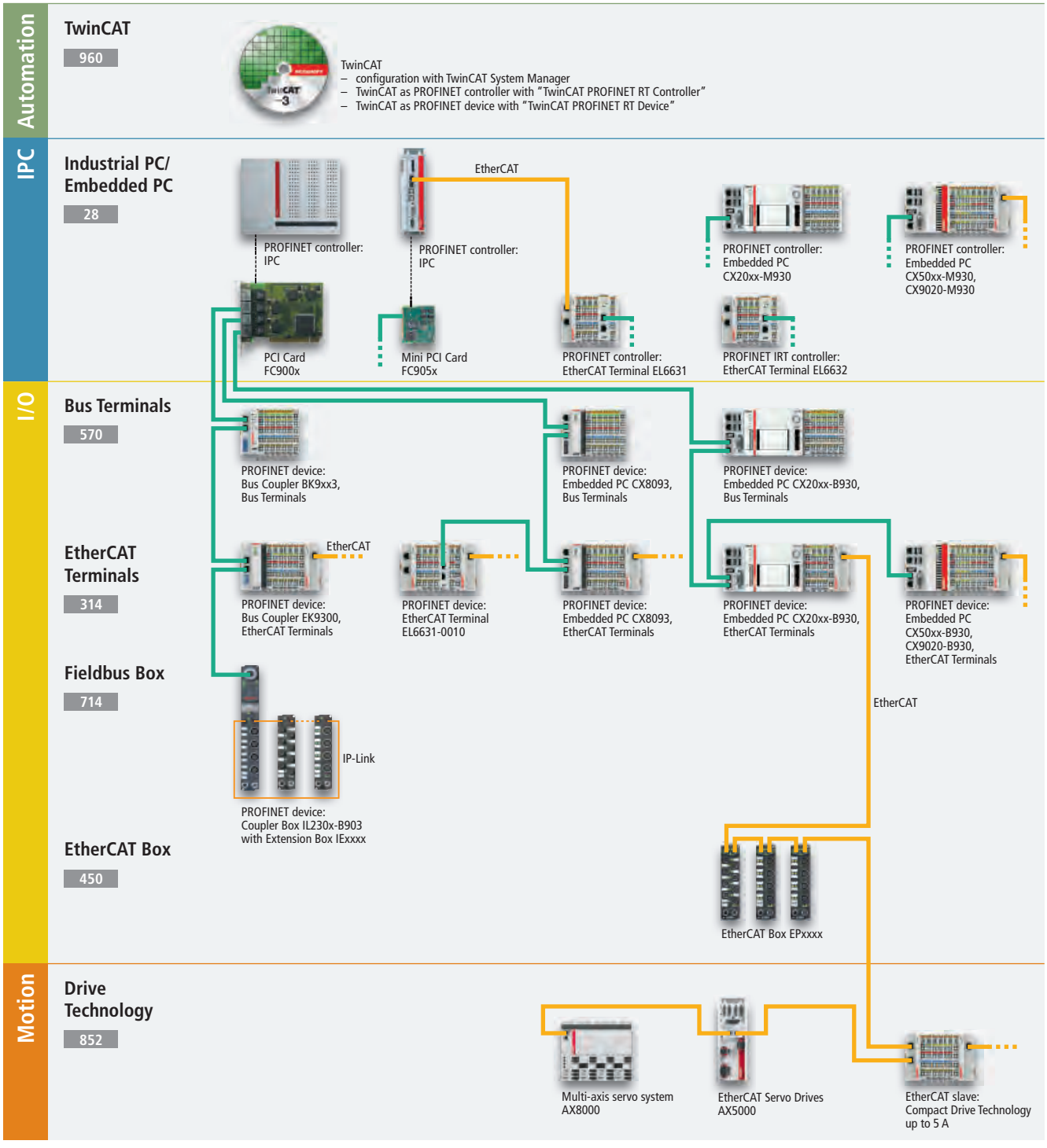
System overview Lightbus



▶lightbus

We reserve the right to make technical changes.

System overview PROFINET



▶profinet

System overview EtherNet/IP

Automation

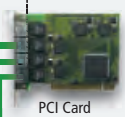
TwinCAT
960

TwinCAT
– configuration with TwinCAT System Manager
– TwinCAT as EtherNet/IP master/slave with "TwinCAT EtherNet/IP Master/Slave"

IPC

Industrial PC/ Embedded PC
28

EtherNet/IP master/slave: IPC



PCI Card FC900x

EtherNet/IP master/slave: IPC

Mini PCI Card FC9x51

EtherNet/IP master/slave: Embedded PC

EtherNet/IP master: EtherCAT Terminal EL6652

EtherNet/IP slave: Embedded PC CX20xx-B950

EtherNet/IP slave: Embedded PC CX50xx-B950, CX9020-B950

I/O

Bus Terminals
570

EtherNet/IP slave: Bus Coupler BK91x5, Bus Terminals

EtherNet/IP slave: Embedded PC CX8095, Bus Terminals

EtherCAT Terminals
314

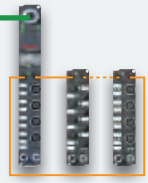
EtherCAT

EtherNet/IP slave: Bus Coupler EK9500, EtherCAT Terminals

EtherNet/IP slave: EtherCAT Terminal EL6652-0010

EtherNet/IP slave: Embedded PC CX8095, EtherCAT Terminals

Fieldbus Box
714



IP-Link

EtherNet/IP slave: Coupler Box IL230x-B905 with Extension Box IExxxx

EtherCAT

EtherCAT Box
450

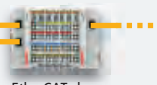
EtherCAT Box EPxxxx

Motion

Drive Technology
852

Multi-axis servo system AX8000

EtherCAT Servo Drives AX5000



EtherCAT slave: Compact Drive Technology up to 5 A

▶ethernet-ip

We reserve the right to make technical changes.

System overview Ethernet TCP/IP

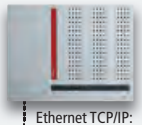
Automation

TwinCAT
960

TwinCAT
- configuration with TwinCAT System Manager
- TwinCAT as TCP/IP client/server with "TwinCAT TCP/IP Server"
- TwinCAT as FTP client mit "TwinCAT FTP Client"
- TwinCAT as OPC UA client/server with "TwinCAT OPC UA"

IPC

Industrial PC/ Embedded PC
28



Ethernet TCP/IP: IPC

PCI Card FC90xx

Ethernet TCP/IP: IPC

Mini PCI Card FC9x51

Ethernet TCP/IP: Embedded PC

I/O

Switches
792

Ethernet switch CU20xx

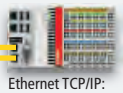
Bus Terminals
570

Ethernet TCP/IP: Bus Coupler BK9xx0, Bus Terminals

Ethernet TCP/IP: Bus Terminal Controller BC9xxx (IEC 61131-3), Bus Terminals

Ethernet TCP/IP: Embedded PC CX8090, Bus Terminals

Ethernet TCP/IP: Embedded PC CX8190, Bus Terminals



Ethernet TCP/IP: Embedded PC CX5000, CX9020, Bus Terminals

EtherCAT Terminals
314

EtherCAT

Ethernet TCP/IP: Bus Coupler EK9000, EtherCAT Terminals

Ethernet TCP/IP: EtherCAT Terminals EL6601 and EL6614

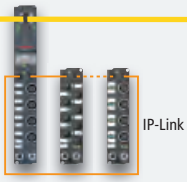
Ethernet TCP/IP: Embedded PC CX8090, EtherCAT Terminals

Ethernet TCP/IP: Embedded PC CX8190, EtherCAT Terminals

Ethernet TCP/IP: Embedded PC CX5000, CX9020, EtherCAT Terminals

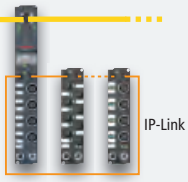
EtherCAT

Fieldbus Box
714



IP-Link

Ethernet TCP/IP: Coupler Box IL230x-B90x with Extension Box IExxxx



IP-Link

Ethernet TCP/IP: PLC Box IL230x-C900 (IEC 61131-3)

EtherCAT Box
450

EtherCAT Box EPxxxx

Motion

Drive Technology
852

Multi-axis servo system AX8000

EtherCAT Servo Drives AX5000

EtherCAT slave: Compact Drive Technology up to 5 A

▶ethernet

System overview SERCOS interface

Automation

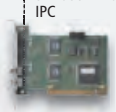
TwinCAT
960

TwinCAT
– configuration with TwinCAT System Manager
– TwinCAT as SERCOS master

IPC

Industrial PC/ Embedded PC
28

SERCOS II master:
IPC



PCI Card FC750x

SERCOS II master:
IPC

Mini PCI Card FC7551

SERCOS II master:
Embedded PC with master connection CX1500-M750

I/O

Bus Terminals
570

SERCOS II slave:
Bus Coupler BK75x0, Bus Terminals

EtherCAT Terminals
314

EtherCAT

SERCOS III slave:
Bus Coupler EK9700, EtherCAT Terminals

▶sercos

System overview Modbus

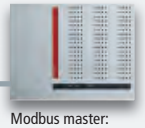
Automation

TwinCAT
960

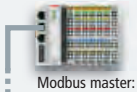
TwinCAT
– configuration with TwinCAT System Manager
– TwinCAT as Modbus RTU device with "TwinCAT Modbus RTU"
– TwinCAT as Modbus TCP server with "TwinCAT Modbus TCP Server"

IPC

Industrial PC/ Embedded PC
28



Modbus master:
IPC



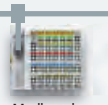
Modbus master:
Embedded PC CX8090
with Modbus TCP protocol implementation

I/O

Bus Terminals
570

Modbus slave:
Bus Coupler BK73x0,
Bus Terminals

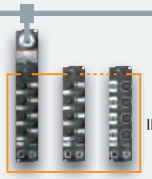
Modbus slave:
Bus Terminal Controller
BC7300 (IEC 61131-3),
Bus Terminals



Modbus slave:
Bus Terminal Controller
BC8050/BC8150 (IEC 61131-3)
with Modbus RTU protocol implementation,
Bus Terminals

Fieldbus Box
714

Modbus slave:
Compact Box IPxxxx-B730



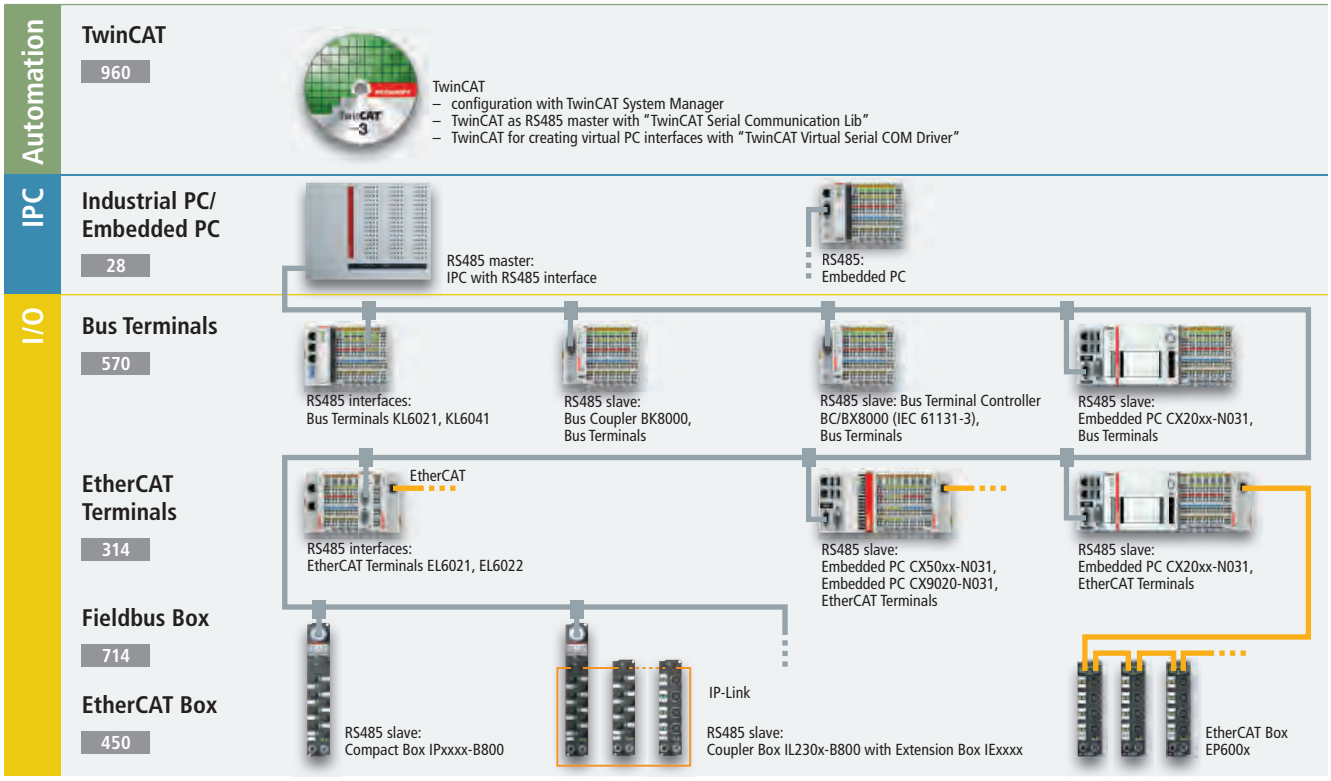
IP-Link

Modbus slave:
Coupler Box IL230x-B730 with Extension Box IExxxx

▶modbus

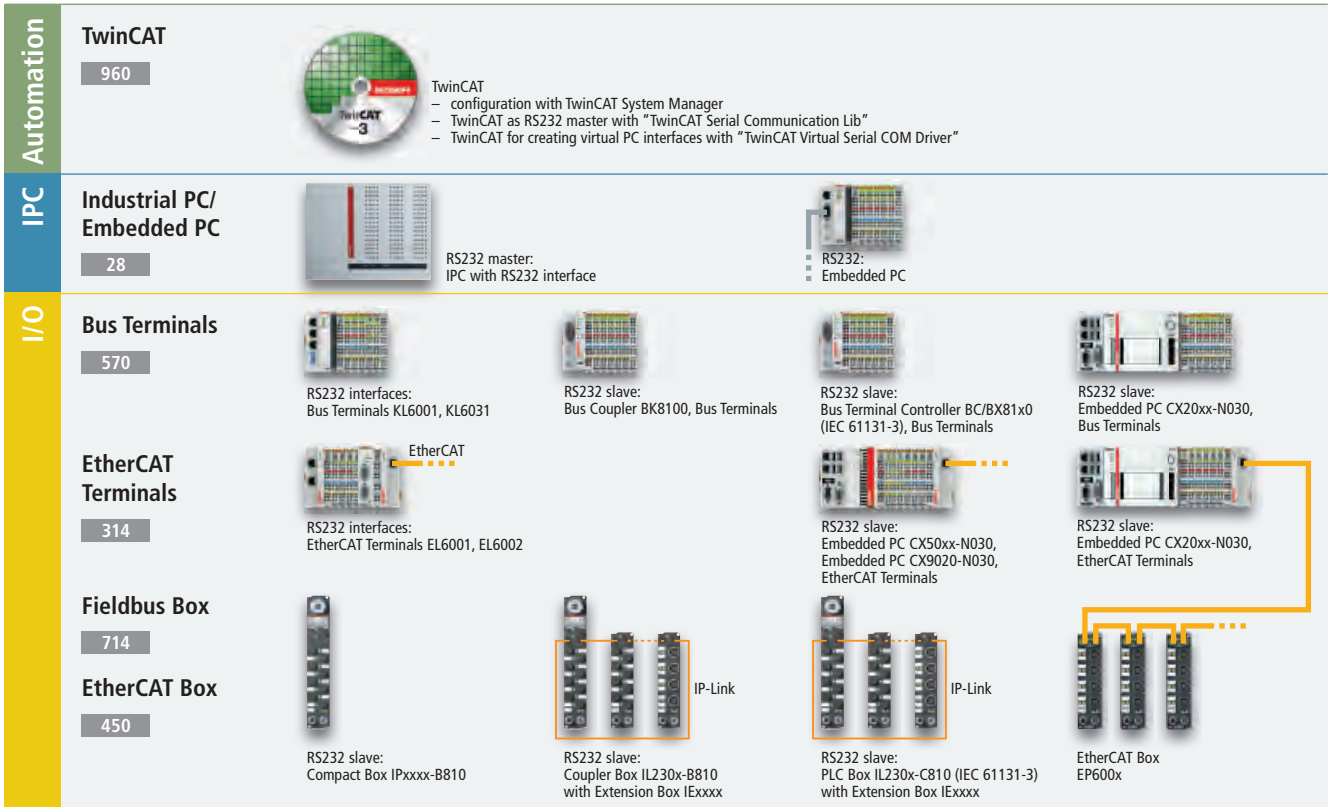
We reserve the right to make technical changes.

System overview RS485



▶RS485

System overview RS232



▶RS232

System overview EnOcean

Automation

TwinCAT

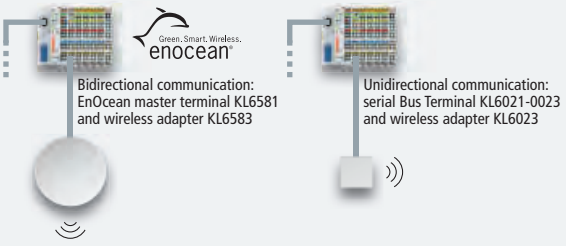
960

TwinCAT
– configuration with TwinCAT System Manager
– TwinCAT as EnOcean device with "TwinCAT PLC Serial Communication EnOcean"

I/O

Bus Terminals

570



Bidirectional communication:
EnOcean master terminal KL6581
and wireless adapter KL6583

Unidirectional communication:
serial Bus Terminal KL6021-0023
and wireless adapter KL6023

▶enocean

System overview IO-Link

Automation

TwinCAT

960

TwinCAT
– configuration with TwinCAT System Manager

I/O

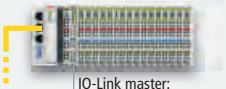
Bus Terminals

570

IO-Link master:
Bus Terminal
KL6224

EtherCAT Terminals

314



IO-Link master:
EtherCAT Terminal
EL6224

Fieldbus Box

714

IO-Link slave:
IO-Link box modules
EPIxxxx

IO-Link slave:
IO-Link box modules
ERIxxxx

EtherCAT Box

450

IO-Link master:
EtherCAT Box
EP622x

▶io-link

We reserve the right to make technical changes.

System overview BACnet/IP

Automation

TwinCAT

960

TwinCAT
– configuration with TwinCAT System Manager
– TwinCAT as BACnet/IP server and client with "TwinCAT BACnet/IP"

IPC

Industrial PC/ Embedded PC

28

BACnet/IP server/client:
IPC

BACnet/IP server/client:
built-in Panel PC

Certified to
ISO 16484-5:2012

BACnet/IP server/client:
Embedded PC CX8091

BACnet/IP server/client:
Embedded PC CX5010

BACnet/IP server/client:
Embedded PC CX9020

BACnet/IP server/client:
Embedded PC CX5020

▶bacnet

System overview subsystem: AS-Interface, EIB/KNX, LON, MP-Bus, M-Bus, DALI/DSI, SMI, IEEE 1588, DMX

Automation

TwinCAT

960

TwinCAT
– configuration with TwinCAT System Manager

I/O

Bus Terminals

570

AS-Interface
master terminals
KL6201, KL6211

EIB/KNX
EIB/KNX
Bus Terminal
KL6301

LON
LON
Bus Terminal
KL6401

MP-Bus
master terminal
KL6771

M-Bus
master terminal
KL6781

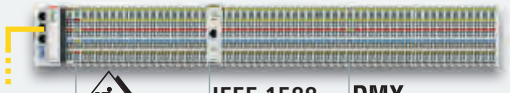
DALI
DALI/DSI
master terminal
KL6811

DALI 2
DALI/DALI 2
multi-master and
power supply terminal
KL6821

SMI
Bus Terminals
KL6831, KL6841

EtherCAT Terminals

314



AS-Interface
master terminal
EL6201

IEEE 1588
IEEE 1588 external
synchronisation
interface EL6688
(master/slave)

DMX
DMX master terminal
EL6851,
DMX slave terminal
EL6851-0010

▶subsystem

EtherCAT®

Highlights

- Ethernet up to the terminal – complete continuity
- Ethernet process interface scalable from 1 bit to 64 kbyte
- Ethernet solution for the field level
- Exact timing and adapted to synchronisation

EtherCAT

The real-time Ethernet fieldbus

▸ EtherCAT

284 Product overview
286 System description
292 System overview

294 EtherCAT technologies

294 EtherCAT P
298 XFC
311 Safety over EtherCAT

304 EtherCAT Development Products

EtherCAT components

28 Industrial PC
184 Embedded PC
314 EtherCAT Terminal
450 EtherCAT Box
550 EtherCAT Plug-in Modules
778 Infrastructure Components
864 EtherCAT Servo Drives
960 TwinCAT
1044 TwinSAFE
800 Accessories

Product overview EtherCAT components

EtherCAT components

PC-based Control

Industrial PCs	**CPxxxx** Panel PCs (EtherCAT masters)	42
	Cxxxx control cabinet PCs (EtherCAT masters)	98
Embedded PCs	**CXxxxx** Embedded PCs (EtherCAT masters)	184
Software PLC/Motion Control	**TwinCAT** EtherCAT masters and development environment	960
Safety	**TwinSAFE** open and scalable control technology	1044
Redundancy	**TwinCAT EtherCAT Redundancy** extension of the EtherCAT master with cable redundancy capability	1029

EtherCAT Terminal

Couplers	**EK1xxx** EtherCAT Coupler E-bus	330
	BK1xxx EtherCAT Coupler K-bus	339
	EKxxxx Bus Coupler for EtherCAT Terminals	340
Digital I/O	**EL1xxx** digital input	344
	EL2xxx digital output	354
Analog I/O	**EL3xxx** analog input	372
	EL4xxx analog output	404
Special functions	**EL5xxx** position measurement	412
	EL6xxx communication	417
	EL7xxx motion	435
System	**EL9xxx** system terminals	442

EtherCAT Box

Digital I/O	**EP1xxx, EQ1xxx, ER1xxx*** digital input	470
	EP2xxx, EQ2xxx, ER2xxx* digital output	477
	EP23xx, EQ23xx, ER23xx* digital combi	484
Analog I/O	**EP3xxx, EQ3xxx, ER3xxx*** analog input	490
	EP4xxx, ER4xxx* analog output	496
Special functions	**EP5xxx, ER5xxx*** position measurement	497
	EP6xxx, ER6xxx* communication	500
	EP7xxx, ER7xxx* motion	502
	EP8xxx, ER8xxx* multi-functional I/O box	505
System	**EP1111** EtherCAT Box with ID switch	506
	EP1122 2-port EtherCAT junction	506
	EP9214, EP9224 4/4-channel power distribution for EtherCAT Box modules	508

EtherCAT P Box

Digital I/O	**EPP1xxx** digital input	512
	EPP2xxx digital output	518
	EPP23xx digital combi	524
Analog I/O	**EPP3xxx** analog input	530
	EPP4xxx analog output	533
Special functions	**EPP5xxx** position measurement	534
	EPP6xxx communication	536
	EPP7xxx motion	537
System	**EPP1111** 3 decimal ID switches	539
	EPP9001 EtherCAT P/EtherCAT connector with power transmission	541
	EPP9022 2 x diagnostics (U_S, U_P)	541
	EPP1322 3 ports, with feed-in	540
	EPP1332 3 ports, with refresh	540
	EPP1342 3 ports	540

*EPxxxx: industrial housing in IP 67, EQxxxx: stainless steel housing in IP 69K, ERxxxx: zinc die-cast housing in IP 67

We reserve the right to make technical changes.

EtherCAT Plug-in Modules

Couplers
- **EJ1100** 557 — EtherCAT Coupler E-bus

Digital I/O
- **EJ1xxx** 558 — digital input
- **EJ2xxx** 561 — digital output

Analog I/O
- **EJ3xxx** 563 — analog input
- **EJ4xxx** 564 — analog output

Special functions
- **EJ5xxx** 565 — position measurement
- **EJ7xxx** 567 — motion

System
- **EJ9xxx** 568 — system modules

Fieldbus Box

Fieldbus Box
- **IL230x-B110** 727 — IP 67 Coupler Box with EtherCAT interface
- **IExxxx** 744 — Extension Box modules for IP-Link

Fieldbus Modules
- **FM33xx-B110** 774 — Thermocouple Fieldbus Modules with EtherCAT interface

Infrastructure Components

PCI Ethernet
- **FC9001, FC9011** 788 — 1-channel PCI Ethernet card
- **FC9002** 789 — 2-channel PCI Ethernet card
- **FC9004** 789 — 4-channel PCI Ethernet card
- **FC9051, FC9151** 790 — 1-channel Mini PCI Ethernet card
- **FC9022** 789 — 2-channel Gbit PCI Ethernet card
- **FC9024** 789 — 4-channel Gbit PCI Ethernet card

PCI EtherCAT
- **FC1100** 791 — PCI EtherCAT slave card
- **FC1121** 791 — PCI Express EtherCAT slave card

Junctions
- **CU2508** 794 — real-time Ethernet port multiplier, 10/100/1000 Mbit/s, IP 20
- **CU1128** 795 — EtherCAT junction, 8-channel EtherCAT RJ45, IP 20
- **EP9128** 798 — EtherCAT junction, 8-channel EtherCAT M8, IP 67

EtherCAT media converter fibre optic
- **CU1521-0000** 796 — multimode, IP 20
- **CU1521-0010** 796 — singlemode, IP 20
- **CU1561** 796 — plastic optical fibre, IP 20
- **EP9521** 799 — multimode, IP 67

Drive Technology

Servo Drives
- **AX51xx** 874 — EtherCAT Servo Drives up to 170 A, 1-channel
- **AX52xx** 875 — EtherCAT Servo Drives up to 2 x 6 A, 2-channel
- **AX8000** 866 — multi-axis servo system for OCT motors
- **EL72xx** 438 — servomotor terminal, 50 V DC, 4 A

Servo-motors
- **AM80xx** 887 — Synchronous Servomotors with One Cable Technology (OCT)
- **AM85xx** 895 — Synchronous Servomotors with increased rotor moment of inertia and One Cable Technology (OCT)
- **AM88xx** 907 — stainless steel Synchronous Servomotors with One Cable Technology (OCT)
- **AM3xxx** 912 — Synchronous Servomotors
- **ALxxxx** 916 — Linear Servomotors

Compact Drive Technology
- **AM81xx** 929 — Synchronous Servomotors with One Cable Technology (OCT) for the EL7201 servo terminal

Transport system
- **XTS** 940 — eXtended Transport System

EtherCAT – Ultra high-speed for automation

Highlights

- Ethernet up to the terminal – complete continuity
- Ethernet process interface scalable from 1 bit to 64 kbyte
- first true Ethernet solution for the field level
- exact timing and adapted to synchronisation

Performance

- 256 digital I/Os in 12 µs
- 1000 digital I/Os in 30 µs
- 200 analog I/Os (16 bit) in 50 µs, corresponding to 20 kHz sampling rate
- 100 servo axes every 100 µs
- 12,000 digital I/Os in 350 µs

Topology

- line, tree or star topology
- up to 65,535 devices within one network
- network size: almost unlimited (> 500 km)
- operation with or without switches
- cost-effective cabling: Industrial Ethernet patch cable (Cat.5)
- physical layer:
  - Ethernet 100BASE-TX via twisted pair, up to 100 m between 2 slaves
  - Ethernet 100BASE-FX via fibre optic cable, up to 20 km between 2 slaves
- hot connect of bus segments

Address space

- network-wide process image: 4 Gbyte
- device process image: 1 bit to 64 kbyte
- address allocation: freely configurable
- device address selection: automatically via software

Cost benefits

- no more network tuning: lower engineering costs
- hard real-time with software master: no plug-in cards required
- no active infrastructure components (switches, etc.) required
- Ethernet cable and connector costs lower than for traditional fieldbuses
- EtherCAT down to the I/O terminal: no complex Bus Couplers
- low interface costs due to highly integrated EtherCAT Slave Controller

Protocol

- optimised protocol directly within the Ethernet frame
- fully hardware-implemented
- for routing and socket interface: UDP datagram
- processing while passing
- distributed clocks for accurate synchronisation
- timestamp data types for resolution in the nanosecond range
- oversampling data types for high-resolution measurements

Diagnostics

- breaking point detection
- continuous "quality of line" measurement enables accurate localisation of transmission faults
- Topology View

Interfaces

- switch port terminal for standard Ethernet devices
- fieldbus terminals for fieldbus devices
- decentralised serial interfaces
- communication gateways
- gateway to other EtherCAT systems

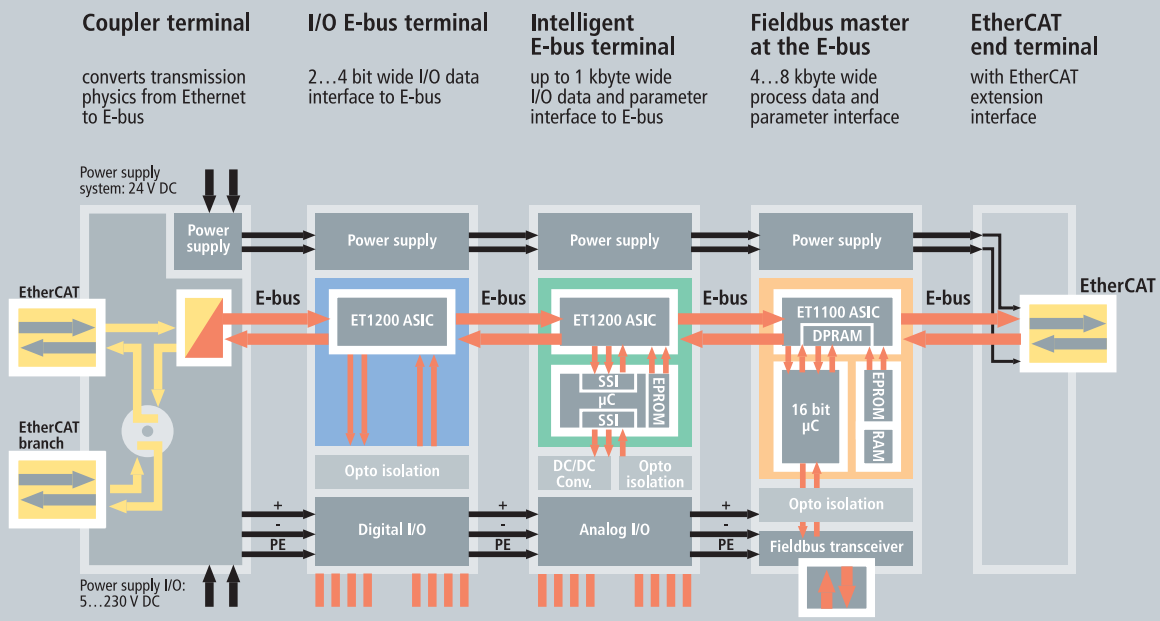
Openness

- fully Ethernet-compatible
- operation with switches and routers possible
- mixed operation with other protocols also possible
- internet technologies (Web server, FTP, etc.)
- compatible with the existing Bus Terminal range
- protocol is published completely
- EtherCAT is IEC, ISO and SEMI standard.

EtherCAT Technology Group

- international pool of companies
- includes users and manufactures
- supports technology development
- ensures interoperability
- integration and development of device profiles

We reserve the right to make technical changes.



Protocol processing completely in hardware | Protocol ASICs flexibly configurable. Process interface from 1 bit to 64 kbyte.

Ethernet for Control Automation Technology

Real-time Ethernet: Ultra high-speed right up to the terminal

Outstanding performance, flexible topology and simple configuration characterise EtherCAT (Ethernet for Control Automation Technology), the real-time Ethernet technology from Beckhoff. EtherCAT sets standards where conventional fieldbus systems reach their limits: 1000 distributed I/Os in 30 µs, almost unlimited network size, and optimum vertical integration thanks to Ethernet and Internet technologies. With EtherCAT, the costly Ethernet star topology can be replaced with a simple line or tree structure – no expensive infrastructure components are required. All types of Ethernet devices can be integrated via a switch port.

Where other real-time Ethernet approaches require special master hardware or scanner cards, EtherCAT manages with very cost-effective standard Ethernet interface cards in the master.

Principle of operation

There are many different approaches that try to provide real-time capability for Ethernet: for example, the CSMA/CD access procedure is disabled via higher level protocol layers and replaced by time slicing or polling. Other propositions use special switches that distribute Ethernet telegrams in a precisely controlled timely manner. While these solutions are able to transport data packets more or less quickly and accurately to the connected Ethernet node, bandwidth utilisation is very poor, particularly for typical automation devices, since even for very small data quantities a complete Ethernet frame has to be sent. Moreover, the times required for the redirection to the outputs or drive controllers and for reading the input data strongly depend on the implementation. A sub-bus is usually also required, particularly in modular I/O systems, which, like the Beckhoff K-bus, may be synchronised and fast, but nevertheless always adds small delays to the communication that cannot be avoided.

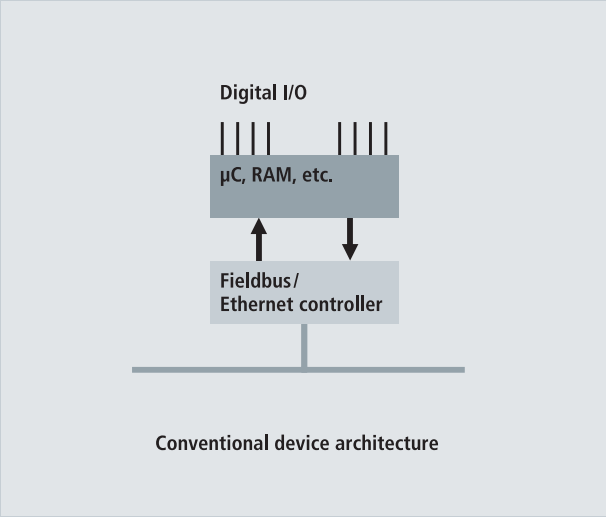
With EtherCAT technology, Beckhoff overcomes these system limitations of other Ethernet solutions: the process no longer involves consecutive steps for receiving and interpreting telegrams and copying the process data. In each device (down to the individual terminals) the EtherCAT Slave Controller reads the data relevant for the device while the frame passes through it. Similarly, input data is inserted into the data stream on the fly. While the frames (delayed by only a few bit times) are already passed on, the slave recognises relevant commands and executes them accordingly. The process is hardware-implemented in the slave controller and is, therefore, independent of the protocol stack software runtimes or the processor power. The last EtherCAT slave in the segment returns the fully processed frame, so that the first slave device forwards it to the master as a kind of response telegram.

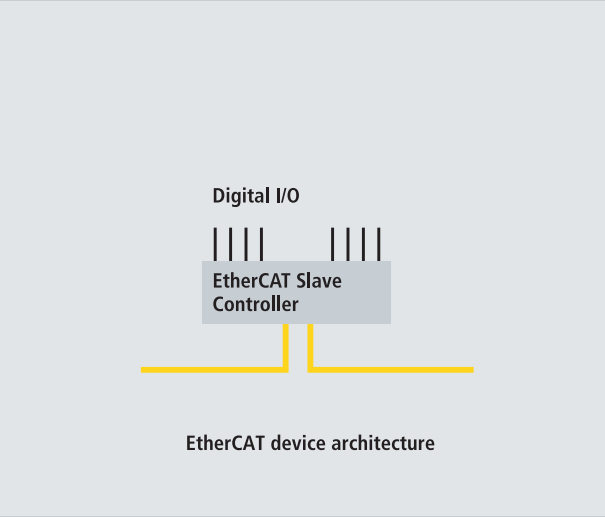
From an Ethernet point of view, an EtherCAT bus segment is simply a single large Ethernet device that receives and sends Ethernet frames. However, the "device" does not contain a single Ethernet controller with downstream microprocessor, but a large number of EtherCAT slaves. Like for any other Ethernet device, direct communication may be established without a switch, thereby creating a pure EtherCAT system.

Ethernet down to the terminal

The Ethernet protocol remains intact right down to the individual devices, i.e. down to the individual terminals; no sub-bus is required. Only the physical layer is converted in the coupler from 100BASE-TX or -FX to E-bus, in order to meet the requirements of the electronic terminal block. The E-bus signal type (LVDS) within the terminal block is nothing proprietary, it is also used for 10 Gbit Ethernet. At the end of the terminal block, the physical bus characteristics are converted back to the 100BASE-TX standard.

The on-board Ethernet MAC is sufficient as hardware in the master device. DMA (direct memory access) is used for data transfer to the main memory. That means that the network data access burden is lifted from the CPU. The same principle is also used in the Beckhoff multiport cards, which bundle up to four Ethernet channels on one PCI slot.





EtherCAT Slave Controller (ESC) | EtherCAT is not only faster outside the I/O device, but also inside. Digital I/Os are directly operated by the EtherCAT Slave Controller, without delays through local firmware and independent of the installed µC performance.

Protocol

The EtherCAT protocol is optimised for process data and is either transported directly in the Ethernet frame or packed into UDP/IP datagrams. The UDP version is used in situations where EtherCAT segments in other subnets are addressed via routers. Ethernet frames may contain several EtherCAT telegrams, with each telegram serving a particular memory area of the logical process image with an addressable size of up to 4 GB. The data sequence is independent of the physical order of the EtherCAT Terminals in the network; addressing can be in any order. Broadcast, Multicast and communication between slaves are possible.

The protocol can also handle parameter communication, which typically is acyclical. The structure and meaning of the parameters is specified via CANopen device profiles, which are available for a wide range of device classes and applications. EtherCAT also supports the SERCOS servo profile according to IEC 61800-7-204.

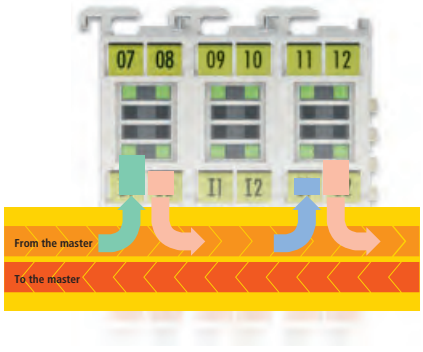
In addition to data exchange according to the master/slave principle, EtherCAT is also very suitable for communication between controllers (master/master). Freely addressable network variables for process data and a variety of services for parameterisation, diagnosis, programming and remote control cover a wide range of requirements. The data interfaces for master/slave and master/master communication are identical.

Performance

EtherCAT reaches new dimensions in network performance. The update time for the data from 1000 distributed inputs/outputs is only 30 µs – including terminal cycle time. Up to 1486 byte of process data can be exchanged with a single Ethernet frame – this is equivalent to almost 12,000 digital inputs and outputs. The transfer of this data quantity only takes 300 µs.

The communication with 100 servo axes takes place every 100 µs. With this cycle time, all axes are provided with set values and control data and report their actual position and status. The distributed clocks technique enables the axes to be synchronised with a jitter of significantly less than 1 microsecond.

The extremely high performance of the EtherCAT technology enables control concepts that could not be realised with classic fieldbus systems. Very fast control loops can thus also be closed via the bus. Functions that previously required dedicated local hardware support can now be mapped in software. The tremendous bandwidth enables status information to be transferred with each data item. With EtherCAT, a communication technology is available that matches the superior computing capacity of modern Industrial PCs. The bus system is no longer the "bottleneck" of the control concept. Distributed I/Os are recorded faster than is possible with most local I/O interfaces.

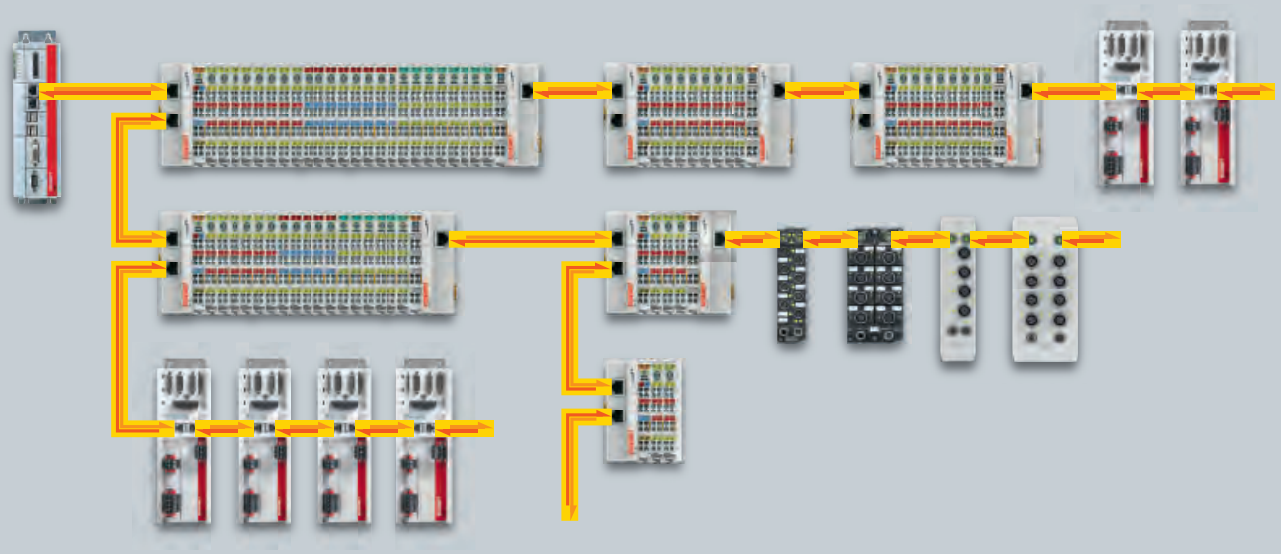


FMMU: telegram processing completely in hardware

The benefits of this network performance also become apparent in smaller controllers with comparatively moderate computing capacity. The EtherCAT cycle is so fast that it can be executed between two control cycles. The controller thus always has the latest input data available; the outputs are addressed with minimum delay. The response behaviour of the controller is improved significantly without increasing the computing capacity itself.

The EtherCAT technology principle is scalable and not bound to the baud rate of 100 Mbaud – extension to Gbit Ethernet is possible.

We reserve the right to make technical changes.



Freedom in the choice of topology | Maximum flexibility for wiring: with or without switch, line or tree topologies can be freely selected and combined. Address assignment is automatic; no IP address setting is required.

EtherCAT instead of PCI

With increasing miniaturisation of the PC components, the physical size of Industrial PCs is increasingly determined by the number of required slots. The bandwidth of Fast Ethernet, together with the data width of the EtherCAT communication hardware (EtherCAT Slave Controller) enables the transfer of PC interfaces to intelligent interface terminals at the EtherCAT system. Apart from the decentralised I/Os, axes and control units, complex systems such as fieldbus masters, fast serial interfaces, gateways and other communication interfaces can be addressed via a single Ethernet port in the PC. Even further Ethernet devices without restriction on protocol variants can be connected via decentralised switch port terminals. The central IPC becomes smaller and therefore more cost-effective, one Ethernet interface is sufficient for the complete communication with the periphery.

Topology

Line, tree or star: EtherCAT supports almost any topology. The bus or line structure known from the fieldbuses thus also becomes available for Ethernet. Particularly useful for system wiring is the combination of lines and branches or stubs. The required interfaces exist on the couplers; no additional switches are required. Naturally, the classic Ethernet star topology with junction terminals can also be used.

Wiring flexibility is further maximised through the choice of different cables. Flexible and inexpensive shielded Industrial Ethernet fieldbus cables transfer the signals in Ethernet mode (100BASE-TX) up to a cable length of 100 m between two devices. The complete bandwidth of the Ethernet network – such as different optical fibres and copper cables – can be used in combination with switches or media converters. For each cable distance, the signal variant can be selected individually. Since up to 65,535 devices can be connected, the size of the network is almost unlimited.

Distributed clocks

Accurate synchronisation is particularly important in cases where spatially distributed processes require simultaneous actions. This may be the case, for example, in applications where several servo axes carry out coordinated movements simultaneously.

The most powerful approach for synchronisation is the accurate alignment of distributed clocks. In contrast to fully synchronous communication, where synchronisation quality suffers immediately in the event of a communication fault, distributed aligned clocks have a high degree of tolerance vis-à-vis possible fault-related delays within the communication system. With EtherCAT, the data exchange is fully based on a pure hardware machine. Since the communication utilises a logical (and thanks to full-duplex Fast Ethernet, also physical) ring structure, the reference clock can determine the runtime offset to the individual local clocks simply and accurately – and vice versa. The distributed clocks are adjusted based on this value, which means that a very precise network-wide timebase with a jitter of significantly less then 1 microsecond is available.

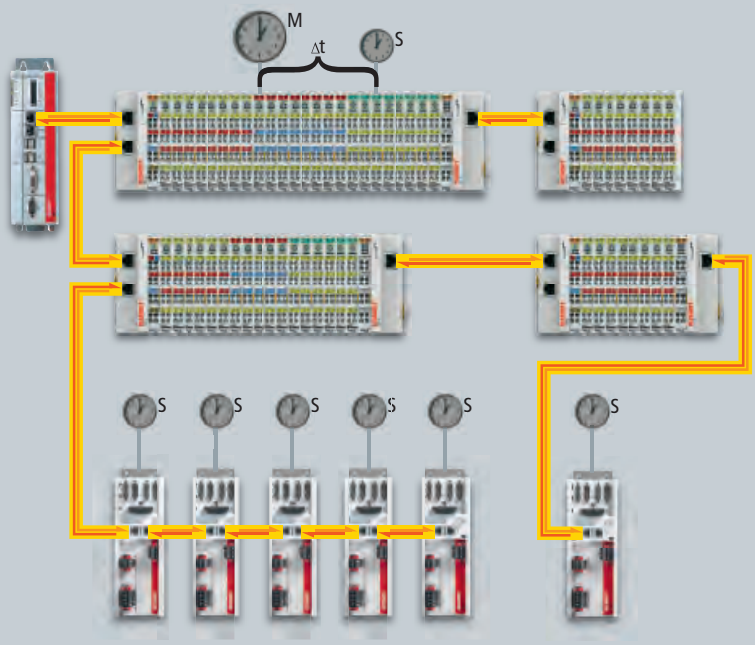
However, high-resolution distributed clocks are not only used for synchronisation, but can also provide accurate information about the local timing of the data acquisition. Thanks to extended data types, very precise timestamps can be assigned to measured values.

Hot Connect

Many applications require a change in I/O configuration during operation. Examples are machining centres with changing, sensor-equipped tool systems or transfer systems with intelligent, flexible workpiece carriers, or printing machines in which individual printing units are switched off. The protocol structure of the EtherCAT system takes account of these requirements: the Hot Connect function enables parts of the network to be linked and decoupled or reconfigured "on the fly", offering flexible response capability for changing configurations.

High availability

Increasing demands in terms of system availability are catered for with optional



Distributed clocks | Local absolute system synchronisation for CPU, I/O and drive units

cable redundancy that enables devices to be changed without having to shut down the network. EtherCAT also supports redundant masters with hot standby functionality. Since the EtherCAT Slave Controllers immediately return the frame automatically if an interruption is encountered, failure of a device does not lead to the complete network being shut down. Dragchain applications, for example, can thus be specifically configured as stubs in order to be prepared for cable break.

Safety over EtherCAT

In the interest of achieving safe data communication with EtherCAT, the Safety over EtherCAT protocol has been created. The protocol meets the requirements of IEC 61508 up to Safety Integrity Level (SIL) 3 and IEC 61784-3, as approved by the German Technical Inspection Agency (TÜV).

EtherCAT is used as a single-channel communication system. The transport medium is regarded as a "black channel" and is not included in the safety considerations. Thus, the protocol can also be transmitted by other communication systems, backplanes, WLAN, etc. The transfer cycle can be as short as required without affecting residual error probability. The cyclic exchange of safe data between a Safety over EtherCAT master and a Safety over EtherCAT slave is referred to as a connection that is monitored via a watchdog timer. A master can establish and monitor several connections to different slaves.

Diagnostics

The diagnostic capability of a network is a crucial factor for availability and commissioning times – and therefore overall costs. Only faults that are detected quickly and accurately and located unambiguously can be rectified quickly. Therefore, special attention was paid to comprehensive diagnostic features during the development of EtherCAT.

During commissioning, the actual configuration of the I/O terminals should be checked for consistency with the specified configuration. The topology should also match the configuration. Due to the built-in topology recognition down to the individual terminals, the verification can not only take place during system start-up, automatic reading in of the network is also possible (configuration upload).

Bit faults during the transfer are reliably detected through evaluation of the CRC checksum in each device. Apart from breaking point detection and localisation, the protocol, transfer physics and topology of the EtherCAT system enable individual quality monitoring of each individual transmission segment. The automatic evaluation of the associated error counters enables precise localisation of critical network sections. Gradual or changing sources of error such as EMC influences, defective connectors or cable damage are detected and located.

EtherCAT components

On the hardware side, EtherCAT technology is located in EtherCAT Terminals, for example. The I/O system in protection class IP 20 is based on the housing of the tried and tested Beckhoff Bus Terminal system. In contrast to Bus Terminals, where the fieldbus protocol data is converted within the Bus Coupler to the internal, fieldbus-independent terminal bus, the EtherCAT protocol remains fully intact down to the individual terminal. In addition to EtherCAT Terminals with E-bus connection, the proven standard Bus Terminals with K-bus connection can also be connected via the BK1120 EtherCAT Bus Coupler. This ensures compatibility and continuity with the prevalent system. Existing and future investments are protected.

EtherCAT is fully integrated into the Beckhoff control architecture. The EtherCAT Box modules feature an integrated EtherCAT interface and can be connected directly to an EtherCAT network without an additional Coupler Box. The EPxxxx series with industrial housing and protection class IP 67 is suitable for application directly at the machine in harsh industrial environments. The EQxxxx series with stainless steel housing and protection class IP 69K is suitable for applications with high hygienic standards, such as in the food, chemical or pharmaceutical industries.

The Beckhoff Industrial PCs, the Embedded PCs of the CX series, the Control Panels

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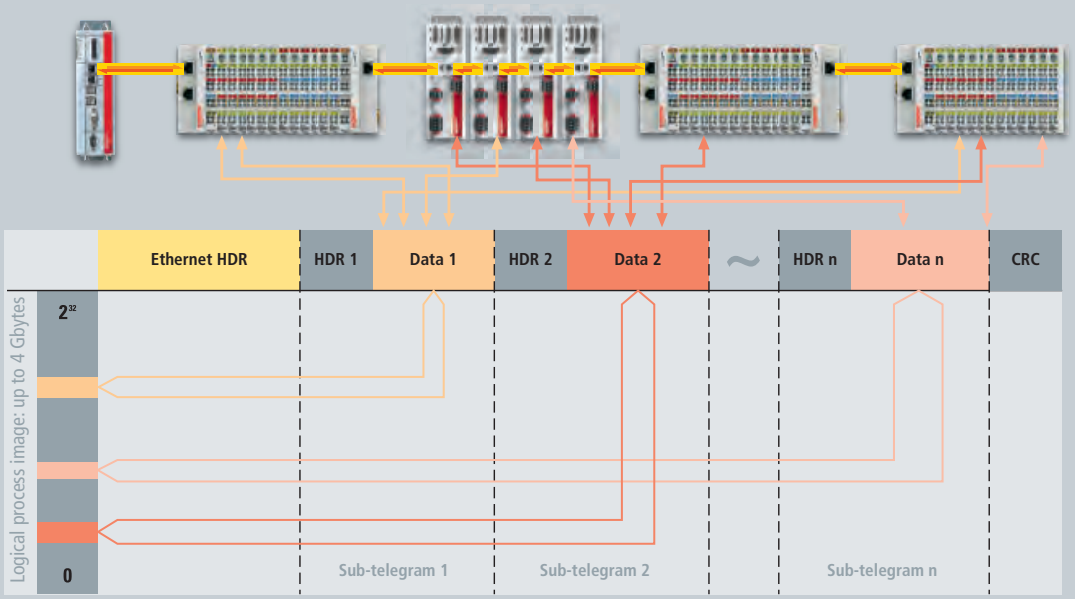


Protocol structure | The process image allocation is freely configurable. Data are copied directly in the I/O terminal to the desired location within the process image: no additional mapping is required. There is a very large address space of 4 Gbytes.

with control functionality, and the Ethernet PCI cards already offer inherent EtherCAT capability. The Beckhoff Servo Drives are also available with EtherCAT interface.

Openness

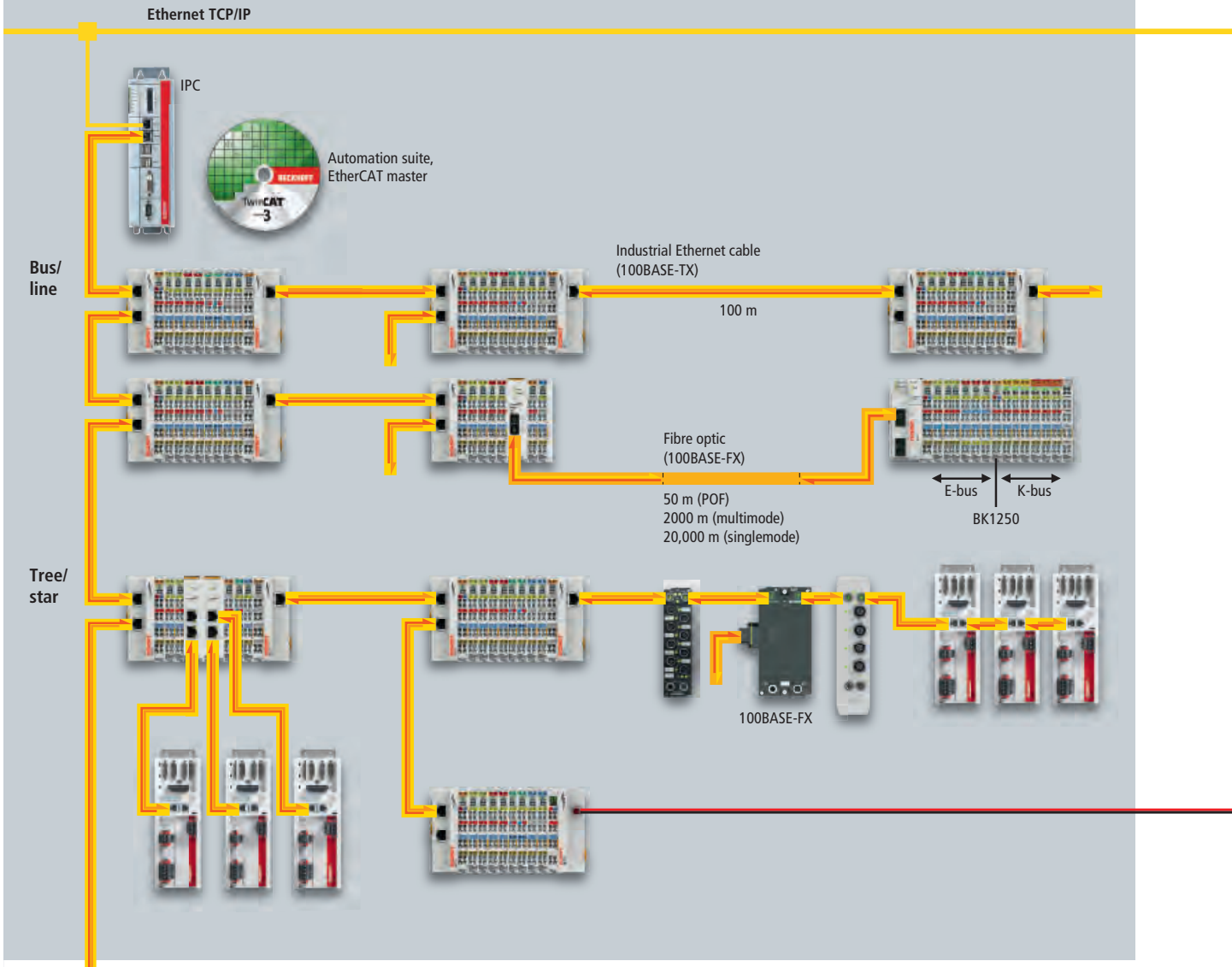
The EtherCAT technology is not only fully Ethernet-compatible, but also characterised by particular openness "by design": the protocol tolerates other Ethernet-based services and protocols on the same physical network – usually only with minimum loss of performance. Any Ethernet device can be connected within the EtherCAT segment via a switch port terminal without influencing the cycle time. Devices with fieldbus interface are integrated via EtherCAT fieldbus master terminals. The UDP protocol variant can be implemented on each socket interface. EtherCAT is a fully open protocol. It is recognised and available as an official IEC specification (IEC 61158, type 12).

EtherCAT Technology Group

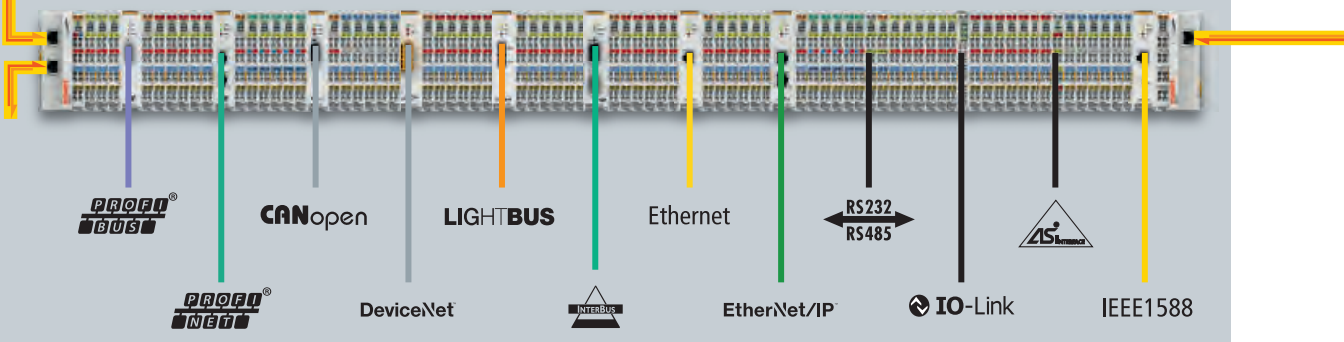
The EtherCAT Technology Group (ETG) is an association of automation users and manufacturers with a mission to support the development of EtherCAT technology. The group represents a variety of industry sectors and application areas. This ensures that the EtherCAT technology functions and interfaces are ideally prepared for the widest range of applications. The organisation ensures that EtherCAT can be easily and cost-effectively integrated in all kinds of automation devices, while ensuring interoperability of these implementations. The EtherCAT Technology Group is the official IEC partner organisation for fieldbus standardisation. Membership is open to all companies.

EtherCAT system overview

Flexible topology



Fieldbus integration



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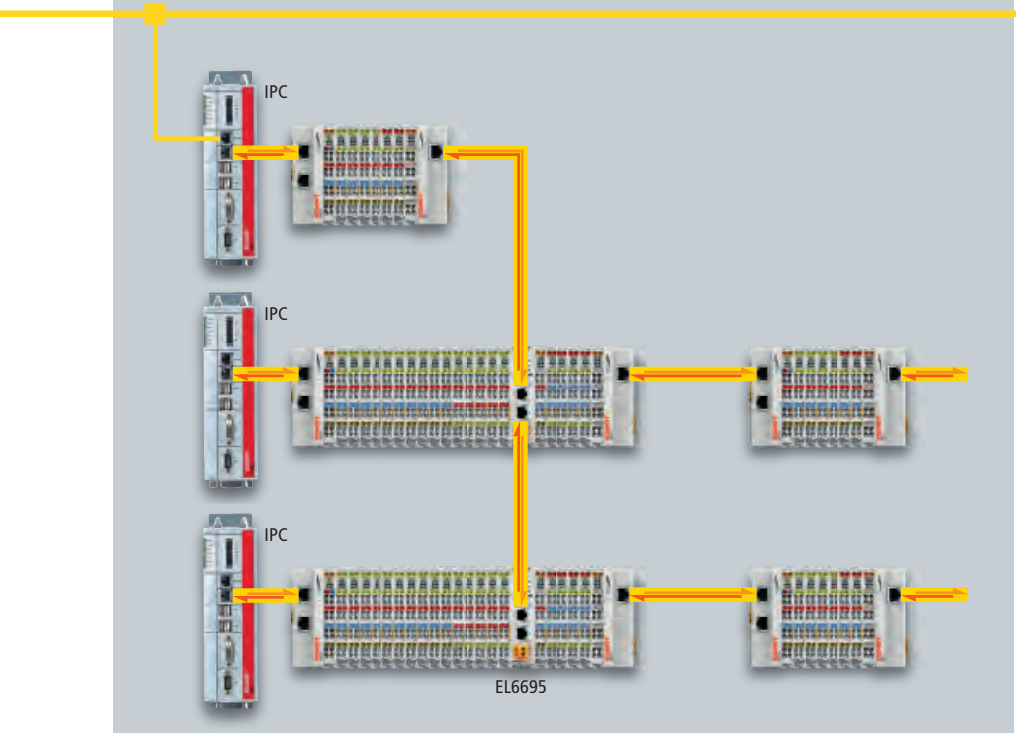
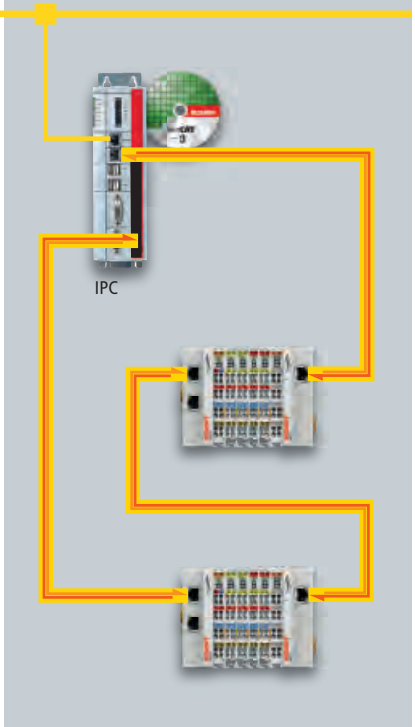
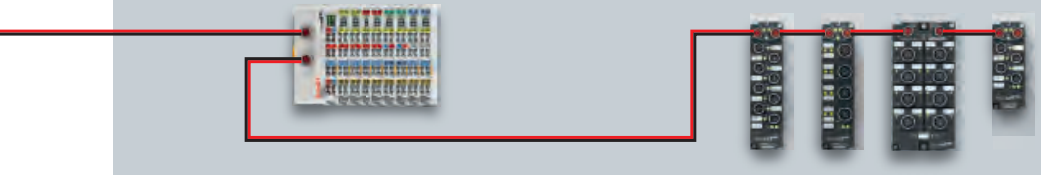
EtherCAT bridge



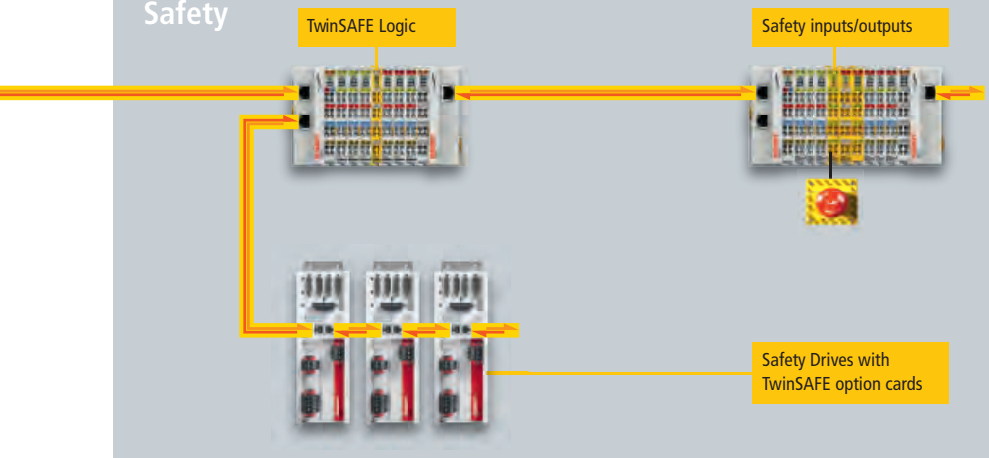
Cable redundancy



EtherCAT P



Safety



EtherCAT P | Ultra-fast communication and power in one cable

▶ **EtherCATP**

The same free and flexible choice of topology well-known from EtherCAT is also available with EtherCAT P.

Minimised installation space in drag chains, control cabinets and machines

Forwarding of power supply in the devices

Outstanding EtherCAT performance at low connection costs

Reduced material and assembly costs

One Cable Connection: EtherCAT + 2 x 24 V DC (U_P, U_S) on just 4 wires

Highly scalable connector family from 24 V DC to 630 V AC/850 V DC

We reserve the right to make technical changes.

EPPxxxx | EtherCAT P products in IP 67

EPPxxxx-06xx | Compact EtherCAT P products in IP 67

EK13xx | EtherCAT P products in IP 20

ENP/ECP | Connector family for all applications

EtherCAT P from Beckhoff extends the EtherCAT technology, which has become an established global standard. The solution combines ultra-fast EtherCAT communication with the 24 V system and peripheral voltage in a single cable, optionally with additional power supply capabilities. This means that with EtherCAT P, One Cable Automation (OCA) can be implemented across the entire field level, enabling plug-and-play connection of machines and other equipment ranging from sensors to drives without the need for control cabinets.

An EtherCAT P line combines 24 V DC supply for connected EtherCAT P slaves, sensors and actuators in a single 4-wire standard Ethernet cable. U_S (system and sensor supply) and U_P (peripheral voltage for actuators) are electrically isolated from each other and can supply current of up to 3 A to the connected components.

EtherCAT P: From 24 V DC sensor to 630 V AC/850 V DC drive

EtherCAT P offers benefits both for connecting remote, smaller I/O stations in terminal boxes and I/O components distributed in the process. A complete connector family was developed, so that the One Cable Automation concept can also be used for connecting components with higher voltage and/or current requirements. The ENP/ECP connector family is designed to cover all applications up to drives with 650 V AC or 850 V DC and up to 64 A.

For higher loads, a compact EtherCAT P element with the same pin assignment as the M8 connector was equipped with additional power pins, resulting in the ENP/ECP connectors B12, B17 and B23 for different performance classes. Featuring a bayonet fitting and IP 67 protection rating, they enable simple, fast and reliable connection directly at the machine and optimised scalability of EtherCAT for the following applications:

- B12 for connecting compact motors with integrated output stages, for up to 48 V DC and 10 A
- B17 for asynchronous motors with frequency converter, for up to 230 V DC and 14 A
- B23 for complete control cabinets, for up to 400 V AC and 30 A

Technical data	EtherCAT P
Voltages	2 x 24 V DC according to IEC 61131 (-15 %/+20 %), max. 3 A each per U_S and U_P
Connectors	Incorrect connections are ruled out with the new EtherCAT-P-coded M8 connector.
Topology	cascadable in all topology variants
Network planning	tool-based calculation of currents and voltages, resulting in optimum design and distribution of feed-in points
Process data	EtherCAT process data scalable from 1 bit…64 kbyte per device
Devices	up to 65,535 devices in one network
Performance	cycle times of < 100 µs, distributed clocks synchronisation << 1 µs, signal sampling with oversampling << 1 µs with n = 1…1000

EtherCAT P simplifies system cabling

The fundamental idea of EtherCAT P is to simplify system wiring by reducing the number of connectors on automation components and devices. The single-cable solution, which is highly scalable according to individual power requirements, can be deployed on the entire field level: A conventional standard Ethernet cable is used for the 24 V range. For higher voltages and currents, EtherCAT P is integrated into the corresponding power cable. For this purpose, Beckhoff offers the ENP/ECP connector family, which includes a comprehensive range of cables and connectors.

Eliminating the need for separate supply cables reduces material costs, installation effort and time, as well as the risks of installation errors. In addition, the installation space required in drag chains, control cabinets and in the machine itself is minimised. Moreover, cable routes become smaller and less cluttered, and the size of sensors and actuators can be reduced. Overall, this opens up significantly more freedom in system design, while minimising material or system costs, which can be further reduced using specific tools for system planning.

EtherCAT P – the ideal sensor, actuator and measurement bus

With EtherCAT P, the U_S and U_P currents are directly fed into the wires of the 100 Mbit/s line, resulting in a very cost-effective and compact connection. This makes EtherCAT P the ideal sensor, actuator and measurement bus, offering benefits for connecting smaller remote I/O stations in terminal boxes as well as I/O components distributed in the process environment. A special M8 connector was developed for this purpose, with mechanical coding that reliably protects against mismating with standard EtherCAT slaves.

To be able to connect components with higher voltage and/or current supply needs, a complete EtherCAT P connector family has been designed: the ECP/ENP connector family covers all applications up to drives with 630 V AC or 850 V DC and 64 A ratings and enables efficient connection of all field level components. For I/O connection, interfaces in IP 20 and IP 67 ratings are available. The system is also suitable for actuators such as AC and DC motors, valve terminals, and sensors, such as proximity switches, light barriers or rotary encoders. Cameras, bar code scanners and 3-D scanners can be integrated for machine vision applications.

EtherCAT P Box modules for all data acquisition requirements

For the 24 V I/O level, a complete range of system and I/O components is already available with IP 67 rating. The entire variety of tried and tested EP Box modules is also available in EPP format with EtherCAT P technology for connecting sensors and actuators. These include different 4-, 8- and 16-channel digital input modules (3.0 ms or 10 µs filter), 4-, 8-, 16- and 24-channel digital output modules (0.5 A or 2 A output current), a wide range of 4-, 8- and 16-channel IP 67 I/Os with combined digital inputs/outputs, as well as serial RS232 and RS422/RS485 interfaces. In addition, there are EPP box modules for analog input and output parameters, e.g. ±10 V/0 to 20 mA, differential/absolute pressure, and data from resistance sensors, thermocouples and incremental encoders.

EtherCAT P topologies are just as freely selectable and customisable as with EtherCAT. The current carrying capacity of 3 A per EtherCAT P segment enables a wide range of sensors/actuators to be used. The following IP 67 infrastructure components can be used for creating the required network structure directly in the field:

- EtherCAT P Box with ID switch (EPP1111)
- EtherCAT P junction with power feed-in (EPP1322), with or without refresh (EPP1332/EPP1342)
- EtherCAT P junction from EtherCAT Box system (EP1312)
- EtherCAT P/EtherCAT connector with power transmission (EPP9001)
- EtherCAT P/EtherCAT connector without power transmission (ZS7000-0005)
- EtherCAT P Box for diagnosing U_S (system and sensor supply) and U_P (peripheral voltage for actuators) (EPP9022)

EtherCAT P Couplers for connecting to the IP 20 world

The IP 20 EK13xx EtherCAT P Couplers enable EtherCAT P to be used all the way through, from the control cabinet right to the machine. The EK1300 Coupler integrates EtherCAT Terminals (ELxxxx) with an EtherCAT P network. The upper EtherCAT P interface is used to connect the coupler to the network, while the lower EtherCAT-P-coded M8 socket is used for optimal continuation of the EtherCAT P topology. Since EtherCAT P integrates power supply and communication on a single line, an additional power supply for the coupler via the terminal points is not required. Depending on the application, the system and sensor supply U_S or the peripheral voltage for actuators U_P can be bridged to the power contacts.

The 2-port EK1322 EtherCAT P junction enables the configuration of EtherCAT P star topologies. The ports can be used to connect individual EtherCAT P devices or whole EtherCAT P segments. The EK1322 can be installed at any point in an EtherCAT segment between the EtherCAT Terminals (ELxxxx). The front terminal points are used for the system and sensor supply U_S, and the peripheral voltage for actuators U_P for the EtherCAT P outputs.

The EK1310 EtherCAT P extension enables conversion from EtherCAT to EtherCAT P or extension of an EtherCAT P network. Terminal points are used for system and sensor supply U_S and the peripheral voltage for actuators U_P for the EtherCAT P output.

EtherCAT P products in IP 67
see page 510

EtherCAT P products in IP 20
see page 338

EtherCAT P accessories
see page 821

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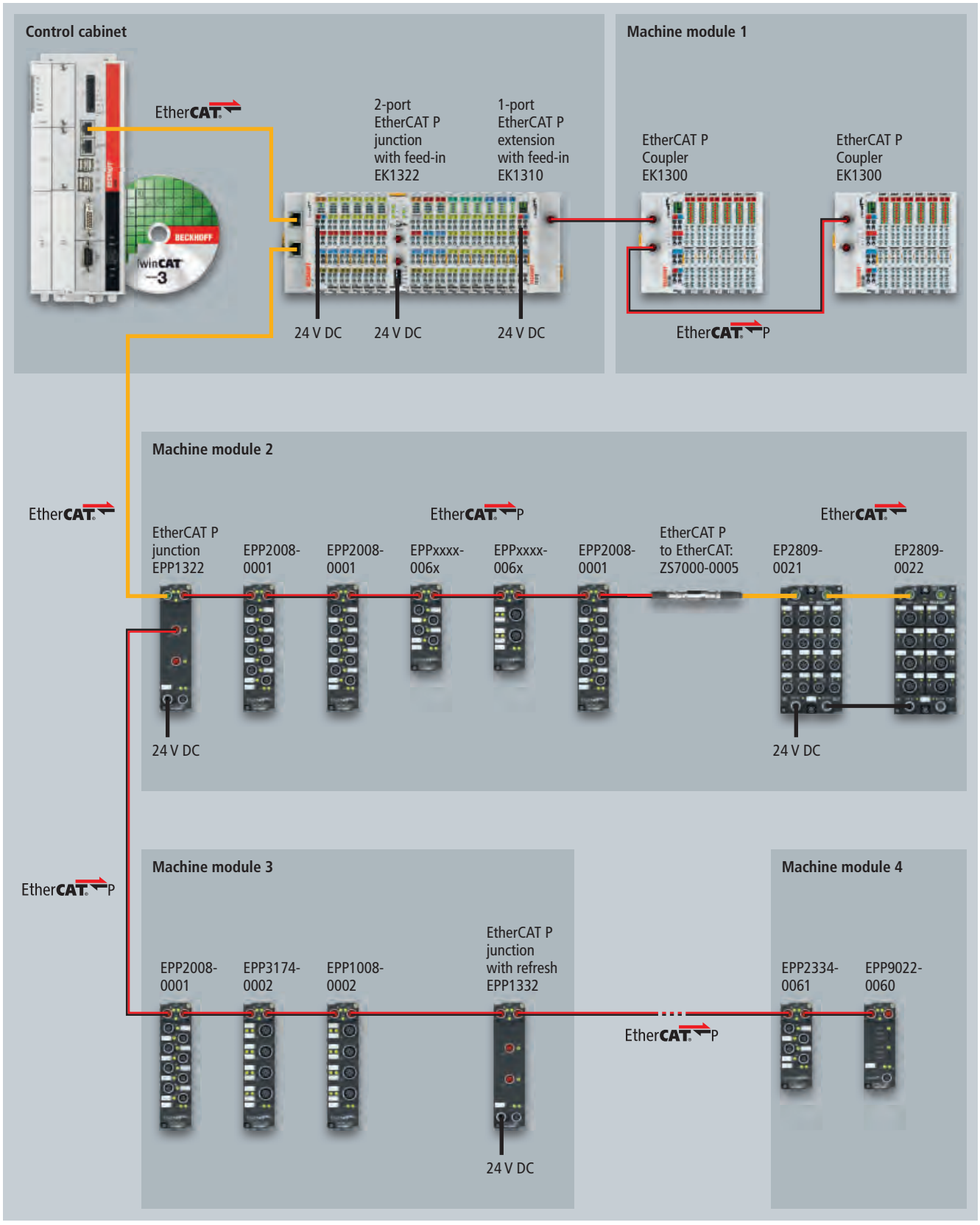
EtherCAT P components

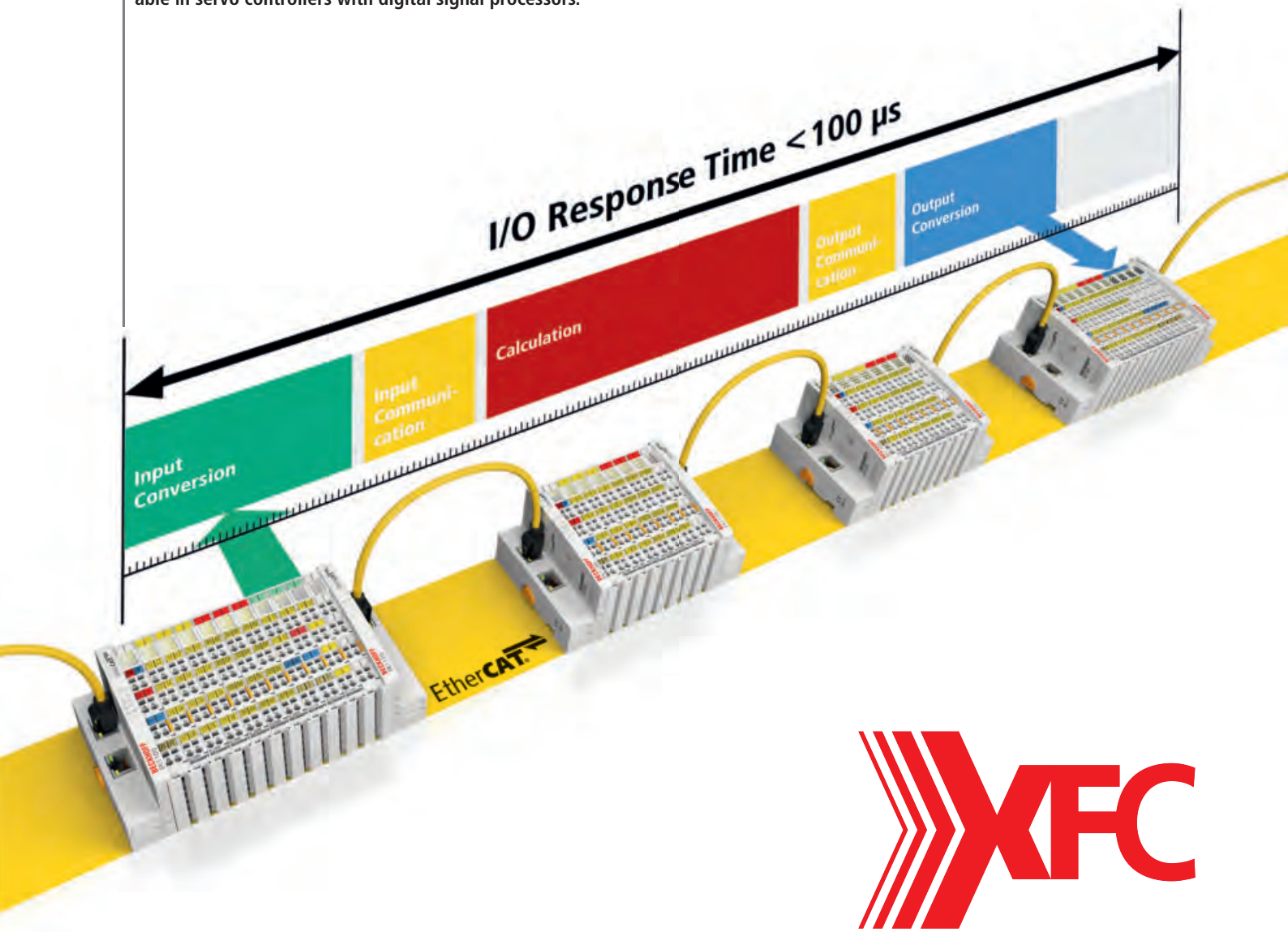


EtherCAT P directly connects different machine modules with power and ultra-fast communication in one cable.

XFC | Higher production efficiency with extremely fast control technology

▶ XFC

The I/O response time includes all hardware processing times (IPC, EtherCAT and I/O system), ranging from physical input event to output response. With an I/O response time of < 100 µs, PLC programmers have access to performance that in the past was only available in servo controllers with digital signal processors.

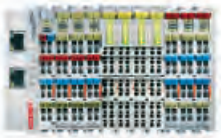


XFC

We reserve the right to make technical changes.

TwinCAT

Industrial PC



Fast I/O

Drive Technology

EtherCAT | Even faster with XFC

With XFC technology (eXtreme Fast Control) Beckhoff presents an ultra fast control solution: XFC is based on optimised control and communication architectures comprising an advanced Industrial PC, ultra-fast I/O terminals with extended real-time characteristics, the EtherCAT high-speed Ethernet system, and the TwinCAT automation software. With XFC it is possible to achieve I/O response times < 100 µs. This technology opens up new process optimisation opportunities for the user that were not possible in the past due to technical limitations.

XFC represents a control technology that enables very fast and highly deterministic responses. It includes all hardware and software components involved in control applications: optimised input and output components that can detect signals with high accuracy or initiate tasks; EtherCAT as very fast communication network; high-performance Industrial PCs; and TwinCAT, the automation software that links all system components.

Not long ago, control cycle times around 10 to 20 ms were normal. The communications interface was free-running, with corresponding inaccuracy of the determinism associated with responses to process signals. The increased availability of high-performance Industrial PC controllers enabled a reduction in cycle times down to 1–2 ms, i.e. by about a factor of 10. Many special control loops could thus be moved to the central machine controller, resulting in cost savings and greater flexibility in the application of intelligent algorithms.

XFC offers a further reduction of response times by a factor of 10, and enables cycle times of 100 µs and below, without having to give up central intelligence and associated high-performance algorithms. XFC also includes additional technologies that not only improve cycle times, but also temporal accuracy and resolution.

Users benefit from options for enhancing the quality of their machines and reducing response times. Measuring tasks such as preventive maintenance measures, monitoring of idle times or documentation of parts quality can simply be integrated in the machine control without additional, costly special devices.

In a practical automation solution, not everything has to be extremely fast and accurate – many tasks can still be handled with "normal" solutions. XFC technology is therefore fully compatible with existing solutions and can be used simultaneously with the same hardware and software.

TwinCAT – The extreme fast real-time control software

- real-time under Microsoft Windows down to 12.5 µs cycle time
- standard IEC 61131-3 programming in XFC real-time tasks
- Standard features of Windows and TwinCAT are XFC-compliant.

EtherCAT – The extreme fast control communication technology

- 1000 distributed digital I/Os in 30 µs
- EtherCAT down to the individual I/O terminals, no sub bus required
- optimised use of standard Ethernet Controllers, e.g. Intel® PC chipset architecture in the EtherCAT master
- advanced real-time feature based on distributed clocks
  - synchronisation
  - timestamping
  - oversampling

EtherCAT Terminals – The extreme fast I/O technology

- full range I/O line for all signal types
- high-speed digital and analog I/Os
- Timestamping and oversampling features allow extreme high timing resolution (down to 10 ns).

IPC – The extreme fast control CPU

- Industrial PC based on high-performance real-time motherboards
- compact form factors optimised for control applications

XFC technologies

Distributed clocks

In a normal, discrete control loop, actual value acquisition occurs at a certain time (input component), the result is transferred to the control system (communication component), the response is calculated (control component), the result is communicated to the set value output module (output component) and issued to the process (controlled system).

The crucial factors for the control process are: minimum response time, deterministic actual value acquisition (i.e. exact temporal calculation must be possible), and corresponding deterministic set value output. At what point in time the communication and calculation occurs in the meantime is irrelevant, as long as the results are available in the output unit in time for the next output, i.e. temporal precision is required in the I/O components, but not in the communication or the calculation unit.

The distributed EtherCAT clocks therefore represent a basic XFC technology and are a general component of EtherCAT communication. All EtherCAT devices have their own local clocks, which are automatically and continuously synchronised with all other clocks via the EtherCAT communication. Different communication runtimes are compensated, so that the maximum deviation between all clocks is generally less than 100 nanoseconds. The current time of the distributed clocks is therefore also referred to as system time, because it is always available across the whole system.

Distributed clocks
- distributed absolute system synchronisation for CPU, I/O and drive devices
- internal sampling 10 ns
- distributed clock precision << 1 µs

Timestamp/multi-timestamp

Process data is usually transferred in its respective data format (e.g. one bit for a digital value or one word for an analog value). The temporal relevance of the process record is therefore inherent in the communication cycle during which the record is transferred. However, this also means that the temporal resolution and accuracy is limited to the communication cycle.

Timestamped data types contain a timestamp in addition to their user data. This timestamp – naturally expressed in the ubiquitous system time – enables provision of temporal information with significantly higher precision for the process record. Timestamps can be used for inputs (e.g. to identify the time of an event occurred) and outputs (e.g. timing of a response). This way it is possible to determine, for example, the precise point in time when an output is to be switched. The switching task is executed independently of the bus cycle.

While timestamp terminals can execute one switching task or switching event per bus cycle, multi-timestamp terminals can execute up to 32 switching tasks or switching events per cycle.

Signal technology for terminals with timestamping (64 bit time resolution)
- extremely precise time measurement for digital single shot events per cycle: resolution 1 ns, internal sampling 10 ns, accuracy with distributed clocks << 1 µs (+ input delay)
- exact time measurement of rising or falling edges of distributed digital inputs
- exact timing of distributed output signals, independent of control cycle
- absolute distributed clocks time with 64 bit resolution, easy time handling over > 580 years

Signal technology for terminals with multi-timestamping (32 bit time resolution)
- precise time measurement of up to 32 events per cycle: resolution 1 ns, internal sampling 10 to 40 µs dependent on the configuration
- exact time measurement of rising or falling edges of distributed digital inputs
- exact timing of distributed output signals, independent of control cycle
- distributed clocks time with 32 bit resolution, sufficient for actions in a ±4-second time frame

We reserve the right to make technical changes.

Oversampling

Process data is usually transferred exactly once per communication cycle. Conversely, the temporal resolution of a process record directly depends on the communication cycle time. Higher temporal resolution is only possible through a reduction in cycle time – with associated practical limits.

Oversampling data types enable multiple sampling of a process record within a communication cycle and subsequent (inputs) or prior (outputs) transfer of all data contained in an array. The oversampling factor describes the number of samples within a communication cycle and is therefore a multiple of one. Sampling rates of 200 kHz can easily be achieved, even with moderate communication cycle times.

Triggering of the sampling within the I/O components is controlled by the local clock (or the global system time), which enables associated temporal relationships between distributed signals across the whole network.

Signal oversampling
- multiple signal conversion within one control cycle
- hard time synchronisation through distributed clocks
- for digital input/output signals
- for analog input/output signals
- support of analog I/O EtherCAT Terminals
  - up to 100 kHz signal conversion
  - down to 10 µs time resolution
- support of digital I/O EtherCAT Terminals
  - up to 1 MHz
  - up to 1 µs time resolution
- application
  - fast signal monitoring
  - fast function generator output
  - signal sampling independent of cycle time
  - fast loop control

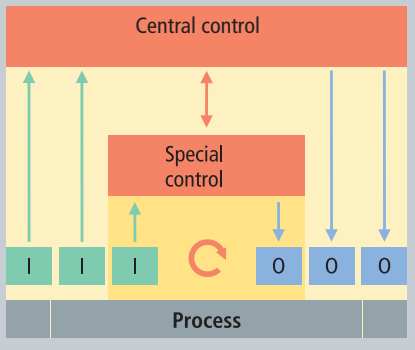
Fast I/O

Very fast physical responses require suitably short control cycle times in the associated control system. A response can only take place once the control system has detected and processed an event.

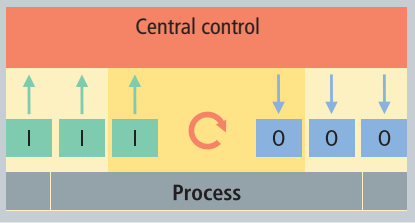
The traditional approach for achieving cycle times in the 100 µs range relies on special separate controllers with their own, directly controlled I/Os. This approach has clear disadvantages, because the separate controller has only very limited information about the overall system and therefore cannot make higher-level decisions. Reparameterisation options (e.g. for new workpieces) are also limited. Another significant disadvantage is the fixed I/O configuration, which generally cannot be expanded.

Extreme fast I/O response time
- from 85 µs
- Deterministic synchronised input and output signal conversion leads to low process timing jitter.
- Process timing jitter is independent of communication and CPU jitter.

Extreme short control cycle time
- 100 µs (min. 12.5 µs)
- new performance class for PLC application: control loops with 100 µs



Subordinate special control (limited process image)



Fast central control (complete process image)

XFC components

Implementation of the XFC technologies described above requires full support for all hardware and software components involved in the control system, including fast, deterministic communication and I/O and control hardware. A significant part of XFC are the software components responsible for fast processing of the control algorithms and optimised configuration of the overall system.

Beckhoff offers a special XFC product range based primarily on four categories: EtherCAT as fieldbus, EtherCAT Terminals as I/O system, IPCs as hardware platform, and TwinCAT as higher-level software. All components are based on open standards, which means that any engineer or programmer can develop very fast control solutions with high performance based on standard components (i.e. without special hardware).

I/O component with XFC technology

Standard EtherCAT Terminals already offer full support for XFC technology. Synchronisation of the I/O conversion with the communication or – more precisely – with the distributed clocks is already standard in EtherCAT and is therefore supported by the corresponding terminals.

XFC terminals offer additional special features that make them particularly suitable for fast or high-precision applications:

- digital EtherCAT Terminals with very short T_{ON}/T_{OFF} times, or analog terminals with particularly short conversion times
- EtherCAT Terminals and EtherCAT Box modules with timestamp/multi-time-stamping latching at the exact system time at which digital or analog events occur. Output of digital or analog values can occur at exactly predefined times.
- Terminals with oversampling enable actual value acquisition or set value output with significantly higher resolution than the communication cycle time.

Communication component – EtherCAT fully utilised

With high communication speed and usable data rates EtherCAT offers the basic prerequisites for XFC. However, speed is not everything. The option of using the bus to exchange several independent process images arranged according to the control application enables parallel application of XFC and standard control technology. The central control system is relieved of time-consuming copying and mapping tasks and can fully utilise the available computing power for the control algorithms.

The distributed EtherCAT clocks that form the temporal backbone of the XFC technologies are available in all communication devices without significant additional effort.

The crucial point of XFC is the option of integrating all I/O components directly in the EtherCAT communication, so that no subordinate communication systems (sub bus) are required. In many XFC terminals the AD or DA converter is connected directly to the EtherCAT chip, so that delays are avoided.

Control component – High-performance Industrial PCs

Central control technology can be particularly advantageous if it can run faster and more powerful control algorithms than would be the case with many distributed small controllers.

Fast multi-core processors are ideal for running the operator interface of the machine in parallel with the control tasks. Large caches available with modern CPUs are ideal for XFC technology, because fast algorithms run in the cache and can therefore be processed even faster.

An important factor for short XFC cycle times is the fact that the CPU is not burdened with complex process data copying tasks needed by traditional fieldbuses with their DPRAM-based central boards. EtherCAT process data communication can be handled entirely by the integrated Ethernet controller (NIC with bus master DMA).

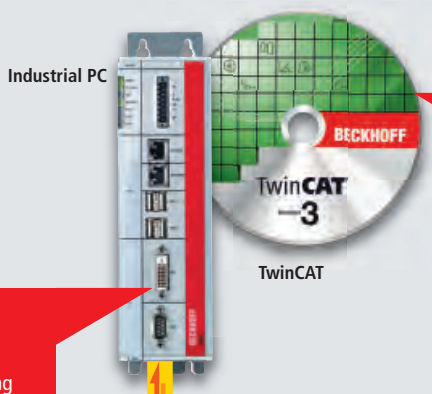
Software component – TwinCAT automation suite

TwinCAT as high-performance automation suite fully supports the XFC technologies while retaining all the familiar features. The real-time implementation of TwinCAT supports different tasks with different cycle times. Modern Industrial PCs can achieve cycle times of 100 µs or less without problem. Several (different) fieldbuses can be mixed. The associated allocations and communication cycles are optimised according to the fieldbus capabilities. The EtherCAT implementation in TwinCAT makes full use of the communication system and enables application of several independent time levels. It uses distributed clocks. Different time levels enable coexistence of XFC and normal control tasks in the same system, without the XFC requirements becoming a "bottleneck".

An option specially designed for XFC enables inputs to be read during independent communication calls and outputs to be sent directly after the calculation. Due to the speed offered by EtherCAT the inputs are read and processed "just" before the start of the control tasks, followed by immediate distribution of the outputs with a second fieldbus cycle. The resulting response times are faster than the fieldbus cycle time in some cases.

Special TwinCAT extensions facilitate handling of the XFC data types (timestamp and oversampling). PLC blocks enable simple analysis and calculation of the timestamps. The TwinCAT scope can display the data picked up via oversampling according to the allocated oversampling factor and enables precise data analyses.

We reserve the right to make technical changes.



XFC

Industrial PC

High-performance Industrial PCs offer plenty of computing power for short XFC cycle times.

XFC

TwinCAT

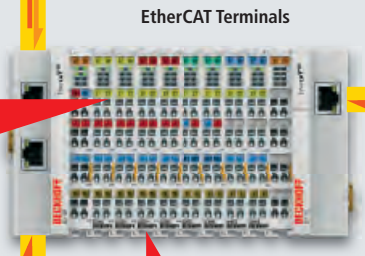
The TwinCAT automation suite supports XFC technology with real-time implementation and extensions for the XFC functions oversampling, timestamp and distributed clocks.

EtherCAT

XFC

Timestamp

Timestamp input/output modules can be used to realise responses with equidistant time intervals.



XFC

Oversampling

Oversampling offers refined temporal resolution of a signal through multiple signal sampling.

XFC

Fast I/O

Fast I/O make delays in the hardware negligible.

XFC

EtherCAT

EtherCAT offers the basis for XFC with an extremely fast communication technology.

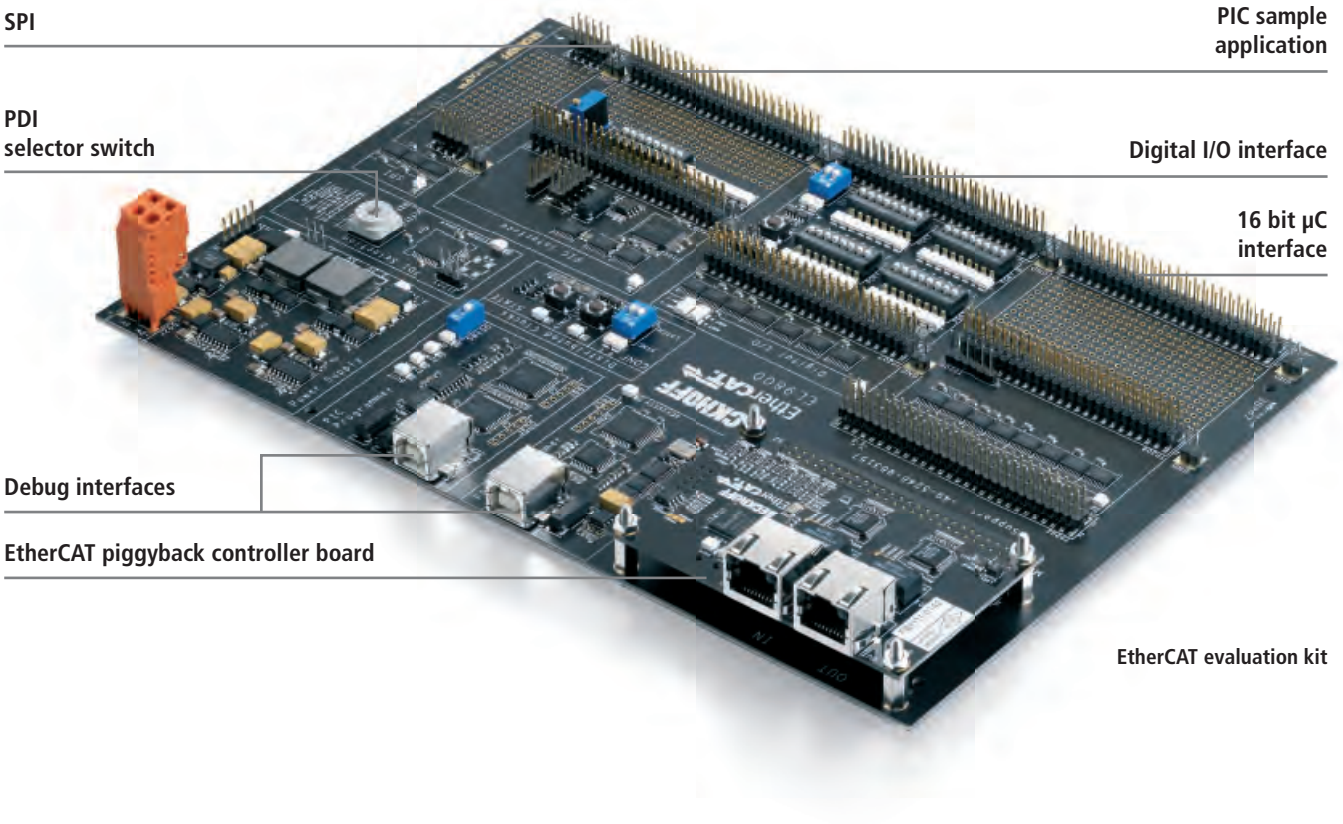
XFC

Drive Technology

The flexible drive interface with short cycle times enables highly dynamic, strictly synchronous control processes covering multiple axes.

EtherCAT | Development Products

▶ EtherCAT-development-products



EtherCAT evaluation kit

We reserve the right to make technical changes.

ET1100, ET1200 | **EtherCAT ASICs**

The ET1100 and ET1200 EtherCAT ASICs offer a cost-effective and compact solution for realising EtherCAT slaves. They process the EtherCAT protocol in the hardware and therefore ensure high-performance and real-time capability, independent of any downstream slave microcontrollers and associated software. Through their three process data interfaces – digital I/O, SPI and 8/16 bit µC (not for ET1200) – the EtherCAT ASICs enable realisation of simple digital modules without microcontrollers and development of intelligent devices with own processor. Both ASICs feature distributed clocks that enable high-precision synchronisation (<< 1 µs) of the EtherCAT slaves. The supply voltage is 3.3 V or 5 V; the core voltage of 2.5 V is generated by the integrated in-phase regulator or can be supplied directly. The ET1100 is suitable as a universal solution for all types of EtherCAT devices; the ET1200 is optimised for modular devices using E-bus/LVDS (Low Voltage Differential Signalling) as internal interface. Due to their compact design and small number of external components, both ASICs only require minimum space on the board.

The ET1100 ASIC housing (BGA128) only measures 10 x 10 mm. The chip can support up to four EtherCAT ports. The 8 kB internal memory (DPRAM) for access to process and parameter data is optionally addressed via parallel or serial data bus. Alternatively, the ASICs can also be used without controller. In this case up to 32 digital signals can be connected directly.

The ET1200 ASIC is the "small" variant of the ET1100; with its QFN48 housing measuring only 7 x 7 mm, the chip is even more compact. The device offers 16 digital I/O interfaces and distributed clock hardware for high-precision synchronisation. The 1 kB internal DPRAM is addressed via a fast (20 Mbit/s) serial interface. The "small ASIC" offers up to three EtherCAT ports, one of which can be used as MII for connecting a standard PHY. The other ports are used for LVDS, which makes the ET1200 the right choice for modular devices using LVDS as internal bus physics.

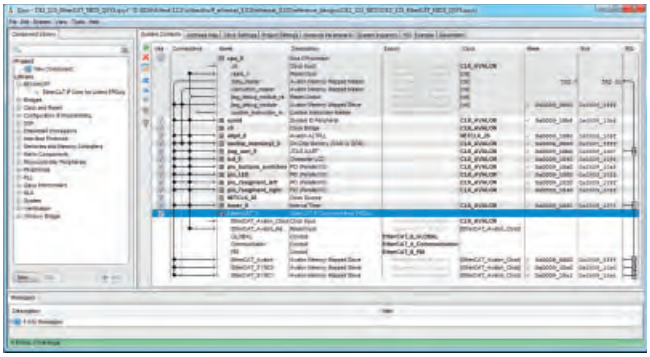
Technical data	ET1100	ET1200
Number of EtherCAT ports	4 (max. 4 x MII)	3 (max. 1 x MII)
FMMUs	8	3
SYNC manager	8	4
DPRAM	8 kbyte	1 kbyte
Distributed clocks	yes (64 bit)	yes (64 bit)
Process data interfaces	32 bit digital I/O	16 bit digital I/O
	SPI	SPI
	8/16 bit µC	–
Housing	BGA128, 10 x 10 mm	QFN48, 7 x 7 mm
Further information	ET1100	ET1200

ET1810, ET1811, ET1812 | **EtherCAT IP core for Altera® FPGAs**

The EtherCAT IP core enables the EtherCAT communication function and application-specific functions to be implemented on an FPGA (Field Programmable Gate Array – i.e. a device containing programmable logical components). The EtherCAT functionality is freely configurable. The IP core can be combined with own FPGA designs, and it can be integrated in System-on-Chips (SoCs) with soft core processors or hard processor systems via the Avalon® or AMBA® AXI™ interfaces. The physical interfaces and internal functions, such as the number of FMMUs and SYNC managers, the size of the DPRAM, etc., are adjustable. The process data interface (PDI) and the distributed clocks are also configurable. The functions are compatible with the EtherCAT specification and the EtherCAT ASICs (ET1100, ET1200).

The ET1811 quantity-based license for Altera® FPGAs offers manufacturers of small lots and development service providers the possibility of entering the world of EtherCAT development with low initial investment. For the development of an EtherCAT device, the ET1811 one-time kick-off charge is required, plus the ET1811-1000 royalty for 1000 devices. The royalties for 1000 devices must be paid in advance each time.

For development service providers only the ET1811 one-time kick-off charge will be required; the ET1811-0030 system integrator OEM license will be required for each customer implementation. The end customer will be required to pay the royalty license (ET1811-1000).



Configurable features	ET1810, ET1811, ET1812
PHY interface	1…3 ports MII, 1…3 ports RGMII or 1…2 ports RMII
FMMUs	0…8
SYNC manager	0…8
DPRAM	0…60 KB
Distributed clocks	0…2 SYNC outputs, 0…2 latch inputs (32/64 bit)
Process data interfaces	32 bit digital I/O, SPI, 8/16 bit asynchronous µC interface, Avalon interface, AMBA AXI3 interface, 64 bit general purpose I/O
Further information	ET1810

Ordering information	
Node-locked buy out license	
ET1810	Node-locked license for using the EtherCAT IP core on one workstation. The license includes 1 year of maintenance and updates.
ET1810-0010	Extension of the node-locked Altera license (ET1810) for one additional workstation
ET1810-0020	One-year maintenance extension for node-locked license (ET1810)
Node-locked quantity-based license	
ET1811	One-time kick-off charge for the node-locked quantity-based license for using the freely configurable EtherCAT IP cores on one workstation
ET1811-1000	Royalty for 1000 devices, ET1811 required
ET1811-0020	One-year maintenance extension, ET1811 required
ET1811-0030	System integrator OEM license
Floating buy out license	
ET1812	Floating buy out license for Altera FPGAs
ET1812-0010	Extension of the floating license (ET1812) for one additional workstation
ET1812-0020	One-year maintenance extension for floating license (ET1812)

Evaluation license (Open Core Plus IP)
Full-featured, time-limited version available. ▶ **ET1810**

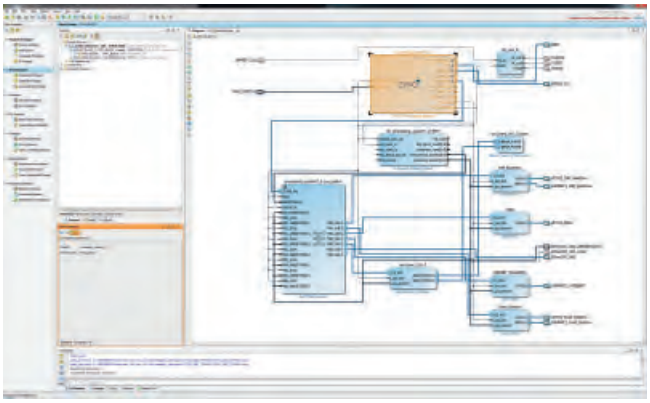
We reserve the right to make technical changes.

ET1815, ET1816 | EtherCAT IP core for Xilinx® FPGAs

The EtherCAT IP core enables the EtherCAT communication function and application-specific functions to be implemented on an FPGA (Field Programmable Gate Array – i.e. a device containing programmable logical components). The EtherCAT functionality is freely configurable. The IP core can be combined with own FPGA designs, and it can be integrated in System-on-Chips (SoCs) with soft core processors or hard processing systems via the AMBA® AXI™ interfaces. The physical interfaces and internal functions, such as the number of FMMUs and SYNC managers, the size of the DPRAM, etc., are adjustable. The process data interface (PDI) and the distributed clocks are also configurable. The functions are compatible with the EtherCAT specification and the EtherCAT ASICs (ET1100, ET1200).

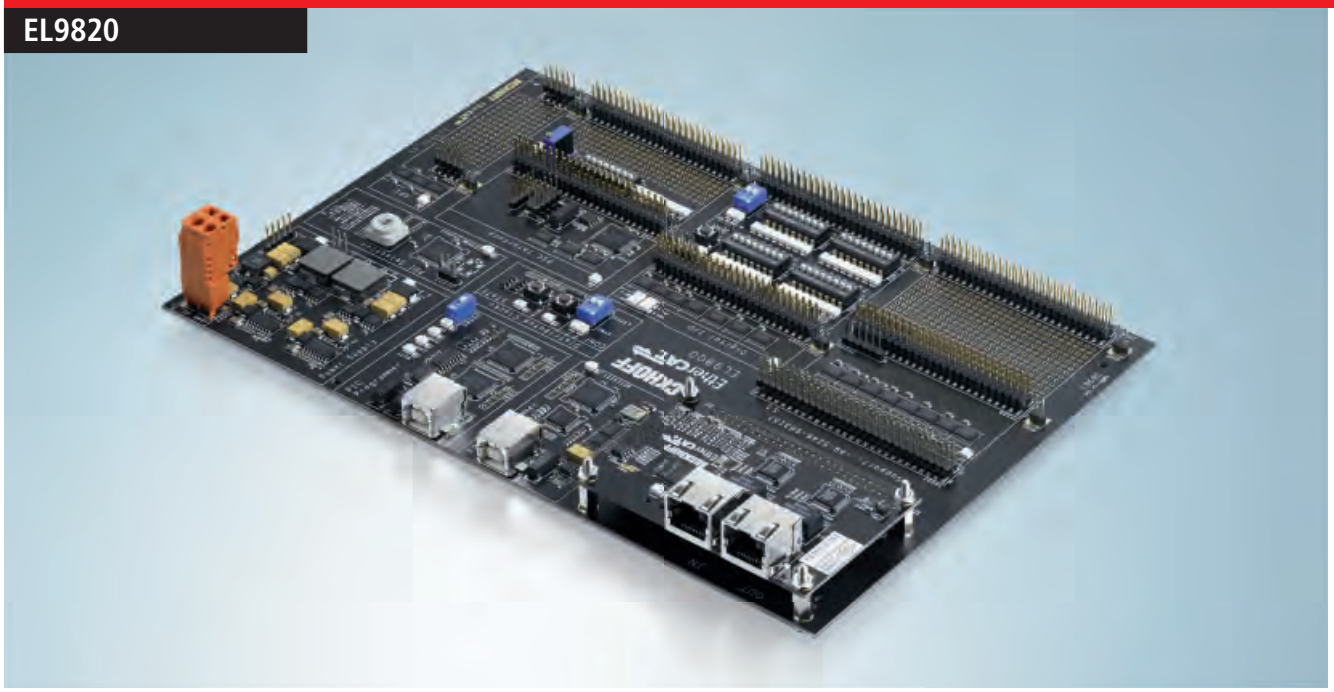
The ET1816 quantity-based license offers manufacturers of small lots and development service providers the possibility of entering the world of EtherCAT development with low initial investment. For the development of an EtherCAT device, the ET1816 one-time kick-off charge is required, plus ET1816-1000 royalty for 1000 devices. The royalties for 1000 devices must be paid in advance each time.

Development service providers only require ET1816 one-time kick-off charge; the ET1811-0030 system integrator OEM license is required for each customer implementation. The end customer requires the royalty license (ET1816-1000).



Configurable features	ET1815, ET1816
PHY interface	1…3 ports MII, 1…3 ports RGMII or 1…2 ports RMII
FMMUs	0…8
SYNC manager	0…8
DPRAM	0…60 KB
Distributed clocks	0…2 SYNC outputs, 0…2 latch inputs (32/64 bit)
Process data interfaces	32 bit digital I/O, SPI, 8/16 bit asynchronous µC interface, AMBA AXI4/AXI4 LITE interface, 64 bit general purpose I/O
Further information	ET1815

Ordering information	
Node-locked buy out license	
ET1815	Node-locked license for using the EtherCAT IP core on one workstation. The license includes 1 year of maintenance and updates.
ET1815-0010	Extension of the node-locked Xilinx license (ET1815) for one additional workstation
ET1815-0020	One-year maintenance extension for node-locked license (ET1815)
Node-locked quantity-based license	
ET1816	One-time kick-off charge for the node-locked quantity-based license for using the freely configurable EtherCAT IP cores on one workstation; target hardware: selected Xilinx devices
ET1816-1000	Royalty for 1000 devices, ET1816 required
ET1816-0020	One-year maintenance extension, ET1816 required
ET1811-0030	System integrator OEM license



EL9820 | EtherCAT evaluation kit

The evaluation kit serves as platform for the development of EtherCAT slaves. The piggyback controller board supplied with the kit realises the complete EtherCAT connection with the ASIC ET1100. All digital I/O, SPI and asynchronous µController process data interfaces (PDIs) are connected to pin strips and can be selected via PDI selector switch. The SPI interface can optionally be connected with a PIC microcontroller included with the kit or directly to the pin strip. A programming and debugging interface for the controller is also provided. The EL9820 can therefore also be used as platform for the ET9300 EtherCAT Slave Stack Code provided with the evaluation kits.

Technical data	EL9820
Evaluation kit	base board
EtherCAT Slave Controller	ASIC ET1100
EtherCAT piggyback controller board	FB1111-0142 with ASIC ET1100
Software	EtherCAT Slave Stack Code ET9300
Accessories	cables, documentation
Workshop	optionally available as TR8100
Further information	EL9820

We reserve the right to make technical changes.

FB1111 | EtherCAT piggyback controller boards

The FB1111 EtherCAT piggyback controller board offers complete EtherCAT connection based on the ET1100 EtherCAT ASIC. All variants of the FB1111 have the same form factor and can be used with the EtherCAT evaluation kit. They can be integrated as EtherCAT interfaces in devices.

Ordering information	
FB1111-0140	EtherCAT piggyback controller board with ET1100 and µC interface; can be integrated as EtherCAT interface in devices.
FB1111-0141	EtherCAT piggyback controller board with ET1100 and SPI interface; can be integrated as EtherCAT interface in devices.
FB1111-0142	EtherCAT piggyback controller board with ET1100 and digital I/O interface; can be integrated as EtherCAT interface in devices; included in the EL9820 evaluation kit.

▶FB1111

ET2000 | Industrial Ethernet multi-channel probe

The ET2000 multi-channel probe from Beckhoff is a versatile piece of hardware for analysing any Industrial Ethernet solution. With eight ports this device enables unlimited synchronised recording of up to four independent channels at a speed of 100 Mbit/s. All real-time Ethernet standards such as EtherCAT, PROFINET, etc. and conventional office Ethernet networks are supported.

Through its compact and rugged design the ET2000 is ideal both for the local application at machines or in the laboratory. The four channels enable recording and analysis of separate networks or different points within the same network. All frames in transit – in both directions – are furnished with a high-precision timestamp in the probe hardware and copied to the Gbit uplink port. The high timestamp resolution of 1 ns enables very precise timing analysis of the connected network segments. The ET2000 probe is transparent for the connected buses. Thanks to the low cycle delay of 1 µs the influence on the system is very small.

The device can be connected to any Gbit Ethernet interfaces on the PC side. A plug-in for the free Wireshark network monitor enables this network monitor to be used for analysing recordings and high-precision timestamps.

Technical data	ET2000
Number of ports/channels	8/4
Uplink port	1 Gbit/s
Delay	approx. 1 µs
Resolution timestamp	1 ns (channel 0/1)
Software interface	WinPcap
Data transfer rates	probe ports: 100 Mbit/s, uplink port: 1 Gbit/s
Hardware diagnosis	link/activity LED per channel, 1 power LED
Power supply	24 (18…30) V DC, 500 mA, 3-pole terminal (+, -, PE)
Dimensions (W x H x D)	approx. 100 mm x 150 mm x 40 mm
Operating temperature	0…+55 °C
Further information	ET2000

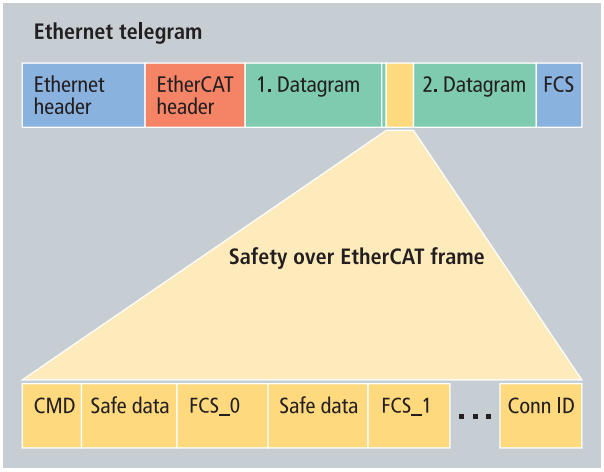
We reserve the right to make technical changes.

Safety over EtherCAT

In the interest of realising safe data communication for EtherCAT, the Safety over EtherCAT protocol has been disclosed. The protocol meets the requirements of IEC 61508 up to Safety Integrity Level (SIL) 3 and of IEC 61784-3, as approved by the TÜV.

EtherCAT is used as a single-channel communication system. The transport medium is regarded as a "black channel" and not included in the safety considerations. Thus, the protocol can also be transmitted by other communication systems, backplanes, WLAN. The cyclic exchange of safe data between a Safety over EtherCAT master and a Safety over EtherCAT slave is referred to as a connection that is monitored via a watchdog timer.

The license for implementation of the Safety over EtherCAT master and slave technology in a device is free of charge.



ET9402 | Safety over EtherCAT Conformance Test Tool

The FSoE Conformance Test Tool (FSoE CTT) enables in-house testing of Safety over EtherCAT (FSoE) slave devices with EtherCAT interface. The utilisation of the ET9402 tool during the development of Safety over EtherCAT devices helps to ensure the conformity and to prepare the device for the official, independent FSoE Conformance Test in an ETG accredited EtherCAT Test Center.

The tool is based on the EtherCAT Conformance Test Tool (ET9400) with extensions regarding to Safety over EtherCAT functionality. A valid subscription of the ET9400 is a prerequisite for the FSoE CTT.

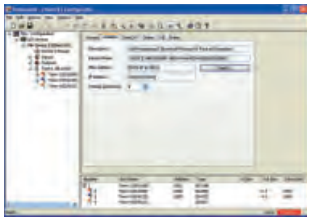
The test includes a complete test set for testing the conformance of FSoE slave devices. The test set is approved by TÜV. According to the Safety over EtherCAT Conformance Test Policy of the EtherCAT Technology Group (ETG), every manufacturer of EtherCAT devices with Safety over EtherCAT is obliged to prove the compatibility of the Safety over EtherCAT implementation by means of the current version of the FSoE tests and the required FSoE Conformance Test Tools.

Ordering information	
ET9402	Safety over EtherCAT Conformance Test Tool – includes a complete test set for testing the conformance of FSoE slave devices – The test set is approved by TÜV. – A valid subscription of the ET9400 is a prerequisite for the FSoE CTT.

▶ET9402

ET9000, ET9200, ET9300 | **EtherCAT development software**

ET9000 | **EtherCAT configurator**



Through clear definition of the interfaces in the EtherCAT specification an EtherCAT master can be developed without having to develop a configurator at the same time. The EtherCAT configurator is aimed at EtherCAT master developers who want to use it or integrate and distribute it with their software package.

The Windows software for configuring an EtherCAT network includes a configurator for:

- reading XML device descriptions (ESI)
- generating XML configuration descriptions (ENI)

Properties

- online features
  - scanning of EtherCAT networks
  - diagnostics
  - free-run online mode for commissioning
- topology representation
- Automation software interface starts the configurator as COM server.
  - COM interface
  - XML interface for parameter exchange between client and server
  - Safety configuration, EL69xx Safety PLC (Safety over EtherCAT)
- including embedded graphical user interface
- EXE file, executable under Windows XP, Vista and Windows 7 (32 bit)

The EtherCAT configurator is not required if the TwinCAT software from Beckhoff is used.

Ordering information	
ET9000	license for using the EtherCAT configurator

▶ET9000

ET9200 | **EtherCAT Master Sample Code**

The EtherCAT Master Sample Code is a user mode Windows application that demonstrates implementation of the EtherCAT master. The TR8200 workshop for EtherCAT master developers is based on the ET9200.

Features

- boot-up and configuration
- sending and receiving of "raw" EtherCAT frames to/from a network adapter
- management of EtherCAT slave states
- reading of XML configuration descriptions
- sending of the initialisation commands that are defined for the different state changes to the slave device
- mailbox communication
- CoE (CAN Application protocol over EtherCAT)
- SoE (Servodrive Profile over EtherCAT)
- EoE (Ethernet over EtherCAT)
- FoE (File Access over EtherCAT)
- AoE (ADS over EtherCAT)
- integrated virtual switch functionality
- cyclical process data communication
- distributed clocks state machine

The software is sent as source code and can be adapted to the hardware environment (Ethernet controller) and integrated in a real-time environment.

Ordering information	
ET9200	license for using the EtherCAT Master Sample Code

▶ET9200

We reserve the right to make technical changes.

ET9300 | **EtherCAT Slave Stack Code**

The EtherCAT Slave Stack Code (SSC) is a code written in ANSI C. Its modular and simple structure enables fast entry into slave development.

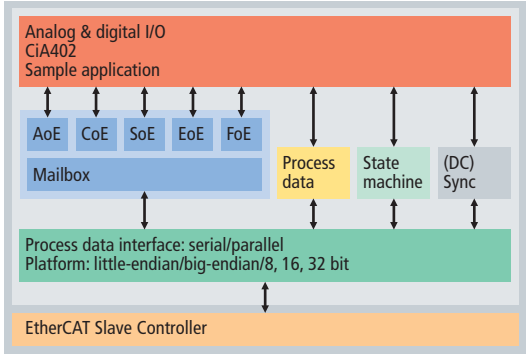
A large number of EtherCAT slaves can be realised with the SSC, from the I/Os to the drives. The stack can be easily adapted to different platforms since it provides a defined hardware access layer and also supports different controller architectures.

The SSC, which has been available since 2004 and has been continously maintained and enhanced in collaboration with the EtherCAT Technology Group, is considered to a certain extent to be the reference for an EtherCAT slave device implementation. Particular attention was paid to the conformity with the protocol specification.

The slave stack code tool provided offers the possibility to generate a slave stack code, device description files (ESI) and individual source code documentation to suit the developer's own needs.

Functionality (excerpt)

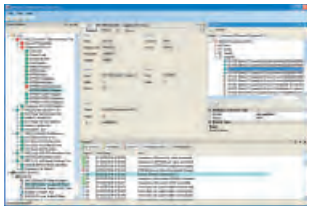
- ESM (EtherCAT State Machine)
- mailbox protocols:
  - CoE (CAN application protocol over EtherCAT)
  - AoE (ADS over EtherCAT)
  - EoE (Ethernet over EtherCAT)
  - FoE (File Transfer over EtherCAT)
  - preparation for SoE (Servo drive profile over EtherCAT)
- preparation for boot loader support
- various synchronisations (e.g. DC), including Sync Watchdog
- example implementation of the CiA402 drive profile according to ETG.6010 specification



Ordering information	
ET9300	license for using the EtherCAT Slave Stack Code (free download from Beckhoff website via Member Area of the EtherCAT Technology Group web page)

▶**ET9300**

ET9400 | **EtherCAT Conformance Test Tool**



The Conformance Test Tool (CTT) enables in-house testing of EtherCAT slave devices. Use of the CTT supports EtherCAT device development, helps to ensure conformance prior to device release and to prepare the device for the official, independent Conformance Test in an EtherCAT Test Center (ETC) accredited by the EtherCAT Technology Group.

The CTT simplifies the development work with many helpful functionalities. Error detection and troubleshooting are supported by comprehensive test log information. The CTT supports the generation of different device configurations (e.g. synchronisation modes or PDO configuration) and their automated tests. Tests can be conducted as long-term tests and thus as communication stress tests, too. Each test is identified individually to enable the assignment of the telegrams in a network capture. All test results can be saved in Excel or CSV for personal documentation.

With the external CU2508 real-time Ethernet port multiplier, any computer can be used for real-time tests, too. That is also the case for tests of devices supporting synchronisation modes with DC.

In addition to many comfortable device configuration functions, the CTT supports an editor for the ESI as well as the EEPROM content (SII) and enables the control of the state machine.

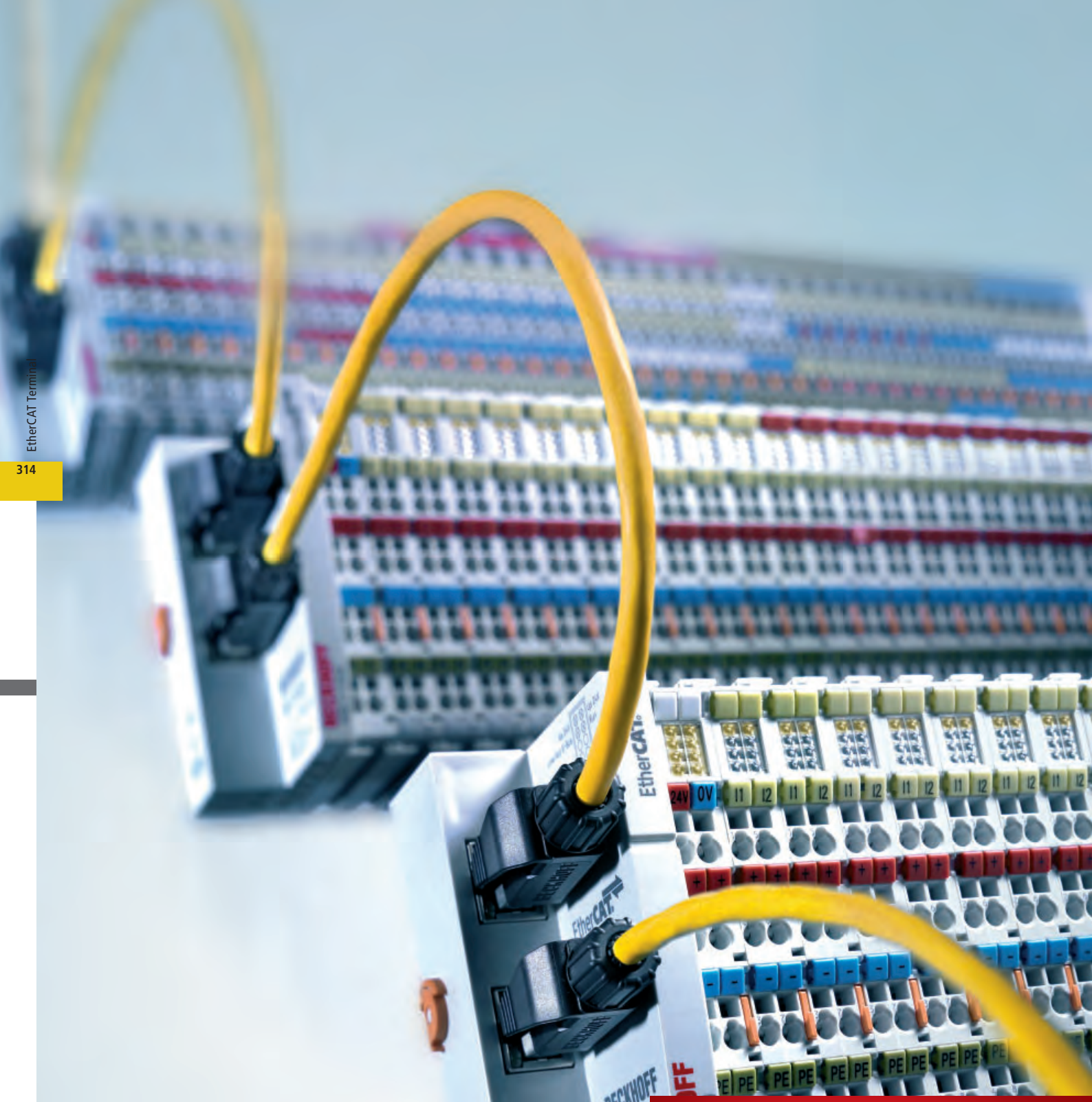
Among others, the delivered tests check:

- consistency and plausibility of the information from CoE object dictionary, SII and ESI
- test of the EtherCAT State Machine (ESM) and Explicit Device Identification methods
- mailbox communication with SoE and CoE
- object dictionary description for different profiles, including CiA402
- FSoE protocol (with existing ET9204 license)

System prerequisites: Standard PC, Windows XP/ Windows 7/Windows 10 (32 or 64 bit), network interface card (100 Mbit/s, together with CU2508: 1000 Mbit/s), CU2508 if applicable.

Ordering information	
ET9400	1-year license for using the EtherCAT Conformance Test Tool

▶**ET9400**



EtherCAT®

Highlights

- IP 20 EtherCAT I/O system
- Real-time Ethernet down to the terminal
- Integration of highly precise measurement technology, drive technology and safety terminals
- Gateways for subordinate fieldbus systems

EtherCAT Terminal

Ultra high-speed communication

▸ EtherCAT-Terminal

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338 EtherCAT P Couplers
339 EtherCAT Couplers K-bus
340 Bus Couplers (for ELxxxx)
337 Extension systems and junctions

342 **EtherCAT Terminals digital I/O**

344 Digital input EL1xxx, ES1xxx
354 Digital output EL2xxx, ES2xxx

372 **EtherCAT Terminals analog I/O**

372 Analog input EL3xxx, ES3xxx
404 Analog output EL4xxx, ES4xxx

412 **EtherCAT Terminals special functions**

412 Position measurement EL5xxx, ES5xxx
417 Communication EL6xxx, ES6xxx
435 Motion terminals EL7xxx, ES7xxx

442 **System terminals**

442 System terminals EL9xxx, ES9xxx

800 **Accessories**

1044 **TwinSAFE**

Product overview EtherCAT Terminals

EtherCAT Couplers

EtherCAT Couplers E-bus	**EK1100** 332	**EK1300** 338 EtherCAT P Coupler	**EK1101** 332 ID switch	**EK1101-0080** 332 ID switch, Fast Hot Connect	**EK1100-0008** 332 M8 connection
	EK1501 334 ID switch, multimode fibre optic	**EK1501-0010** 335 ID switch, singlemode fibre optic	**EK1501-0100** 335 media converter (multimode fibre optic to RJ45), ID switch	**EK1541** 335 ID switch, POF	
EtherCAT Couplers E-bus with integrated digital I/Os	**EK1814** 333 4 inputs + 4 outputs	**EK1818** 333 8 inputs + 4 outputs	**EK1828** 333 4 inputs + 8 outputs	**EK1828-0010** 333 8 outputs	
	EK1914 4 in- + 4 outputs, 332 2 safe inputs + 2 safe outputs	**EK1960** TwinSAFE Compact Controller, 1053 20 safe digital inputs, 10 safe digital outputs			
EtherCAT Couplers K-bus	**BK1120** 339	**BK1150** 339 "Compact"	**BK1250** 339 between E-bus and K-bus terminals		
Bus Couplers (for ELxxxx)	**EK3100** 340 PROFIBUS	**EK9000** 340 Ethernet	**EK9160** 340 IoT	**EK9300** 341 PROFINET RT	**EK9500** 341 EtherNet/IP
	EK9700 341 SERCOS III				
Extension system and junctions	**EK1110** 337 extension end terminal	**EK1310** 338 extension end terminal, EtherCAT P	**EK1122** 337 2-port junction	**EK1322** 338 2-port junction, EtherCAT P	**EK1122-0008** 337 2-port junction, M8
	EK1122-0080 337 2-port junction, Fast Hot Connect	**EK1521** 336 multimode fibre optic junction	**EK1521-0010** 336 singlemode fibre optic junction	**EK1561** 336 POF junction	

Embedded PCs with E-bus interface see page 188, Infrastructure Components see page 738

EtherCAT Terminal | Digital input: EL1xxx/ES1xxx

Signal	2-channel	4-channel		8-channel	16-channel
5/12/24 V DC	**EL1382** 347 24 V DC, thermistor	**EL1124** 351 5 V DC	**EL1144** 351 12 V DC		
24 V DC (filter 3.0 ms)	**EL1002** type 3 346	**EL1004** type 3 345	**EL1004-0020** > 2500 V 345	**EL1008** type 3 344	**EL1809** type 3 345
		EL1104 347 with sensor supply, type 3	**EL1804** 347 8 x 24 V, 4 x 0 V, type 3	**EL1808** 345 8 x 24 V DC, type 3	**EL1862** 347 flat-ribbon cable, type 3
		EL1084 350 negative switching	**EL1024** 346 type 2	**EL1859** type 3, 345 8 inputs, 8 outputs, I_{MAX} = 0.5 A	**EL1862-0010** 350 flat-ribbon cable, negative switching
				EL1088 negative switching 350	**EL1889** negative switching 350
24 V DC (filter 10 µs)	**EL1012** 346 type 3	**EL1014** 345 type 3	**EL1034** 346 potential-free inputs, type 1	**EL1018** 344 type 3	**EL1819** 345 type 3
		EL1114 347 with sensor supply, type 3	**EL1814** 347 8 x 24 V, 4 x 0 V, type 3		**EL1872** 347 flat-ribbon cable, type 3
			EL1094 negative switching 350	**EL1098** negative switching 350	
24 V DC (XFC, T_{ON}/T_{OFF} 1 µs)	**EL1202** fast input, type 3 348			**EL1258** multi-timestamping 349	
	EL1252 timestamp, type 3 348			**EL1259** 8 multi-timestamping inputs and outputs 349	
	EL1262 oversampl., type 3 349				
24 V DC (safe inputs)		**EL1904** 353 TwinSAFE, 4 safe inputs			
48 V DC		**EL1134** filter 10 µs, type 1 351			
120 V AC/DC	**EL1712** power contacts 351				
230 V AC	**EL1702** power contacts 351				
	EL1722 no power contacts 351				
Counter	**EL1502** 352 100 kHz, 32 bit, type 1				
	EL1512 352 1 kHz, 16 bit, type 1				

The standard EtherCAT Terminals (ELxxxx) can be optionally ordered as ESxxxx with pluggable wiring level.

EN 61131-2 specifi cation ▶ **N61131-2**

We reserve the right to make technical changes.

EtherCAT Terminal | Digital output: EL2xxx/ES2xxx, EM2xxx

Signal	2-channel		4-channel	8-channel	16-channel
5 V DC			EL2124 361 I_{MAX} = ±20 mA		
12 V DC			EL2024-0010 361 I_{MAX} = 2.0 A		
24 V DC	EL2042 357 2 x 4 A/1 x 8 A				
24 V DC (I_{MAX} = 0.5 A)	EL2002 354		EL2004 354	EL2008 355	EM2042 D-sub connection 356
			EL2014 with diagnostics 355		EL2872 flat-ribbon cable 355
				EL2808 8 x 0 V 355	EL2809 355
					EL2819 with diagnostics 356
			EL2084 360 negative switching	EL2088 360 negative switching	EL2889 360 negative switching
				EL1859 356 8 inputs, 8 outputs, filter 3.0 ms, type 3	EL2872-0010 360 flat-ribbon cable, negative switching
24 V DC (I_{MAX} = 2.0 A)	EL2022 356		EL2024 357	EL2828 357	
	EL2032 357 with diagnostic		EL2034 357 with diagnostic		
24 V DC (XFC, T_{ON}/T_{OFF} 1 µs)	EL2202 358 push-pull outputs	EL2212 358 overexcitation, multi-timestamping		EL1259 359 8 multi-timestamping inputs and outputs	
	EL2252 359 timestamp	EL2262 359 oversampling		EL2258 359 multi-timestamping	
24 V DC (safe outputs)	EL2901 371 TwinSAFE, 1 safe output	EL2902 371 TwinSAFE, 2 safe outputs	EL2904 371 TwinSAFE, 4 safe outputs		
30 V AC/DC (I_{MAX} = 2.0 A)			EL2784 362	EL2788 363	
			EL2794 363 potential-free	EL2798 363 potential-free	
Relay (up to 230 V AC)	EL2602 368 I_{MAX} = 5.0 A, make contact, power contacts	EL2622 369 I_{MAX} = 5.0 A, make contact, no power contacts	EL2624 369 I_{MAX} = 2.0 A, make contact, no power contacts		
	EL2612 369 I_{MAX} = 2.0 A, change-over, no power contacts	EL2652 369 I_{MAX} = 1.0 A, change-over, no power contacts			
Triac (12…230 V AC)	EL2712 370 I_{MAX} = 0.5 A, power contacts	EL2722 370 I_{MAX} = 1.0 A, mutually locked outputs			
	EL2732 370 I_{MAX} = 0.5 A, no power contacts				
PWM	EL2502 366 24 V DC, I_{MAX} = 0.5 A				
Frequency output	EL2521 365 1-channel AB, 0…500 kHz	EL2522 365 2-channel AB, 1-channel ABC, 0…4 MHz			
Current control	EL2595 367 1-channel, LED constant current terminal	EL2535 367 24 V DC, I_{MAX} = ±50 mA, ±1 A or ±2 A			
		EL2545 367 50 V DC, I_{MAX} = ±3.5 A			

EtherCAT Terminal | Analog input: EL3xxx/ES3xxx

Signal	1-channel	2-channel	4-channel	5-/8-channel
Multi-function	EL3751 387 24 bit, 10 ksps			
±10 V, ±20 mA, NAMUR NE43			EL3174 386 16 bit EL3174-0002 386 16 bit, electrically isolated	
±75 mV, 24 bit		EL3602-0010 375		
±200 mV		EL3602-0002 375		
0…10 V	EL3061 376 12 bit EL3161 377 16 bit	EL3062 376 12 bit EL3162 377 16 bit	EL3064 376 12 bit EL3164 377 16 bit	EL3068 376 12 bit
0…30 V, 12 bit		EL3062-0030 376		
±10 V	EL3001 372 single-ended, 12 bit	EL3002 373 single-ended, 12 bit	EL3004 373 single-ended, 12 bit	EL3008 373 single-ended, 12 bit
	EL3101 374 differential input, 16 bit	EL3102 374 differential input, 16 bit EL3602 375 differential input, 24 bit EL3702 375 differential input, 16 bit, oversampling	EL3104 374 differential input, 16 bit	
0…20 mA	EL3041 378 single-ended, 12 bit EL3141 380 single-ended, 16 bit	EL3042 378 single-ended, 12 bit EL3142 380 single-ended, 16 bit EL3742 381 differential input, 16 bit, oversampling	EL3044 378 single-ended, 12 bit EL3144 380 single-ended, 16 bit	EL3048 378 single-ended, 12 bit
	EL3011 379 differential input, 12 bit EL3111 381 differential input, 16 bit	EL3012 379 differential input, 12 bit EL3112 381 differential input, 16 bit EL3612 381 differential input, 24 bit	EL3014 379 differential input, 12 bit EL3114 381 differential input, 16 bit	
4…20 mA	EL3051 382 single-ended, 12 bit EL3151 384 single-ended, 16 bit	EL3052 382 single-ended, 12 bit EL3152 384 single-ended, 16 bit	EL3054 382 single-ended, 12 bit EL3154 384 single-ended, 16 bit	EL3058 382 single-ended, 12 bit
	EL3021 383 differential input, 12 bit EL3121 385 differential input, 16 bit	EL3022 383 differential input, 12 bit EL3122 385 differential input, 16 bit	EL3024 383 differential input, 12 bit EL3124 385 differential input, 16 bit	
			EL3124-0090 385 TwinSAFE SC, 16 bit	
±10 mA		EL3142-0010 380 single-ended, 16 bit		
Thermo-couple/mV	EL3311 392 16 bit	EL3312 392 16 bit	EL3314 393 16 bit EL3314-0090 393 TwinSAFE SC, 16 bit	EL3318 393 16 bit
Resistance thermometer (RTD)	EL3201 390 16 bit	EL3202 391 16 bit	EL3204 389 2-wire, 16 bit EL3214 389 3-wire, 16 bit	EL3208 389 16 bit
			EL3204-0200 389 16 bit, parameterisable EL3214-0090 389 TwinSAFE SC, 16 bit	
Resistor bridge	EL3351 396 EL3356 397 self-calibration			
3-phase power measurement		EL3403 398 500 V AC, 1 A EL3413 399 690 V AC, 5 A EL3433 399 500 V AC, 10 A		
Measurement technology/ Condition Monitoring	EL3681 400 digital multimeter terminal, 18 bit	EL3632 394 IEPE terminal, acceleration sensors EL3692 395 resistance measurement, 10 mΩ…10 MΩ EL3773 399 power monitoring		EL3255 401 potentiometer measurement, 5-channel
Pressure measuring	EM3701 402 differential pressure measuring, -100…+100 hPa	EM3702 403 relative pressure measuring, 7500 hPa EM3712 403 relative pressure measuring, -1000…+1000 hPa		

The standard EtherCAT Terminals (ELxxxx) can be optionally ordered as ESxxxx with pluggable wiring level.

We reserve the right to make technical changes.

EtherCAT Terminal | Analog output: EL4xxx/ES4xxx

Signal	1-channel	2-channel	4-channel	8-channel
0…10 V	EL4001 406 12 bit	EL4002 406 12 bit EL4102 407 16 bit	EL4004 406 12 bit EL4104 407 16 bit	EL4008 406 12 bit
±10 V	EL4031 404 12 bit	EL4032 404 12 bit EL4132 405 16 bit EL4732 405 16 bit, oversampling	EL4034 405 12 bit EL4134 405 16 bit	EL4038 405 12 bit
0…20 mA	EL4011 408 12 bit	EL4012 408 12 bit EL4112 409 16 bit EL4712 409 16 bit, oversampling	EL4014 408 12 bit EL4114 409 16 bit	EL4018 408 12 bit
4…20 mA	EL4021 410 12 bit	EL4022 410 12 bit EL4122 411 16 bit	EL4024 410 12 bit EL4124 411 16 bit	EL4028 410 12 bit
±10 mA		EL4112-0010 409 16 bit		

EtherCAT Terminal | Position measurement: EL/ES5xxx

Signal	1-channel			2-channel
Position measurement	EL5001 412 SSI encoder interface	EL5101 414 differential inputs, RS485, incremental encoder interface	EL5021 415 SinCos encoder interface, 1 V_{PP}	EL5002 412 SSI encoder interface
	EL5001-0011 412 SSI monitor terminal	EL5101-0090 414 incremental encoder interface, TwinSAFE SC	EL5021-0090 415 SinCos encoder interface, 1 V_{PP}, TwinSAFE SC	EL5032 413 EnDat 2.2 interface
	EL5101-0010 414 differential inputs, RS485, incremental encoder interface	EL5101-0011 416 incremental encoder interface, RS422, oversampling	EL5151 415 24 V DC, incremental encoder interface	EL5152 415 24 V DC, incremental encoder interface

EtherCAT Terminal | Communication: EL/ES6xxx

Signal	1-channel			2-channel	4-channel
Communication	**EL6001** 417 RS232, 115.2 kbaud	**EL6021** 417 RS422/RS485, 115.2 kbaud	**EL6080** 420 memory terminal 128 kbyte	**EL6002** 417 RS232, 115.2 kbaud, D-sub	**EL6224** 426 IO-Link master
	EL6090 421 display terminal	**EL6070** 419 license key terminal	**EL6688** 423 IEEE 1588 master/slave	**EL6022** 417 RS422/RS485, 115.2 kbaud, D-sub	**EL6224-0090** 426 IO-Link master, TwinSAFE SC
	EL6601 422 switch port			**EL6692** 424 EtherCAT bridge	**EL6614** 422 switch port
				EL6695 424 EtherCAT bridge, high performance	
Communication (master terminal)	**EL6201** 425 AS-Interface	**EL6631** 427 PROFINET RT	**EL6632** 427 PROFINET IRT		
	EL6652 428 EtherNet/IP	**EL6720** 432 Lightbus	**EL6731** 429 PROFIBUS		
	EL6751 430 CANopen	**EL6752** 431 DeviceNet	**EL6851** 433 DMX		
Communication (slave terminal ELxxxx-0010)	**EL6631-0010** 427 PROFINET RT	**EL6652-0010** 428 EtherNet/IP	**EL6731-0010** 429 PROFIBUS		
	EL6740-0010 432 Interbus	**EL6751-0010** 430 CANopen	**EL6752-0010** 431 DeviceNet		
	EL6851-0010 433 DMX				
Safety	**EL6900** 434 TwinSAFE Logic	**EL6910** 434 TwinSAFE Logic	**EL6930** 434 TwinSAFE/PROFIsafe logic and gateway		

EtherCAT Terminal | Motion: EL/ES7xxx, EM7xxx

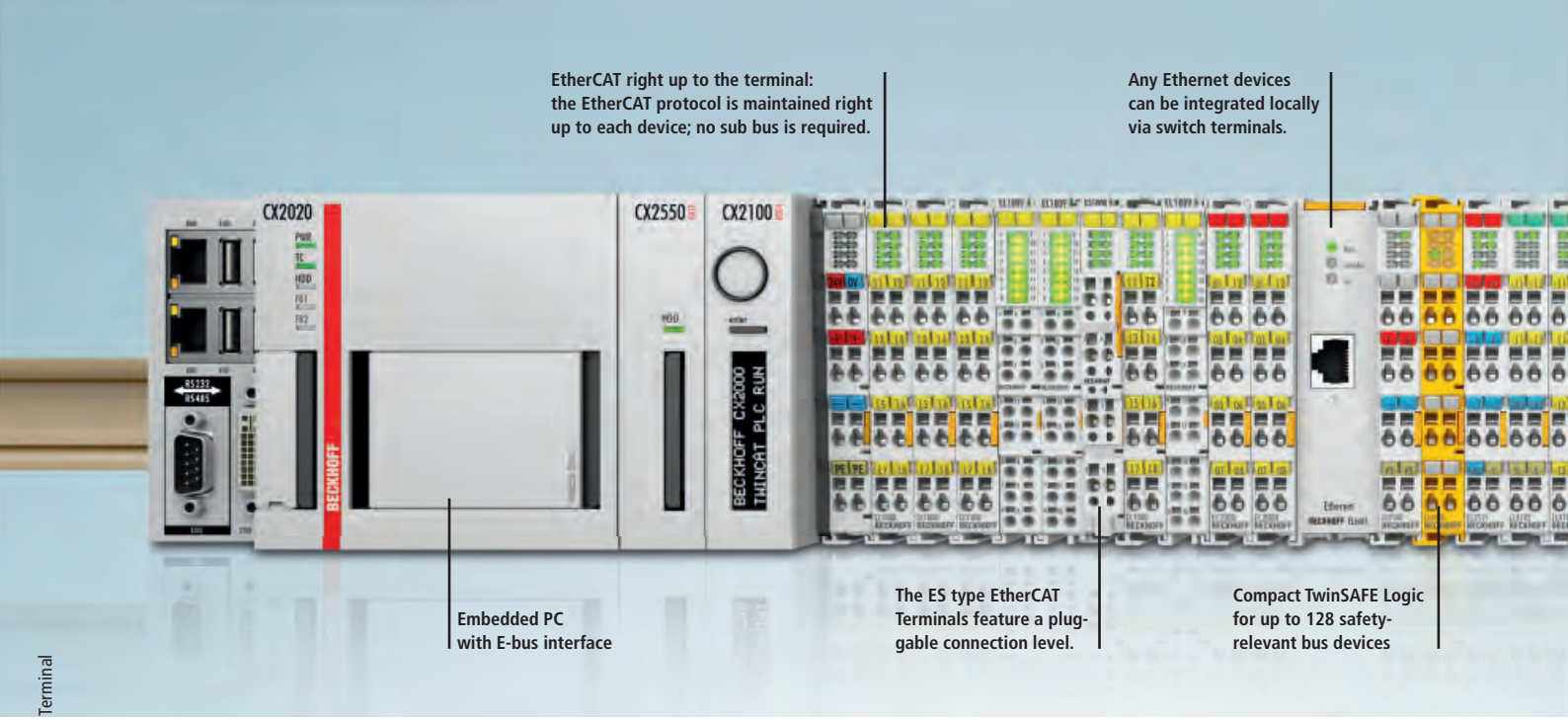
Signal	< 3 A	3…5 A	≥ 5 A
Servomotor	**EL7201-9014** 438 I_{MAX} = 2.8 A_{RMS}, 50 V DC, OCT, STO	**EL7211-9014** 439 I_{MAX} = 4.5 A_{RMS}, 50 V DC, OCT, STO	
	EL7201 439 I_{MAX} = 2.8 A_{RMS}, 50 V DC, resolver	**EL7211** 439 I_{MAX} = 4.5 A_{RMS}, 50 V DC, resolver	
	EL7201-0010 438 I_{MAX} = 2.8 A_{RMS}, 50 V DC, OCT	**EL7211-0010** 439 I_{MAX} = 4.5 A_{RMS}, 50 V DC, OCT	
Stepper motor	**EL7037** 437 I_{MAX} = 1.5 A, 24 V DC, incremental encoder, vector control		**EL7047** 437 I_{MAX} = 5.0 A, 50 V DC, incremental encoder, vector control
	EL7031 437 I_{MAX} = 1.5 A, 24 V DC		**EL7041** 437 I_{MAX} = 5.0 A, 50 V DC, incremental encoder
DC motor output stage	**EL7332** 441 I_{MAX} = 1.0 A, 24 V DC	**EL7342** 441 I_{MAX} = 3.5 A, 50 V DC, incremental encoder	
4-axis interface	**EM7004** 435 4 incremental encoders, 32 digital I/Os 24 V DC, 4 analog outputs ±10 V		

The standard EtherCAT Terminals (ELxxxx) can be optionally ordered as ESxxxx with pluggable wiring level.

We reserve the right to make technical changes.

EtherCAT Terminal | System terminals: EL9xxx/ES9xxx

Signal	System			
Components for system bus	**EL9011** 444 bus end cap	**EL9070** 443 shield terminal	**EL9080** 443 isolation terminal	**EL9195** 443 shield terminal
Potential distribution	**EL9180** 444 2 clamping units per power contact	**EL9181** 445 2 x 8 terminal points	**EL9182** 445 8 x 2 terminal points	**EL9183** 445 1 x 16 terminal points
	EL9184 445 8 x 24 V DC, 8 x 0 V DC	**EL9185** 444 4 clamping units at 2 power contacts	**EL9186** 444 8 x 24 V DC	**EL9187** 445 8 x 0 V DC
	EL9188 445 16 x 24 V DC	**EL9189** 445 16 x 0 V DC		
Potential supply, 24 V DC	**EL9100** 442	**EL9110** 442 diagnostic	**EL9200** 443 with fuse	**EL9210** 443 diagnostic, with fuse
	EL9520 446 AS-Interface potential supply with filter			
Potential supply, 120…230 V AC	**EL9150** 442 with LED	**EL9160** 442 diagnostic	**EL9190** 443	**EL9250** 443 with fuse, with LED
	EL9260 443 diagnostic, with fuse	**EL9290** 443 with fuse		
Power supply	**EL9410** 446 input 24 V DC, output 5 V DC/2 A	**EL9505** 447 input 24 V DC, output 5 V DC/0.5 A	**EL9508** 447 input 24 V DC, output 8 V DC/0.5 A	**EL9510** 447 input 24 V DC, output 10 V DC/0.5 A
	EL9512 447 input 24 V DC, output 12 V DC/0.5 A	**EL9515** 447 input 24 V DC, output 15 V DC/0.5 A	**EL9560** 447 input 24 V DC, output 24 V DC/0.1 A with electrical isolation	447
Filtering and smoothing	**EL9540** 448 surge filter terminal for field supply	**EL9550** 448 surge filter terminal for system/field supply	**EL9576** 449 brake chopper terminal, up to 72 V DC, 155 µF	



Beckhoff EtherCAT Terminals

In analogy to the Beckhoff Bus Terminals, the EtherCAT Terminal system is a modular I/O system consisting of electronic terminal blocks. In contrast to Bus Terminals, where the fieldbus signal is implemented within the Bus Coupler on the internal, fieldbus-independent terminal bus, the EtherCAT protocol remains fully intact down to the individual terminal. In addition to EtherCAT Terminals with E-bus connection, the standard Bus Terminals with K-bus connection can also be connected via the BK1120 or BK1150 EtherCAT Bus Coupler. This ensures compatibility and continuity with the existing system. Existing and future investments are protected.

Structure

The robust housing, secure contacts and the solidly built electronics are prominent features of Beckhoff components. An I/O station consists of an EtherCAT Coupler and almost any number of terminals. Since up to 65,535 devices can be connected, the size of the network is almost unlimited.

The electronic terminal blocks are attached to the EtherCAT Coupler. The contacts are made as the terminal clicks into place, without any other manipulation. This means that each electronic terminal block can be individually exchanged. It can be placed on a standard DIN rail.

Like the Beckhoff Bus Terminals, the outer contour of the EtherCAT Terminals perfectly adapts to the dimensions of terminal boxes. A clearly arranged connection panel with LEDs for status display and push-in contact labels ensures clarity in the field.

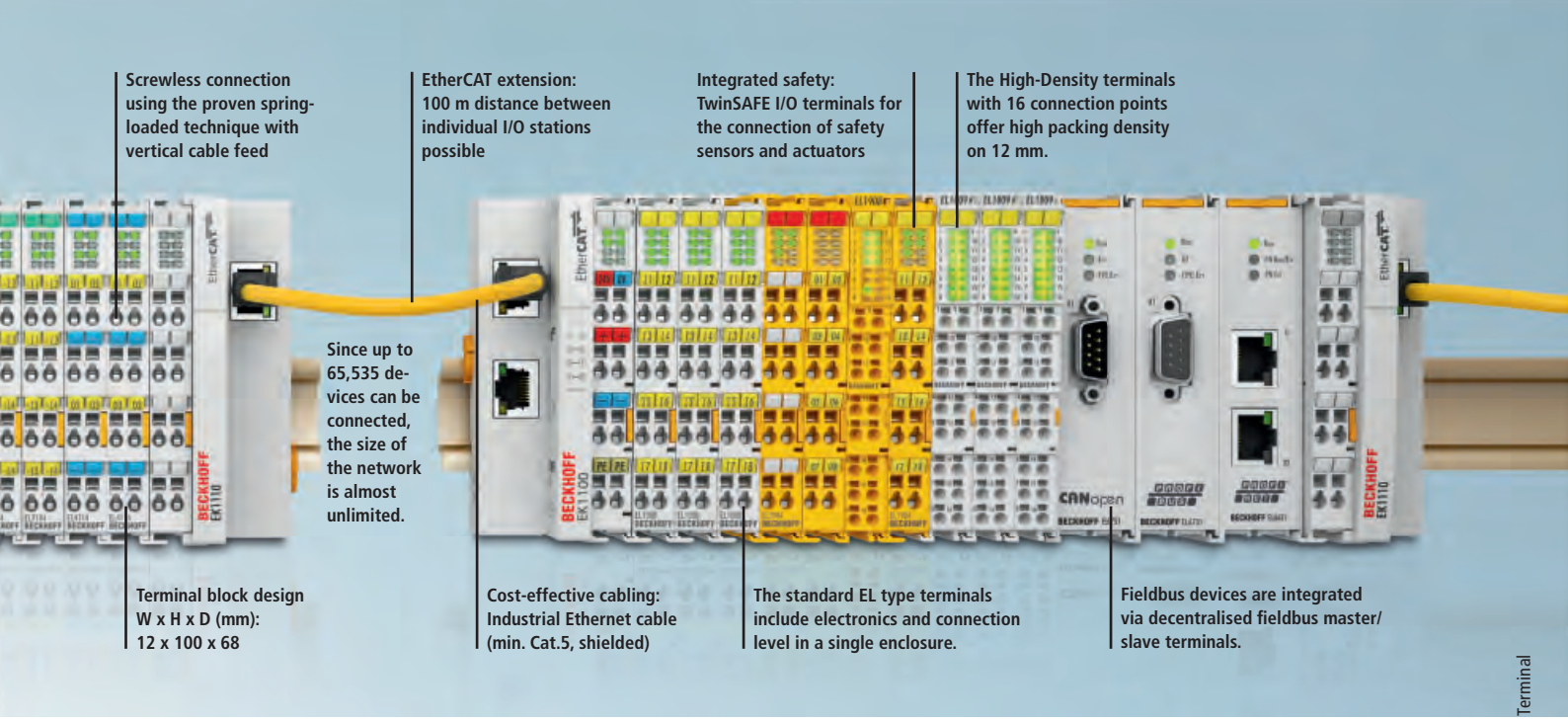
Free mix of signals

Suitable EtherCAT Terminals are available for all common digital and analog signal types encountered in the world of automation. Fieldbus devices, e.g. for PROFIBUS, PROFINET, CANopen, DeviceNet, Interbus, IO-Link or Lightbus, are integrated via local fieldbus master/slave terminals. Removal of the fieldbus master saves PCI slots in the PC. Any Ethernet devices can be integrated locally via switch port terminals.

The fine granularity of the EtherCAT Terminals enables bit-precise composition of the required I/O channels. The digital EtherCAT Terminals are designed as 2-, 4-, 8- or 16-channel terminals. In the 16-channel variant, digital input and output signals are arranged in an ultra-compact way within a standard terminal housing across a width of only 12 mm. The standard analog signals of ±10 V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA are all available as 1-, 2-, 4- and 8-channel variants within a standard housing.

Ethernet down to the terminal | Full duplex Ethernet in the ring, one telegram for many devices, connection directly at the standard Ethernet port.

We reserve the right to make technical changes.



Flexible connection system

The EtherCAT Terminal system offers different connection options for optimum adaptation to the respective application. The ELxxxx EtherCAT Terminals include electronics and connection level in a single enclosure. The ESxxxx type EtherCAT Terminals feature a pluggable connection level. The ES series Bus Terminals enable the complete wiring to be removed as a plug connector from the top of the housing for servicing.

Bus Coupler for the EtherCAT Terminal system

The Bus Couplers from the EKxxxx series connect conventional fieldbus systems to EtherCAT. The ultra-fast, powerful I/O system with its large choice of terminals is now available for other fieldbus and Industrial Ethernet systems. EtherCAT makes a very flexible topology configuration possible. Thanks to the Ethernet physics, long distances can also be bridged without the bus speed being affected. When changing to the field level – without a control cabinet – the IP 67 EtherCAT Box modules (EPxxxx) can also be connected to the EKxxxx. The EKxxxx Bus Couplers are fieldbus slaves and contain an EtherCAT master for the EtherCAT Terminals. The EKxxxx is integrated in exactly the same way as the Bus Couplers from the BKxxxx series via the corresponding fieldbus system configuration tools and the associated configuration files, such as GSD, ESD or GSDML. The TwinCAT-programmable variant is the CX8000 Embedded PC series.

EtherCAT Coupler with integrated I/Os

Beckhoff is consistently continuing the path towards miniaturisation of designs and cost optimisation: tailored to applications with a small number of I/O points and cramped space conditions, the EK18xx and EK19xx EtherCAT Couplers with integrated digital I/Os offer users a precisely dimensioned compact solution.

The EK18xx series includes combinations of digital inputs and outputs. Further digital, analog and Motion EtherCAT Terminals can be attached to the EK18xx Couplers, taking into account the E-bus current consumption. The EK19xx series includes combinations of safe digital inputs and outputs. In conjunction with TwinSAFE – the safety solution from Beckhoff – users have an ultra-compact, space-saving solution available for direct connection of safety-relevant sensors and actuators.

EtherCAT Terminal with standard wiring

HD EtherCAT Terminal (High Density) with 16 terminal points

EtherCAT Terminal with pluggable wiring

EtherCAT topology and system description see page 282
TwinSAFE see page 1044

TwinSAFE SC (TwinSAFE Single Channel)

With the aid of the TwinSAFE SC technology it is possible to make use of standard signals for safety tasks in any network or fieldbus. To do this, EtherCAT Terminals from the areas of analog input, postition measurement or communication (4…20 mA, incremental encoder, IO-Link, etc.) are extended by the TwinSAFE SC function. The data from these extended EtherCAT Terminals is fed to the TwinSAFE Logic, where they undergo safety-related multi-channel processing.

In the Safety Logic the data originating from different sources is analysed, checked for plausibility and submitted to a "voting". This is done by certified function blocks such as Scale, Compare/Voting (1oo2, 2oo3, 3oo5), Limit, etc. For safety reasons, however, at least one of the data sources must be a TwinSAFE SC component. The remainder of the data can originate from other standard Bus Terminals, drive controllers or measuring transducers. In this way, it is possible to use all the process data existing in the system for the safety technology. The TwinSAFE SC technology thus opens up completely new possibilities in the Beckhoff system world and offers a simple, efficient and inexpensive possibility to fully integrate the safety tasks into the existing infrastructure.

With the aid of the TwinSAFE SC technology it is typically possible to achieve a safety level equivalent to PL d/Cat. 3 in accordance with EN ISO 13849-1 or SIL 2 in accordance with EN 62061.

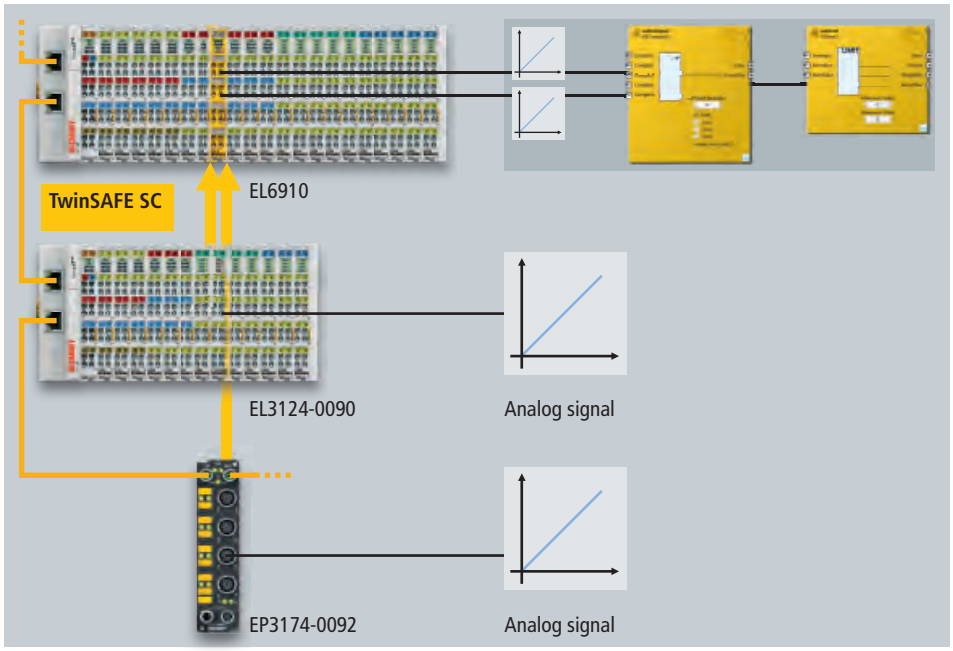
EP3174-0092 | TwinSAFE SC EtherCAT Box, IP 67, 4-channel analog input ±10 V or 0/4…20 mA, see page 491

EL6910 | TwinSAFE Logic see page 434

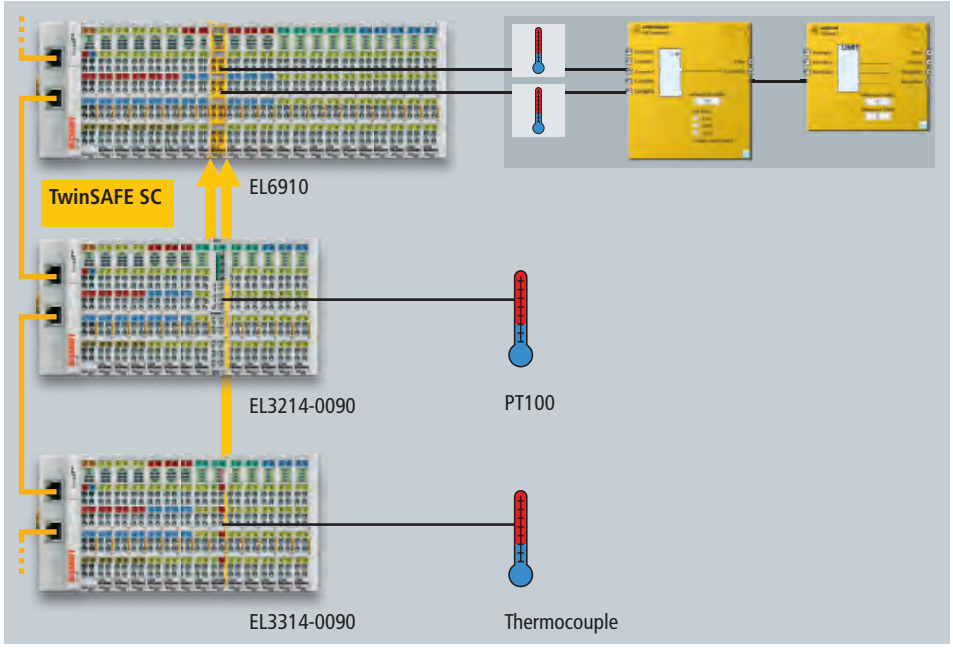
EK1960 | TwinSAFE Compact Controller see page 1044

▶TwinSAFE-SC

We reserve the right to make technical changes.



Safe analog value processing with TwinSAFE SC



Safe temperature monitoring with TwinSAFE SC

Ordering information		
Analog input		
EL3124-0090	EtherCAT Terminal, 4-channel analog input terminal 4…20 mA, differential input, 16 bit, TwinSAFE SC	385
EL3214-0090	EtherCAT Terminal, 4-channel input terminal PT100 (RTD) for 3-wire connection, TwinSAFE SC	389
EL3314-0090	EtherCAT Terminal, 4-channel thermocouple input terminal with open-circuit recognition, TwinSAFE SC	393
EP3174-0092	EtherCAT Box, 4-channel analog input ±10 V or 0/4…20 mA, differential input, 16 bit, TwinSAFE SC	491
Position measurement		
EL5021-0090	EtherCAT Terminal, 1-channel SinCos encoder interface, 1 V_{PP}, TwinSAFE SC	415
EL5101-0090	EtherCAT Terminal, incremental encoder interface, TwinSAFE SC	414
Communication		
EL6224-0090	EtherCAT Terminal, IO-Link terminal, TwinSAFE SC	426

For availability status see Beckhoff website at:

System overview EtherCAT I/O

EK EtherCAT Coupler series

EtherCAT Coupler with integrated digital I/Os

Bus Coupler (e.g. PROFIBUS) for EtherCAT Terminals

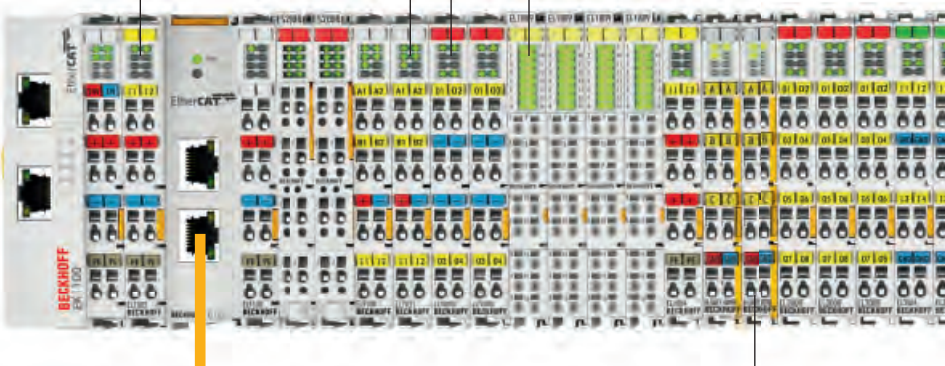
Embedded PC series CX,
further Embedded PCs see page 184

Free mix of signals: more than 200 different EtherCAT Terminals enable connection of all common sensors and actuators.

EtherCAT Terminals in 1-, 2-, 4-, 8- and 16-channel modularity

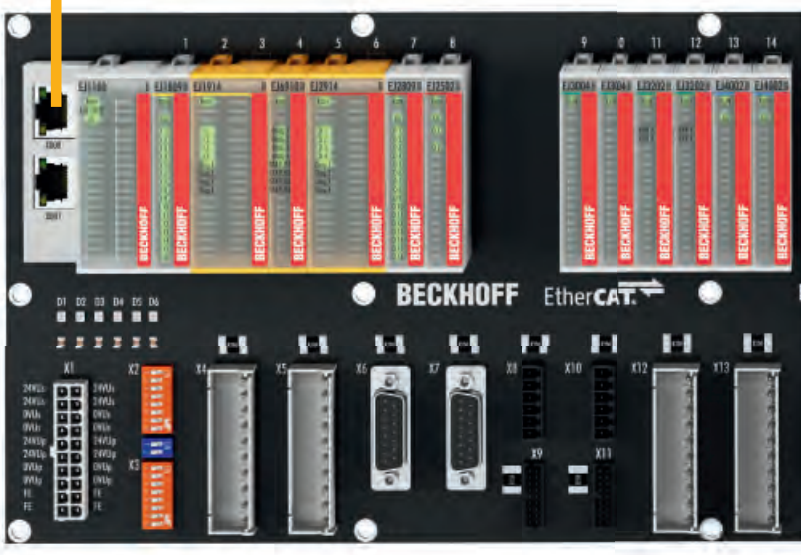
Motion terminals for stepper, servo or DC motors or hydraulic valves

HD EtherCAT Terminals (high-density) with 16 connection points offer high packing density on 12 mm.



100 m Industrial Ethernet cable (100BASE-TX)

With the aid of the TwinSAFE SC technology it is possible to make use of standard signals for safety tasks in any network or fieldbus.



We reserve the right to make technical changes.

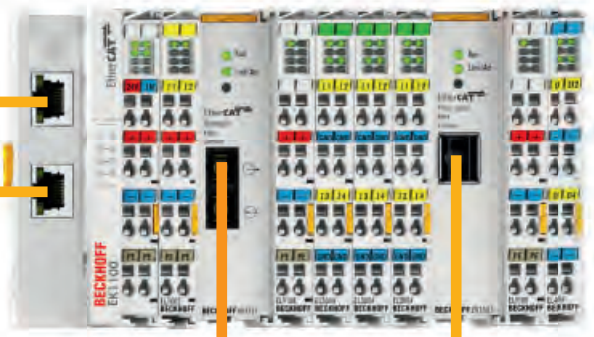
TwinSAFE: safety I/Os and compact Safety PLC for up to 128 safetyrelevant bus devices

Ultra-fast I/O terminals for I/O response times < 100 µs for fast I/O, oversampling and timestamp

Optional fieldbus integration via decentralised field-bus master/slave terminals

High-speed measurement, high-precision measurement, Condition Monitoring, energy monitoring

EtherCAT plug-in modules: very compact EtherCAT I/O system in IP 20 for plug-in into a circuit board (signal distribution board)
see page 550



2000/20,000 m fibre optic (100BASE-FX)

50 m Plastic Optical Fibre (100BASE-FX POF)

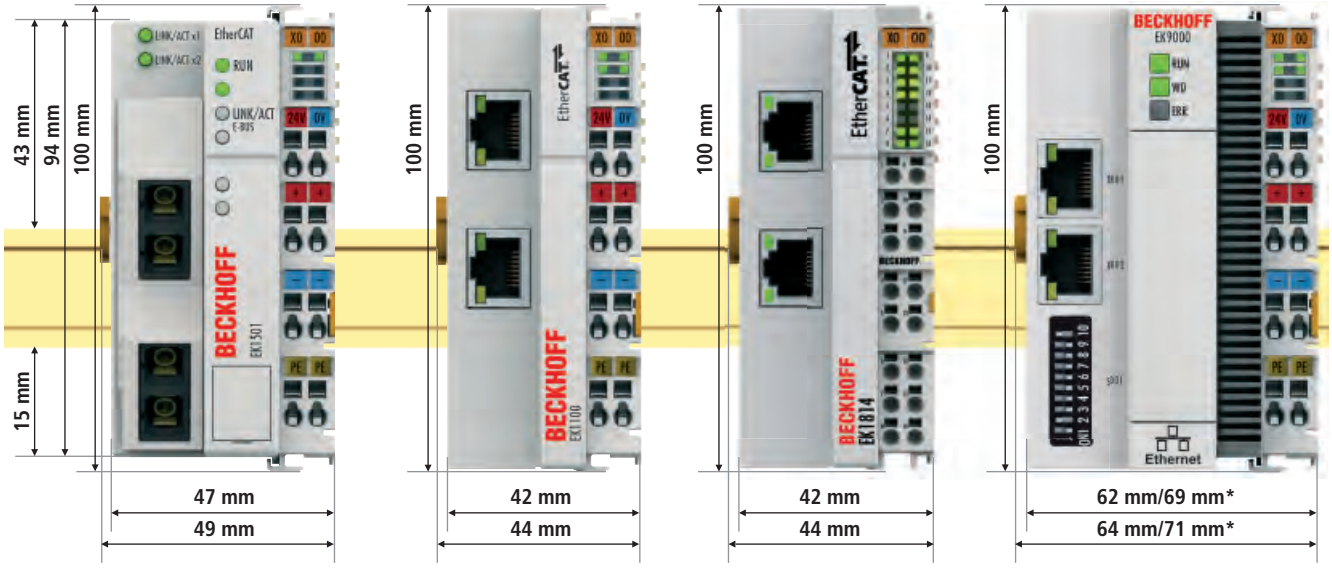
IP 67 EtherCAT Box, further EtherCAT Box modules see page 450

IP 69K EtherCAT Box (stainless steel)

IP 67 EtherCAT Box (die-cast zinc)

Technical data – EtherCAT Coupler housing

The EtherCAT Coupler electronics can be mounted in a variety of housings. A housing has three power contacts, which, if the application requires, automatically implement a continued connection, carrying the potential of the power circuit to the next EtherCAT Terminal. The supply voltage that is connected to the coupler spring-loaded terminals is 24 V DC. If a different voltage is required for the power contacts, the appropriate power feed terminal must be inserted after the coupler.



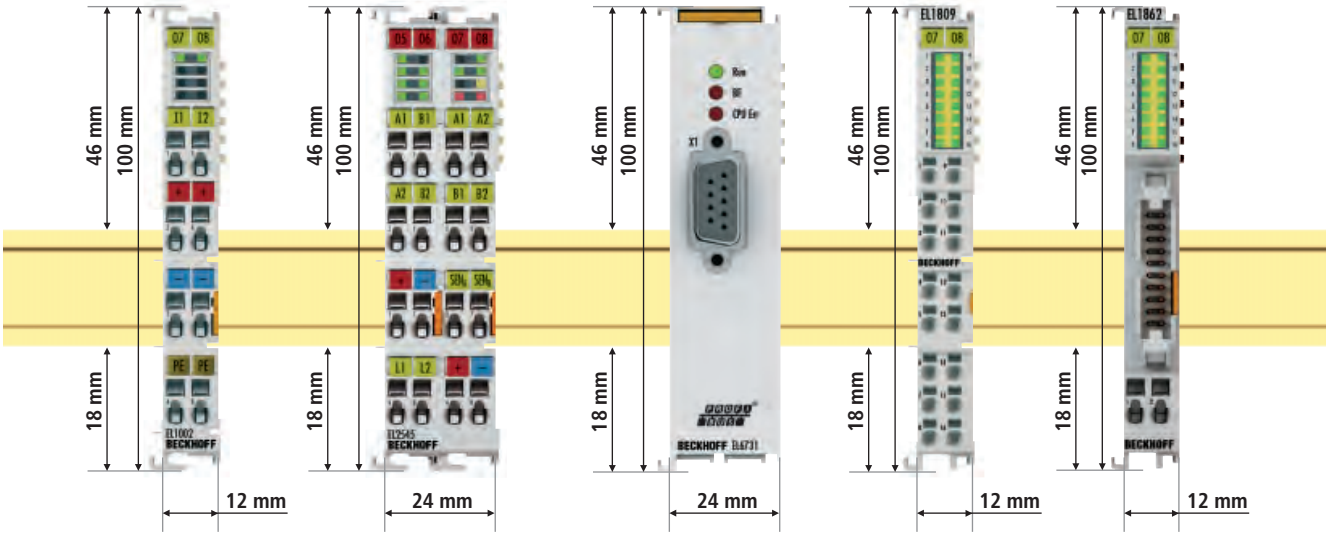
Mechanical data	EK1501, BK1120	EK11xx, EK18xx, EK1914	EK3100, EK9xxx	EK91xx
Design form	compact terminal housing with signal LED			
Material	polycarbonate			
Dimensions (W x H x D)	49 mm x 100 mm x 68 mm	44 mm x 100 mm x 68 mm	64 mm x 100 mm x 73 mm	71 mm x 100 mm x 73 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock			
Side by side mounting by means of	double slot and key connection			
Marking	standard terminal block marking and plain language slides (8 mm x 47 mm)			
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)			
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes			
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4			

Connection	EK1501, BK1120, EK11xx, EK18xx, EK1914, EK3100, EK9xxx, EK91xx
Wiring	spring-loaded technique
Connection cross-section	0.08…2.5 mm², AWG 28-14, stranded wire, solid wire
Stripping length	8…9 mm
Fieldbus connection	depending on fieldbus
Power contacts	3 spring contacts
Current load	I_{MAX}: 10 A (125 A short-circuit)
Nominal voltage	24 V DC

We reserve the right to make technical changes.

Technical data – EtherCAT Terminal housing

The EtherCAT Terminals have different housings. They are available with up to three power contacts and can have a variety of voltages. Care should be taken to ensure that a change in voltage always starts with a power feed terminal.



ELxxxx, ESxxxx, BK1250 | ELxxxx, ESxxxx | EL66xx, EL67xx, EK1122, EK1521 | HD housing | EL1862, ELx872

Mechanical data	ELxxxx, BK1250	EL66xx, EL67xx, EK1122, EK1521	ESxxxx	HD housing	EL1862, ELx872
Design form	compact terminal housing with signal LED	compact terminal housing with signal LED	terminal housing with pluggable wiring level	HD (High Density) housing with signal LED	compact terminal housing with signal LED
Material	polycarbonate				
Dimensions (W x H x D)	12/24 mm x 100 mm x 68 mm	24 mm x 100 mm x 52 mm	12/24 mm x 100 mm x 71 mm	12 mm x 100 mm x 68 mm	12 mm x 100 mm x 68 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock				
Side by side mounting by means of	double slot and key connection				
Marking	standard terminal block marking	–	standard terminal block marking	–	standard terminal block marking
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)				
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				

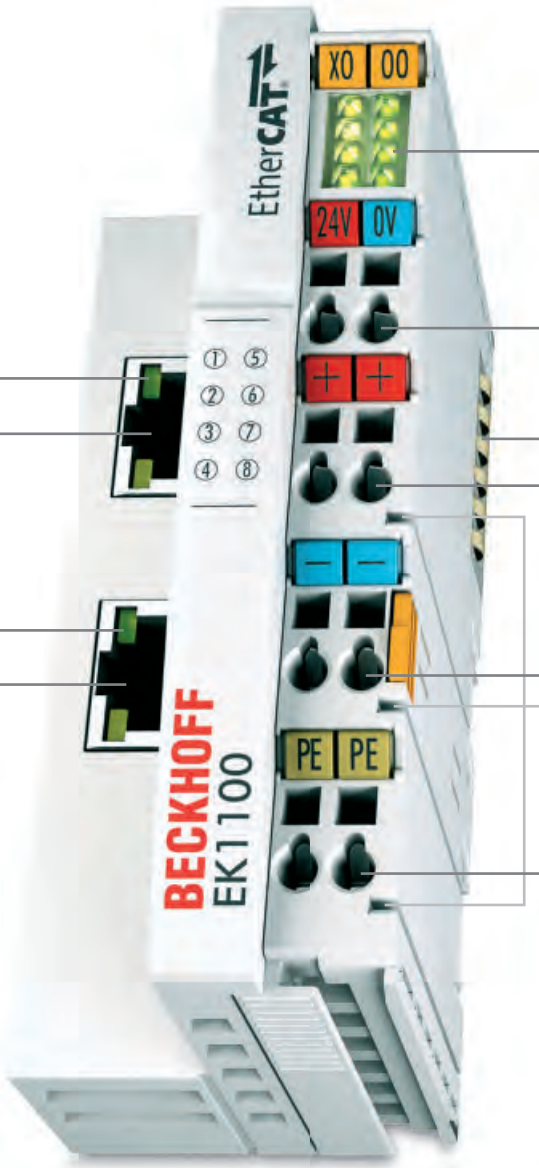
Connection	ELxxxx, BK1250	EL66xx, EL67xx, EK1122, EK1521	ESxxxx	HD housing	EL1862, ELx872
Wiring	spring-loaded technique	specific push-in connection	spring-loaded technique	direct plug-in technique	flat-ribbon cable connection
Connection cross-section	s, st*: 0.08…2.5 mm², AWG 28-14, f: 0.14…1.5 mm²	–	s, st*: 0.08…1.5 mm², f: 0.14…1.5 mm²	s*: 0.08…1.5 mm²; st: 0.25…1.5 mm²; f: 0.14…0.75 mm²	common flat-ribbon cables, AWG 28, spacing 1.27 mm
Stripping length	8…9 mm	–	9…10 mm	8…9 mm	–
Fieldbus connection	depending on fieldbus				
Power contacts	3 spring contacts				
Current load	I_{MAX}: 10 A (125 A short-circuit)				
Nominal voltage	24 V DC				

*s: solid wire; st: stranded wire; f: ferrule

We reserve the right to make technical changes.

EKxxxx | EtherCAT Couplers

▶ EtherCAT-Coupler



Power LEDs

Coupler supply

E-bus

Input for power contacts

Power contacts

Link/Act In

Fieldbus connection

Link/Act Out

Fieldbus connection

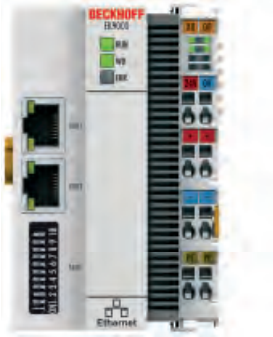
+60 °C -25 °C	Extended operating/ storage temperature
25 g	Extended mechanical load

We reserve the right to make technical changes.

E-bus EtherCAT Couplers
An I/O station consists of an EtherCAT Coupler and almost any number of terminals. The EtherCAT protocol is maintained right down into the individual terminal.

K-bus EtherCAT Couplers
EtherCAT Couplers with K-bus connection can also be used to connect Beckhoff Bus Terminals. This way, compatibility and consistency with existing system are guaranteed.

EtherCAT Couplers with optical fibre connection
For linking devices over large distances with plastic optical fibre (up to 50 m), multimode glass fibre (up to 2 km) or singlemode glass fibre (up to 20 km).



E-bus Bus Couplers
The Bus Couplers for EtherCAT Terminals are used to connect conventional fieldbus systems with EtherCAT.

The EtherCAT Couplers are the link between the EtherCAT protocol at the fieldbus level and E-bus-based EL/ES/EM terminals. Different versions are available, depending on:

– which physical layer is used "on the left", i.e. on the fieldbus side,
– whether the coupler supports Hot Connect functionality,
– and whether it has a dedicated, local PLC/small controller.

In a conventional fieldbus the coupler can be the most complex and most expensive element, since it has to translate between the fieldbus protocol level and the terminal bus I/O level, which can be complex and time-consuming. This often results in delays and inconsistent access to parameters and diagnostic data in the individual downstream devices.

In EtherCAT systems the coupler is one of the simplest devices. It has almost no dedicated intelligence, but merely transforms the electrical physical layer without changing the data structure: EtherCAT means integrated communication down to the last terminal. The EtherCAT Couplers of the EK1xxx series are currently available with copper-based RJ45 connectors or optical fibre connectors. The number of downstream terminals is almost unlimited and is subject to only two conditions. In an EtherCAT network a maximum of 65,535 slaves are permitted. If necessary, the E-bus current has to be supplemented with an EL9410 E-bus power supply unit.

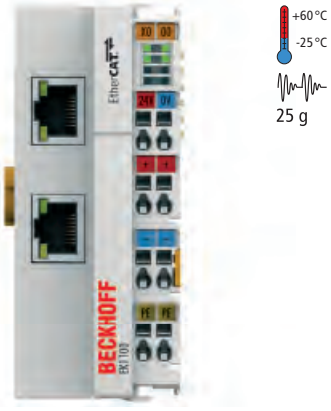
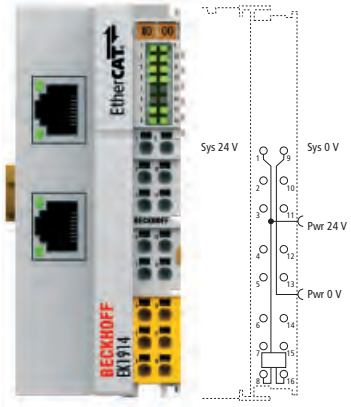
Some couplers support Hot Connect functionality. They have three hexadecimal ID switches on the side, which enable ID settings between 0 and 4095. The EtherCAT master detects a terminal station at this ID if it is connected to an EK1122 or EK1521 junction terminal at any point in the network during operation. In the TwinCAT System Manager the corresponding terminal station (coupler and terminals) has to be defined as a Hot Connect group.

Couplers from the EK3xxx or EK9xxx series are available for integrating the EtherCAT Terminals in a fieldbus other than EtherCAT. They feature a microcontroller that deals with the data management and the data transfer between the different bus systems: EtherCAT on the right-hand terminal side and the fieldbus protocol on the left.

For applications with a small number of I/O points and cramped space conditions, the EK18xx and EK19xx EtherCAT Couplers with integrated digital I/Os offer users a precisely dimensioned compact solution. The EK18xx series includes combinations of digital inputs and outputs. The EK19xx series includes combinations of safe digital inputs and outputs. In conjunction with TwinSAFE, users have an ultra-compact, space-saving solution available for direct connection of safety-relevant sensors and actuators.

Technical data	EKxxxx
Electrical isolation	500 V
Operating/storage temperature	0…+55 °C/-25…+85 °C (extended temperature range: -25…+60 °C/-40…+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/see documentation

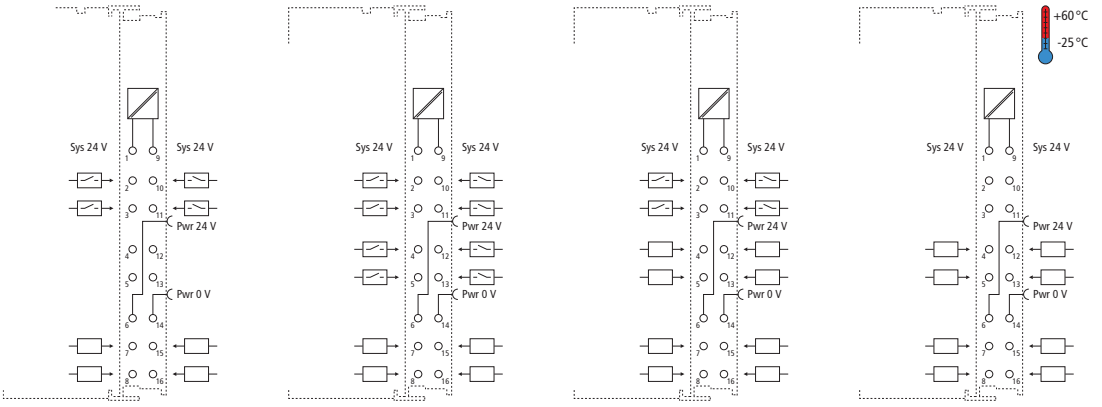
EtherCAT Couplers E-bus

	EtherCAT Coupler	EtherCAT Coupler with ID switch, Hot Connect	EtherCAT Coupler with 4 inputs and 4 outputs as well as 2 safe inputs and 2 safe outputs
Technical data	**EK1100**	**EK1101**	**EK1914**
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT networks	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT networks, with identity verification	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT networks
No. of EtherCAT Terminals	up to 65,534		
Data transfer rates	100 Mbaud	100 Mbaud	100 Mbaud
			
	The EK110x EtherCAT Couplers connect 100BASE-TX EtherCAT with the EtherCAT Terminals and convert the passing telegrams from Ethernet 100BASE-TX to E-bus signal representation. The coupler is connected to the network via the upper RJ45 Ethernet interface; further EtherCAT devices can be connected in the same strand via the lower RJ45 socket. The couplers do not need to be parameterised and are treated as EtherCAT slaves without process data. The EK1101 has three hexadecimal ID switches, with which an ID can be assigned to the coupler station. This group can be located at any position within the EtherCAT network. Variable topologies can therefore be easily implemented.		The EK1914 has four digital inputs and four digital outputs as well as two fail-safe inputs and two fail-safe outputs. The safe outputs switch 24 V DC actuators with up to 0.5 A current per channel. The EK1914 meets the requirements of DIN EN ISO 13849-1:2008 (Cat 4, PL e).
Bus interface	2 x RJ45	2 x RJ45	2 x RJ45
Type/number of peripheral signals	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points
Data transfer medium	Ethernet/EtherCAT cable (min. Cat.5), shielded	Ethernet/EtherCAT cable (min. Cat.5), shielded	Ethernet/EtherCAT cable (min. Cat.5), shielded
Current consumpt. from U_S	70 mA + (∑ E-bus current/4)	70 mA + (∑ E-bus current/4)	72 mA + (∑ E-bus current/4)
Current consumpt. from U_P	load	load	load
Distance between stations	max. 100 m (100BASE-TX)	max. 100 m (100BASE-TX)	max. 100 m (100BASE-TX)
Delay	approx. 1 µs	approx. 1 µs	approx. 1 µs
Power supply	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %) (PELV)
Current supply E-bus	2000 mA	2000 mA	max. 500 mA
Weight	approx. 105 g	approx. 105 g	approx. 123 g
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, TÜV SÜD
Further information	EK1100	EK1101	EK1914 or see page 1054
Special couplers	**EK1100-0008**	**EK1101-0080**	
Distinguishing features	M8	Fast Hot Connect, CE	

Cordsets and connectors see page 800

We reserve the right to make technical changes.

	EtherCAT Coupler with 4 digital inputs and 4 digital outputs	EtherCAT Coupler with 8 digital inputs and 4 digital outputs	EtherCAT Coupler with 4 digital inputs and 8 digital outputs	EtherCAT Coupler with 8 digital outputs
	EK1814	**EK1818**	**EK1828**	**EK1828-0010**
	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT networks			
	100 Mbaud	100 Mbaud	100 Mbaud	100 Mbaud



The EtherCAT Couplers from the EK18xx series combine the functionalities of the EK1100 EtherCAT Coupler with standard digital I/Os in one housing. This results in a compact design that is especially suitable for applications with a low number of I/Os. Like the EK1100, the EK18xx coupler can be extended by all EL/ES terminals. The digital I/Os are implemented with a 1-wire technique. The wiring can be implemented without tools using a direct plug-in technique with solid wire conductors or ferrules.

– EK1814: 4 digital inputs (3.0 ms), 4 digital outputs (0.5 A)
– EK1818: 8 digital inputs (3.0 ms), 4 digital outputs (0.5 A)
– EK1828: 4 digital inputs (3.0 ms), 8 digital outputs (0.5 A)
– EK1828-0010: 8 digital outputs (0.5 A)

	2 x RJ45	2 x RJ45	2 x RJ45	2 x RJ45
	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points
	Ethernet/EtherCAT cable (min. Cat.5), shielded	Ethernet/EtherCAT cable (min. Cat.5), shielded	Ethernet/EtherCAT cable (min. Cat.5), shielded	Ethernet/EtherCAT cable (min. Cat.5), shielded
	100 mA + (∑ E-bus current/4)	100 mA + (∑ E-bus current/4)	100 mA + (∑ E-bus current/4)	100 mA + (∑ E-bus current/4)
	40 mA + load	40 mA + load	40 mA + load	40 mA + load
	max. 100 m (100BASE-TX)	max. 100 m (100BASE-TX)	max. 100 m (100BASE-TX)	max. 100 m (100BASE-TX)
	approx. 1 µs	approx. 1 µs	approx. 1 µs	approx. 1 µs
	24 V (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	1000 mA	1000 mA	1000 mA	1000 mA
	approx. 95 g	approx. 95 g	approx. 95 g	approx. 95 g
	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL	CE, UL	CE, UL	CE, UL
	EK1814	EK1818	EK1828	EK1828-0010

EtherCAT Couplers with fibre optic connection

The EK1501, EK1501-0010, EK1501-0100 and EK1541 EtherCAT Couplers connect fibre optic-based EtherCAT with the EtherCAT Terminals by converting the telegrams on the fly from Ethernet 100BASE FX or FX POF to the E-bus signal representation. The EK1501 and EK1501-0010 EtherCAT Couplers are equipped with SC sockets, while the EK1541 is equipped with a POF plug. The EK1501-0100 is a media converter from optical fibre to copper. It has an SC (IN) as well as an RJ45 socket (OUT).

The couplers are connected to the network via the upper interface. The lower socket is used for the optional connection of further EtherCAT devices in the same strand. Distances of up to 2 km can be bridged with multimode fibre optics (EK1501, EK1501-0100) and up to 20 km with single-mode fibre optics (EK1501-0010). Distances of up to 50 m can be bridged using the Plastic Optical Fibre (EK1541); the POF is simple to assemble in the field.

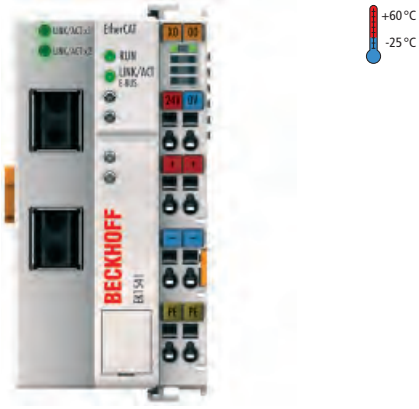
The couplers do not need to be parameterised and are treated as EtherCAT slaves without process data. They have three hexadecimal ID switches, with which an ID can be assigned to the coupler station. This group can be located at any position within the EtherCAT network.

	EtherCAT Coupler with ID switch, multimode fibre optic connection, Hot Connect
Technical data	**EK1501**
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-FX EtherCAT networks, with identity verification
Number of EtherCAT Terminals	up to 65,534
Data transfer rates	100 Mbaud
Data transfer medium	multimode glass fibre 50/125 µm (MM)
Bus interface	2 x SC Duplex
Type/number of peripheral signals	max. 4.2 GB addressable I/O points
Current consumption 24 V DC	typ. 70 mA
Distance between stations	max. 2000 m (100BASE-FX)
Delay	approx. 1 µs
Power supply	24 V DC (-15 %/+20 %)
Current consumption E-bus	–
Current supply E-bus	2000 mA
Weight	approx. 190 g
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Further information	EK1501

Cordsets and connectors see page 800

For availability status see Beckhoff website at: EK1501-0100

We reserve the right to make technical changes.

	EtherCAT Coupler with ID switch, singlemode fibre optic connection, Hot Connect	EtherCAT Coupler with ID switch, multimode fibre optic IN, RJ45 OUT	EtherCAT Coupler with ID switch, plastic optical fibre
	EK1501-0010	**i EK1501-0100**	**EK1541**
		media transition from multimode fibre optic to RJ45 copper physics and coupling of EtherCAT Terminals (ELxxxx)	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-FX EtherCAT POF networks, with identity verification
	100 Mbaud	100 Mbaud	100 Mbaud
	singlemode glass fibre 9/125 µm (SM)	multimode glass fibre 50/125 µm; Ethernet/EtherCAT cable (min. Cat.5), shielded	plastic optical fibre (POF)
			
	2 x SC Duplex	1 x SC Duplex; 1 x RJ45	2 x ZS1090-0008 POF plug
	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points
	typ. 70 mA	typ. 70 mA	typ. 70 mA
	max. 20,000 m (100BASE-FX)	max. 2000 m (100BASE-FX); max. 100 m (100BASE-TX)	max. 50 m (100BASE-FX)
	approx. 1 µs	approx. 1 µs	approx. 1 µs
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	–	–	–
	2000 mA	2000 mA	2000 mA
	approx. 190 g	approx. 190 g	approx. 190 g
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL, Ex	CE, UL	CE, UL
	EK1501	EK1501-0100	EK1541

EtherCAT junctions with fibre optic connection

	1-port EtherCAT multimode fibre optic junction, Hot Connect	1-port EtherCAT singlemode fibre optic junction, Hot Connect	1-port EtherCAT plastic optical fibre junction
Technical data	**EK1521**	**EK1521-0010**	**EK1561**
Task within EtherCAT system	coupling of EtherCAT junctions via multimode glass fibre	coupling of EtherCAT junctions via singlemode glass fibre	coupling of EtherCAT junctions via POF
Data transfer medium	multimode glass fibre 50/125 µm (MM)	singlemode glass fibre 9/125 µm (SM)	plastic optical fibre (POF)
Data transfer rates	100 Mbaud	100 Mbaud	100 Mbaud
	In conjunction with an EK1100 EtherCAT Coupler, the EK1521(-0010) 1-port EtherCAT fibre optic junction enables conversion from 100BASE-TX to 100BASE-FX physics (glass fibre). Distances of up to 2 km can be bridged with the EK1521 and the EK1501 EtherCAT Coupler for multimode fibre optics. EK1521-0010 and EK1501-0010 for singlemode fibre optics permit distances up to 20 km. Even cable redundant systems with fibre optic can be realised using the 1-port EtherCAT fibre optic junction.		In connection with an EK1100 EtherCAT coupler, the EK1561 single-port POF branch makes it possible to convert from 100BASE-TX physics to 100BASE-FX physics (POF – Plastic Optical Fibre). Distances of up to 50 m between two couplers can be bridged using the EK1561 and the EK1541 EtherCAT Coupler for POF. Unlike the glass fibre, the POF fibre is easily wireable in the field. The Run LED indicates the status of the EK1561.
Bus interface	1 x SC Duplex	1 x SC Duplex	1 x ZS1090-0008 POF plug
Type/number of peripheral signals	–	–	–
Current consumption 24 V DC	–	–	–
Distance between stations	max. 2000 m (100BASE-FX)	max. 20,000 m (100BASE-FX)	max. 50 m (100BASE-FX)
Delay	approx. 1 µs	approx. 1 µs	approx. 1 µs
Power supply	from E-bus	from E-bus	from E-bus
Current consumption E-bus	typ. 350 mA	typ. 350 mA	typ. 200 mA
Weight	approx. 65 g	approx. 65 g	approx. 65 g
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL
Further information	EK1521	EK1521	EK1561

Cordsets and connectors see page 800

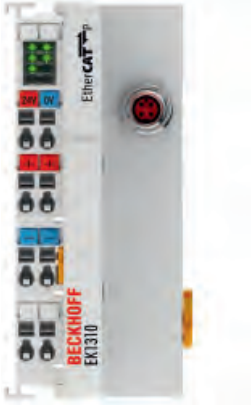
We reserve the right to make technical changes.

EtherCAT junctions and extensions

	2-port EtherCAT junction		EtherCAT extension
Technical data	**EK1122**		**EK1110**
Task within EtherCAT system	coupling of EtherCAT junctions		conversion of the E-bus signals to 100BASE-TX Ethernet for extension of the EtherCAT network
Data transfer rates	100 Mbaud		
	+60 °C -25 °C		+60 °C -25 °C 25 g
	The 2-port EtherCAT junction enables configuration of EtherCAT star topologies. A modular EtherCAT star can be realised by using several EK1122 units in a station. Individual devices or complete EtherCAT strands can be connected at the junction ports. The EtherCAT junctions are connected via RJ45 sockets with direct display of link and activity status.		Like the E-bus end cap, the EK1110 EtherCAT extension is connected to the end of the EtherCAT Terminal block. The terminal offers the option of connecting an Ethernet cable with RJ45 connector, thereby extending the EtherCAT strand electrically isolated by up to 100 m. In the EK1110 terminal, the E-bus signals are converted on the fly to 100BASE-TX Ethernet signal representation. Power supply to the EK1110 electronics is via the E-bus. No parameterisation or configuration tasks are required.
Bus interface	2 x RJ45		1 x RJ45
Data transfer medium	Ethernet/EtherCAT cable (min. Cat.5), shielded		Ethernet/EtherCAT cable (min. Cat.5), shielded
Distance between stations	100 m (100BASE-TX)		100 m (100BASE-TX)
Delay	approx. 1 µs		approx. 1 µs
Power supply	from E-bus		from E-bus
Current consumption E-bus	typ. 220 mA		typ. 130 mA
Weight	approx. 65 g		approx. 50 g
Operating temperature	-25…+60 °C		-25…+60 °C
Approvals	CE, UL, Ex		CE, UL, Ex
Further information	EK1122		EK1110
Special couplers	**EK1122-0008**	**EK1122-0080**	**EK1110-0008**
Distinguishing features	M8	Fast Hot Connect, CE	M8

Cordsets and connectors see page 800

EtherCAT P Coupler, junction and extension

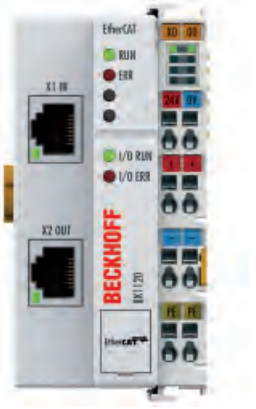
	EtherCAT P Coupler	EtherCAT P extension	2-port EtherCAT P junction
Technical data	**EK1300**	**EK1310**	**EK1322**
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT P networks	conversion of the E-bus signals to 100BASE-TX Ethernet for extension of the EtherCAT P network	coupling of EtherCAT P junctions
Number of EtherCAT Terminals	up to 65,534	–	
Data transfer rates	100 Mbaud	100 Mbaud	100 Mbaud
			
	– coupler connection to the network via upper EtherCAT P interface – optional continuation of the EtherCAT P topology via lower EtherCAT-P-coded M8 socket – additional power supply for the coupler via the terminal points no longer required	– conversion from EtherCAT to EtherCAT P or extension of an EtherCAT P network	– configuration of EtherCAT P star topologies – connection of individual EtherCAT P devices or whole EtherCAT P strands – installation at any point in an EtherCAT strand between the EtherCAT Terminals (ELxxxx)
Bus interface	2 x M8 socket, shielded, screw type, EtherCAT-P-coded	1 x M8 socket, shielded, screw type, EtherCAT-P-coded	2 x M8 socket, shielded, screw type, EtherCAT-P-coded
Data transfer medium	EtherCAT P cable, shielded, to 100BASE-TX EtherCAT P networks	EtherCAT P cable, shielded, to 100BASE-TX EtherCAT P networks	EtherCAT P cable, shielded, to 100BASE-TX EtherCAT P networks
Total current	from EtherCAT P, max. 3 A per U_S and U_P	max. 3 A per U_S and U_P	max. 3 A per U_S and U_P
Current consumpt. from U_S	70 mA + (∑ E-bus current/4)	typ. 4 mA	typ. 4 mA
Current consumpt. from U_P	–	–	–
Power supply	from EtherCAT P (24 V DC for U_S and U_P)	external feed-in: 24 V DC for U_S and U_P	external feed-in: 24 V DC for U_S and U_P
Current consumption E-bus	–	typ. 130 mA	typ. 220 mA
Current rating per port	max. 3 A per U_S and U_P	max. 3 A per U_S and U_P	max. 3 A per U_S and U_P
Weight	approx. 105 g	approx. 50 g	approx. 65 g
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE
Further information	EK1300	EK1310	EK1322

Cordsets and connectors see page 800

For availability status see Beckhoff website at:

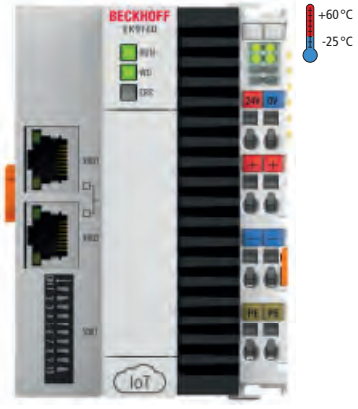
We reserve the right to make technical changes.

EtherCAT Couplers K-bus

	EtherCAT "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	EtherCAT "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	EtherCAT "Compact" coupler between E-bus and K-bus terminals
Technical data	**BK1120**	**BK1150**	**BK1250**
Number of Bus Terminals	64 (255 with K-bus extension)		
Max. number of bytes fieldbus	1024 byte input and 1024 byte output		
Current supply K-bus	1750 mA	2000 mA	500 mA
	 +60 °C -25 °C 25 g	+60 °C -25 °C 25 g	+60 °C -25 °C 25 g
	The BK1120 Bus Coupler connects EtherCAT, the real-time Ethernet system, with the modular, extendable electronic terminal blocks. A unit consists of a Bus Coupler, any number (between 1 and 64) of terminals (255 with K-bus extension) and one end terminal.	The BK1150 Bus Coupler connects EtherCAT to the modular extendable Bus Terminals (K-bus). A unit consists of a Bus Coupler, any number of terminals from 1 to 64 (with K-bus extension: 255) and a bus end terminal. The "Compact" Bus Coupler offers a cost-optimised alternative to the BK1120 EtherCAT Bus Coupler.	The BK1250 is a "Bus Coupler in terminal housing" for mixed application of EtherCAT Terminals (ELxxxx) and standard Bus Terminals (KLxxxx) in a bus station. It enables implementation of compact and cost-effective control solutions. The wide range of Bus Terminals can thus be optimally combined with the communication speed and large bandwidth of EtherCAT Terminals. Up to 64 Bus Terminals (with K-bus extension up to 255) can be connected to a BK1250. The Bus Coupler recognises the connected Bus Terminals and automatically allocates them into the EtherCAT process image.
Bus interface	2 x RJ45	2 x RJ45	via E-bus contacts
Data transfer rates	100 Mbaud	100 Mbaud	100 Mbaud E-bus
Distance between stations	100 m (100BASE-TX)	100 m (100BASE-TX)	–
Weight	approx. 150 g	approx. 110 g	approx. 55 g
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Further information	BK1120	BK1150	BK1250

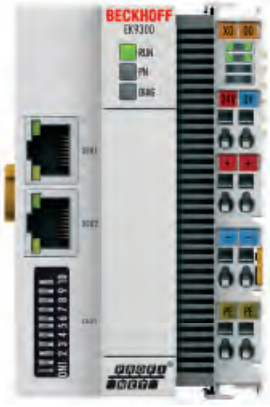
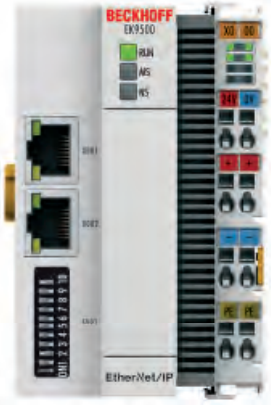
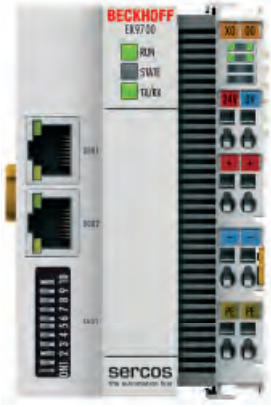
Cordsets and connectors see page 800, Bus Terminals see page 570

Bus Couplers for EtherCAT Terminals

	PROFIBUS	Ethernet	IoT
	PROFIBUS Bus Coupler	Ethernet Bus Coupler	IoT Bus Coupler
Technical data	**EK3100**	**EK9000**	**EK9160**
Task within EtherCAT system	coupling of standard digital and analog EtherCAT Terminals and EtherCAT Box modules to PROFIBUS networks	coupling of standard digital and analog EtherCAT Terminals and EtherCAT Box modules to Ethernet networks	coupling of standard digital and analog EtherCAT Terminals and EtherCAT Box modules to the IoT world
Number of EtherCAT Terminals	depending on the process data size		
Data transfer rates	up to 12 Mbaud (automatic detection)	100 Mbaud	100 Mbaud
			
	The EK3100 Bus Coupler converts the telegrams from PROFIBUS to the E-bus signal representation. The coupler supports the PROFIBUS profile and fits seamlessly into PROFIBUS networks.	The EK9000 Bus Coupler converts the telegrams from Ethernet to the E-bus signal representation. The coupler supports the Modbus TCP protocol and fits seamlessly into Ethernet networks.	The EK9160 Bus Coupler enables the direct connection of EtherCAT I/Os from Beckhoff to the Internet of Things (IoT) by converting the E-bus signal representation to different IoT communication protocols.
Protocol	PROFIBUS DP	Modbus TCP, Modbus UDP	MQTT, AMQP (in preparation)
Bus interface	1 x D-sub 9-pin socket with shielding	2 x RJ45 (switched)	2 x RJ45 (switched)
Type/number of peripheral signals	depending on the process data size	depending on the process data size	depending on the process data size
Power supply	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Operating temperature	0…+55 °C	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE
Further information	EK3100	EK9000	EK9160
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
PC Fieldbus Cards	FC310x 782	FC90xx 788	FC90xx 788

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

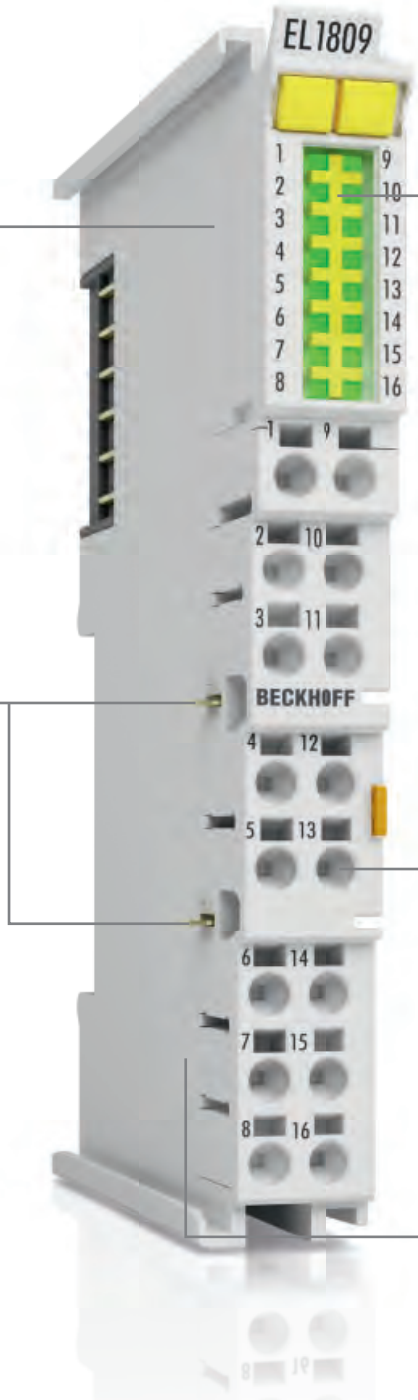
	PROFINET RT Bus Coupler	EtherNet/IP Bus Coupler	SERCOS III Bus Coupler
	EK9300	**i EK9500**	**i EK9700**
	coupling of standard digital and analog EtherCAT Terminals and EtherCAT Box modules to PROFINET RT networks	coupling of standard digital and analog EtherCAT Terminals and EtherCAT Box modules to EtherNet/IP networks	coupling of standard digital and analog EtherCAT Terminals and EtherCAT Box modules to SERCOS III networks
	100 Mbaud	100 Mbaud	100 Mbaud
			
	The EK9300 Bus Coupler converts the telegrams from PROFINET RT to the E-bus signal representation. The coupler supports the PROFINET RT profile and fits seamlessly into PROFINET RT networks.	The EK9500 Bus Coupler converts the telegrams from EtherNet/IP to the E-bus signal representation. The coupler supports the EtherNet/IP profile and fits seamlessly into EtherNet/IP networks.	The EK9700 Bus Coupler converts the telegrams from SERCOS III to the E-bus signal representation. The coupler supports the SERCOS III profile and fits seamlessly into SERCOS III networks.
	PROFINET RT	EtherNet/IP	SERCOS III I/O profile
	2 x RJ45 (switched)	2 x RJ45 (switched)	2 x RJ45 (switched)
	depending on the process data size	depending on the process data size	depending on the process data size
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	EK9300	EK9500	EK9700
	see page 800	see page 800	see page 800
	FC90xx 788	FC90xx 788	FC750x 787

Embedded PC CX8000 see page 196

EtherCAT | I/O modules with 100 Mbit communication

▶ EtherCAT-IO

The EtherCAT Terminals have a galvanic isolation between the field level and the communication level (E-bus). A terminal is equipped with 1…n input or output channels. The channels within a terminal are usually not electrically isolated from each other.



Beckhoff EtherCAT HD Terminals feature function-dependant colour-coded LED frames: yellow for digital inputs, red for digital outputs, green for analog inputs, blue for analog outputs.

Different field level connection techniques can be used for EtherCAT Terminals:
- standard terminal point: 0.08…2.5 mm² spring-loaded technique
- HD EtherCAT Terminal: 0.08…0.75 mm² (with ferrule); 0.08…1.5 mm² (single-wire); spring-loaded technique; direct plug-in technique
- D-sub, 9-pin, common for serial communication or fieldbus master terminals
- ribbon: especially used in Asia for digital input/output channels
- plug-in wiring level: ES terminals

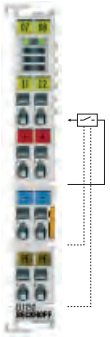
The power contacts on the left hand side (if available) supply the terminals with field voltage. Depending on the terminals 24 V DC, 230 V AC or other voltages are transferred. The supply power required is listed in the technical data. The maximum load of the power contacts is 10 A.

Some 2-channel EtherCAT Terminals have a PE power contact, which can be used for PE distribution by connecting it together with similar terminals. The EMC spring contact on the underside of the terminal only serves to remove interference and may not be used as a protective earth.

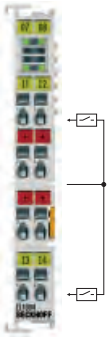
XFC	eXtreme Fast Control Technology
+60 °C -25 °C	Extended operating/ storage temperature
25 g	Extended mechanical load
	Terminals with calibration certificate

Technical data see page 329

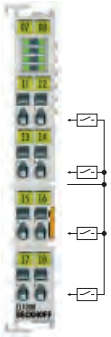
We reserve the right to make technical changes.



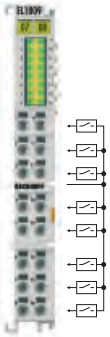
2-channel terminals
The 2-channel terminals provide additional power (+24 V DC), ground (0 V DC) and in many cases also PE for each channel. Connection is carried out with 3- or 4-wire connection.



4-channel terminals
Along with four channels the 4-channel terminals have another four connection points available. These can provide 24 V DC or ground. Connection is carried out with 2-wire connection.



8-channel terminals
The 8-channel terminals have one channel per connection point due to a high packing density. The power contact of the terminal will be used as the common reference potential. Connection is carried out with 1-wire connection.



16-channel terminals
The HD (High Density) housing allows 16 channels to be accommodated on a unit that is only 12 mm wide. The power contact of the terminal will be used as the common reference potential. Connection is carried out with 1-wire connection.

The EtherCAT Terminals offer the possibility to directly connect many different signals. No signal converter or additional evaluation device is needed. The direct connection reduces the costs and simplifies the control technology. Each EtherCAT Terminal separates the internal electronics from the connection level and thus simplifies the creation of voltage groups with different voltages. In addition, interfering voltages on the signal connector lose their adverse effects.

The EL1xxx and EL2xxx EtherCAT Terminals are designed for the processing of digital or binary signals. Unless otherwise noted, the High level corresponds to the supply voltage, the Low level corresponds to ground. For negative switching logic it is the other way around. For both types of logic various supply voltages are available. 1-, 2-, 3- and 4-wire connections allow the use of EtherCAT Terminals in almost all applications without further wiring work.

The EL3xxx and EL4xxx EtherCAT Terminals process analogue signals with 0 to 10 V, ±10 V, 0 to 20 mA or 4 to 20 mA. Also many other industry-standard voltage and current signals are supported and pre-processed.

In the EL5xxx and EL6xxx EtherCAT Terminals other complex signals, such as encoders, position values and digital interfaces, are supported. Some EtherCAT Terminals act as fieldbus masters for subordinate bus systems. turning the station into a universal gateway between different systems.

The EL7xxx EtherCAT Terminals offer compact drive solutions for stepper, DC and servomotors.

The EL9xxx system terminals round off the application of EtherCAT Terminals with filters, power feed and power supply units.

The XFC terminals are particularly suitable for fast, precise sensor detection or actuator control in the ns range in conjunction with TwinCAT as real-time environment and PC-based high-performance control technology.

Technical data	**ELxxxx** | ESxxxx
Electrical isolation	500 V (E-bus/field potential), unless stated otherwise
Operating/storage temperature	0…+55 °C/-25…+85 °C (extended temperature range: -25…+60 °C/-40…+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable conforms to EN 60529 (see documentation)
Pluggable wiring	for all ESxxxx terminals

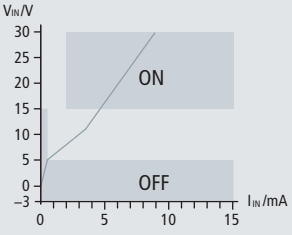
Digital input | 24 V DC, positive switching

The digital inputs of a 24 V supply are among the most used signals. The EN 61131-2 standard describes the input characteristic and distinguishes three types. Type 1 has a small input current with low power dissipation. This input is optimised for mechanical switches and actively-switched electronic outputs. Type 2 has a significantly larger input current and is optimised for 2-wire sensors with a high quiescent current consumption. In switched-on state the current consumption of this input is high. The related power dissipation is generally not acceptable. Type 3 is a combination between type 1, with low current in switched-on state, and a satisfactorily high quiescent current for the majority of modern 2-wire sensors. The type 3 input can be used in almost all applications as a replacement for type 1. The diagram shows the typical current/voltage curves of the EtherCAT Terminal inputs and the allowable range of conformity in accordance with the standard.

The input circuits differ in their filtering functions. The filtering has the task of suppressing electromagnetic interference. However, this does have the drawback of signal deceleration. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and delivers a stable signal for simple PLC applications. Filter times of 10 µs are suitable for applications with shortest possible reaction times and should be used for mechanical switches only in a restricted manner.

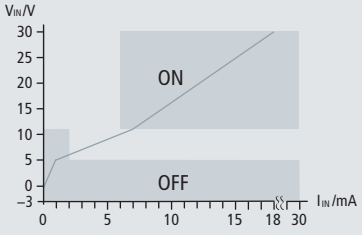
XFC terminals with a filter time of << 1 µs are available for particularly fast signals and exact edge identification.

Type 1



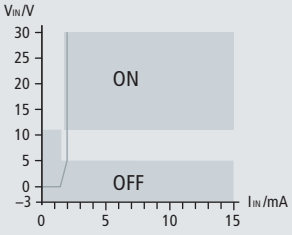
Signal voltage "0": -3…5 V DC
Signal voltage "1": 15…30 V DC

Type 2



Signal voltage "0" -3…5 V DC
Signal voltage "1": 11…30 V DC

Type 3

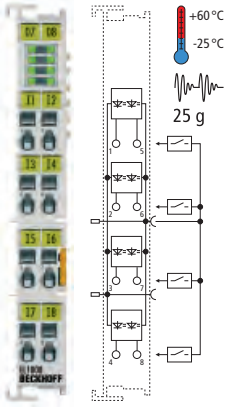


Signal voltage "0": -3…5 V DC
Signal voltage "1": 11…30 V DC

Characteristics of the 3 input types according to EN 61131-2 (24 V DC)

8-channel digital input terminal, 1-wire, 24 V DC, type 1/3

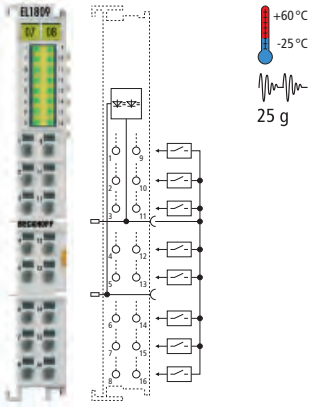
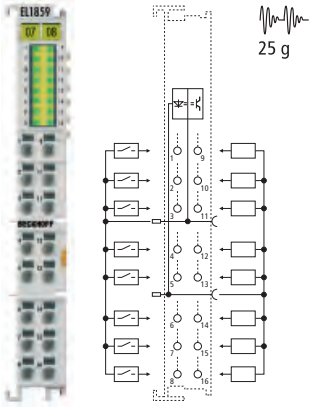
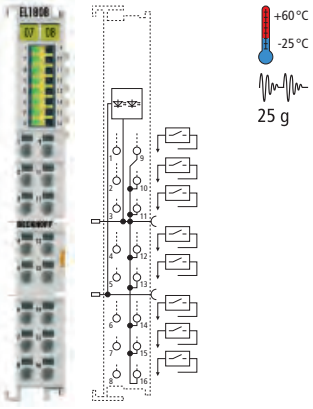
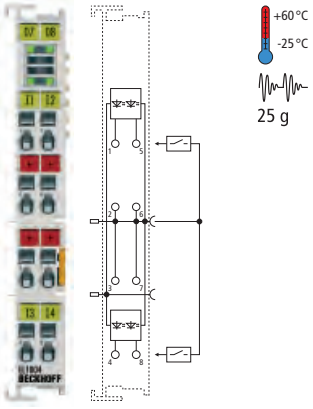
Technical data	EL1008 | ES1008	EL1018 | ES1018
Connection technology	1-wire	
Specification	EN 61131-2, type 1/3	
Input filter	typ. 3.0 ms	typ. 10 µs
Number of inputs	8	



The EL1008 and EL1018 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit.

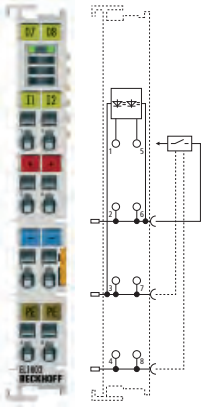
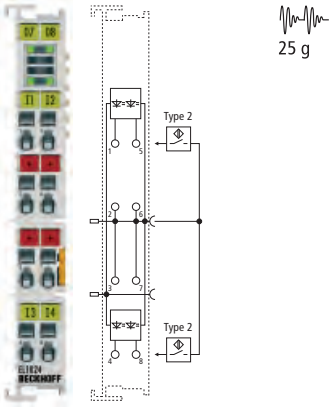
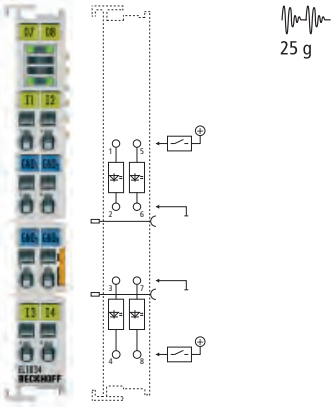
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 2 mA + load
Current consumption E-bus	typ. 90 mA
Distributed clocks	–
Special features	standard input terminals for fast (filter 10 µs) or bouncing signals (filter 3 ms)
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Weight	approx. 55 g
Further information	EL1008
Special terminals	
Distinguishing features	

We reserve the right to make technical changes.

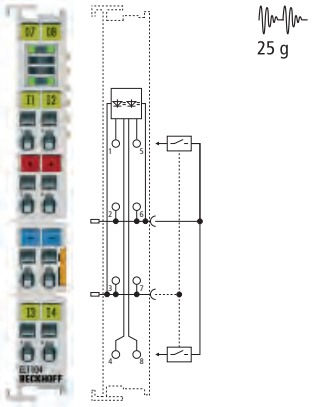
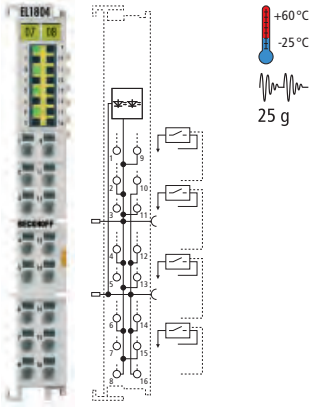
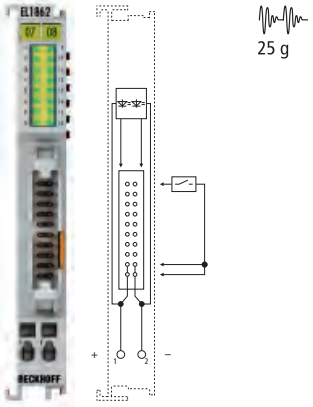
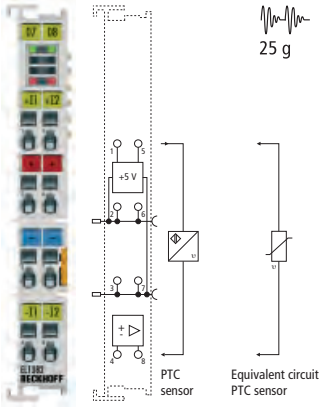
	16-channel digital input terminal, 1-wire, 24 V DC, type 1/3		8-channel digital input + 8-channel digital output, 1-wire, 24 V DC, type 1/3	8-channel digital input terminal, 2-wire, 24 V DC, type 1/3	4-channel digital input terminal, 2-wire, 24 V DC, type 1/3	
	EL1809	**EL1819**	**EL1859**	**EL1808**	**EL1004** | ES1004	**EL1014** | ES1014
				2-wire		
	typ. 3.0 ms	typ. 10 µs	typ. 3.0 ms	typ. 3.0 ms	typ. 3.0 ms	typ. 10 µs
	16		8 inputs + 8 outputs	8	4	
						
	With 16 input channels and only 12 mm width the EL1809 and EL1819 digital input terminals are suitable for space-saving control cabinet installation. Reference ground for all terminal points is the 0 V power contact. Single wires can be connected directly without tools. A screwdriver is required for disconnection.		The digital EL1859 EtherCAT Terminal combines eight digital inputs and eight digital outputs in one device.	The EL1808 digital input terminal acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation device. With its 3 ms input filter it is suitable for identifying slow edges or bouncing signals, for which multiple detection is undesirable.	With its 3 ms input filter the EL1004 is suitable for identifying slow edges or bouncing signals, for which multiple detection is undesirable. The EL1014 is suitable for identifying fast signal edges in the µs range. There is no electrical isolation between the channels.	
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	
	typ. 4 mA + load		typ. 15 mA + load	typ. 2 mA + load	typ. 2 mA + load	
	typ. 100 mA		typ. 130 mA	typ. 100 mA	typ. 90 mA	
	–		–	–	–	
	standard input terminal with high number of channels for slow or fast 24 V DC edges, direct plug-in technique		combi EtherCAT Terminal, 8 x output 24 V DC, max. output current 0.5 A, load type: ohmic, inductive, lamp load, reverse voltage protection	direct plug-in technique, 2-wire connection	standard input terminals for 2-wire connection	
	-25…+60 °C		0…+55 °C	-25…+60 °C	-25…+60 °C	
	CE, UL, Ex		CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	
	approx. 65 g		approx. 65 g	approx. 60 g	approx. 50 g	
	EL1809		EL1859	EL1808	EL1004	
					i EL1004-0020	
					isolation voltage > 2500 V, CE	

i For availability status see Beckhoff website at: EL1004

Digital input | 24 V DC, positive switching

	2-channel digital input terminal, 4-wire, 24 V DC, type 1/3		4-channel digital input terminal, 2-wire, 24 V DC, type 2	4-channel digital input terminal, 2-wire, 24 V DC, type 1
Technical data	**EL1002** | ES1002	**EL1012** | ES1012	**EL1024** | ES1024	**EL1034** | ES1034
Connection technology	4-wire		2-wire	
Specification	EN 61131-2, type 1/3		EN 61131-2, type 2	EN 61131-2, type 1
Input filter	typ. 3.0 ms	typ. 10 µs	typ. 3.0 ms	typ. 10 µs
Number of inputs	2		4	4
				
	The EL1002 and EL1012 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation unit.		The EL1024 enables the connection of up to four type 2 24 V sensors with high quiescent current consumption. 2-wire connection is possible through the four 24 V connection points. The input filter is 3 ms, e.g. for bouncing signals.	The EL1034 enables electrically isolated and potential-free connection of four digital 24 V signals. A filter time of 10 µs enables sampling of fast signal edges.
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 2 mA + load		typ. 30 mA + load	–
Current consumption E-bus	typ. 90 mA		typ. 90 mA	typ. 90 mA
Distributed clocks	–		–	–
Special features	4-wire connection		type 2	4 electrically isolated fast inputs, potential-free
Operating temperature	-25…+60 °C		0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex		CE, UL, Ex	CE, UL, Ex
Weight	approx. 50 g		approx. 50 g	approx. 50 g
Further information	EL1002		EL1024	EL1034
Special terminals				
Distinguishing features				

We reserve the right to make technical changes.

	4-channel digital input terminal, 2-/3-wire, 24 V DC, type 1/3		4-channel digital input terminal, 3-wire, 24 V DC, type 1/3		16-channel digital input terminal, flat-ribbon cable connection, 24 V DC, type 1/3		2-channel digital input terminal, 24 V DC, thermistor
	EL1104 | ES1104	**EL1114** | ES1114	**EL1804**	**EL1814**	**EL1862**	**EL1872**	**EL1382** | ES1382
	2-/3-wire		3-wire		flat-ribbon cable		2-wire
	EN 61131-2, type 1/3						thermistor PTC
	typ. 3.0 ms	typ. 10 µs	typ. 3.0 ms	typ. 10 µs	typ. 3.0 ms	typ. 10 µs	30 ms
	4		4		16		2
							
	With 2- or 3-wire connections the EL1104/EL1114 enables reading of up to four digital signals. The EL1114 with a 10 µs filter time is a good choice for fast signal changes with short cycle times. Reference ground for all terminal points is the 0 V power contact.		The EL1804 and EL1814 digital input terminals acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the higher-level automation device. The EtherCAT Terminals each contain four channels, consisting of a signal input, 24 V DC and 0 V. The power contacts are looped through.		A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points.		The digital EL1382 input terminal analyses the input signal of thermistor sensors with the aid of a current loop and a voltage of less than 5 V. It is a monitoring device for the thermal machine protection of PTC sensors, suitable for the direct monitoring of motors, bearings and equipment. In the process image, the state of the sensor is indicated by one bit each. A further bit reports short circuits or line interruptions. – sensor voltage: ≤ 5 V – diagnostics: open-circuit: > 8 kΩ short-circuit: < 25 Ω
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V (-15 %/+20 %)
	typ. 2 mA + load		typ. 2 mA + load		4 mA from the 24 V supply (no power contacts)		–
	typ. 90 mA		typ. 90 mA		typ. 100 mA		typ. 120 mA
	–		–		–		–
	4 inputs for 2- and 3-wire connection		–		also available as negative switching		monitoring device for thermal machine protection
	-25…+60 °C	0…+55 °C	-25…+60 °C		0…+55 °C		0…+55 °C
	CE, UL, Ex		CE, UL, Ex		CE, UL, Ex		CE, UL
	approx. 55 g		approx. 60 g		approx. 50 g		approx. 55 g
	EL1104		EL1804		EL1862		EL1382
					EL1862-0010		
					negative switching, see page 350		

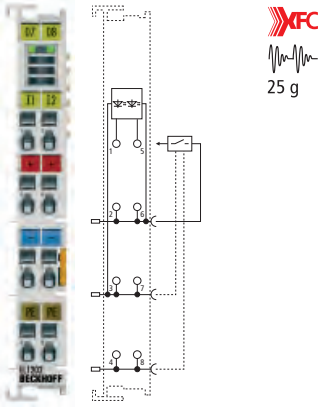
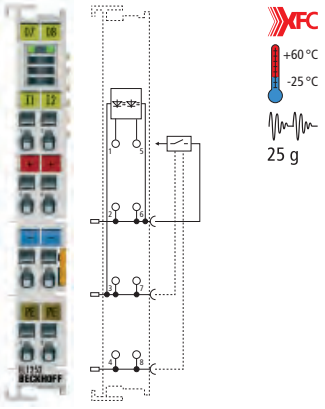
XFC digital input | 24 V DC, positive, fast inputs

XFC – eXtreme Fast Control – comprises a fast controller, fast real-time capable communication and fast, high-precision input/output modules. Based on synchronisation through the distributed clocks principle, input modules read their inputs at exactly defined times. Outputs can be controlled with nanosecond precision, irrespective of restrictions through the bus cycle time or communication jitter.

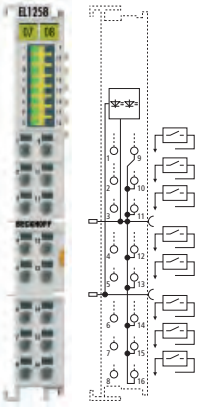
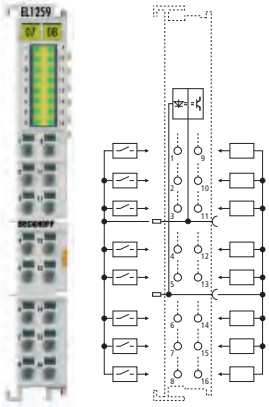
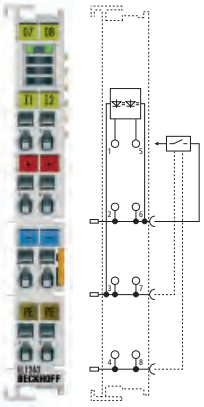
The DC devices trigger the reading of inputs or the activation of outputs through their local clocks. This way, a uniform, application-wide timebase is formed in the modules, which makes parallel hardware wiring unnecessary. Responses with equidistant time intervals are possible largely independent of the bus cycle time.

EtherCAT components with DC support, such as shaft encoders, drives or I/O modules, enable synchronised, time-based operation for exact control of the mechanical components. All EL12xx terminals feature a fast input circuit, which enables the signal information from the field to be transferred to the communication level without delay.

For further information on XFC see page 298

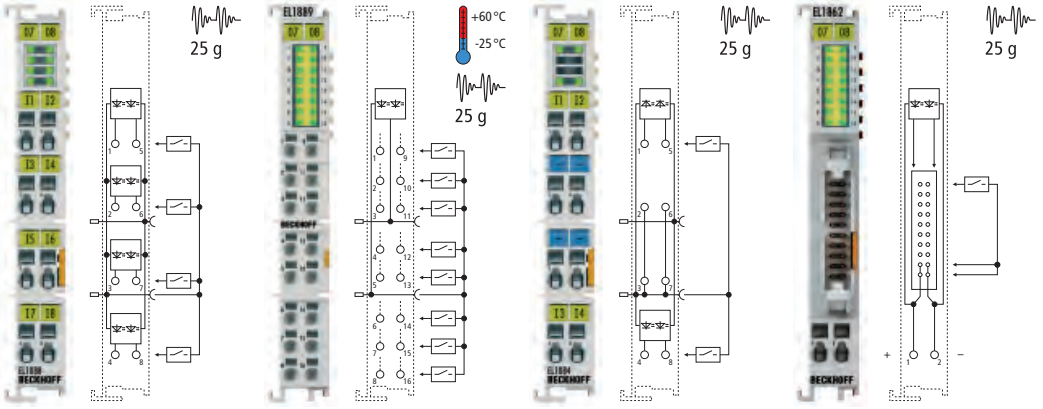
	2-channel digital input terminal, 24 V DC, 4-wire, fast input	2-channel digital input terminal, 24 V DC, 4-wire, timestamping
Technical data	**EL1202** | ES1202	**EL1252** | ES1252
Connection technology	4-wire	
Specification	similar to EN 61131-2, type 3, "0": -3…5 V DC, "1": 11…30 V DC, typ. 3 mA input current	
Input filter	typ. < 1 µs	typ. < 1 µs
Number of inputs	2	2
		
	The very fast input circuit enables sampling of short input pulses, even with very short EtherCAT cycle times.	The EL1252 allocates a 64-bit timestamp (1 ns triggering) to each edge change as a process data.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consum. pow. cont.	typ. 6 mA + load	typ. 6 mA + load
Current consumption E-bus	typ. 110 mA	typ. 110 mA
Distributed clocks	yes	yes
Internal sampling/ execution	10 ns (+ input delay)	10 ns (+ input delay)
Distributed clock precision	<< 1 µs	<< 1 µs
Oversampling/multi-timestamping factor	–	–
Special features	DC can be activated, see documentation	timestamping, latch last edge
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 55 g	approx. 55 g
Further information	EL1202	EL1252
Special terminals		**EL1252-0050**
Distinguishing features		5 V inputs

We reserve the right to make technical changes.

	8-channel digital input terminal, 24 V DC, 2-wire, multi-timestamping	8-channel digital input + 8-channel digital output, 24 V DC, 1-wire, multi-timestamping	2-channel digital input terminal, 24 V DC, 4-wire, oversampling
	EL1258	**EL1259**	**EL1262** | ES1262
	2-wire	1-wire	4-wire
	typ. < 1 µs	typ. < 1 µs	typ. < 1 µs
	8	8 inputs + 8 outputs	2
	 XFC 25 g	 XFC 25 g	 XFC 25 g
	The ELx258 EtherCAT HD terminals with timestamp technology offer optimised sensor/actuator control with high channel density and compact design. In contrast to the ELx252 series with a timestamp interval of 1 ns, the EL1258, EL1259 and EL2258 operate with a 10…40 µs interval. They can sample inputs or issue outputs at these intervals, synchronised through the distributed clocks. The 16-channel digital EL1259 EtherCAT Terminal combines the functions of the EL1258 – eight timestamp inputs – with those of the EL2258 – eight timestamp outputs. Multi-timestamping enables up to 10 events per channel to be sampled or output in each EtherCAT cycle. The outputs feature auto-activation, i.e. they can be re-activated in each cycle. The EL1259, as a combination of DC-controlled inputs and outputs within a terminal, is particularly suitable for local switching tasks.		The EL1262 oversamples both channels with up to 1 Msample/s and transfers the state of the inputs as a bit datastream collectively to the controller. This way, even the fastest signals can be acquired.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 6 mA + load	typ. 6 mA + load	typ. 20 mA + load
	typ. 110 mA	typ. 90 mA	typ. 70 mA
	yes	yes	yes
	< 10…40 µs, corresponds to 100…25 k detectable edges/s, dependent on configuration	< 10…40 µs, corresponds to 100…25 k detectable edges/s, dependent on configuration	10 ns (+ input delay)
	<< 1 µs	<< 1 µs	<< 1 µs
	n = integer multiple of the cycle time, 1…10	n = integer multiple of the cycle time, 1…10	n = integer multiple of the cycle time, 1…1000, see documentation
	multi-timestamping	multi-timestamping, auto activation	oversampling
	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL	CE, UL	CE, UL, Ex
	approx. 55 g	approx. 55 g	approx. 60 g
	EL1258	EL1259	EL1262
			EL1262-0050
			5 V inputs

Digital input | 24 V DC, negative switching

	8-channel digital input terminal, 1-wire, 24 V DC, negative switching		16-channel digital input terminal, 1-wire, 24 V DC, negative switching	4-channel digital input terminal, 2-wire, 24 V DC, negative switching		16-channel digital input terminal, flat-ribbon, 24 V DC, negative switching
Technical data	**EL1088** | ES1088	**EL1098** | ES1098	**EL1889**	**EL1084** | ES1084	**EL1094** | ES1094	**EL1862-0010**
Connection technology	1-wire			2-wire		flat-ribbon cable
Specification	negative switching "0": 18…30 V DC, "1": 0…7 V DC, typ. 3 mA input current					
Input filter	typ. 3.0 ms	typ. 10 µs	typ. 3.0 ms	typ. 3.0 ms	typ. 10 µs	typ. 3.0 ms
Number of inputs	8		16	4		16



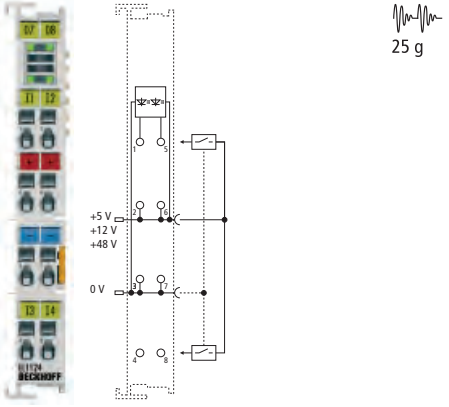
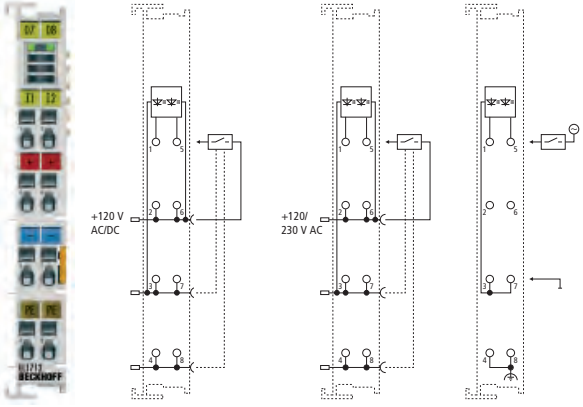
The EL terminals of the EL108x and EL109x series and the EL1889 and EL1862-0010 interpret input signals with negative logic: 0 V signal level means logic "1". The rated voltage level is read as logic "0". Versions with 10 µs input filter are available for sampling fast input edges. The slow 3 ms filter enables logging of bouncing contacts or slowly rising signal edges. The 4-channel versions enable 2-wire connection. In the ribbon version the 0 V and 24 V rails are available for 3-wire connection. In all cases, a power supply with 24 V DC rated voltage is required for operation.

In the EL1862-0010 a 20-pole pin contact strip with a 2.54 mm contact spacing with locking enables safe connection of plug connectors with insulation displacement.

Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 25 mA		typ. 35 mA	typ. 20 mA		typ. 35 mA
Current consumption E-bus	typ. 90 mA		typ. 110 mA	typ. 90 mA		typ. 100 mA
Distributed clocks	–		–	–		–
Special features	–		–	2-wire connection		–
Operating temperature	0…+55 °C		-25…+60 °C	0…+55 °C		0…+55 °C
Approvals	CE, UL, Ex		CE, UL, Ex	CE, UL, Ex		CE, UL, Ex
Weight	approx. 50 g		approx. 55 g	approx. 50 g		approx. 50 g
Further information	EL1088		EL1889	EL1084		EL1862

We reserve the right to make technical changes.

Digital input | 5 V…230 V

	4-channel digital input terminal, 2-/3-wire, 5 V DC	4-channel digital input terminal, 2-/3-wire, 12 V DC	4-channel digital input terminal, 2-/3-wire, type 1, 48 V DC	2-channel digital input terminal, 4-wire, type 1, 120 V AC/DC	2-channel digital input terminal, 4-wire, type 1, 120/230 V AC	2-channel digital input terminal, 2-wire, type 1, 120/230 V AC
Technical data	**EL1124** | ES1124	**EL1144** | ES1144	**EL1134** | ES1134	**EL1712** | ES1712	**EL1702** | ES1702	**EL1722** | ES1722
Connection technology	2-/3-wire			4-wire		2-wire
Specification	"0": < 0.8 V DC, "1": > 2.4 V DC, typ. 50 µA	"0": < 2.4 V DC, "1": > 8.5 V DC, input current "1": typ. 3 mA	EN 61131-2, type 1	"0": < 40 V, "1": 80…140 V, input current "1": > 3 mA, typ. 6 mA	"0": < 40 V, "1": 79…260 V, input current "1": > 3 mA, typ. 6 mA	
Input filter	typ. 0.05 µs	typ. 10 µs	typ. 10 µs	typ. 10 ms	typ. 10 ms	typ. 10 ms
Number of inputs	4	4	4	2	2	2
						
	The digital EL11x4 input terminals are suitable for reading logical signals based on direct current: EL1124 (5 V DC), EL1144 (12 V DC) and EL1134 (48 V DC). The EL9505 power supply terminals (5 V DC, for EL1124) and EL9512 (12 V DC, for EL1144) are available for feeding in the supply voltage at the power contacts. The EL9190 potential supply terminal in conjunction with an external 48 V DC power supply unit can be used for supplying the EL1134.			The EL17x2 digital input terminals are suitable for recording logic signals ≥ 120 V. The EL1712 is suitable for both DC and AC voltages and can therefore be used in the voltage range 120 V AC/DC. Using the EL1702 and EL1722, logic signals can be recorded on a 120 or 230 V AC basis. The EL1722 is suitable for the construction of individual potential groups, since it has no power contacts.		
Nominal voltage	5 V DC	12 V DC	48 V DC	120 V AC/DC	120/230 V AC	120/230 V AC
Current consumption power contacts	typ. 14 mA + load	typ. 14 mA + load	typ. 10 mA + load	–	–	–
Current consumption E-bus	typ. 90 mA	typ. 90 mA	typ. 90 mA	typ. 110 mA	typ. 110 mA	typ. 110 mA
Distributed clocks	–	–	–	–	–	–
Electrical isolation	500 V (E-bus/ field potential)	500 V (E-bus/ field potential)	500 V (E-bus/ field potential)	500 V (E-bus/ mains voltage); 3750 V AC, 1 min.	500 V (E-bus/ mains voltage); 3750 V AC, 1 min.	500 V (E-bus/ mains voltage); 3750 V AC, 1 min.
Special features	fast CMOS input	–	–	also suitable for 120 V DC	–	no power contacts
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE	CE	CE
Weight	approx. 55 g	approx. 55 g	approx. 55 g	approx. 60 g	approx. 60 g	approx. 60 g
Further information						

i For availability status see Beckhoff website at: EL1712

Digital input | 24 V DC, counter

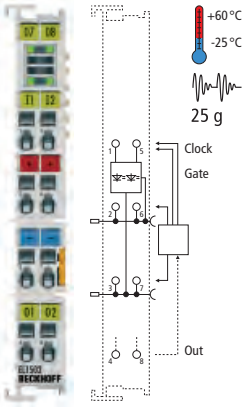
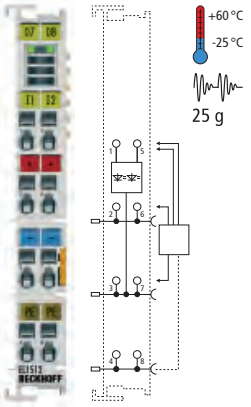
Pulses often need to be captured in technical control applications. This can be done with fast inputs such as EL1202 and a central pulse counter. If the pulse length is the order of magnitude of the control cycle time or less, the controller cannot record these signals correctly any more. Pre-processing counter terminals can then be used to count the number and direction of the pulses, which enables the controller to determine reliable values. The counter is adapted to the individual requirements, such as up/down counter or Gate/Latch-controlled, by fieldbus parameterisation. With a counting depth of 32 bit any overflow can be controlled reliably, even at high frequencies.

As a multi-functional EtherCAT Terminal the EL1502 supports the following operating modes:

– 1 x 32 bit up/down counter (the counting direction is specified via the input)
– 1 x 32 bit gated counter (the counter is enabled via the input)
– 2 x 32 bit up or down counter (no direction detection)

The EtherCAT Terminal can switch its outputs depending on the counter values. The EL1502 device supports the distributed clocks function. This enables the counter value to be read at highly constant intervals.

The EL1512 was developed for price-sensitive applications and has limitations in terms of speed and functionality.

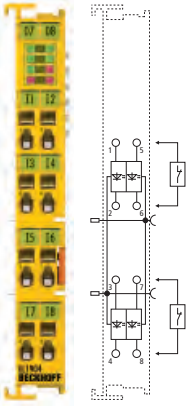
	2-channel digital input terminal, 24 V DC, 100 kHz, counter	2-channel digital input terminal, 24 V DC, 1 kHz, counter
Technical data	**EL1502** | ES1502	**EL1512** | ES1512
Connection technology	1 x up/down counter, 2 x up or down counter	2 up counters
Specification	EN 61131-2, type 1, "0": < 5 V DC, "1": > 15 V DC, typ. 5 mA	
		
	The EL1502 supports numerous functions for demanding counting tasks such as distributed clocks, fast counting frequency and switchable outputs.	The EL1512 is suitable for slow, simple and unidirectional counting tasks with two channels.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 14 mA + load	typ. 14 mA + load
Current consumption E-bus	typ. 130 mA	typ. 130 mA
Distributed clocks	yes	–
Electrical isolation	500 V (E-bus/field potential)	500 V (E-bus/field potential)
Counting frequency	max. 100 kHz	max. 1 kHz
Max. output current	24 V/0.5 A (short-circuit-proof) per channel	–
Counter depth	32 bit	32 bit
Special features	set counters, switch outputs	10 µs input filter
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 50 g	approx. 55 g
Further information	EL1502	EL1512

We reserve the right to make technical changes.

Digital input | 24 V DC, TwinSAFE

The EL1904 safety terminal is a digital input terminal for sensors with potential-free 24 V DC contacts. It has four fail-safe inputs. It conforms to the requirements of IEC 61508 SIL 3 and DIN EN ISO 13849-1:2008 PL e.

For further information on TwinSAFE and the TwinSAFE products see page 1044

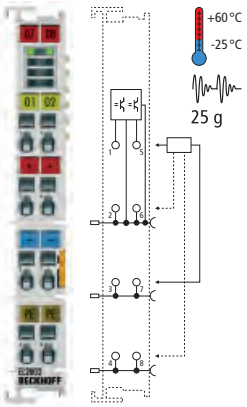
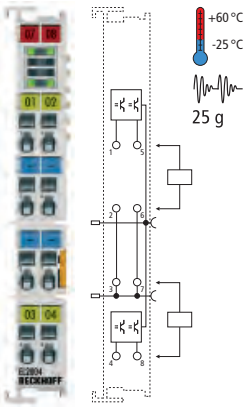
	4-channel digital input terminal, TwinSAFE, 24 V DC
Technical data	**EL1904**
Connection technology	1-/2-wire
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Number of inputs	4
	
Protocol	TwinSAFE/Safety over EtherCAT
Current consumption power contacts	see documentation
Current consumption E-bus	approx. 200 mA
Response time	typ. 4 ms (read input/write to E-bus)
Fault response time	≤ watchdog time (parameterisable)
Special features	4 safe inputs
Operating/storage temperature	-25…+55 °C/-40…+70 °C
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 50 g
Further information	EL1904

Digital output | 24 V DC, positive switching

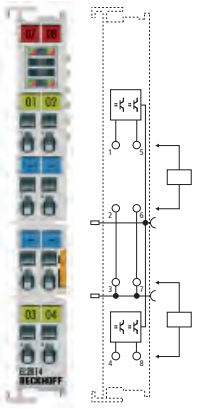
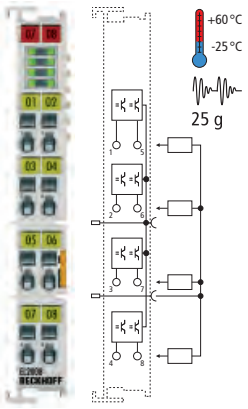
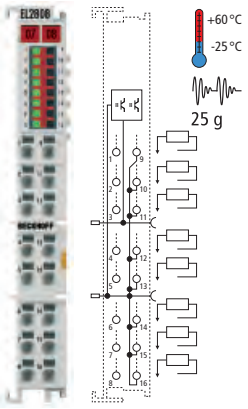
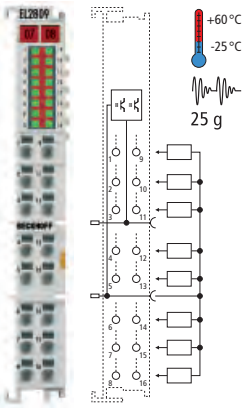
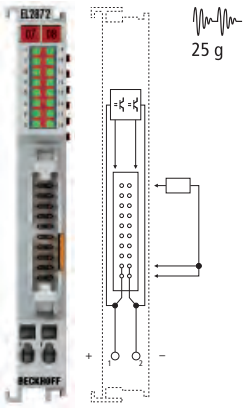
Many actuators are driven or controlled with 24 V DC. The EtherCAT Terminals of the "positive switching" category switch all output channels to 24 V DC, so all connected actuators are hard-wired to ground (0 V). The output of an EtherCAT Terminal can be considered as a functional 24 V DC relay contact. The output circuit offers further functions such as short-circuit-current limitation, short-circuit switch-off and the rapid depletion of inductive energy from the coil.

The most common output circuit delivers a maximum continuous current of 0.5 A. Special output terminals are available for higher currents. Any type of load (ohmic, capacitive, inductive) can be connected to an output terminal. As lamp and capacitive loads are critical due to their high starting currents, they are limited by the output circuits of the EtherCAT Terminals. This ensures that the upstream circuit-breaker is not triggered. Inductive loads are problematic at switch-off, as high induction voltages develop if the current is interrupted too fast. An integrated freewheeling diode prevents this voltage peak. However, the current is reduced so slowly that it leads to faults in many technical control applications. For example, a valve remains open for many milliseconds. The EtherCAT Terminals represent a compromise between prevention of overvoltage and rapid switch-off. They suppress the induction voltage to about 24 V DC and realise switch-off times which approximately correspond to the switch-on time of the coil.

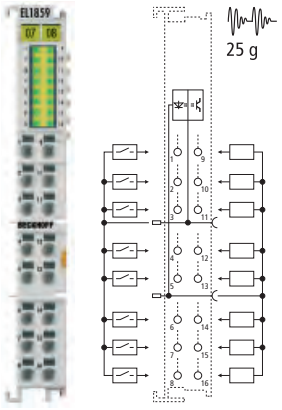
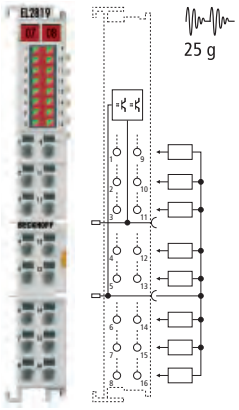
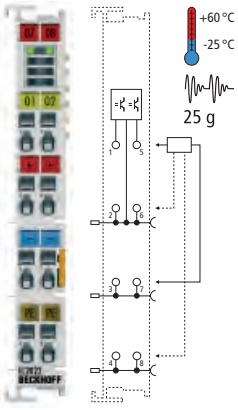
In the case of short-circuit, the output circuit limits the current and prevents the activation of the upstream circuit-breaker. The EtherCAT Terminal maintains this current until important self-heating and finally switches off. After the circuit has cooled, it switches back on. The output signal is driven in time until the output of the controller is switched off or the short-circuit is rectified. The clock frequency depends on the ambient temperature and the load of the other terminal channels. The overload protection of the output is also realised by thermal switch-off.

	2-channel digital output terminal, 4-wire, 24 V DC, 0.5 A	4-channel digital output terminal, 2-wire, 24 V DC, 0.5 A
Technical data	**EL2002** | ES2002	**EL2004** | ES2004
Connection technology	4-wire	2-wire
Load type	ohmic, inductive, lamp load	
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Switching times	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs
Number of outputs	2	4
		 The digital EL2004 EtherCAT Terminal is suitable for the connection of four 2-wire actuators.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 15 mA + load	typ. 15 mA + load
Current consumption E-bus	typ. 100 mA	typ. 100 mA
Distributed clocks	–	–
Breaking energy	< 150 mJ/channel	< 150 mJ/channel
Reverse voltage protection	yes	yes
Short circuit current	–	typ. < 2 A
Special features	–	–
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 55 g	approx. 55 g
Further information	EL2002	EL2004

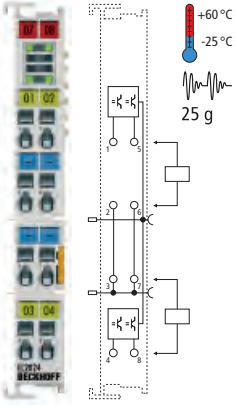
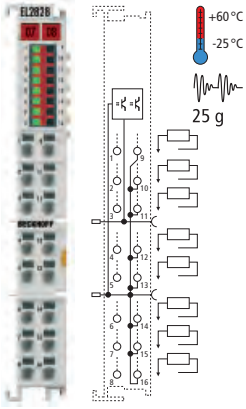
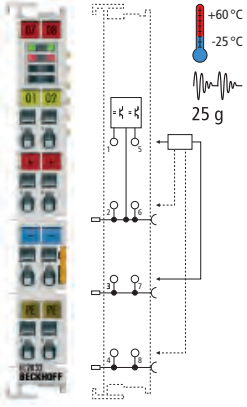
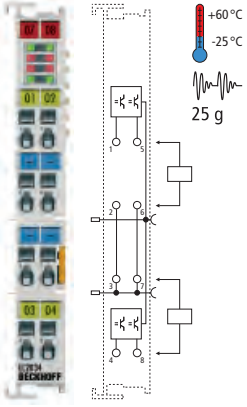
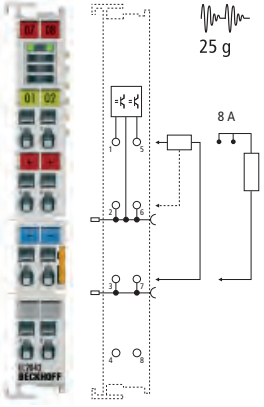
We reserve the right to make technical changes.

	4-channel digital output terminal, 1-wire, 24 V DC, 0.5 A, with diagnostics	8-channel digital output terminal, 1-wire, 24 V DC, 0.5 A	8-channel digital output terminal, 2-wire, 24 V DC, 0.5 A	16-channel digital output terminal, 1-wire, 24 V DC, 0.5 A	16-channel digital output terminal, flat-ribbon cable connection, 24 V DC
	EL2014	**EL2008** | ES2008	**EL2808**	**EL2809**	**EL2872**
	1-wire		2-wire	1-wire	flat-ribbon cable
	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
	typ. T_{ON}: 50 µs, typ. T_{OFF}: 100 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs
	4	8	8	16	16
					
		8-channel standard output terminal for 1-wire connection; output signalling through LED	The EL2808 High Density EtherCAT Terminal contains eight outputs for the connection of 2-wire actuators and thus allows a very high packing density.	16-channel standard output terminal for 1-wire connection; output signalling through LED	
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 15 mA + load	typ. 15 mA + load	typ. 15 mA + load	typ. 35 mA + load	typ. 25 mA + load (no power contacts)
	typ. 60 mA	typ. 110 mA	typ. 110 mA	typ. 140 mA	typ. 130 mA
	–	–	–	–	–
	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel
	yes	yes	yes	yes	yes
	< typ. 1 A	typ. < 2 A	typ. < 2 A	typ. < 2 A	typ. < 2 A
	diagnostics via process data and LED: overtemperature, PowerFail, short circuit (per channel)	–	–	–	ideal for multi-pin connector valve terminals
	0…+55 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C	0…+55 °C
	CE	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 70 g	approx. 55 g	approx. 65 g	approx. 70 g	approx. 55 g
	EL2014	EL2008	EL2808	EL2809	EL2872

Digital output | 24 V DC, positive switching

	16-channel digital output terminal, D-sub, 24 V DC	8-channel digital input + 8-channel digital output, 1-wire, 24 V DC, 0.5 A	16-channel digital output terminal, 1-wire, 24 V DC, 0.5 A, with diagnostics	2-channel digital output terminal, 4-wire, 24 V DC, 2 A (+ diagnostics)
Technical data	**EM2042**	**EL1859**	**EL2819**	**EL2022** | ES2022
Connection technology	D-sub	1-wire		4-wire
Load type	ohmic, inductive, lamp load			
Max. output current	0.5 A per channel, individually short-circuit-proof, ∑ 4 A	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	2.0 A (short-circuit-proof) per channel
Switching times	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 50 µs, typ. T_{OFF}: 100 µs	typ. T_{ON}: 40 µs, typ. T_{OFF}: 200 µs
Number of outputs	16	8 outputs + 8 inputs	16	2
				
	Plug X2 is included in the scope of supply.	Combi EtherCAT Terminal with 8 digital inputs and outputs in HD direct plug-in technique and 1-wire connection	16-channel output terminal with diagnostics	
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consum. pow. cont.	X2: typ. 25 mA + load	typ. 15 mA + load	typ. 50 mA + load	typ. 9 mA + load
Current consumption E-bus	typ. 115 mA	typ. 110 mA	typ. 90 mA	typ. 100 mA
Distributed clocks	–	–	–	–
Breaking energy	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel	< 1.7 J/channel
Reverse voltage protection	yes	yes	yes	yes
Short circuit current	typ. < 2 A	typ. < 2 A	< typ. 1 A	typ. < 70 A
Special features	ideal for multi-pin connector valve terminals	combi EtherCAT Terminal, 8 x input 24 V DC – input filter: 3 ms – type: 1/3	diagnostics via process data and LED: overtemperature, PowerFail, short circuit (per channel)	–
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	-25…+60 °C
Approvals	CE	CE, UL, Ex	CE, UL	CE, UL, Ex
Weight	approx. 90 g	approx. 65 g	approx. 70 g	approx. 55 g
Further information	EM2042	EL1859	EL2819	EL2022
Special terminals				
Distinguishing features				

We reserve the right to make technical changes.

	4-channel digital output terminal, 2-wire, 24 V DC, 2 A	8-channel digital output terminal, 2-wire, 24 V DC, 2 A	2-channel digital output terminal, 4-wire, 24 V DC, 2 A (+ diagnostics)	4-channel digital output terminal, 2-wire, 24 V DC, 2 A, with diagnostics	2-channel digital output terminal, 3-wire, 24 V DC, 2 x 4 A/1 x 8 A
	EL2024 | ES2024	**EL2828**	**EL2032** | ES2032	**EL2034** | ES2034	**EL2042** | ES2042
	2-wire		4-wire	2-wire	3-wire
	2.0 A (short-circuit-proof) per channel	2 A per channel (∑ 10 A)	2.0 A (short-circuit-proof) per channel	2.0 A (short-circuit-proof) per channel, with diagnostics	4.0 A (short-circuit-proof) per channel, 8 A for parallel connection
	typ. T_{ON}: 40 µs, typ. T_{OFF}: 200 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 250 µs	typ. T_{ON}: 40 µs, typ. T_{OFF}: 200 µs	typ. T_{ON}: 40 µs, typ. T_{OFF}: 200 µs	typ. T_{ON}: 40 µs, typ. T_{OFF}: 200 µs
	4	8	2	4	2
					
	Direct 2-wire connection of 4 actuators	The EL2828 High Density EtherCAT Terminal contains eight outputs for the connection of 2-wire actuators and thus allows a very high packing density.	The EL2032 has diagnostics for short circuit and open circuit.	Direct 2-wire connection of 4 actuators with diagnostics over EtherCAT	The EL2042 can supply up to 8 A output current if the outputs are connected in parallel.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 13 mA + load	typ. 15 mA + load	typ. 13 mA + load	typ. 14 mA + load	typ. 15 mA + load
	typ. 120 mA	typ. 110 mA	typ. 100 mA	typ. 120 mA	typ. 120 mA
	–	–	–	–	–
	< 1.7 J/channel	< 1.2 J/channel	< 1.7 J/channel	< 1.7 J/channel	< 1.7 J/channel
	yes	yes	yes	yes	yes
	typ. < 70 A	< 40 A typ.	typ. < 70 A	typ. < 70 A	typ. < 70 A
	–	–	especially suitable for loads with high input current	diagnostics: short circuit and open circuit	–
	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C	0…+55 °C
	CE, UL, Ex	CE, UL	CE, UL, Ex	CE, UL, Ex	CE
	approx. 55 g	approx. 70 g	approx. 55 g	approx. 55 g	approx. 55 g
	EL2024	EL2828	EL2032	EL2034	EL2042
	EL2024-0010				
	nom. volt. 12 V DC 361				

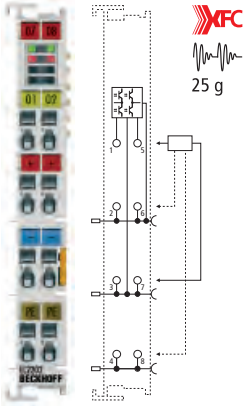
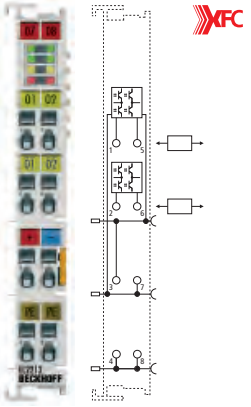
XFC digital output | 24 V DC, positive switching

XFC – eXtreme Fast Control – comprises a fast controller, fast real-time capable communication and fast, high-precision input/output modules. Based on synchronisation through the distributed clocks principle, input modules read their inputs at exactly defined times. Outputs can be controlled with nanosecond precision, irrespective of restrictions through the bus cycle time or communication jitter. Further information on XFC see pages 298 and 348

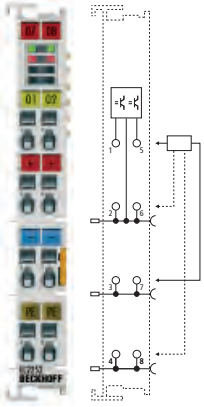
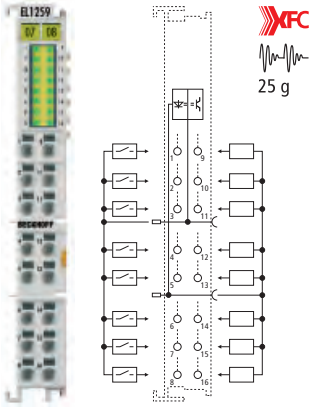
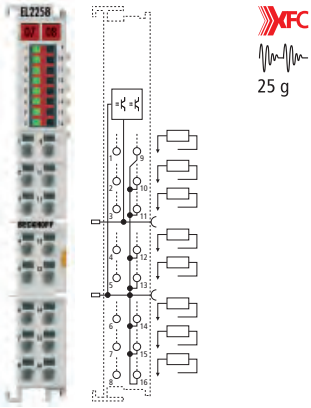
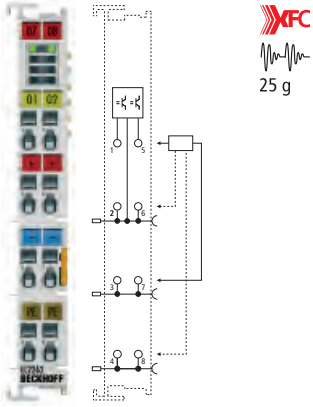
EtherCAT components with DC support, such as shaft encoders, drives or I/O modules, enable synchronised, time-based operation for exact control of the mechanical components. All EL12xx terminals feature a fast input circuit, which enables the signal information from the field to be transferred to the communication level without delay. The EL22xx XFC output terminals connect their outputs correspondingly fast and with distributed clock accuracy.

With overexcitation, the EL2212 supports the particularly fast switching of inductive loads, such as valves. A supply of 24 to 72 V is connected to the power contacts and passed through to the load when switched on. After an adjustable waiting period the terminal begins to control the current channel-wise in order to protect the load. The switching event is precisely positionable by the timestamping functionality. The switch-off process is also accelerated considerably by the pole reversal of the voltage.

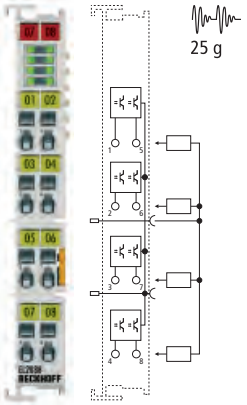
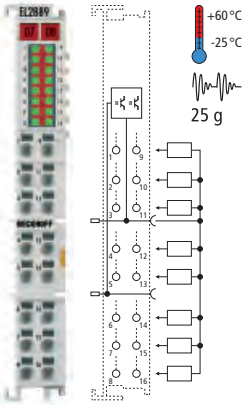
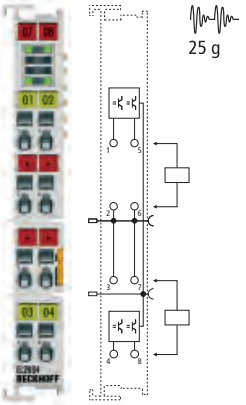
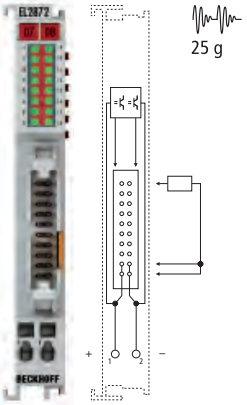
The ELx258 and EL1259 EtherCAT HD terminals with multi-timestamping technology offer optimised sensor/actuator control with high channel density and compact design. In contrast to the ELx252 series with a timestamp per PLC cycle and a time resolution of 1 ns, the EL1258, EL1259 and EL2258 operate with up to 10 timestamps per PLC cycle and thus a 10 to 40 µs time interval. They can sample inputs or issue outputs at these intervals, synchronised through the distributed clocks.

	2-channel digital output terminal, 4-wire, 24 V DC, T_{ON}/T_{OFF} 1 µs, push-pull outputs, tri-state	2-channel digital output terminal, 4-wire, 24…72 V DC, multi-time-stamping, overexcitation
Technical data	**EL2202** | ES2202	**EL2212** | ES2212
Connection technology	4-wire	
Load type	ohmic, inductive, lamp load	inductive > 1 mH
Max. output current	0.5 A (short-circuit-proof in push operation) per channel	peak current: max. 10 A per channel, holding current: 0.2…2.5 A per channel
Switching times	typ. T_{ON}: < 1 µs, typ. T_{OFF}: < 1 µs	without distributed clocks: T_{ON}/T_{OFF} typ. 20 µs, with distributed clocks: T_{ON}/T_{OFF} typ. < 1 µs via internal compensation
Number of outputs	2	2
		
Nominal voltage	24 V DC (-15 %/+20 %)	24…72 V DC (-15 %/+0 %)
Current consum. pow. cont.	typ. 30 mA + load	load-dependent
Current consumption E-bus	typ. 130 mA	typ. 120 mA
Distributed clocks	– (EL2202-0100 yes)	yes
Output stage	push-pull, high-ohmic	full bridge (push-pull)
Internal sampling/ execution	–	10 ns
Distributed clock precision	<< 1 µs	<< 1 µs
Oversampling/multi-timestamping factor	–	–
Breaking energy	< 150 mJ/channel	load-dependent
Reverse voltage protection	yes	–
Short circuit current	typ. < 1.5 A	12 A typ.
Special features	can be converted to DC version EL2202-0100, outputs connectable in high-resistance mode	Multi-timestamping, current-controlled outputs can be connected in high-resistance mode.
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE
Weight	approx. 55 g	approx. 50 g
Further information	EL2202	EL2212

We reserve the right to make technical changes.

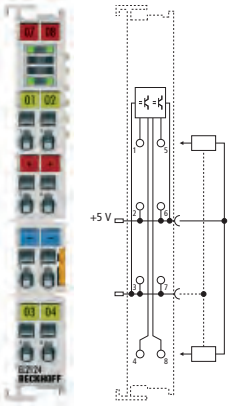
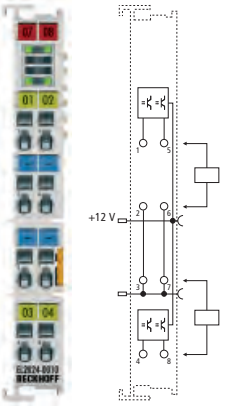
	2-channel digital output terminal, 4-wire, timestamping, push-pull outputs, tri-state	8-channel digital input + 8-channel digital output, 1-wire, 24 V DC, multi-timestamping	8-channel digital output terminal, 2-wire, multi-timestamping	2-channel digital output terminal, 4-wire, oversampling, push-pull outputs
	EL2252 | ES2252	**EL1259**	**EL2258**	**EL2262** | ES2262
		1-wire	2-wire	4-wire
	ohmic, inductive, lamp load			
	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof in push operation) per channel
	typ. T_{ON}: < 1 µs, typ. T_{OFF}: < 1 µs	typ. T_{ON}: < 1 µs, typ. T_{OFF}: < 1 µs	typ. T_{ON}: < 1 µs, typ. T_{OFF}: < 1 µs	typ. T_{ON}: < 1 µs, typ. T_{OFF}: < 1 µs
	2	8 outputs + 8 inputs	8	2
	 XFC 25 g	 XFC 25 g	 XFC 25 g	 XFC 25 g
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 30 mA + load	typ. 6 mA + load	typ. 30 mA + load	typ. 35 mA + load
	typ. 130 mA	typ. 90 mA	typ. 130 mA	typ. 70 mA
	yes	yes	yes	yes
	push-pull	push	push	push-pull
	10 ns	< 10…40 µs, corresponds to 100…25 k detectable edges/s, dependent on configuration	< 10…40 µs, corresponds to 100…25 k detectable edges/s, dependent on configuration	10 ns
	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs
	–	n = integer multiple of the cycle time, 1…10	n = integer multiple of the cycle time, 1…10	n = integer multiple of the cycle time, 1…1000
	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel
	yes	yes	yes	yes
	typ. < 1.5 A	< typ. 1 A	< typ. 1 A	typ. < 1.5 A
	Timestamping, outputs can be connected in high-resistance mode, short-circuit-proof.	multi-timestamping, auto activation	multi-timestamping, auto activation, further information see page 349	up to 1000 x oversampling, max. 1 Msample/s, min. output cycle 1 µs
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, Ex	CE, UL	CE, UL	CE, UL, Ex
	approx. 60 g	approx. 55 g	approx. 55 g	approx. 60 g
	EL2252	EL1259	EL2258	EL2262

Digital output | 24 V DC, negative switching

	8-channel digital output terminal, 1-wire, 24 V DC, 0.5 A	16-channel digital output terminal, 1-wire, 24 V DC, 0.5 A	4-channel digital output terminal, 2-wire, 24 V DC, 0.5 A	16-channel digital output terminal, flat-ribbon cable connection, 24 V DC, 0.5 A
Technical data	**EL2088** | ES2088	**EL2889**	**EL2084** | ES2084	**EL2872-0010**
Connection technology	1-wire		2-wire	flat-ribbon cable
Load type	ohmic, inductive, lamp load			
Max. output current	0.5 A (short-circuit-proof) per channel, ∑ 3 A	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Switching times	T_{ON}: 50 µs, T_{OFF}: 200 µs	T_{ON}: 50 µs, T_{OFF}: 200 µs	T_{ON}: 50 µs, T_{OFF}: 200 µs	T_{ON}: 50 µs, T_{OFF}: 200 µs
Number of outputs	8	16	4	16
				
	The negative switching EL2088 digital output terminal is suitable for the connection of eight actuators using 1-wire connection technology.	The negative switching EL2889 digital output terminal offers terminal points for 16 actuators using 1-wire connection technology and thus a very high packing density.	The negative switching EL2084 digital output terminal offers four outputs and additionally provides 24 V DC for each channel.	A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points 1 and 2.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 30 mA + load	typ. 30 mA + load	typ. 30 mA + load	typ. 30 mA + load
Current consumption E-bus	typ. 110 mA	typ. 140 mA	typ. 100 mA	typ. 130 mA
Distributed clocks	–	–	–	–
Breaking energy	< 100 mJ/channel	< 100 mJ/channel	< 100 mJ/channel	< 150 mJ/channel
Reverse voltage protection	yes	yes	yes	yes
Short circuit current	typ. < 7 A	typ. < 7 A	typ. < 7 A	typ. < 7 A
Operating temperature	0…+55 °C	-25…+60 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 70 g	approx. 70 g	approx. 70 g	approx. 55 g
Further information	EL2088	EL2889	EL2084	EL2872

We reserve the right to make technical changes.

Digital output | 5/12 V DC, positive switching

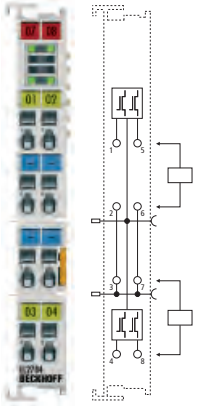
	4-channel digital output terminal, 2-/3-wire, 5 V DC, 20 mA	4-channel digital output terminal, 2-wire, 12 V DC, 2 A
Technical data	**EL2124** | ES2124	**EL2024-0010**
Connection technology	2-/3-wire	2-wire
Load type	ohmic, lamp load	ohmic, inductive, lamp load
Max. output current	±20 mA (short-circuit-proof) per channel, type CMOS output/push-pull	2.0 A (short-circuit-proof) per channel
Switching times	typ. T_{ON}: < 1 µs, typ. T_{OFF}: < 1 µs	typ. T_{ON}: 40 µs, typ. T_{OFF}: 200 µs
Number of outputs	4	4
	 25 g	 25 g
	The EL2124 is suitable for particularly fast switching of 5 V signals in push-pull mode. A 5 V supply is required via the power contacts, e.g. via a EL9505 power supply terminal.	The 12 V EL2024-0010 version is particularly suitable for automotive and building applications.
Nominal voltage	5 V DC	12 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 12 mA + load	typ. 13 mA + load
Current consumption E-bus	typ. 130 mA	typ. 120 mA
Distributed clocks	–	–
Peak current	–	–
Isolation voltage (channel/channel)	no data	no data
On-resistance	no data	no data
Breaking energy	–	< 1.7 J/channel
Reverse voltage protection	–	yes
Short circuit current	typ. < 50 A	typ. < 70 A
Special features	fast 5 V output	for automotive applications
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 70 g	approx. 55 g
Further information	EL2124	EL2024

Digital output | 30 V AC/DC, positive switching

The EL2784, EL2788, EL2794 and EL2798 digital output terminals each provide four (EL27x4) or eight (EL27x8) switches, which can be used like a relay contact for AC/DC voltages. The EL2784 and EL2788 use power contacts as a common potential. In the KL2794 and KL2798, the power contacts are passed directly to the circuit without connection.

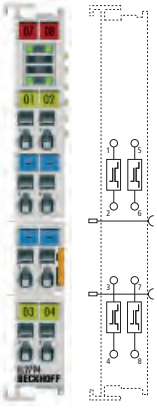
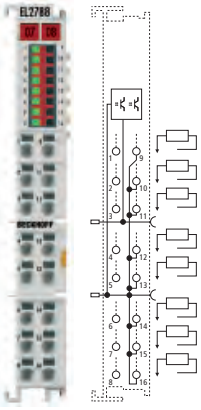
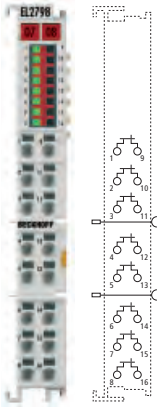
The electronic switch in the EtherCAT Terminal is implemented by efficient MOSFET transistors with a low switch-on resistance. The electronics are virtually wear-free. The switch itself is not short-circuit-proof, but can conduct a high current with its high pulse current capability long enough, until the circuit-breaker switches off. It behaves like a robust relay contact.

Inductive loads can be switched directly, without further safety measures. The circuit switches relatively slowly and prevents high peak voltages. No break sparks are created in the terminal and thus no electromagnetic interference pulse.

	4-channel digital output terminal, 2-wire, 30 V AC/DC, 2 A
Technical data	**EL2784**
Connection technology	2-wire
Load type	AC/DC loads
Max. output current	2 A per channel
Switching times	T_{ON}: typ. 1.8 ms, T_{OFF}: typ. 30 ms
Number of outputs	4 x make contacts
	 25 g 4 electronic switches on the power contact
Nominal voltage	0…30 V AC/DC (only ohmic load: 0…48 V DC)
Current consumption power contacts	–
Current consumption E-bus	typ. 140 mA
Distributed clocks	–
Peak current	5 A (100 ms), < 50 A (10 ms)
Isolation voltage (channel/channel)	–
On-resistance	typ. 0.03 Ω
Breaking energy	no data
Reverse voltage protection	–
Short circuit current	not short-circuit-proof, see peak current
Special features	substitute for relay contacts
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 70 g
Further information	EL2784

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	4-channel digital output terminal, 2-wire, 30 V AC/DC, 2 A, potential-free	8-channel digital output terminal, 2-wire, 30 V AC/DC, 2 A	8-channel digital output terminal, 2-wire, 30 V AC/DC, 2 A, potential-free
	i EL2794	i EL2788	EL2798
	2 A per channel	2 A per channel (∑ 10 A)	2 A per channel (∑ 10 A)
	T_{ON}: typ. 1.8 ms, T_{OFF}: typ. 30 ms	T_{ON}: typ. 1.8 ms, T_{OFF}: typ. 30 ms	T_{ON}: typ. 1.8 ms, T_{OFF}: typ. 30 ms
	4 x make contacts	8 x make contacts	8 x make contacts
	 25 g	 25 g	 25 g
	4 potential-free electronic switches	8 electronic switches on the power contact	8 potential-free electronic switches
	0…30 V AC/DC (only ohmic load: 0…48 V DC)	0…30 V AC/DC (only ohmic load: 0…48 V DC)	0…30 V AC/DC (only ohmic load: 0…48 V DC)
	–	–	–
	typ. 140 mA	typ. 140 mA	typ. 140 mA
	–	–	–
	5 A (100 ms), < 50 A (10 ms)	5 A (100 ms), < 50 A (10 ms)	5 A (100 ms), < 50 A (10 ms)
	< 200 V	–	< 200 V
	typ. 0.03 Ω	typ. 0.03 Ω	typ. 0.03 Ω
	no data	no data	no data
	–	–	–
	not short-circuit-proof, see peak current	not short-circuit-proof, see peak current	not short-circuit-proof, see peak current
	substitute for relay contacts, potential-free	substitute for relay contacts	substitute for relay contacts; potential-free
	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL	CE, UL	CE, UL
	approx. 70 g	approx. 70 g	approx. 70 g
	EL2794	EL2788	EL2798

Digital output | 24 V DC, pulse train/frequency output

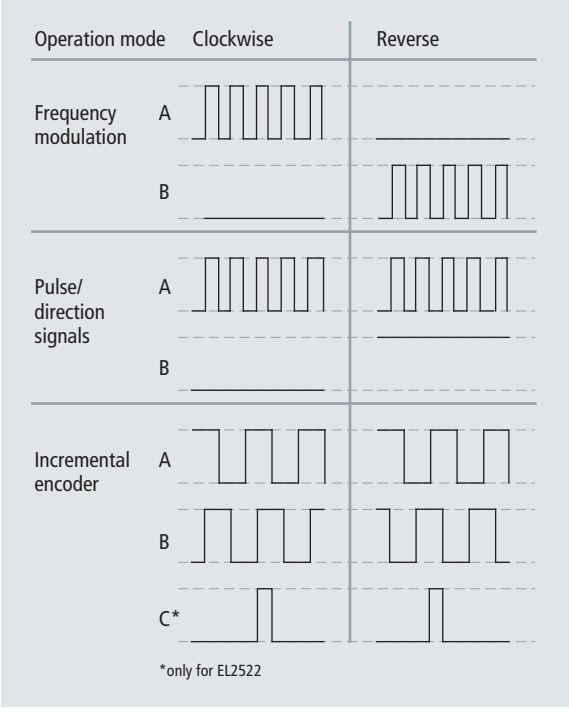
The output terminals of the series EL252x-xxxx issue a configurable pulse sequence via their outputs. The operating mode is individually configurable for each channel. These operating modes are available:

– frequency modulation on the individual channels (A- and B-channel)
– pulse direction setting
– incremental encoders

Pulse rate and frequency are specified by the controller via a 16-bit value. Distributed clock synchronisation enables the output to be synchronised with other EtherCAT slaves.

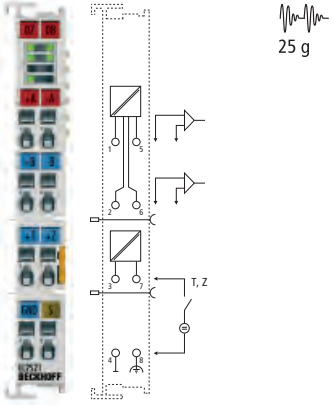
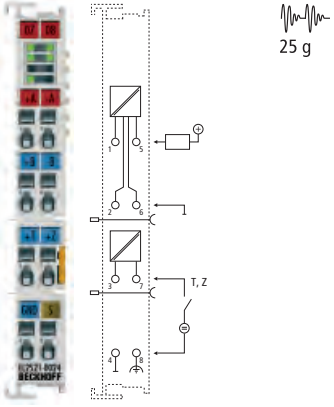
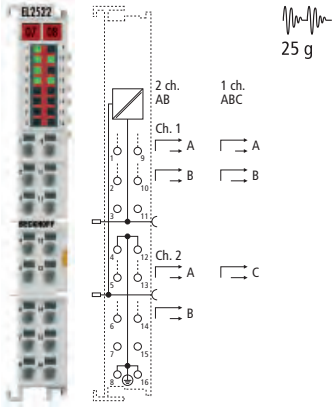
The EL2521-xxxx is a single-channel output terminal with two differential outputs and two digital inputs that are transferred into the process image. The two RS422-compatible differential outputs of the EL2521-0000 are supplied (electrically isolated) from the E-bus. In contrast, in the EL2521-0024 and EL2521-0025 the two output channels are designed as potential-free FET switches and have to be supplied externally. Moreover, in the EL2521-0025 the outputs switch to negative potential. Another available version is the EL2521-0124 with a 24 V latch input and an automatically switching 24 V output (Capture/Compare). In this way, the EtherCAT Terminal can automatically switch the output at a specifiable step number, for example for controlling an external device at a required position, independent of the bus cycle. The 100 mA switch output is short-circuit-proof.

The EL2522 is the two-channel version of the EL2521-0000 with the same functionality. In addition, in single-channel mode it offers the option to control three output channels in an ABC encoder simulation.



Frequency pulse patterns

We reserve the right to make technical changes.

	1-channel pulse train output terminal, 2 x RS422	1-channel pulse train output terminal, 2 x 24 V DC	Incremental encoder simulation terminal (pulse train)
Technical data	**EL2521** | ES2521	**EL2521-0024**	**EL2522**
Connection technology	pulse train (frequency output)		
Load type	ohmic, min. 220 Ω	ohmic, inductive	ohmic, min. 220 Ω
Max. output current	RS422 specification, 50 mA	5…24 V DC, 1 A	RS422 specification, 50 mA
Number of outputs	1 channel (2 differential outputs A, B)	1 channel (2 outputs A, B)	2 channel A/B, 1 channel A/B/C (4 differential outputs)
			
Current consum. pow. cont.	–	load	typ. 50 mA (load-dependent)
Current consumption E-bus	typ. 280 mA (load-dependent)	typ. 280 mA (load-dependent)	typ. 120 mA
Distributed clocks	yes	yes	yes
Input specification	24 V DC	24 V DC	–
Output specification	RS422, differential	5…24 V DC	RS422, differential, 50 mA, min. 220 Ω load
Base frequency	0…500 kHz, 50 kHz default	0…500 kHz, 50 kHz default	0…4 MHz, 50 kHz default
Resolution	max. 15 bit (16 bit + sign)	max. 15 bit (16 bit + sign)	16 bit (incl. sign, scaled via the set frequency range)
Step size	10 mHz	10 mHz	min. 10 ns (internal)
Short circuit current	short-circuit-proof	–	short-circuit-proof
Special features	different modes, ramp function, travel distance control	different modes, ramp function, travel distance control	operating modes as with EL2521, ABC incremental encoder simulation including interfacing with TwinCAT NC
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL
Weight	approx. 50 g	approx. 50 g	approx. 50 g
Further information	EL2521	EL2521	EL2522
Special terminals	**EL2521-0025**	**EL2521-0124**	
Distinguishing features	pulse train output, 24 V version, negative switching	24 V version with Capture/Compare input/output	

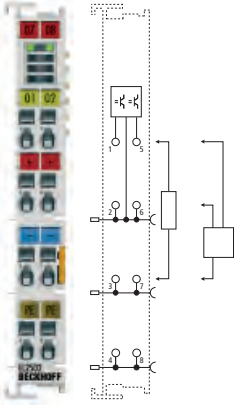
Digital output | **PWM up to 24/50 V DC, current control**

EtherCAT Terminals with PWM output are used to control variable actuators such as valves, solenoid coils, lamps, heating elements and rotary magnets. To this end, the base frequency can be set via the process data (EL2502) or through parameterisation. The EL25xx PWM terminals deal with determining switching times, thus taking a load off the central controller.

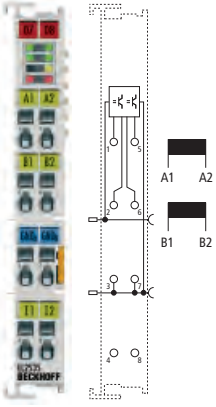
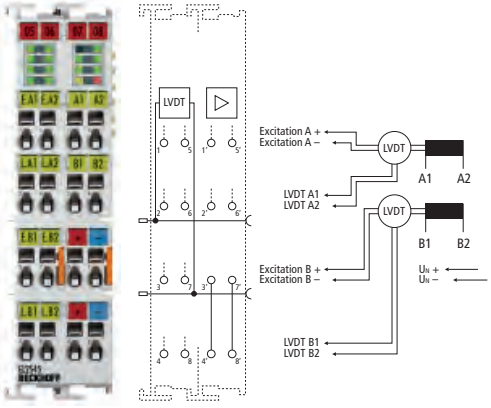
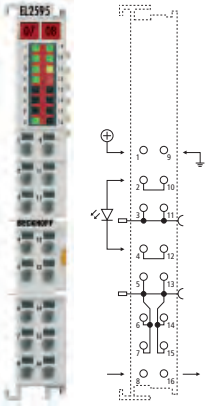
The EL2502 modulates its 24 V outputs independently in terms of frequency and pulse width based on the process data specification. The output stage is protected against overload and short circuit.

In contrast to the EL2502, which is an uncontrolled actuator and operates based on a specified duty factor, the EL2535 and EL2545 measure the actual current at an inductive load and regulate it through the duty factor based on the actual rated current specification. They also monitor overload and short circuit. Moreover, stored characteristic valve curves can be retrieved. The PWM frequency can be set separately for the two channels. Two digital 24 V inputs can be read via the process data. The EL2545 has a larger output stage and a 24 V incremental encoder unit. It can be used as a single- or two-encoder unit with up to 400,000 increments/second. In addition, a latch function and a reset function are available via the two digital inputs.

The EL2595 also enables connection of non-inductive loads and is particularly suitable for precisely timed pulse operation of LEDs, e.g. for camera lighting. In addition, the EL2595 enables continuous lighting with real-time diagnostics. Internally the EL2595 features a PWM stage, which is smoothed and filtered towards the output. This means that in practice almost a DC output voltage is available.

	2-channel pulse width output terminal, 24 V DC, 0.5 A
Technical data	**EL2502** | ES2502
Connection technology	PWM output, push-pull outputs
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Number of outputs	2
	 25 g
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 30 mA + load
Current consumption E-bus	typ. 150 mA
Distributed clocks	–
PWM clock frequency	20 Hz…20 kHz, 250 Hz default
Duty factor	0…100 % (T_{ON} > 750 ns, T_{OFF} > 500 ns)
Resolution	10 bit
Reverse voltage protection	yes
Short circuit current	typ. < 1.5 A
Special features	separate frequency can be set for each channel
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 50 g
Further information	EL2502
Special terminals	
Distinguishing features	

We reserve the right to make technical changes.

	2-channel pulse width current terminal, 24 V DC, ±1 A, current-controlled	2-channel pulse width current terminal, 50 V DC, ±3.5 A, current-controlled, with LVDT	1-channel LED constant current terminal, 2-wire, adjustable
	EL2535 | ES2535	**EL2545** | ES2545	**EL2595**
			2-wire
	inductive > 1 mH		ohmic
	±1 A	±3.5 A (short-circuit-proof, thermal overload-proof) per channel	700 mA steady load (short-circuit-proof)
	2	2	1
	 25 g		 XFC
	24 V DC (-15 %/+20 %)	8…50 V DC	2…48 V DC (controlled automatically)
	typ. 30 mA + load	typ. 50 mA + load	typ. 20 mA + load
	typ. 110 mA	typ. 180 mA	typ. 130 mA
	–	yes	yes
	30 kHz default	32 kHz default	–
	0…100 % (current-controlled)	0…100 % (current-controlled)	typ. T_{ON}: < 1 µs, typ. T_{OFF}: < 1 µs
	10 bit	12 bit	–
	yes	yes	–
	typ. < 2 A	typ. < 5 A	–
	2 digital 24 V inputs	with LVDT feedback	optional automatic operation in case of communication interruption, extensive real-time diagnostics, external trigger input
	0…+55 °C	0…+55 °C	0…+55 °C
	CE	CE	CE
	approx. 50 g	approx. 50 g	approx. 55 g
	EL2535	EL2545	EL2595
	EL2535-0050 | **EL2535-0002**		
	output ±50 mA, ATEX | typ. ±2 A		

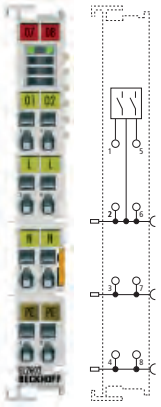
For availability status see Beckhoff website at: EL2545

Digital output | **Relay outputs up to 230 V AC**

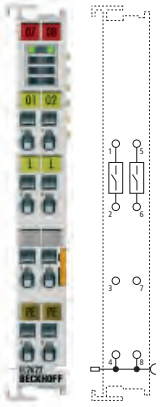
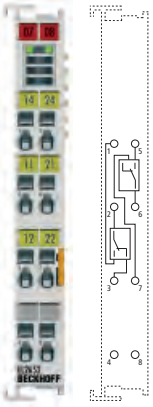
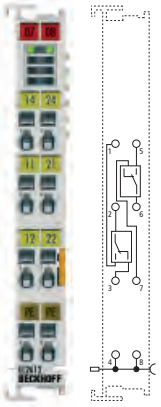
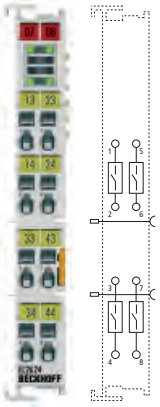
The EtherCAT Terminals switch a relay as a function of a bit in the process image. The relays completely isolate the current flow by a mechanical contact; there is no residual current through the open contact. The EtherCAT Terminals are not equipped with a protective circuit, so as not to allow for residual current by parallel switched components. The relay contacts differ in their contact material. Signal contacts also switch small voltages and currents; large current here leads to a change in the contact characteristics. Power contacts can also switch large loads. However, an oxide layer on the power contacts prevents safe contact for small voltages below 1 V DC. The contacts of the small-signal relays in the EL2612 and EL2614 are specially coated, so that they can switch small loads reliably. Should this coating become damaged through overload caused by high switching currents, only larger loads can be handled thereafter.

Switching on is accompanied by a bouncing: the electrical connection is initially switched on and off briefly, until the contact is securely in its closed location. With an inductive load (coil) this behaviour leads to a spark and to corresponding electromagnetic radiation. Capacitive loads create a short-circuit for a brief period of time. This can – particularly with alternating voltages – lead to such high switch-on currents at switch-on under peak value that the bouncing contact is burned shut. A capacitive load can also be electronic devices, which are typically equipped with a rectifier in the input and a relatively large smoothing capacitor. Electronic ballast is especially critical for fluorescent lamps. The maximum switch-on currents of the devices are generally specified in the technical data.

The relay is switched off through opening of a mechanical contact. An arc burns for a short moment and warms the contact. For an inductive load (coil) a large part of the magnetic energy stored in the coil is additionally released as heat at the contact. This load on the contact determines the service life of the relay and is called the electrical service life. The mechanical service life is defined as the number of switching operations without current flow through the contact.

	2-channel relay output terminal, 230 V AC/30 V DC
Technical data	**EL2602** | ES2602
Connection technology	relay output
Load type	ohmic, inductive, lamp load
Number of outputs	2 x make contacts for power contact
	
Nominal voltage	230 V AC/30 V DC
Current consumption power contacts	–
Current consumption E-bus	typ. 170 mA
Distributed clocks	–
Ohmic switching current	5 A AC/DC per channel
Inductive switching current	2 A AC/DC per channel
Switching current max.	–
Operat. cycles mech. (min.)	2 x 10^7
Operat. cycles electr. (min.)	1 x 10^5 (5 A/30 V DC)
Switching frequency max.	–
Lamp test, electronic ballast	4 x 58 W
Minimum permitted load	10 mA at 5 V DC
Special features	1-wire connection possible
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 50 g
Further information	EL2602

We reserve the right to make technical changes.

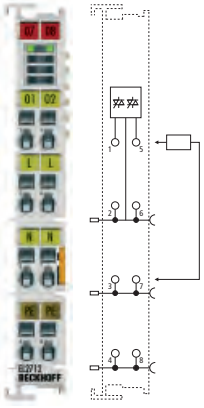
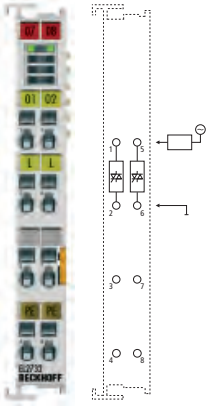
	2-channel relay output terminal, 230 V AC/30 V DC	2-channel relay output terminal, 230 V AC, 300 V DC	2-channel relay output terminal, 125 V AC/30 V DC	4-channel relay output terminal, 125 V AC/30 V DC
	EL2622 | ES2622	**EL2652** | ES2652	**EL2612** | ES2612	**EL2624** | ES2624
			ohmic	
	2 x make contacts	2 x change-over	2 x change-over	4 x make contacts
				
	230 V AC/30 V DC	230 V AC (max. switching voltage 250 V AC/300 V DC)	125 V AC/30 V DC	125 V AC/30 V DC
	–	– (no power contacts)	–	–
	typ. 170 mA	180 mA	typ. 150 mA	typ. 200 mA
	–	–	–	–
	5 A AC/DC per channel	–	0.5 A AC/2 A DC per channel	0.5 A AC/2 A DC per channel
	2 A AC/DC per channel	–	no data	no data
	–	1 A AC/1 A DC at 40 V DC; 0.15 A at 300 V DC (UL: max. 230 V AC, 1 A)	–	–
	2×10^7	5×10^6 (180 switching cycles/minute)	1×10^8	1×10^8
	1×10^5 (5 A/30 V DC)	1×10^6 (1 A/250 V AC ohmic load)	2×10^5 (1 A/30 V DC)	2×10^5 (1 A/30 V DC)
	–	6/min. (at rated load)	–	–
	4 x 58 W	–	–	–
	10 mA at 5 V DC	100 mA (12 V DC)	10 µA at 10 mV DC with intact contact coating	10 µA at 10 mV DC with intact contact coating
	–	reverse switching realisable	signal relay	–
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL	CE, UL	CE, UL	CE, UL
	approx. 50 g	approx. 55 g	approx. 50 g	approx. 50 g
	EL2622	EL2652	EL2612	EL2624

Digital output | **Triac outputs up to 230 V AC**

In applications with particularly frequent switching operations the service life of a mechanical relay is potentially very short. An electronic switch in the form of triacs and Mosfet transistors is an almost wear-free replacement.

A triac is a robust switch and will only be used as a zero crossing switch in the EtherCAT Terminals. Switch-on only occurs in zero crossing voltage and switch-off only in zero crossing current. Inductive loads are therefore switched off without overvoltage. The disadvantage of a Triac is a relatively high voltage drop in switched-on state, which leads to a higher power dissipation compared to a relay contact. An essential protective circuit leads to a leakage current in switched-off state. The output is not safely isolated from the mains. Triacs need a minimum load so that they remain switched-on, and a minimum voltage for error-free zero crossing detection.

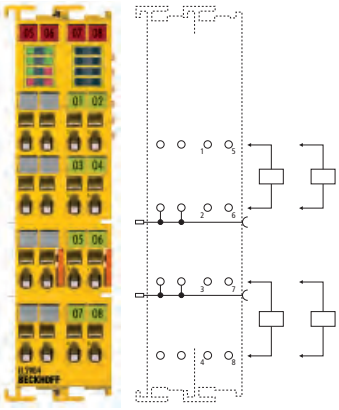
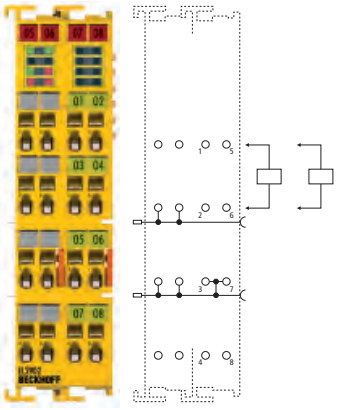
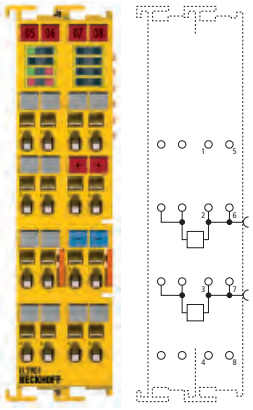
When fusing EtherCAT Terminals from the triac family it should be noted that electronic switches cannot withstand high short-circuit currents. The fuses which are used should at least be fast-acting (characteristic: F) with low rated/reference current.

	2-channel triac output terminal, up to 230 V AC		2-channel triac output terminal, up to 230 V AC, no power contacts
Technical data	**EL2712 | ES2712**	**EL2722 | ES2722**	**EL2732 | ES2732**
Connection technology	triac output, 2-wire		
Load type	ohmic, inductive		
Max. output current	0.5 A	1 A (0.5 A if both outputs are on)	0.5 A
Switching times	in zero crossing, 0.1…10 ms		in zero crossing, 0.1…10 ms
Number of outputs	2 x make contacts	2 x make contacts, mutually locked	2 x make contacts (without power contacts), mutually locked
			
Nominal voltage	12…230 V AC		12…230 V AC
Current consum. pow. cont.	–		–
Current consumption E-bus	typ. 120 mA		typ. 120 mA
Distributed clocks	–		–
Frequency range	47…63 Hz		47…63 Hz
Surge voltage protection	> 275 V		> 275 V
Peak current	40 A (16 ms), 1.5 A (30 s)		40 A (16 ms), 1.5 A (30 s)
Leakage current	typ. 0.8 mA, max. 1.5 mA (OFF state)		typ. 0.8 mA, max. 1.5 mA (OFF state)
Switch-off time	T/2		T/2
Maximum residual voltage	1.5 V (60 mA…1 A), 150 Ω (< 60 mA)		1.5 V (60 mA…1 A), 150 Ω (< 60 mA)
Special features	suitable for conventional blind motors		suitable for conventional blind motors
Operating temperature	0…+55 °C		0…+55 °C
Approvals	CE		CE
Weight	approx. 55 g		approx. 55 g
Further information	EL2712	EL2722	EL2732

i For availability status see Beckhoff website at: EL2712

We reserve the right to make technical changes.

Digital output | 24 V DC, TwinSAFE

	4-channel digital output terminal, TwinSAFE, 24 V DC	2-channel digital output terminal, TwinSAFE, 24 V DC	Potential power supply terminal, TwinSAFE, 24 V DC, 10 A
Technical data	**EL2904**	**EL2902**	**EL2901**
Connection technology	1-/2-wire	1-wire	1-/2-wire and/or via power contacts
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
Max. output current	0.5 A (per channel), min. 20 mA (with active current measurement)	2.3 A (per channel)	10 A
Number of outputs	4	2	1
			
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	load-dependent	load-dependent	load-dependent
Current consumption E-bus	approx. 221 mA	approx. 221 mA	approx. 221 mA
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Special features	4 safe outputs	2 safe outputs	safe power supply
Operating/storage temperature	-25…+55 °C/-40…+70 °C	0…+55 °C/-40…+70 °C	0…+55 °C/-40…+70 °C
Approvals	CE, UL, Ex, TÜV SÜD	in preparation (CE, UL, Ex, TÜV SÜD)	in preparation (CE, UL, Ex, TÜV SÜD)
Weight	approx. 90 g	approx. 90 g	approx. 90 g
Further information	EL2904	EL2902	EL2901

For TwinSAFE products and further information on the TwinSAFE technology see page 1044

For availability status see Beckhoff website at:

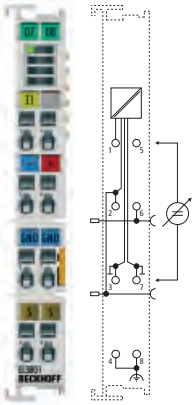
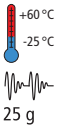
Analog input | -10…+10 V, 12 bit, single-ended

The EL3xxx EtherCAT Terminals read analog signal voltages in the common standard signal range of -10 to +10 V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA. Within the EtherCAT Terminal the field side is electrically isolated from the E-bus and enables interconnection to form potential groups as required. The 1-channel terminals are available for applications in which each signal must be completely electrically isolated. An additional electrically isolated 24 V DC supply can be created by the application of the EL9560 power supply terminal (24 V DC/24 V DC).

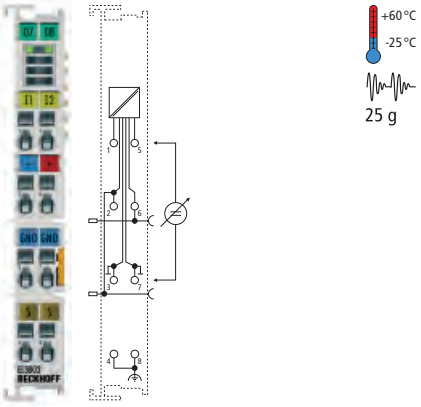
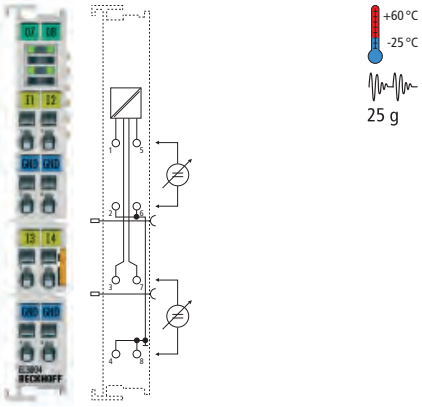
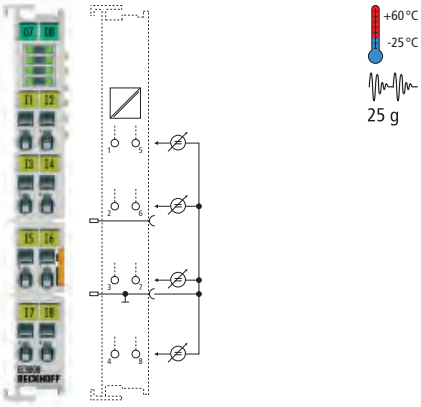
The analog input EtherCAT Terminals differ in their different resolutions of the analog/digital conversion, conversion speed and accuracy. For 1- and 2-channel terminals 1-, 2-, 3- and 4-wire connections are available for the sensors. 4-channel EtherCAT Terminals can only be used with 1- and 2-wire connections.

The input circuit of the EtherCAT Terminals differs between single-ended and differential inputs. A single-ended input expects a signal with a fixed reference to ground. In practice, single-ended is easily to be wired using single-wire connection. The differential input measures the difference between both inputs +I and -I. A superposition within the common-mode area (common-mode voltage) has no effect on the measuring result. For measurement two conductors should always be connected; in the case of single-wire connection input -I can be connected to ground.

The product range is rounded off by further special input voltages and covers a wide field of application for the processing of analog signals. By the expansion of power supply terminals well-stabilised auxiliary voltages from 5 to 15 V can be generated.

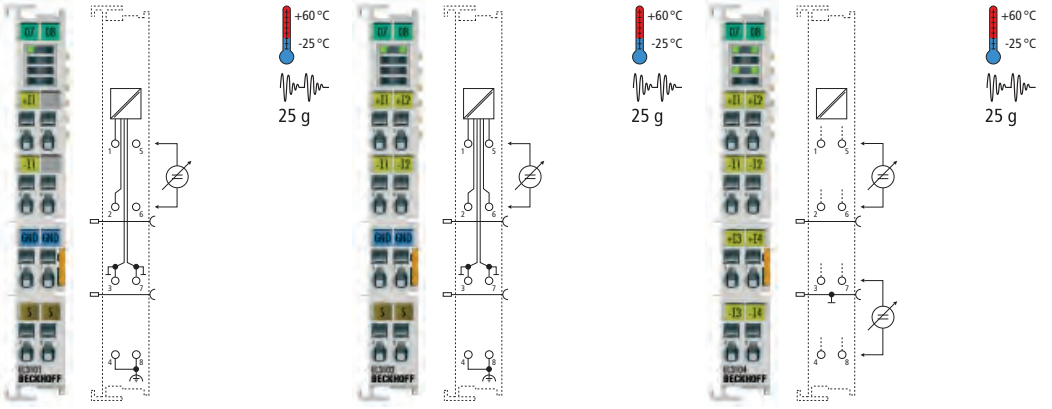
	1-channel analog input terminal, -10…+10 V, 12 bit, single-ended
Technical data	**EL3001** | ES3001
Signal voltage	-10…+10 V
Resolution	12 bit (16 bit presentation, incl. sign)
Technology	single-ended
Conversion time	0.625 ms default setting, configurable
Number of inputs	1 (single-ended)
	  The EL3001 analog input terminal is characterised by its fine granularity and electrical isolation.
Dielectric strength	max. 30 V
Current consumption power contacts	–
Current consumption E-bus	typ. 130 mA
Distributed clocks	–
Internal resistance	> 130 kΩ
Input filter limit frequency	1 kHz
Measuring error	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring, overload display in the process data
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Weight	approx. 70 g
Further information	EL3001

We reserve the right to make technical changes.

	2-channel analog input terminal, -10…+10 V, 12 bit, single-ended	4-channel analog input terminal, -10…+10 V, 12 bit, single-ended	8-channel analog input terminal, -10…+10 V, 12 bit, single-ended
	EL3002 | ES3002	**EL3004** | ES3004	**EL3008** | ES3008
	single-ended	single-ended	single-ended
	0.625 ms default setting, configurable	0.625 ms default setting, configurable	1.25 ms default setting, configurable
	2 (single-ended)	4 (single-ended)	8 (single-ended)
			
	The EL3002 analog input terminal combines two analog inputs with a common internal ground potential in one housing.	The four single-ended inputs of the EL3004 have a common reference ground that is fed out. A 2-wire connection is thus possible.	With eight input channels, the EL3008 is particularly suitable for space-saving installation in the control cabinet. The common reference ground is the 0 V power contact. A 0 V distribution terminal, e.g. EL9187 or EL9189, must be added for a 2-wire connection.
	max. 30 V	max. 30 V	max. 30 V
	–	–	–
	typ. 130 mA	typ. 130 mA	typ. 130 mA
	–	–	–
	> 130 kΩ	> 130 kΩ	> 130 kΩ
	1 kHz	1 kHz	1 kHz
	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring, overload display in the process data	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring, overload display in the process data	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring, overload display in the process data
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 70 g	approx. 70 g	approx. 70 g
	EL3002	EL3004	EL3008

Analog input | -10…+10 V, 16 bit, differential input

	1-channel analog input terminal, -10…+10 V, 16 bit, differential input	2-channel analog input terminal, -10…+10 V, 16 bit, differential input	4-channel analog input terminal, -10…+10 V, 16 bit, differential input
Technical data	**EL3101** | ES3101	**EL3102** | ES3102	**EL3104** | ES3104
Signal voltage	-10…+10 V		
Resolution	16 bit (incl. sign)		
Technology	differential input	differential input	differential input
Conversion time	~ 40 µs	~ 60 µs (fast mode ~ 40 µs)	~ 100 µs
Number of inputs	1 (differential)	2 (differential)	4 (differential)

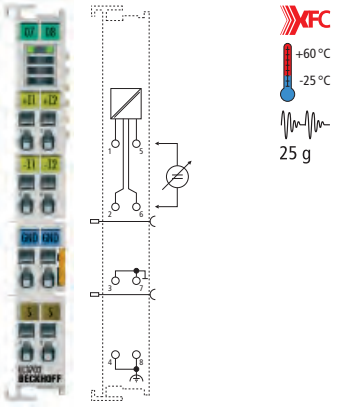
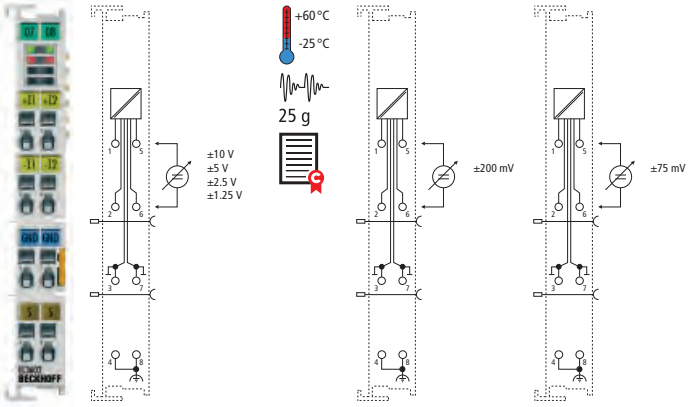


The EL310x analog input terminals measure input voltages from -10 to +10 V with 16-bit resolution. The significantly faster conversion time and support for distributed clocks enable use in time-critical applications and set them apart from the EL30xx series. The differential inputs of the EL3102/EL3104 have the same reference ground.

Common-mode voltage U_{CM}	35 V max. (relative to the internal GND)	35 V max. (relative to the internal GND)	35 V max. (relative to GND power contact)
Current consumption power contacts	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 170 mA	typ. 130 mA
Distributed clocks	yes	yes	yes
Oversampling factor	–	–	–
Distributed clock precision	<< 1 µs	<< 1 µs	<< 1 µs
Input signal bandwidth	–	–	–
Internal resistance	> 200 kΩ	> 200 kΩ	> 200 kΩ
Input filter limit frequency	5 kHz	5 kHz	5 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 65 g
Further information	EL3101	EL3102	EL3104

We reserve the right to make technical changes.

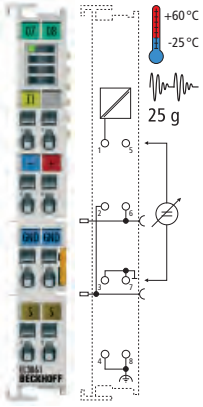
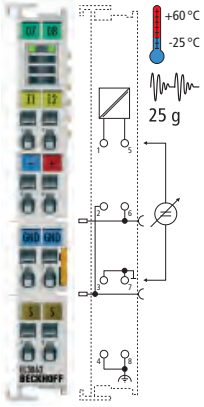
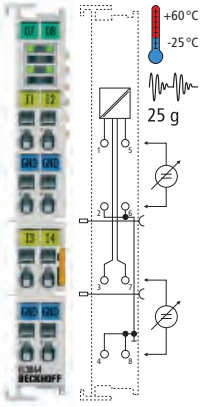
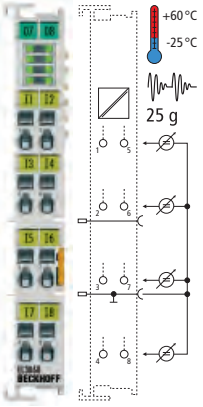
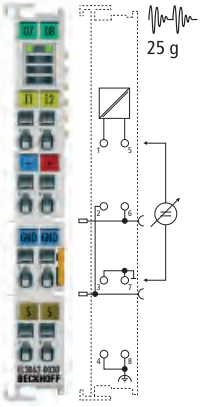
Analog input | **Oversampling, precision measurement**

	2-channel analog input terminal, -10…+10 V, 16 bit, oversampling, differential input	2-channel analog input terminal, -10…+10 V, 24 bit, differential input	2-channel analog input terminal, ±200 mV, differential input, 24 bit	2-channel analog input term., -75…+75 mV, 24 bit, differential input
Technical data	**EL3702** | ES3702	**EL3602** | ES3602	**EL3602-0002**	**EL3602-0010**
Signal voltage	-10…+10 V	-10…+10 V, -5…+5 V, -2.5…+2.5 V, -1.25…+1.25 V (parameterisable)	-200…+200 mV	-75…+75 mV
Resolution	16 bit (incl. sign)	24 bit (incl. sign)		
Technology	differential input, oversampling	differential input		
Conversion time	~ 10 µs per sample	20 ms default setting, 1…400 ms configurable		
Number of inputs	2 (differential)	2 (differential)		
				
	The ±10 V signals are sampled with an adjustable integral multiple (oversampling factor: n) of the bus cycle time (n microcycles for each bus cycle). For each microcycle a process data block is generated and transferred collectively during the next bus cycle.	The EL3602 terminal is a precise measuring device with 24-bit resolution and a common ground potential for both differential inputs. Shielded connecting cables, secure shield and earth connections and a controlled ambient temperature are necessary in order to obtain precise results. The EL9195 shield terminal is to be placed adjacently if necessary.		
Common-mode voltage U_{CM}	35 V max.	35 V max.		
Current consum. pow. cont.	–	–		
Current consumption E-bus	typ. 200 mA	typ. 190 mA		
Distributed clocks	yes	–		
Oversampling factor	n = 1…100 select. (max. 100 ksamples/s)	–		
Distributed clock precision	<< 1 µs	–		
Input signal bandwidth	0…30 kHz recommended	–		
Internal resistance	> 200 kΩ	> 200 kΩ		
Input filter limit frequency	30 kHz	3 kHz	3 kHz	10 kHz
Measuring error	< ±0.3 % up to 10 Hz (relative to full scale value)	< ±0.01 % at 25 °C, 50 Hz filter (relative to full scale value)	< ±0.05 % at 25 °C, 50 Hz filter (relative to full scale value)	
Special features	oversampling	various filter times, limit value monitoring, high precision		
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex		
Weight	approx. 60 g	approx. 60 g		
Further information	EL3702	EL3602		
Special terminals		EL3602-0020		
Distinguishing features		with calibration certificate		

Further information on XFC see page 298

We reserve the right to make technical changes.

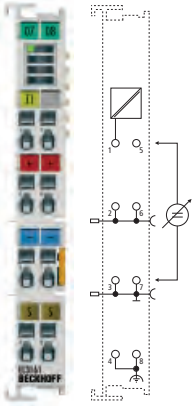
Analog input | 0…10 V/30 V, 12 bit, single-ended

	1-channel analog input terminal, 0…10 V, 12 bit, single-ended	2-channel analog input terminal, 0…10 V, 12 bit, single-ended	4-channel analog input terminal, 0…10 V, 12 bit, single-ended	8-channel analog input terminal, 0…10 V, 12 bit, single-ended	2-channel analog input terminal, 0…30 V, 12 bit, single-ended
Technical data	**EL3061** | ES3061	**EL3062** | ES3062	**EL3064** | ES3064	**EL3068** | ES3068	**EL3062-0030**
Signal voltage	0…10 V				0…30 V
Resolution	12 bit (16 bit presentation, incl. sign)				
Technology	single-ended	single-ended	single-ended	single-ended	single-ended
Conversion time	0.625 ms default setting, configurable	0.625 ms default setting, configurable	0.625 ms default setting, configurable	1.25 ms default setting, configurable	0.625 ms default setting, configurable
Number of inputs	1 (single-ended)	2 (single-ended)	4 (single-ended)	8 (single-ended)	2 (single-ended)
					
Dielectric strength	max. 30 V	max. 30 V	max. 30 V	max. 30 V	max. 30 V
Current consumption power contacts	–	–	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 130 mA	typ. 130 mA	typ. 130 mA	typ. 130 mA
Distributed clocks	–	–	–	–	–
Internal resistance	> 130 kΩ	> 130 kΩ	> 130 kΩ	> 130 kΩ	> 130 kΩ
Input filter limit frequency	1 kHz	1 kHz	1 kHz	1 kHz	1 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	activatable FIR/IIR filters, limit value monitoring	activatable FIR/IIR filters, limit value monitoring	activatable FIR/IIR filters, limit value monitoring	activatable FIR/IIR filters, limit value monitoring	activatable FIR/IIR filters, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL3061	EL3062	EL3064	EL3068	EL3062

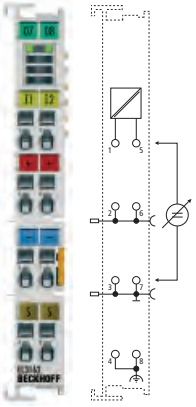
We reserve the right to make technical changes.

Analog input | 0…10 V, 16 bit, single-ended

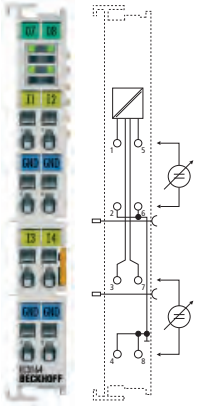
	1-channel analog input terminal, 0…10 V, 16 bit, single-ended	2-channel analog input terminal, 0…10 V, 16 bit, single-ended	4-channel analog input terminal, 0…10 V, 16 bit, single-ended
Technical data	**EL3161** | ES3161	**EL3162** | ES3162	**EL3164** | ES3164
Signal voltage	0…10 V		
Resolution	16 bit (incl. sign)		
Technology	single-ended	single-ended	single-ended
Conversion time	~ 35 µs	~ 50 µs	~ 100 µs
Number of inputs	1 (single-ended)	2 (single-ended)	4 (single-ended)



25 g



25 g



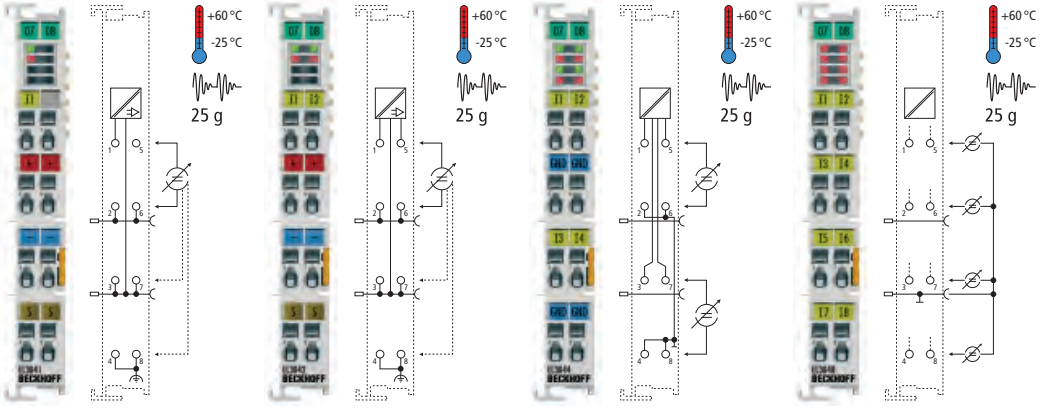
25 g

The EL316x analog input terminals measure input voltages from 0 to 10 V with 16-bit resolution. The significantly faster conversion time and support for distributed clocks enable use in time-critical applications and set them apart from the EL30xx series. The inputs have a common reference potential and display overrange and limit evaluation via the process data.

Dielectric strength	max. 30 V	max. 30 V	max. 30 V
Current consumption power contacts	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 130 mA	typ. 130 mA
Distributed clocks	yes	yes	yes
Internal resistance	> 200 kΩ	> 200 kΩ	> 200 kΩ
Input filter limit frequency	5 kHz	5 kHz	5 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 65 g
Further information	EL3161	EL3162	EL3164

Analog input | 0…20 mA, 12 bit, single-ended

	1-channel analog input terminal, 0…20 mA, 12 bit, single-ended	2-channel analog input terminal, 0…20 mA, 12 bit, single-ended	4-channel analog input terminal, 0…20 mA, 12 bit, single-ended	8-channel analog input terminal, 0…20 mA, 12 bit, single-ended
Technical data	**EL3041** | ES3041	**EL3042** | ES3042	**EL3044** | ES3044	**EL3048** | ES3048
Signal voltage	0…20 mA			
Resolution	12 bit (16 bit presentation, incl. sign)			
Technology	single-ended	single-ended	single-ended	single-ended
Conversion time	0.625 ms default setting, configurable	0.625 ms default setting, configurable	0.625 ms default setting, configurable	1.25 ms default setting, configurable
Number of inputs	1 (single-ended)	2 (single-ended)	4 (single-ended)	8 (single-ended)

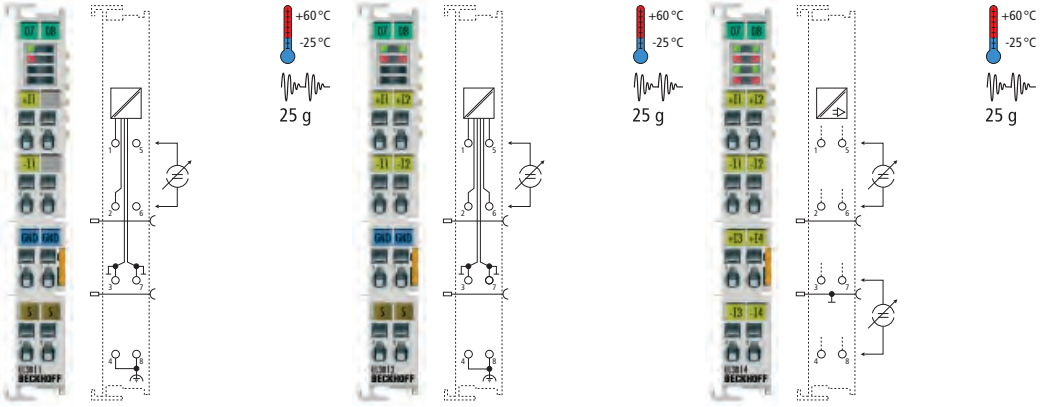


The EL304x analog input terminals have a common reference potential. This reference potential is connected to the 0 V power contact in the EL3041, EL3042 and EL3048. Overcurrent is displayed not only in the process image, but also by an error LED for each channel.

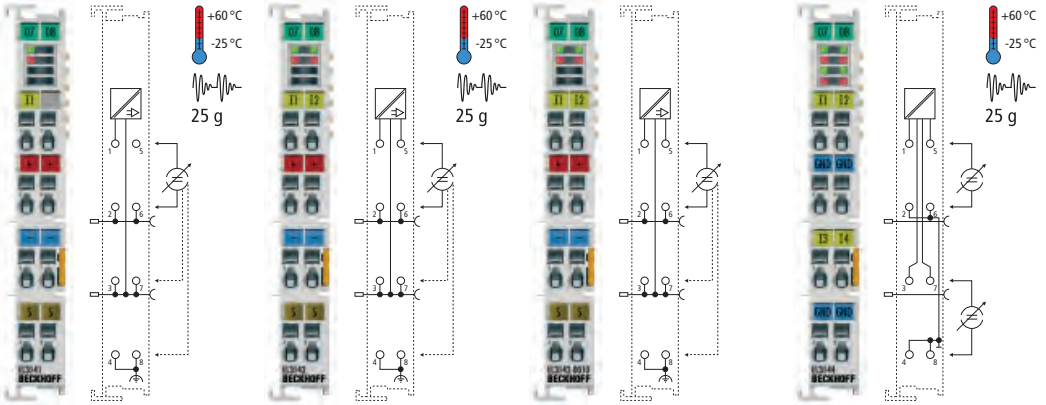
Dielectric strength	max. 30 V	max. 30 V	max. 30 V	max. 30 V
Current consumption power contacts	–	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 130 mA	typ. 130 mA	typ. 130 mA
Distributed clocks	–	–	–	–
Internal resistance	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	1 kHz	1 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL3041	EL3042	EL3044	EL3048

We reserve the right to make technical changes.

Analog input | 0…20 mA, 12 bit, differential input

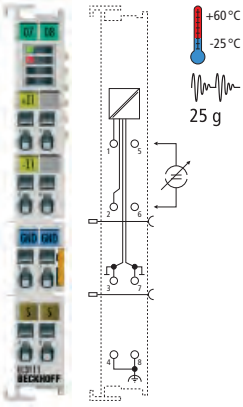
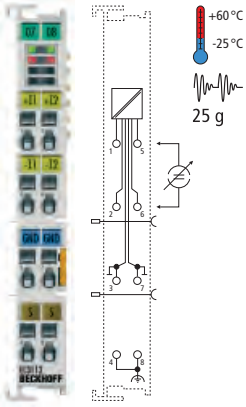
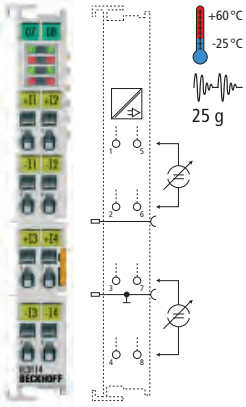
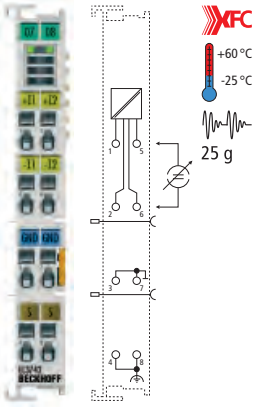
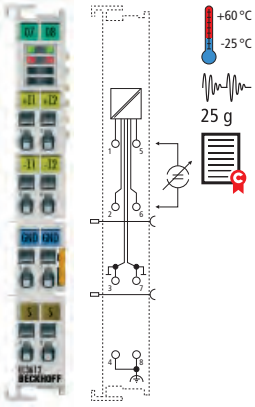
	1-channel analog input terminal, 0…20 mA, 12 bit, differential input	2-channel analog input terminal, 0…20 mA, 12 bit, differential input	4-channel analog input terminal, 0…20 mA, 12 bit, differential input
Technical data	**EL3011** | ES3011	**EL3012** | ES3012	**EL3014** | ES3014
Signal voltage	0…20 mA		
Resolution	12 bit (16 bit presentation, incl. sign)		
Technology	differential input	differential input	differential input
Conversion time	0.625 ms default setting, configurable	0.625 ms default setting, configurable	0.625 ms default setting, configurable
Number of inputs	1 (differential)	2 (differential)	4 (differential)
			
	The differential inputs of the EL301x series measure the current between input and output as a floating current measurement. Overcurrent is displayed not only in the process image, but also by an error LED for each channel.		
Common-mode voltage U_{CM}	10 V max.	10 V max.	10 V max.
Current consumption power contacts	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 130 mA	typ. 130 mA
Distributed clocks	–	–	–
Internal resistance	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	1 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	activatable FIR/IIR filters, limit value monitoring	activatable FIR/IIR filters, limit value monitoring	activatable FIR/IIR filters, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 55 g	approx. 55 g	approx. 55 g
Further information	EL3011	EL3012	EL3014

Analog input | 0…20 mA, 16 bit, single-ended

	1-channel analog input terminal, 0…20 mA, 16 bit, single-ended	2-channel analog input terminal, 0…20 mA, 16 bit, single-ended	2-channel analog input terminal, -10…+10 mA, 16 bit, single-ended	4-channel analog input terminal, 0…20 mA, 16 bit, single-ended
Technical data	**EL3141** | ES3141	**EL3142** | ES3142	**EL3142-0010**	**EL3144** | ES3144
Signal voltage	0…20 mA		-10…+10 mA	0…20 mA
Resolution	16 bit (incl. sign)			
Technology	single-ended	single-ended	single-ended	single-ended
Conversion time	~ 40 µs	~ 60 µs (fast mode ~ 40 µs)	~ 60 µs (fast mode ~ 40 µs)	~ 40 µs
Number of inputs	1 (single-ended)	2 (single-ended)	2 (single-ended)	4 (single-ended)
				
	The EL314x analog input terminals measure input currents from 0 to 20 mA. The significantly faster conversion time and support for distributed clocks enable use in time-critical applications and set them apart from the EL30xx series. Overcurrent is displayed not only in the process image, but also by an error LED for each channel.			
Dielectric strength	max. 30 V	max. 30 V	max. 30 V	max. 30 V
Current consum. pow. cont.	–	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 170 mA	typ. 170 mA	typ. 130 mA
Distributed clocks	yes	yes	yes	yes
Oversampling factor	–	–	–	–
Distributed clock precision	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs
Input signal bandwidth	see input filter	see input filter	see input filter	see input filter
Internal resistance	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Input filter limit frequency	5 kHz	5 kHz	5 kHz	5 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, switchable measuring data representation in the EL3142-0010, activatable FIR/IIR filters, limit value monitoring			
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL3141	EL3142	EL3142	EL3144
Special terminals				
Distinguishing features				

We reserve the right to make technical changes.

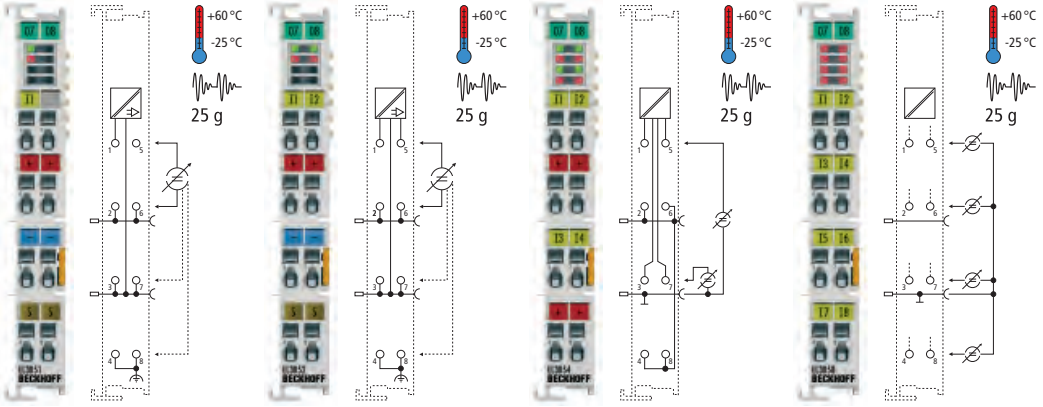
Analog input | 0…20 mA, 16/24 bit, differential input

	1-channel analog input terminal, 0…20 mA, 16 bit, differential input	2-channel analog input terminal, 0…20 mA, 16 bit, differential input	4-channel analog input terminal, 0…20 mA, 16 bit, differential input	2-channel analog input terminal, 0…20 mA, 16 bit, differential input, oversampling	2-channel analog input terminal, 0…20 mA, 24 bit, differential input
	EL3111 | ES3111	**EL3112** | ES3112	**EL3114** | ES3114	**EL3742** | ES3742	**EL3612** | ES3612
					24 bit (incl. sign)
	differential input	differential input	differential input	differential input, oversampling	differential input
	~ 40 µs	~ 50 µs (fast mode ~ 35 µs)	~ 100 µs	min. 10 µs	1…400 ms configurable
	1 (differential)	2 (differential)	4 (differential)	2 (differential)	2 (differential)
					
	The EL311x analog input terminals measure input currents from 0 to 20 mA. The significantly faster conversion time and support for distributed clocks enable use in time-critical applications and set them apart from the EL30xx series. Overcurrent is displayed not only in the process image, but also by an error LED for each channel.			The EL3742 is an oversampling terminal like the EL3702, see description on page 375	The EL3612 terminal is a precise measuring device with 24-bit resolution.
	max. 10 V common-mode voltage	max. 10 V common-mode voltage	max. 10 V common-mode voltage	max. 35 V common-mode voltage	max. 10 V common-mode voltage
	–	–	–	–	–
	typ. 130 mA	typ. 170 mA	typ. 130 mA	typ. 200 mA	typ. 190 mA
	yes	yes	yes	yes	–
	–	–	–	n = 1…100 selectable	–
	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs	–
	see input filter	see input filter	see input filter	0…30 kHz recommended	see input filter
	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
	5 kHz	5 kHz	5 kHz	30 kHz	3 kHz
	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value) up to 10 Hz input signal	< ±0.01 % at 25 °C (relative to full scale value, 50 Hz filter)
	standard and compact process image, activatable FIR/IIR filters, limit value monitoring			oversampling	various filter times, limit evaluation, high precision
	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 55 g	approx. 55 g	approx. 55 g	approx. 60 g	approx. 60 g
	EL3111	EL3112	EL3114	EL3742	EL3612
					EL3612-0020
					with calibration certificate

Further information on XFC see page 298

Analog input | 4…20 mA, 12 bit, single-ended

	1-channel analog input terminal, 4…20 mA, 12 bit, single-ended	2-channel analog input terminal, 4…20 mA, 12 bit, single-ended	4-channel analog input terminal, 4…20 mA, 12 bit, single-ended	8-channel analog input terminal, 4…20 mA, 12 bit, single-ended
Technical data	**EL3051** | ES3051	**EL3052** | ES3052	**EL3054** | ES3054	**EL3058** | ES3058
Signal voltage	4…20 mA			
Resolution	12 bit (16 bit presentation, incl. sign)			
Technology	single-ended	single-ended	single-ended	single-ended
Conversion time	0.625 ms default setting, configurable	0.625 ms default setting, configurable	0.625 ms default setting, configurable	1.25 ms default setting, configurable
Number of inputs	1 (single-ended)	2 (single-ended)	4 (single-ended)	8 (single-ended)

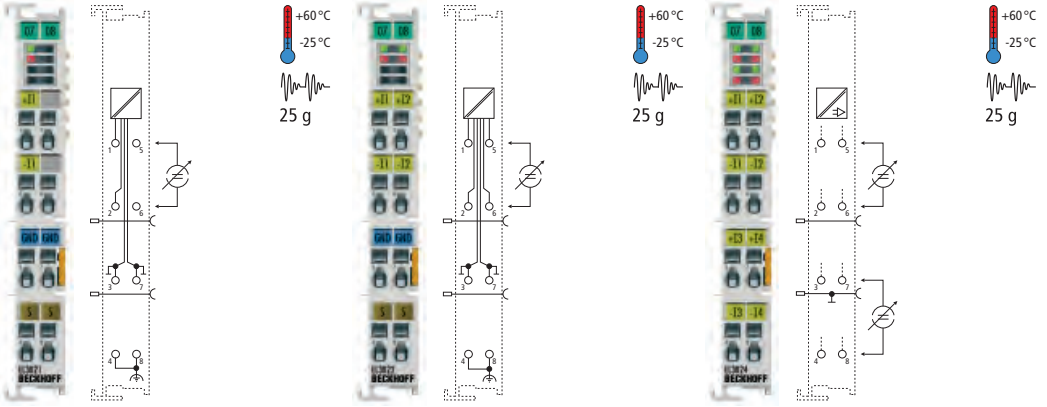


In the EL305x series (4 to 20 mA), overcurrent and undercurrent are displayed not only in the process image, but also by an error LED for each channel. The EL3054 is particularly suitable for the connection of 2-wire sensors.

Dielectric strength	max. 30 V	max. 30 V	max. 30 V	max. 30 V
Current consumption power contacts	–	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 130 mA	typ. 130 mA	typ. 130 mA
Distributed clocks	–	–	–	–
Internal resistance	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	1 kHz	1 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL3051	EL3052	EL3054	EL3058

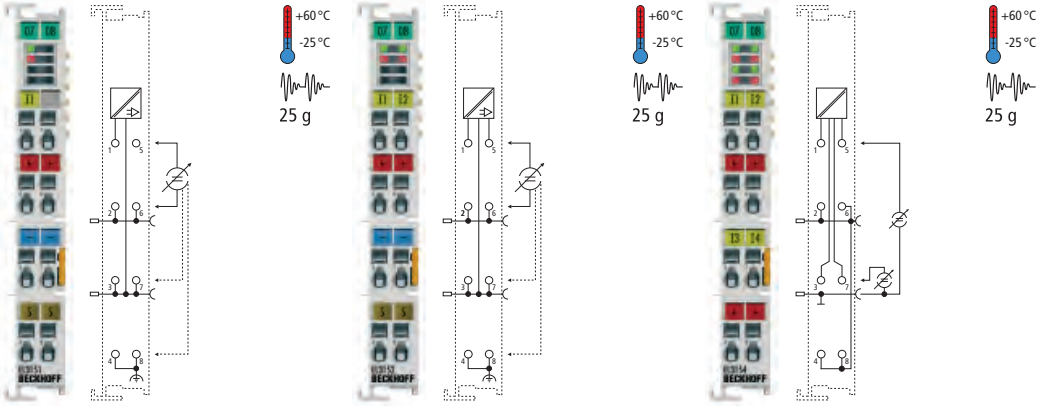
We reserve the right to make technical changes.

Analog input | 4…20 mA, 12 bit, differential input

	1-channel analog input terminal, 4…20 mA, 12 bit, differential input	2-channel analog input terminal, 4…20 mA, 12 bit, differential input	4-channel analog input terminal, 4…20 mA, 12 bit, differential input
Technical data	**EL3021** | ES3021	**EL3022** | ES3022	**EL3024** | ES3024
Signal voltage	4…20 mA		
Resolution	12 bit (16 bit presentation, incl. sign)		
Technology	differential input	differential input	differential input
Conversion time	0.625 ms default setting, configurable	0.625 ms default setting, configurable	0.625 ms default setting, configurable
Number of inputs	1 (differential)	2 (differential)	4 (differential)
			
	In the EL302x series (4 to 20 mA), overcurrent and undercurrent are displayed not only in the process image, but also by an error LED for each channel.		
Common-mode voltage U_{CM}	10 V max.	10 V max.	10 V max.
Current consumption power contacts	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 130 mA	typ. 130 mA
Distributed clocks	–	–	–
Internal resistance	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Input filter limit frequency	1 kHz	1 kHz	1 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 55 g	approx. 55 g	approx. 60 g
Further information	EL3021	EL3022	EL3024

Analog input | 4…20 mA, 16 bit, single-ended

	1-channel analog input terminal, 4…20 mA, 16 bit, single-ended	2-channel analog input terminal, 4…20 mA, 16 bit, single-ended	4-channel analog input terminal, 4…20 mA, 16 bit, single-ended
Technical data	**EL3151** | ES3151	**EL3152** | ES3152	**EL3154** | ES3154
Signal voltage	4…20 mA		
Resolution	16 bit (incl. sign)		
Technology	single-ended	single-ended	single-ended
Conversion time	~ 40 µs	~ 60 µs (fast mode ~ 40 µs)	~ 100 µs
Number of inputs	1 (single-ended)	2 (single-ended)	4 (single-ended)

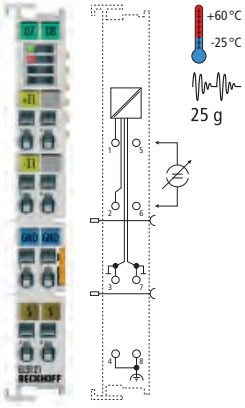
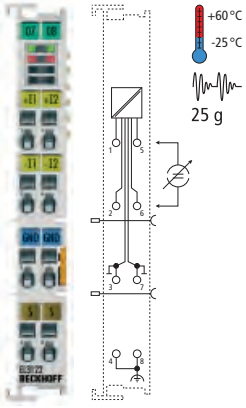
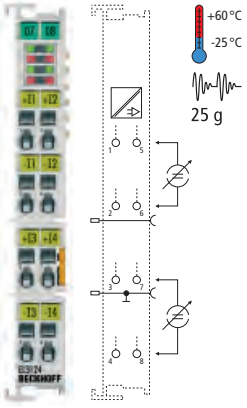
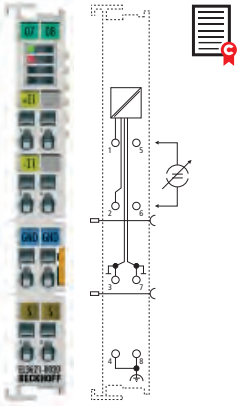


The EL315x analog input terminals measure input currents from 4 to 20 mA. The significantly faster conversion time and support for distributed clocks enable use in time-critical applications and set them apart from the EL30xx series. Overcurrent and undercurrent are displayed not only in the process image, but also by an error LED for each channel.

Dielectric strength	max. 30 V	max. 30 V	max. 30 V
Current consumption power contacts	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 170 mA	typ. 130 mA
Distributed clocks	yes	yes	yes
Internal resistance	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Input filter limit frequency	5 kHz	5 kHz	5 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL3151	EL3152	EL3154

We reserve the right to make technical changes.

Analog input | 4…20 mA, 16/24 bit, differential input

	1-channel analog input terminal, 4…20 mA, 16 bit, differential input	2-channel analog input terminal, 4…20 mA, 16 bit, differential input	4-channel analog input terminal, 4…20 mA, 16 bit, differential input	1-channel analog input terminal, 4…20 mA, 24 bit, with calibration certificate
Technical data	**EL3121** | ES3121	**EL3122** | ES3122	**EL3124** | ES3124	**EL3621-0020**
Signal voltage	4…20 mA			
Resolution	16 bit (incl. sign)			24 bit (incl. sign)
Technology	differential input	differential input	differential input	differential input
Conversion time	~ 40 µs	~ 50 µs (fast mode ~ 35 µs)	~ 100 µs	1…400 ms configurable
Number of inputs	1 (differential)	2 (differential)	4 (differential)	1 (differential)
				
	The EL312x analog input terminals measure input currents from 4 to 20 mA. The significantly faster conversion time and support for distributed clocks enable use in time-critical applications and set them apart from the EL30xx series. Overcurrent and undercurrent are displayed not only in the process image, but also by an error LED for each channel.			The EL3621-0020 is a precise measuring device with 24-bit resolution.
Common-mode voltage U_{CM}	10 V max.	10 V max.	10 V max.	10 V max.
Current consumption power contacts	–	–	–	–
Current consumption E-bus	typ. 130 mA	typ. 170 mA	typ. 130 mA	typ. 190 mA
Distributed clocks	yes	yes	yes	–
Internal resistance	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage	85 Ω typ. + diode voltage
Input filter limit frequency	5 kHz	5 kHz	5 kHz	3 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.01 % at 25 °C (relative to full scale value, 50 Hz filter)
Special features	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	standard and compact process image, activatable FIR/IIR filters, limit value monitoring	various filter times, limit evaluation, high precision, with calibration certificate
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE
Weight	approx. 55 g	approx. 55 g	approx. 60 g	approx. 60 g
Further information	EL3121	EL3122	EL3124	EL3621-0020
Special terminals			i EL3124-0090	
Distinguishing features			TwinSAFE SC 324	

i For availability status see Beckhoff website at: EL3124-0090

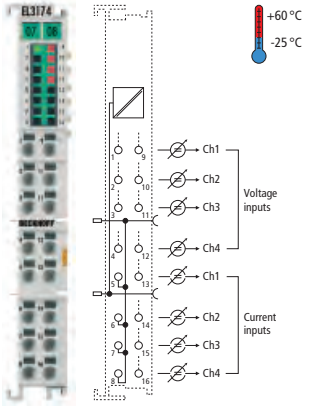
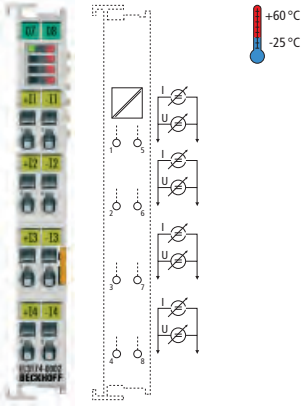
Analog input | -10/0…+10 V, -20/0/+4…+20 mA, 16 bit

The EL3174 and EL3174-0002 analog input terminals have four individually parameterisable inputs. Signals in the range from -10/0 to +10 V or -20/0/+4 to +20 mA can be processed via each channel.

Physically, the voltage and current signals of the EL3174 should be connected to different terminal points. Each channel should then be set by the controller/TwinCAT to U or I mode via CoE. The voltage inputs operate differentially; the current inputs are single-ended. All inputs are digitised with a resolution of 16 bits and transmitted, electrically isolated, to the higher-level automation device.

Each channel of the EL3174-0002 should be set by the controller to U or I mode via CoE. The input voltage or current is digitised with a resolution of 16 bits, and is transmitted, electrically isolated, to the higher-level automation device. The four differential inputs are electrically isolated against each other and against the fieldbus (2500 V DC).

With a technical measuring range of ±107 % of the nominal range, the terminals also support commissioning with sensor values in the limit range and diagnostics according to NAMUR NE43.

	4-channel analog input, parameterisable, -10/0…+10 V, -20/0/+4…+20 mA, differential, 16 bit	4-channel analog input, -10/0…+10 V, -20/0/+4…+20 mA, electrically isolated, 16 bit
Technical data	**EL3174**	**EL3174-0002**
Measuring range, nominal	-10/0…+10 V | -20/0/+4…+20 mA	
Resolution	16 bit (incl. sign)	
Technology	U differential, I single-ended	differential input, channels electrically isolated
Conversion time	min. 150 µs	min. 150 µs
Number of inputs	4	4
		
Measuring range, technical	-10.73…+10.73 V | -21.47…+21.47 mA	-10.73…+10.73 V | -21.47…+21.47 mA
Dielectric strength	max. 30 V (current measurement)	see eletrical isolation
Common-mode voltage U_{CM}	35 V max. (voltage measurement)	see electrical isolation
Distributed clocks	yes	yes
Oversampling factor	–	–
Distributed clock precision	<< 1 µs	<< 1 µs
Input signal bandwidth	–	–
Internal resistance	> 200 kΩ | 85 Ω typ	> 200 kΩ | 85 Ω typ
Electrical isolation	500 V (E-bus/signal voltage)	2500 V functional isolation (test voltage channel/channel and channel/fieldbus, production test)
Input filter limit frequency	5 kHz	5 kHz
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.2 % (at 25 °C ±5 °C, or else < ±0.3 %, relative to full scale value)
Special features	U/I parameterisable, ExtendedRange,standard and compact process image, activatable FIR/IIR filters	U/I parameterisable, ExtendedRange,standard and compact process image, activatable FIR/IIR filters
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE	CE
Weight	approx. 65 g	approx. 65 g
Further information	EL3174	EL3174-0002

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

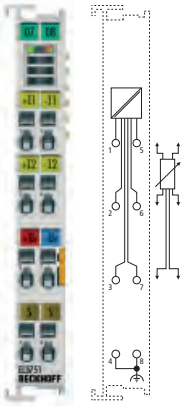
XFC analog input | **Multi-functional input, 24 bit**

The EL3751 analog input terminal is part of the new generation of analog EtherCAT measurement terminals. The nominal measuring range of the input channel can be comprehensively parameterised, both electrically and on the software side. The measuring ranges generally reach accuracy class 0.01 %. For further information please refer to the documentation. Through the feature "ExtendedRange" the user has the full technical measuring range available, up to 107 % of the specified nominal measuring range, depending on the measuring range. This feature can be disabled, in order to ensure compatibility with the "LegacyRange" of the EL30xx/EL31xx series.

To suppress aliasing effects, the input channel features two configurable numeric software filters up to 39th order FIR/6th order IIR. The filters can be preselected or freely described, so that a band stop or a band pass can be realised. The measurement at the differential input channel is digitised with a resolution of 24 bit and 10 ksps and is transmitted to the higher-level automation device electrically isolated and optionally with oversampling. The data rate can be internally reduced, in which case the filters have to be adjusted accordingly. Non-linear characteristic sensor curves can be corrected flexibly through an integrated sampling points table. Simple mathematical operations are also possible.

The integrated supply and the switchable auxiliary resistors enable direct connection of a resistor bridge (strain gauge) or a load cell, a fixed ohmic resistor, a PTC or a potentiometer. The signal state of the EtherCAT Terminal is indicated by light emitting diodes. Each terminal has a unique ID number.

XFC	1-channel analog input, high-precision, parameterisable, 24 bit, 10 ksps, differential, oversampling

Technical data	EL3751
Measuring range, nominal	±30/10/5/2.5/1.25 V, ±640/320/160/80/40/20/10/5 mV, 0…5/10 V, ±20 mA, 0/4…20 mA, NAMUR NE43, 0…5 kΩ, RTD, PT100/PT1000, Ni, KTY, ¼ bridge (350 Ω + 120 Ω), ½ bridge (±16 mV/V), full bridge (±32 mV/V), potentiometer ≥ 1 kΩ
Resolution	24 bit (incl. sign)
Technology	differential input, 2-/3-/4-/5-/6-wire connection
Conversion time	100 µs/10 ksps
Number of inputs	1
	
Measuring range, technical	generally 107 % of the nominal measuring range, see documentation
Dielectric strength	max. 36 V
Distributed clocks	yes
Oversampling factor	n = 1…64
Distributed clock precision	<< 1 µs
Internal resistance	> 500 kΩ (30 V); > 4 MΩ (others); 150 Ω (current)
Input filter limit frequency	3 kHz
Measuring error	typ. ±0.01 % relative to the respective full scale value @ 23 °C in some measuring ranges, see documentation
Special features	integr. power supply for strain gauge 0.5…5 V, parameterisable, ExtendedRange 107 %, free numeric filter, TrueRMS, integrator/differentiator, non-linear scaling, PeakHold
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 65 g
Further information	EL3751
Special terminals	**EL3751-0020**
Distinguishing features	with calibration certificate

Further information on XFC see page 298

Analog input | **Resistance thermometer (RTD, PT100, PT1000)**

EL32xx analog input terminals enable the direct connection of resistance sensors. Depending on the terminal type, sensors in 2-, 3- or 4-wire technology can be connected. Apart from resistance measurement, temperatures can also be directly output; various sensor characteristics are supported (PT100, PT1000, Ni100, Ni1000 and KTY types, among others).

For temperature measurement, the conversion of the resistance into a temperature value and its linearisation are performed by a microprocessor within the terminal, depending on the preset characteristics.

The following measurement scaling is used:

– for temperature: 1/10 °C (1 digit = 0.1 °C)
– in the measuring range 10 to 1047 Ω: 1/64 Ω (approx. 15 mΩ)
– in the measuring range 10 to 4095 Ω: 1/16 Ω (approx. 62 mΩ)

In addition, a broken wire is reported to the controller and indicated by an error LED.

With resistance sensors, different characteristic curves are implemented over their entire measuring range in order to enable temperature measurements between -200 and +850 °C. The terminals are fully configurable via fieldbus communication. This way, for example, various sensor characteristics, the required connection technology and different filters can be selected; automatic temperature conversion can be switched off, and upper or lower limit values can be set for a temperature.

To achieve maximum measurement accuracy, the 4-wire system should be used (in conjunction with highly precise sensors, e.g. PT100).

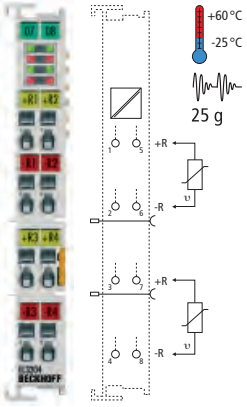
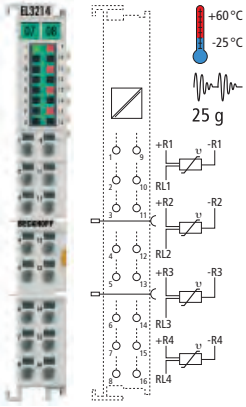
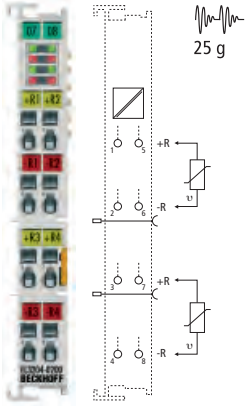
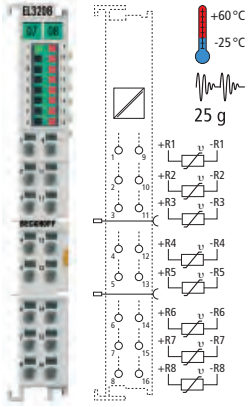
Apart from 4-wire connection, the EL320x-0010 variants offer higher accuracy with a resolution of 0.01 °C/digit.

The calibration result for the EL3201-0020 and EL3202-0020 terminals is confirmed by a calibration certificate. Like the EL320x-0010 series, these terminals operate in the 4-wire system and therefore also offer a higher accuracy.

For 2-wire measurements, PT sensors/ Ni1000 sensors are recommended. Whereas the EL3204 was designed for the connection of four sensors in 2-wire technology, using the EL3208 as many as eight sensors in 2-wire technology can be connected. In addition, the EL3214 and the EL3202 offer the possibility to connect four or two sensors in 3-wire technology respectively. Terminals with 4 or 3-wire connection can also be operated in 2-wire mode by setting an external bridge.

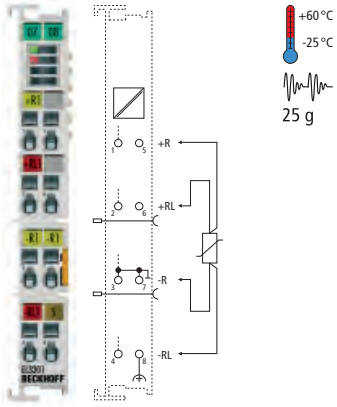
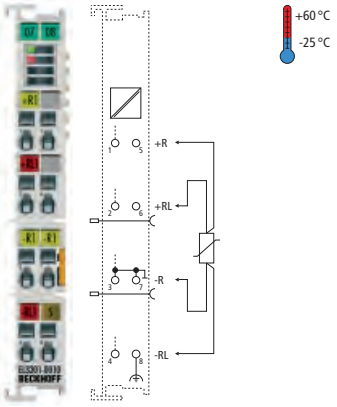
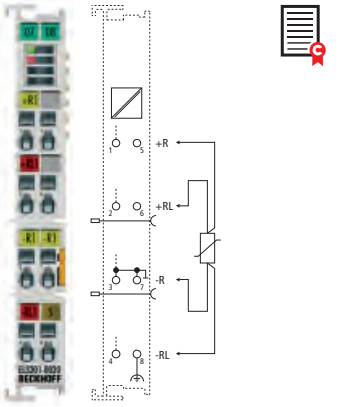
The analog EL3204-0200 input terminal enables direct connection of four resistance sensors for up to 240 kΩ, so that the usable measuring range is significantly larger compared with the EL3204. As a result, NTC sensors can also be used in addition to PT100 to 1000 and Ni100 to 1000 sensors. In addition, the resistance values can be converted (linearisation) in the terminal either based on preset characteristics, conversion formulas with specific material parameters (e.g. according to IEC 60751, Steinhart-Hart equation, B-parameter equation), or according to freely programmable conversion tables. Due to this flexibility the EL3204-0200 is especially suitable for applications where customer-specific sensors are used.

We reserve the right to make technical changes.

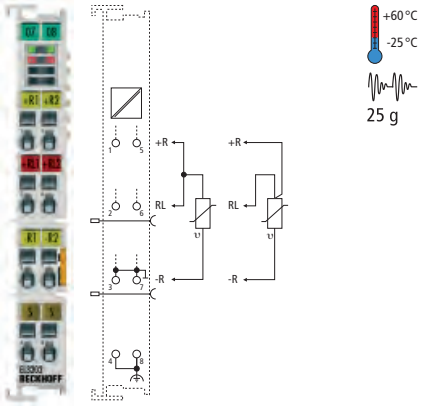
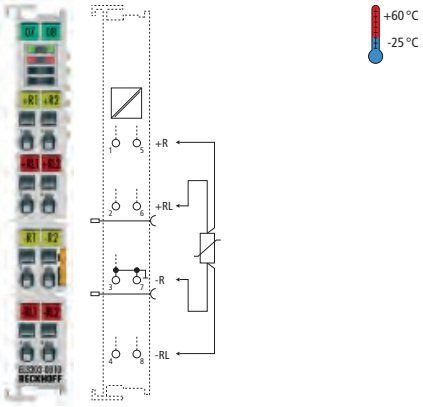
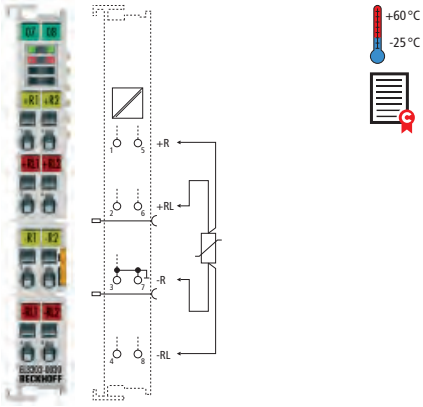
	4-channel analog input terminal, PT100 (RTD), 16 bit	4-channel analog input terminal, PT100 (RTD), 3-wire, 16 bit	4-channel universal input terminal for RTD up to 240 kΩ, NTC 20 k, 16 bit	8-channel analog input terminal, PT100 (RTD), 16 bit
Technical data	**EL3204** | ES3204	**EL3214**	**EL3204-0200**	**EL3208**
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ), KTY sensors	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ), KTY sensors	Ni/PT, any RTD in the range of 100 Ω…240 kΩ, calculation possible on the basis of a table or material constant, resistance measurement	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ), KTY sensors
Technology	2-wire	2-/3-wire	2-wire	
Resolution	0.1 °C per digit	0.1 °C per digit	0.1 °C per digit	0.1 °C per digit
Conversion time	approx. 85 ms default setting, 2…800 ms configurable	approx. 170 ms default setting	approx. 24 ms default setting, 4…500 ms configurable	approx. 170 ms default setting, 3…1600 ms configurable
Number of inputs	4	4	4	8
				
Temperature range	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	dependent on the sensor (e.g. PT sensors -200…+850 °C, Ni sensors -60…+250 °C)	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)
Current consum. pow. cont.	–	–	–	–
Current consumption E-bus	typ. 190 mA	typ. 140 mA	typ. 150 mA	typ. 140 mA
Distributed clocks	–	–	–	–
Measuring current	< 0.5 mA (load-dependent)	< 0.5 mA (load-dependent)	< 0.03 mA typ.	< 0.5 mA (load-dependent)
Input filter limit frequency	typ. 1 kHz	typ. 1 kHz	–	typ. 1 kHz
Measuring error	< ±0.5 °C for PT sensors	< ±0.5 °C for PT sensors, 4 x 3-wire connection	< ±0.3 % relative to full scale value (6 kΩ, 65 kΩ, 240 kΩ)	< ±0.5 °C for PT sensors
Special features	integrated digital filter, limit value monitoring	integrated digital filter, limit value monitoring, variable connection technology	temperature calculation on the basis of Steinhart-Hart, B parameters, IEC 60751, free table, predefined sensors	integrated digital filter, limit value monitoring
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL	CE, UL, Ex	CE, UL
Weight	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL3204	EL3214	EL3204	EL3208
Special terminals		i EL3214-0090		
Distinguishing features		TwinSAFE SC 324		

i For availability status see Beckhoff website at: EL3214-0090

Analog input | **Resistance thermometer (RTD, PT100, PT1000)**

	1-channel analog input terminal, PT100 (RTD), 16 bit	1-channel analog input terminal, PT100 (RTD), 16 bit, high-precision	1-channel analog input terminal, PT100 (RTD), 16 bit, high-precision, with calibration certificate
Technical data	**EL3201** | ES3201	**EL3201-0010**	**EL3201-0020**
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ), KTY sensors (types see documentation)		
Technology	2-, 3-, 4-wire	4-wire	
Resolution	0.1 °C per digit	0.01 °C per digit	0.01 °C per digit
Conversion time	approx. 24 ms default setting, 4…500 ms configurable	approx. 24 ms default setting, 4…500 ms configurable	approx. 24 ms default setting, 4…500 ms configurable
Number of inputs	1	1	1
			
Temperature range	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	-200…+320 °C (PT sensors)	-200…+320 °C (PT sensors)
Current consumption power contacts	–	–	–
Current consumption E-bus	typ. 190 mA	typ. 190 mA	typ. 190 mA
Distributed clocks	–	–	–
Measuring current	< 0.5 mA (load-dependent)	< 0.5 mA (load-dependent)	< 0.5 mA (load-dependent)
Input filter limit frequency	typ. 1 kHz	typ. 1 kHz	typ. 1 kHz
Measuring error	< ±0.5 °C for PT sensors	< ±0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors (measuring range: -200…+320 °C) and 50 Hz filter	< ±0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors (measuring range: -200…+320 °C) and 50 Hz filter
Special features	integrated digital filter, limit value monitoring, variable connection technology	integrated digital filter, limit value monitoring, variable connection technology	integrated digital filter, limit value monitoring, variable connection technology, with calibration certificate
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL3201	EL3201-0010	EL3201-0020

We reserve the right to make technical changes.

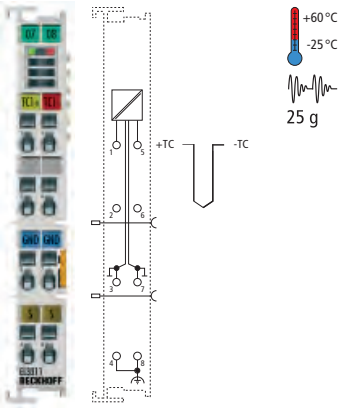
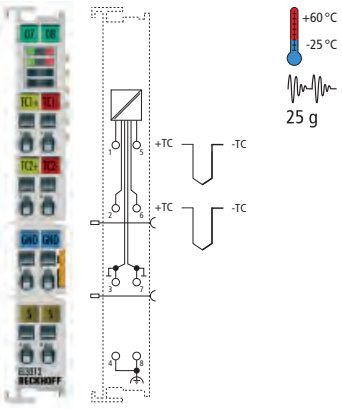
	2-channel analog input terminal, PT100 (RTD), 16 bit	2-channel analog input terminal, PT100 (RTD), 16 bit, high-precision	2-channel analog input terminal, PT100 (RTD), 16 bit, high-precision, with calibration certificate
	EL3202 | ES3202	**EL3202-0010**	**EL3202-0020**
	2-, 3-wire (default setting: 3-wire)	4-wire	
	0.1 °C per digit	0.01 °C per digit	0.01 °C per digit
	approx. 85 ms default setting, 2…800 ms configurable	approx. 85 ms default setting, 2…800 ms configurable	approx. 85 ms default setting, 2…800 ms configurable
	2	2	2
			
	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	-200…+320 °C (PT sensors)	-200…+320 °C (PT sensors)
	–	–	–
	typ. 190 mA	typ. 190 mA	typ. 190 mA
	–	–	–
	< 0.5 mA (load-dependent)	< 0.5 mA (load-dependent)	< 0.5 mA (load-dependent)
	typ. 1 kHz	typ. 1 kHz	typ. 1 kHz
	< ±0.5 °C for PT sensors	< ±0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors (measuring range: -200…+320 °C) and 50 Hz filter	< ±0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors (measuring range: -200…+320 °C) and 50 Hz filter
	integrated digital filter, limit value monitoring, variable connection technology	integrated digital filter, limit value monitoring, variable connection technology	integrated digital filter, limit value monitoring, variable connection technology, with calibration certificate
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 60 g	approx. 60 g	approx. 60 g
	EL3202	EL3202-0010	EL3202-0020

Analog input | **Thermocouple/mV measurement**

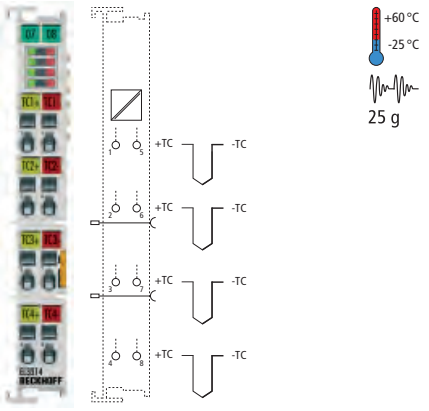
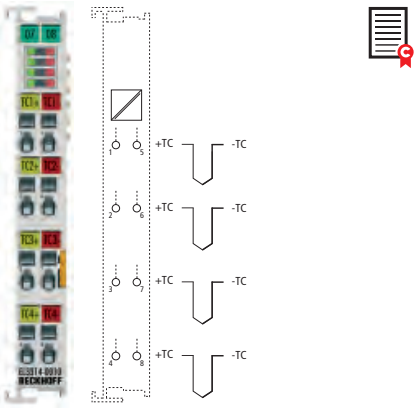
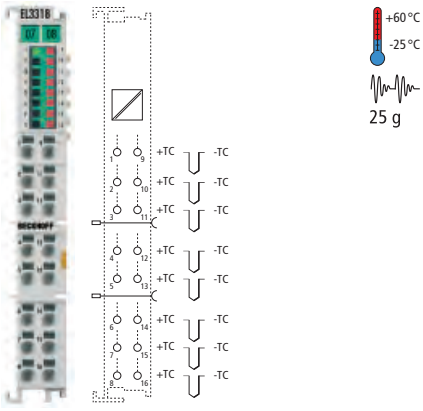
Thermocouples can be classified as active transducers. They exploit the thermo-electric effect (Seebeck, Peltier, Thomson). Where two electrical conductors of different materials (e.g. iron and constantan) make contact, a contact voltage occurs, which is clearly a function of temperature and thus is called thermovoltage. The material change associated with thermocouples will always result in at least two such material combinations. One is placed at the measurement location, the other is the so-called comparison point, which is normally located in the measurement device.
In order to compensate for the reference point effect, the temperature at the reference point must be known. For the EL331x this is the connection point of the thermocouple to the terminal contacts, which is why the terminal contact temperature is specially measured here.

Thermocouples represent cost-effective and easy to install sensors for temperature measurement with reduced need for accuracy.

Depending on the type of thermocouple temperatures from -200 to +2300 °C can be measured. The linearisation and cold junction compensation is carried out by a characteristic curve on a microprocessor. The directions in the documentation, concerning earthing and thermocouples which are not potential-free, must be observed. An error LED indicates any broken wire.

	1-channel analog input terminal, thermocouple with open-circuit recognition	2-channel analog input terminal, thermocouple with open-circuit recognition
Technical data	**EL3311**	**EL3312**
Thermocouple sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement	
Technology	2-wire	
Resolution	0.1 °C per digit	0.1 °C per digit
Conversion time	approx. 750 ms up to 20 ms, depending on configuration and filter setting, default: approx. 75 ms	approx. 1.2 s up to 20 ms, depending on configuration and filter setting, default: approx. 125 ms
Number of inputs	1	2
		
Temperature range	in the range defined in each case for the sensor (default setting: type K; -200…+1370 °C); voltage measurement: ±30 mV…±75 mV	in the range defined in each case for the sensor (default setting: type K; -200…+1370 °C); voltage measurement: ±30 mV…±75 mV
Current consum. pow. cont.	–	–
Current consumption E-bus	200 mA	200 mA
Distributed clocks	–	–
Input filter limit frequency	typ. 1 kHz; dependent on sensor length, conversion time, sensor type	typ. 1 kHz; dependent on sensor length, conversion time, sensor type
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Special features	open-circuit recognition	open-circuit recognition
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g
Further information	EL3311	EL3312
Special terminals		
Distinguishing features		

We reserve the right to make technical changes.

	4-channel analog input terminal, thermocouple with open-circuit recognition	4-channel analog input terminal, high-precision, thermocouple with open-circuit recognition	8-channel analog input terminal, thermocouple with open-circuit recognition
	EL3314	**EL3314-0010**	**EL3318**
	0.1 °C per digit	24 bit, presentation adjustable: 0.1/0.01/0.001 °C per digit or 10 nV per digit	0.1 °C per digit
	approx. 2.5 s up to 20 ms, depending on configuration and filter setting, default: approx. 250 ms	approx. 2.5 s up to 20 ms, depending on configuration and filter setting, default: approx. 250 ms	approx. 5 s up to 40 ms, depending on configuration and filter setting, default: approx. 500 ms
	4	4	8
			
		The internal high-precision measurement of the temperature of the cold junction in the terminal allows exact temperature measurement in calibrated mode even with thermocouples.	The 16-pin HD housing enables the connection of up to eight thermocouples on a terminal width of 12 mm. Errors are displayed for each channel by LED and process data.
	in the range defined in each case for the sensor (default setting: type K; -200…+1370 °C); voltage measurement: ±30 mV…±75 mV	in the range defined in each case for the sensor (default setting: type K; -200…+1370 °C); voltage measurement: ±78 mV in 10 nV resolution	in the range defined in each case for the sensor (default setting: type K; -200…+1370 °C); voltage measurement: ±30 mV…±75 mV
	–	–	–
	typ. 200 mA	typ. 200 mA	typ. 210 mA
	–	–	–
	typ. 1 kHz; dependent on sensor length, conversion time, sensor type	typ. 1 kHz; dependent on sensor length, conversion time, sensor type	typ. 1 kHz; dependent on sensor length, conversion time, sensor type
	< ±0.3 % (relative to full scale value)	voltage measurement < ±25 µV, e.g. type K: < ±1.8 °C, others see documentation	< ±0.3 % (relative to full scale value)
	open-circuit recognition	open-circuit recognition	open-circuit recognition
	-25…+60 °C	0…+55 °C	-25…+60 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 60 g	approx. 60 g	approx. 70 g
	EL3314	EL3314-0010	EL3318
	EL3314-0090	**EL3314-0020**	
	TwinSAFE SC 324	with calibration certificate	

For availability status see Beckhoff website at:

XFC analog input | **Oscillation measurement**

The EL3632 EtherCAT Terminal is a 2-channel oversampling input terminal, which is able to sample up to 50 ksamples per channel and second. As a minimum every 20 µs an analog input value is sampled and stored in a buffer for retrieval by the EtherCAT master. The master cyclically retrieves not only a single measured value, but a package consisting of n measurement readings that were sampled at equidistant intervals. System-wide distributed clock synchronisation enables the measurement readings to be related to other system components. This is used for correlation with axis positions, for example.

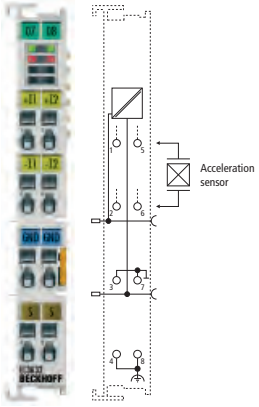
Many manufacturers offer suitable sensors, usually under their brand names or the standardised IEPE interface name.

Up to two IEPE sensors can be connected to the EL3632 in 2-wire mode. IEPE sensors are dynamic vibration sensors that are supplied with a constant current and respond to mechanical deflection with a variable resistance. The constant current source integrated in the EL3632 continues to stabilise the constant current rapidly, so that the change in resistance results in a change in voltage on the feed line, which is measured by the EL3632. The constant current can be set separately between 4 and 10 mA for each channel, depending on the sensor and the cable length. It is generated from the 24 V voltage available at the power contacts. An electrically isolated measurement configuration can be achieved using the EL9560 power supply terminal.

Except for filtering no preprocessing of the vibration amplitude values takes place in the EL3632. This is handled by the retrieving controller.

Please note that such dynamic sensors can only be used for vibrations up to a lower limit frequency, but not for static position without dynamic movement.

A TwinCAT library with mathematical functions is available for evaluating the signals on the controller. This enables all benefits of the PC platform, such as performance and flexibility, to be fully utilised.

XFC	2-channel analog input terminal for Condition Monitoring (IEPE), 16 bit
Technical data	**EL3632**
Signal voltage	IEPE constant current supply and recording of modulated AC voltage
Technology	Condition Monitoring (IEPE), oversampling recording
Resolution	16 bit (incl. sign)
Conversion time	20 µs (max. 50 ksamples/s)
Number of inputs	2
	
Measuring range	default ±5 V up to 25 kHz, ±250 mV up to 10 Hz
Sensor voltage	max. power contact voltage less 1 V
Supply current I_{EXCITE}	typ. 2/4/8 mA (separately configurable for both channels)
Current consumption power contacts	24 V, typ. 20 mA + load
Current consumption E-bus	typ. 220 mA
Distributed clocks	yes
Input filter limit frequency	analog parameterisable 5th order low-pass filter up to 25 kHz, typically 0.05 Hz high-pass filter
Measuring error	< ±0.5 % (DC; relative to full scale value)
Special features	automatic anti-aliasing function, wire breakage detection
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 60 g
Further information	EL3632
Special terminals	i EL3632-0020
Distinguishing features	with calibration certificate

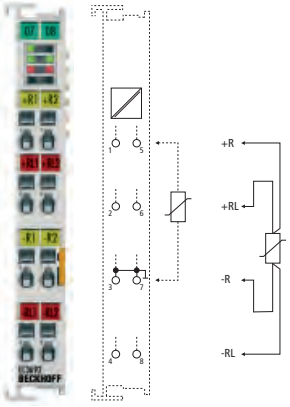
Further information on XFC see page 298

i For availability status see Beckhoff website at: EL3632-0020

We reserve the right to make technical changes.

Analog input | **Resistance measurement**

The EL3692 2-channel resistance measurement terminal is designed for slow sampling of ohmic resistors over a wide range from 10 mΩ to 10 MΩ. The circuitry of the EtherCAT Terminal enables measurement in 2- or 4-wire versions. Due to the electrical isolation of 1.5 kV between the field side and the E-bus, in single-channel mode measurements can be carried out at live points (within the permissible range). Contact resistance values of contacts can be sampled both in closed and open state. The measurement is parameterisable for continuous measurement (single-channel) or alternate measurement in pulsed mode.

	2-channel analog resistance measurement terminal, 10 mΩ…10 MΩ, 24 bit, high-precision
Technical data	**EL3692**
Measuring range	10 mΩ, 1 Ω, 10 Ω, 100 Ω, 1 kΩ, 10 kΩ, 100 kΩ, 1 MΩ, 10 MΩ
Technology	2- or 4-wire, resistance measurement
Resolution	24 bit
Conversion time	typ. 10…400 ms, dependent on measuring range and settings
Number of inputs	2
	 25 g
Measuring error	< ±0.5 % (relative to the respective full scale value with 4-wire connection)
Current consumption power contacts	–
Current consumption E-bus	typ. 220 mA
Distributed clocks	–
Internal resistance	> 100 MΩ
Electrical isolation	1500 V (E-bus/signal voltage)
Input filter limit frequency	100 Hz
Special features	automatic range selection, pulse and continuous measurement
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 55 g
Further information	EL3692
Special terminals	i EL3692-0020
Distinguishing features	with calibration certificate

i For availability status see Beckhoff website at: EL3692-0020

Analog input | **Measurement technology, strain gauge**

The analog input terminals EL3351, EL3356 and EL3356-0010 are suitable for connection of full resistor bridges such as strain gauges, for example. Like 2-channel analog input terminals, they measure the two voltages U_{REF} (power supply of the bridge) and U_D (bridge voltage or variable sensor voltage depending on the detuning of the bridge). The respective measuring range is adapted to the levels: The bridge is usually operated with a high supply voltage, U_{REF} ±12 V DC; the measurable bridge voltage U_D, conversely, lies in the mV range.

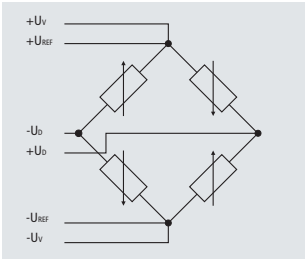
Thanks to the high measuring resolution of U_D with 16 bits (EL3351 and EL3356) or 24 bits (EL3356-0010), the detuning of the bridge can be evaluated with high accuracy. The simultaneous measurement of U_{REF} and U_D eliminates long-term and temperature drift; in the EL3356 and EL3356-0010 the integrated self-calibration additionally increases the measuring accuracy. Beyond that the EL335x has adaptive filter functions, by means of which it is possible to map the static condition of the sensor with high accuracy, or a dynamic load with the minimum delay.

The EL3351 supplies the bridge internally with ±5 V DC from the E-bus supply; alternatively an external bridge supply with up to ±12 V DC can also be connected. Any number of sensors can be connected in parallel to the EL3356 and EL3356-0010, therefore an external supply is required in any case. The EL9512 power supply terminal is suitable for the direct supply of 12 V DC via the power contacts.

Depending on the type of sensor and the required accuracy/sensitivity, resistance bridges are designed as quarter, half or full bridges. If the EL335x is to be operated with a quarter or half-bridge, external supplementary bridge resistors must be provided.

Sensors with measuring bridges are used, for example, for:

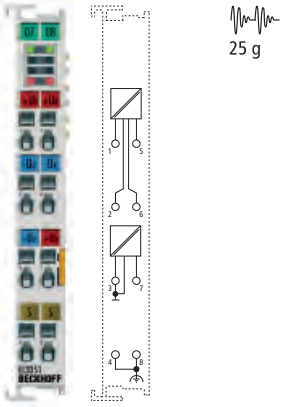
- Weighing tasks such as slow silo measurement or fast bag filling by load cells, where strain gauges are glued onto an elastic mechanical carrier, e.g. double-cantilever beam spring elements, and additionally covered to protect against environmental influences.
- vibration measurement for moving components
- deformation measurement under static load and deformation warning
- pressure measurement through sensor deformation measurement



Full bridge

1-channel analog input terminal, resistor bridge analysis, 16 bit

Technical data	EL3351 | ES3351
Resolution	16 bit, 32 bit presentation
Technology	resistor bridge, strain gauge
Number of inputs	2, for 1 resistor bridge in full bridge technology
Conversion time	2.5…800 ms, configurable, max. 400 samples/s



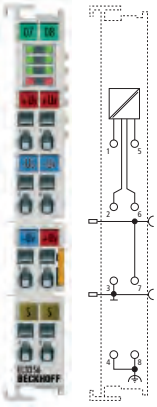
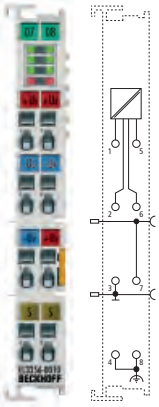
25 g

The EL3351 analog input terminal is suitable for slow measuring tasks.

Power supply U_V	5 V, max. 20 mA
Current consum. pow. cont.	–
Current consumption E-bus	typ. 170 mA
Distributed clocks	–
Measuring range U_D	max. -20…+20 mV
Measuring range U_{REF}	max. -12…+12 V
Internal resistance	> 200 kΩ (U_{REF}), > 1 MΩ (U_D)
Input filter limit frequency	50 Hz default setting, parameterisable
Measuring error	< ±0.1 % (relative to full scale value, 50 Hz filter)
Supported nominal sensitivity	calculated in PLC, freely selectable
Special features	integrated ±5 V DC bridge supply
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 60 g
Further information	EL3351
Special terminals	
Distinguishing features	

Further information on XFC see page 298

We reserve the right to make technical changes.

	1-channel precise load cell analysis (resistor bridge), 16 bit	1-channel precise load cell analysis (resistor bridge), 24 bit
	EL3356 | ES3356	**EL3356-0010**
		24 bit, 32 bit presentation
	2, for 1 resistor bridge in full bridge technology	2, for 1 resistor bridge in full bridge technology
	10…250 ms, configurable, max. 100 samples/s	0.1…250 ms, configurable, max. 10,000 samples/s
	 XFC 25 g	 XFC
	The EL3356 analog input terminal is suitable for high-precision measurements with high demands on the prefiltering of the measured values in the terminal.	The EL3356-0010 analog input terminal with measuring cycles of 100 µs and a resolution of 24 bits can be used for fast and precise monitoring of torque or vibration sensors.
	up to 12 V from power contacts, dependent on sensor	up to 12 V from power contacts, dependent on sensor
	depends on strain gauge supply, min. 1 mA	depends on strain gauge supply, min. 1 mA
	typ. 210 mA	typ. 210 mA
	–	yes
	max. -25…+25 mV rated voltage	max. -25…+25 mV rated voltage
	max. -12…+12 V rated voltage	max. -12…+12 V rated voltage
	> 200 kΩ (U_{REF}), > 1 MΩ (U_D)	> 200 kΩ (U_{REF}), > 1 MΩ (U_D)
	10 kHz low pass (-3 dB)	10 kHz low pass (-3 dB)
	< ±0,01 % for the calculated load value in relation to the final load value with a 12 V feed and 24 mV bridge voltage (hence nominal strain gauge characteristic value of 2 mV/V), self-calibration active, 50 Hz filter active	< ±0,01 % for the calculated load value in relation to the final load value with a 12 V feed and 24 mV bridge voltage (hence nominal strain gauge characteristic value of 2 mV/V), self-calibration active, 50 Hz filter active
	all, resolution of parameter: 0.01 µV/V recommended: 0.5…4 mV/V	all, resolution of parameter: 0.01 µV/V recommended: 0.5…4 mV/V
	self-calibration, quadruple averager, dynamic filters	self-calibration, quadruple averager, dynamic filters, fast data sampling
	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex
	approx. 60 g	approx. 60 g
	EL3356	EL3356-0010
		i EL3356-0020
		with calibration certificate

i For availability status see Beckhoff website at: EL3356-0020

Analog input | **Power measurement**

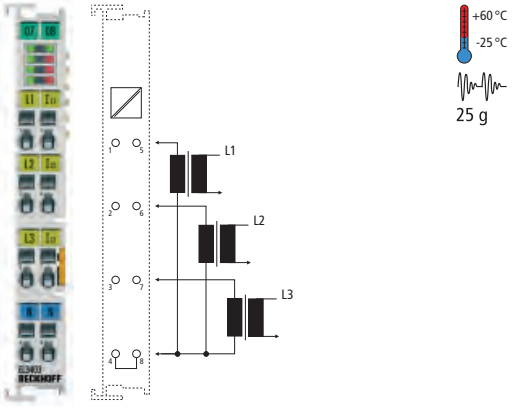
The EL34x3 and EL3773 EtherCAT power measurement terminals enable analysis of the energy consumption of the connected plant or building segment or, quite specifically, the key energy data of individual consumers directly via the fieldbus.

The EL34x3 terminals are suitable for measurements in 50/60 Hz power networks; the three phases plus neutral can be wired directly to the terminal for voltage measurement. For current measurement the three phases L1, L2 and L3 are fed in via simple current transformers. The measured current and voltage values are output as RMS values. From the RMS values for voltage (U) and current (I), the EL34x3 calculates the effective power (P), the energy consumption (W) and the power factor (cos φ) for each phase. From these values the terminals calculate the apparent power (S) and the phase shift angle (φ). Simple net analyses up to the 21st harmonic component as well as measurements of the neutral conductor current can additionally be performed using the EL3413 and EL3433.

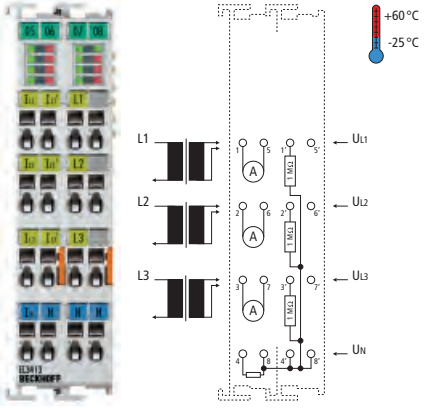
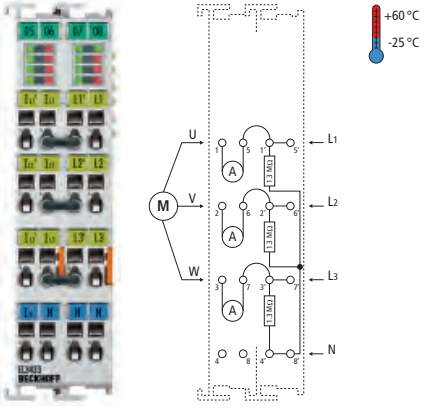
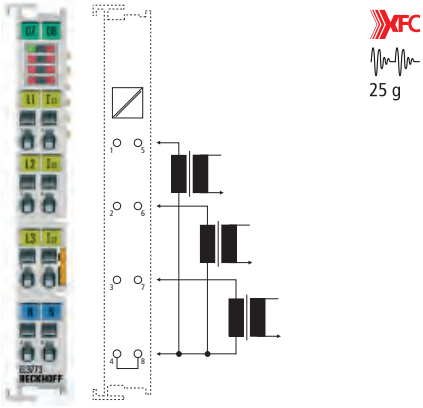
With up to 690 V AC the voltage inputs of the EL3413 are optimised for direct monitoring of high-performance generators, as used in the wind power industry, for example. The current inputs are electrically isolated from one another.

The EL3773 is designed to detect the state of a 3-phase AC voltage system. For each phase voltages up to 288 V_{eff} and currents up to 1 A_{eff} are sampled as instantaneous values with a resolution of 16 bit.

The EL3773 further enables the measurement of direct current voltage up to 410 V DC and direct current up to 1.5 A DC. Based on the EtherCAT oversampling principle, the measured values are measured simultaneously with a temporal resolution of up to 100 µs and passed on to the controller. The controller has sufficient computing power for true RMS or performance calculation and complex custom algorithms based on the measured voltages and currents. The EL3773 supports distributed clocks and can therefore measure synchronous with other EtherCAT devices, but can also operate without distributed clocks.

	3-phase power measurement terminal, 500 V AC	
Technical data	**EL3403** | ES3403	
Technology	3-phase power measurement for alternating voltages	
Measuring voltage	max. 500 V AC 3~ (UL_x-N: max. 288 V AC)	
Resolution	1 µA, 0.1 mV, 10 mW	
Conversion time	mains-synchronous	
Number of inputs	3 x current, 3 x voltage	
		
Measured values	current (I1, I2, I3), voltage, effective power, reactive power, apparent power, energy, cos φ, frequency	
Current consum. pow. cont.	–	
Current consumption E-bus	typ. 120 mA	
Distributed clocks	–	
Oversampling factor	–	
Measuring current	max. 1 A (AC), via measuring transformers x A/1 A	
Electrical isolation	1500 V	
Measurement frequency range	45…65 Hz	
Measuring error	0.5 % relative to full scale value (U/I), 1 % calculated value	
Special features	true RMS value calculation, single-phase operation also possible	
Operating temperature	-25…+60 °C	
Approvals	CE, UL	
Weight	approx. 75 g	
Further information	EL3403	
Special terminals	**EL3403-0010**	**EL3403-0xxx**
Distinguishing features	500 V AC, 5 A	further special terminals see EL3403

We reserve the right to make technical changes.

	3-phase power measurement terminal, 690 V AC	3-phase power measurement terminal 500 V AC, 10 A	Power monitoring oversampling terminal, 500 V AC
	EL3413	**EL3433**	**EL3773**
			3-phase power monitoring for alternating/direct voltages
	max. 690 V AC 3~ (UL_x-N: max. 400 V AC)	max. 500 V AC 3~ (UL_x-N: max. 288 V AC)	max. 500 V AC 3~ (UL_x-N: max. 288 V AC), max. 410 V DC
	1 µA, 0.1 mV, 10 mW	1 µA, 0.1 mV, 10 mW	16 bit (incl. sign)
	mains-synchronous	mains-synchronous	min. 100 µs, all channels simultaneously
	4 x current, 3 x voltage	4 x current, 3 x voltage	3 x current, 3 x voltage
			
	current (I1, I2, I3, In), voltage, effective power, reactive power, apparent power, energy, cos φ, frequency, harmonic	current (I1, I2, I3, In), voltage, effective power, reactive power, apparent power, energy, cos φ, frequency, harmonic	current (I1, I2, I3), voltage as instantaneous values (oversampling)
	–	–	–
	typ. 160 mA	typ. 120 mA	typ. 215 mA
	–	–	yes
	–	–	n = 1…100 selectable
	adjustable, 100 mA, 1 A (default), 5 A; potential-free	max. 10 A (AC)	max. 1 A (AC)/1.5 A (DC), via measuring transformers x A AC/1 A AC
	4500 V	4500 V	2500 V
	45…65 Hz	45…65 Hz	0…5 kHz
	0.5 % relative to full scale value (U/I), 1 % calculated value	0.5 % relative to full scale value (U/I), 1 % calculated value	0.5 % relative to full scale value
	galvanically isolated current inputs, harmonic analysis, single-phase operation also possible	direct current measurement, harmonic analysis, single-phase operation also possible	oversampling, AC/DC measurement, single-phase operation also possible, adjustable hardware filters
	-25…+60 °C	-25…+60 °C	0…+55 °C
	CE, UL	CE, UL	CE, UL
	approx. 100 g	approx. 100 g	approx. 75 g
	EL3413	EL3433	EL3773
	EL3413-0001 / **EL3413-0120**		
	max. 600 V AC, UL approval / max. 210 V AC 3~ (ULx-N: max. 120 V AC)		

Further information on XFC see page 298

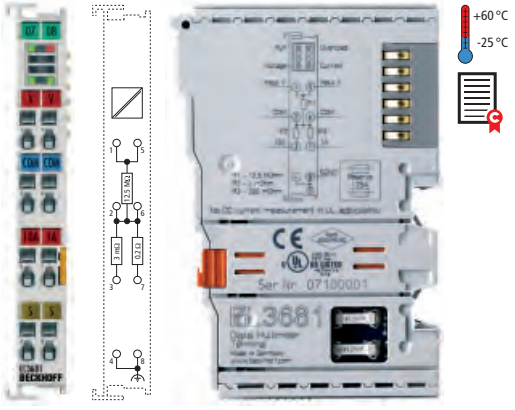
Analog input | **Measurement technology, multimeter terminal**

The EL3681 EtherCAT Terminal enables measurement of currents and voltages in a wide input range. The measuring ranges are switched automatically, as usual in advanced digital multimeters. There are two current paths available for current measurement: for small currents protected with 1 A and a high-current path for up to 10 A. The current and the high-resistance voltage measurement can be used for DC and AC. The alternating parameters are issued as true RMS values, the direct parameters with arithmetic averaging. The measured data are read via EtherCAT and processed further in the controller. At the same time, the EL3681 enables the measuring type and range to be set via the bus.

Excellent interference immunity is achieved through the fully electrically isolated design of the electronic measuring system and the dual slope conversion system. High precision and simple, high-impedance measurement from 300 mV to 300 V allow the EtherCAT Terminals to be used like a modern digital multimeter.

For voltages greater than 25 V AC (42 V peak) or 60 V DC the fuse opening must be covered by an additional terminal or the EL9011 end terminal.

In measuring applications in particular, the voltage to be expected is often not yet known during the planning phase. Automatic adjustment of the measurement range simplifies use and reduces stock levels.

	Digital multimeter terminal, 18 bit
Technical data	**EL3681** | ES3681
Signal voltage	max. 300 V AC/DC, 10 A
Resolution	18 bit + sign in each measurement range
Conversion time	0.5 s (1 s during measuring range switching) preset, min. 65 ms
Number of inputs	1 voltage or 1 current (10 A/1 A)
	
Measuring voltage	300 mV, 3 V, 30 V, 300 V
Current consumption power contacts	–
Current consumption E-bus	150 mA
Distributed clocks	–
Measuring current	100 mA, 1 A and 10 A via high-current path
Internal resistance	3 mΩ/0.2 Ω/12.5 MΩ
Electrical isolation	1500 V (E-bus/field potential)
Measuring error	0.01 % DC voltage measurement at 25 °C
Special features	automatic or manual range selection, 1.25 A fuse installed + spare fuse, filter deactivatable
Operating temperature	-25…+60 °C
Approvals	CE
Weight	approx. 70 g
Further information	EL3681
Special terminals	i EL3681-0020
Distinguishing features	with calibration certificate
Accessories	ZB8000-0001
Spare fuse	10 pieces, 1.25 A 844

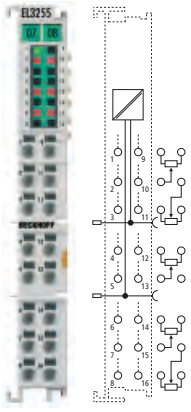
i For availability status see Beckhoff website at: EL3681-0020

We reserve the right to make technical changes.

Analog input | **Potentiometer measurement**

The EL3255 EtherCAT Terminal enables direct connection of up to five resistive voltage dividers. It is possible to connect potentiometers, e.g. for manual operation of a system, or path or pressure sensors, whose value can be determined through resistance comparison.

The EL3255 generates the 10 V supply voltage for the sensors internally and measures this voltage as well as the voltages fed back by the five sensors. Since all voltages are subject to the same influences, the potentiometer analysis is based on determination of the individual voltage components.

	5-channel input, potentiometer measurement with sensor supply, 10 V
Technical data	**EL3255**
Sensor types	potentiometer 300 Ω…50 kΩ
Technology	ratiometric potentiometer evaluation with own supply, 3-wire connection
Resolution	16 bit (incl. sign)
Number of inputs	5
	 25 g
Conversion time	typ. 300…700 µs, dependent on settings, default setting: approx. 500 µs (5 channels, filter deactivated)
Current consumption power contacts	dependent on the potentiometers, max. 70 mA
Current consumption E-bus	typ. 80 mA
Distributed clocks	yes
Feed voltage potentiometer	typ. 10 V ±10 %
Internal resistance	>> 100 kΩ to wiper connection
Measuring error	< ±0.5 % (relative to full scale value)
Special features	open-circuit recognition, supply monitoring, activatable filters, simultaneous measurement of the channels
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Weight	approx. 70 g
Further information	EL3255

We reserve the right to make technical changes.

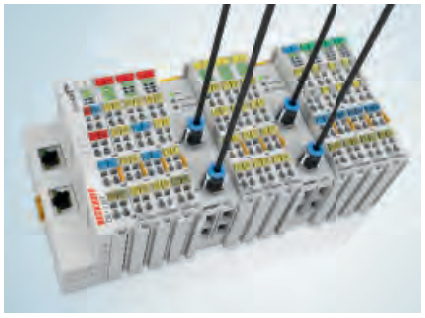
Analog input | **Pressure measuring**

The EtherCAT Terminal system is extended with pressure measuring terminals for recording differential and relative pressures. In a similar way to electrical signal acquisition, an EtherCAT Terminal with 24 mm width is used for pressure measurement. The compact design and simple connection system supports space-saving and quick installation. Additional measuring instruments are unnecessary.

The pressure measuring terminals of the EM37xx series are divided into two groups: differential pressure measurement (measurement between two terminals) and relative pressure measurement (measurement relative to the environment). The EtherCAT Terminals can be used for measuring the pressure or as a substitute for a pressure switch. The pressure value in the controller makes it possible to store the switching threshold as a parameter for a logic link. Manual setting at the pressure switch in the application is therefore no longer required.

While the EM3701 measures the pressure difference between two hose connections, the EM3702 and EM3712 enable direct measurement of the pressure value relative to the environment (relative pressure measurement). In contrast to the EM3702, with the EM3712 negative pressure values, as differential values relative to ambient, are also permitted.

The measured values are available as 16-bit values. The status LEDs indicate proper function or errors such as over-range. The pressure measurement terminals are not suitable for the measurement of aggressive gases.



1-channel differential
pressure measuring terminal
-100…+100 hPa

Technical data	EM3701
Technology	differential pressure measurement

The EM3701 pressure measuring terminal enables direct measurement of pressure differences between two hose connections. The pressure difference is available as a 16 bit value and can be measured between any points up to an ambient pressure of 10 bar. The status LEDs indicate proper function or errors such as over-range.

Measuring error	3 % (relative to full scale value)
Measuring range	-100…+100 hPa (-100…+100 mbar)
Current consumption power contacts	– (no power contacts)
Max. overload	500 hPa (500 mbar) differential
Medium	non-aggressive gases
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 95 g
Further information	EM3701

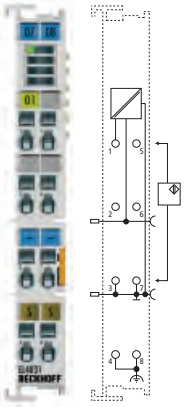
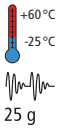
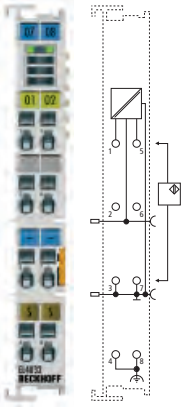
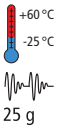
We reserve the right to make technical changes.

	2-channel relative pressure measuring terminal 7500 hPa	2-channel relative pressure measuring terminal -1000…+1000 hPa
	EM3702	**EM3712**
	relative pressure measurement	
	The EM3702 pressure measuring terminal enables direct measurement of two pressure values at the hose connections. The pressure is determined as a pressure difference to the ambiance of the EM3702 and is available as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.	The EM3712 pressure measuring terminal enables direct measurement of two negative pressure values at the hose connections. The pressure is determined as a pressure difference to the ambiance of the KM3712 and is available as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.
	3 % (relative to full scale value)	3 % (relative to full scale value)
	0…7500 hPa (7.5 bar)	-1000…+1000 hPa (-1…+1 bar)
	– (no power contacts)	– (no power contacts)
	10,000 hPa (10 bar)	5000 hPa (5 bar)
	non-aggressive gases	non-aggressive gases
	0…+55 °C	0…+55 °C
	CE, UL	CE, UL
	approx. 95 g	approx. 95 g
	EM3702	EM3712

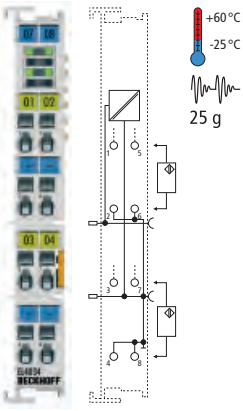
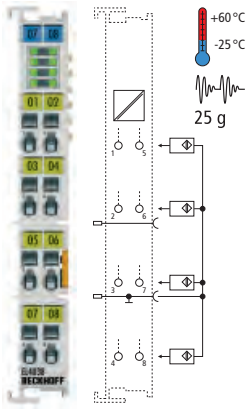
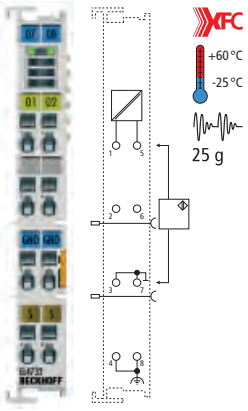
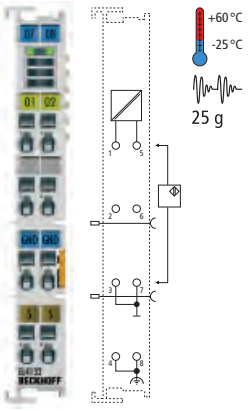
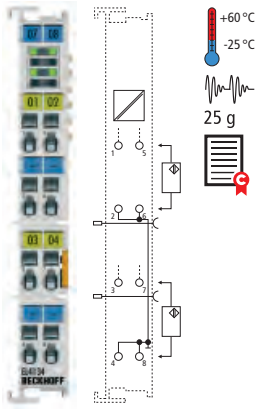
Analog output | -10…+10 V, 12 bit/16 bit

The output from the EL4xxx EtherCAT Terminals is an analog voltage or current parameter, depending on the controller specification: Terminals with 1 to 8 output channels on a 12 mm wide terminal are available for the ranges -10 to +10 V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA. All terminals feature a watchdog which, in the event of a communication failure, issues a stored value (default: 0) or even moves to it via a ramp. All EL4xxx units feature distributed clocks, which means that, if activated, they issue their output values reproducibly and synchronous with the other distributed clock devices in the system. The fewer channels a terminal has, the faster it can update its channels. The EL47xx is even able to generate new output values every 10 µs and can therefore output up to 100,000 samples per second.

The EL4732 and EL4712 oversampling terminals are particularly suitable for high-precision responses in DC systems, e.g. in conjunction with input terminals (EL37xx, EL31xx) or servo controllers.

	1-channel analog output terminal, -10…+10 V, 12 bit	2-channel analog output terminal, -10…+10 V, 12 bit
Technical data	**EL4031** | ES4031	**EL4032** | ES4032
Signal voltage	-10…+10 V	
Resolution	12 bit	
Connection technology	2-wire, single-ended	2-wire, single-ended
Conversion time	~ 100 µs	~ 150 µs
Number of outputs	1	2
	    The EL4031 and EL4032 EtherCAT Terminals are analog output terminals with average conversion times and 12-bit resolution. Both use the 0 V power contact as common reference potential and are designed for 2-wire connection. User scaling can be set in the terminal.	
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Current consumption E-bus	typ. 140 mA	typ. 140 mA
Distributed clocks	yes	yes
Distributed clock precision	<< 1 µs	<< 1 µs
Oversampling factor	–	–
Output rate	–	–
Current consum. pow. cont.	typ. 25 mA	typ. 25 mA
Output error	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
Special features	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 55 g	approx. 55 g
Further information	EL4031	EL4032
Special terminals		
Distinguishing features		

We reserve the right to make technical changes.

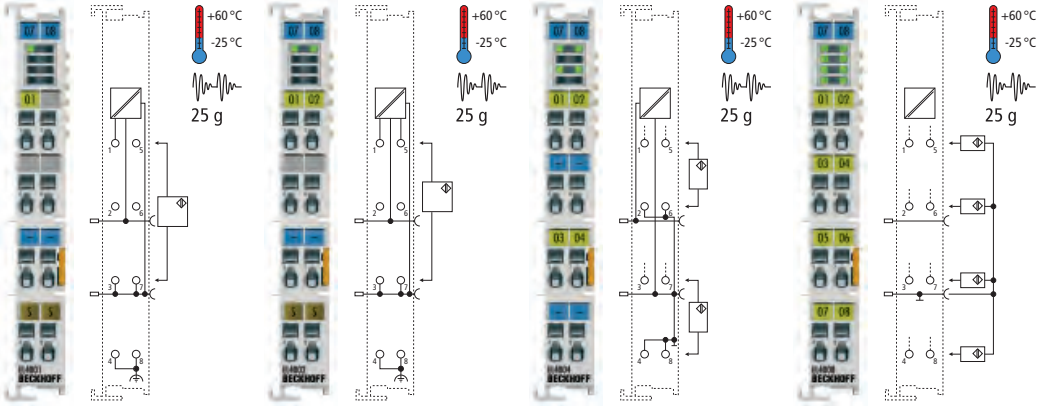
	4-channel analog output terminal, -10…+10 V, 12 bit	8-channel analog output terminal, -10…+10 V, 12 bit	2-channel analog output terminal, -10…+10 V, 16 bit, oversampling	2-channel analog output terminal, -10…+10 V, 16 bit	4-channel analog output terminal, -10…+10 V, 16 bit
	EL4034 | ES4034	**EL4038** | ES4038	**EL4732** | ES4732	**EL4132** | ES4132	**EL4134** | ES4134
			16 bit (incl. sign)		
	2-wire, single-ended	1-wire, single-ended	2-wire, single-ended	2-wire, single-ended	2-wire, single-ended
	~ 250 µs	~ 400 µs	~ 10 µs	~ 40 µs	~ 290 µs
	4	8	2	2	4
					
	The EL4034 and EL4038 EtherCAT Terminals are analog output terminals with average conversion times and 12-bit resolution. The EL4034 is designed for 2-wire connection. The channels have a common reference ground. The EL4038 uses the 0 V power contact as reference potential and is designed for single-wire connection. User scaling can be set in the terminal.		The EL4732 EtherCAT Terminal can output up to 100 sequential output values (which have previously been supplied as a package) per EtherCAT cycle. The oversampling factor must be an integer multiple of the cycle time.	The EL4132 and EL4134 EtherCAT Terminals are analog output terminals with short conversion times and 16-bit resolution and are suitable for fast control tasks. Both terminals are designed for 2-wire connection. The channels have a common reference ground. The EL4134 uses the 0 V power contact as reference potential. User scaling can be set in the terminal.	
	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
	typ. 140 mA	typ. 100 mA	typ. 180 mA	typ. 210 mA	typ. 265 mA
	yes	yes	yes	yes	yes
	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs
	–	–	n = 1…100 selectable	–	–
	–	–	max. 100 ksamples/s	–	–
	typ. 25 mA	typ. 25 mA	–	–	–
	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	oversampling	Watchdog parameterisable; user synchronisation can be activated.	Watchdog parameterisable; user synchronisation can be activated.
	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 85 g	approx. 85 g	approx. 50 g	approx. 55 g	approx. 65 g
	EL4034	EL4038	EL4732	EL4132	EL4134
					i EL4134-0020
					with calibration certificate

Further information on XFC see page 298

i For availability status see Beckhoff website at: EL4134-0020

Analog output | 0…10 V, 12 bit

	1-channel analog output terminal, 0…10 V, 12 bit	2-channel analog output terminal, 0…10 V, 12 bit	4-channel analog output terminal, 0…10 V, 12 bit	8-channel analog output terminal, 0…10 V, 12 bit
Technical data	**EL4001** | ES4001	**EL4002** | ES4002	**EL4004** | ES4004	**EL4008** | ES4008
Signal voltage	0…10 V			
Resolution	12 bit			
Connection technology	2-wire, single-ended	2-wire, single-ended	2-wire, single-ended	1-wire, single-ended
Conversion time	~ 100 µs	~ 150 µs	~ 250 µs	~ 400 µs
Number of outputs	1	2	4	8



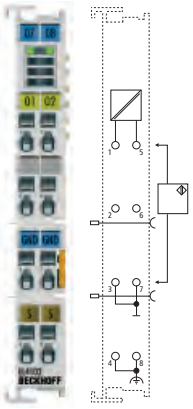
The EL4001, EL4002, EL4004 and EL4008 EtherCAT Terminals are analog output terminals with average conversion times and 12-bit resolution. The channels use the 0 V power contact as common reference potential. The EL4008 is designed for single-wire connection. The other terminals are designed for 2-wire connection. User scaling can be set in the terminal.

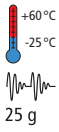
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Current consumption E-bus	typ. 140 mA	typ. 140 mA	typ. 140 mA	typ. 100 mA
Distributed clocks	yes	yes	yes	yes
Distributed clock precision	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs
Current consumption power contacts	typ. 25 mA	typ. 25 mA	typ. 25 mA	typ. 25 mA
Output error	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
Special features	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 85 g	approx. 85 g
Further information	EL4001	EL4002	EL4004	EL4008

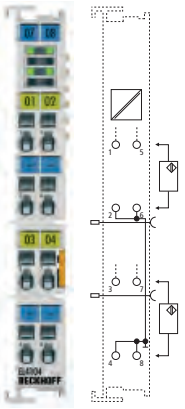
We reserve the right to make technical changes.

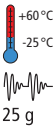
Analog output | 0…10 V, 16 bit

	2-channel analog output terminal, 0…10 V, 16 bit	4-channel analog output terminal, 0…10 V, 16 bit
Technical data	**EL4102** | ES4102	**EL4104** | ES4104
Signal voltage	0…10 V	
Resolution	16 bit (incl. sign)	
Connection technology	2-wire, single-ended	2-wire, single-ended
Conversion time	~ 40 µs	~ 290 µs
Number of outputs	2	4







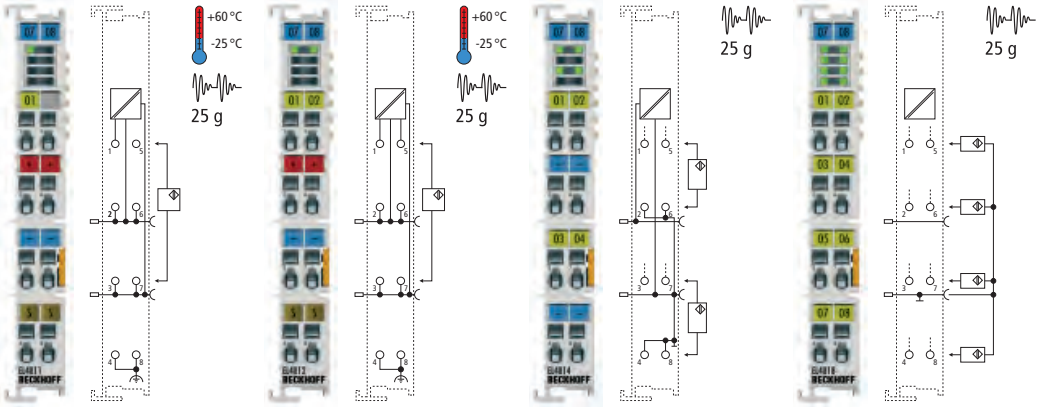


The EL4102 and EL4104 EtherCAT Terminals are analog output terminals with short conversion times and 16-bit resolution and are suitable for fast control tasks. Both terminals are designed for 2-wire connection. The channels have a common reference ground. User scaling can be set in the terminal.

Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Current consumption E-bus	typ. 210 mA	typ. 190 mA
Distributed clocks	yes	yes
Distributed clock precision	<< 1 µs	<< 1 µs
Current consumption power contacts	–	–
Output error	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
Special features	Watchdog parameterisable; user synchronisation can be activated.	Watchdog parameterisable; user synchronisation can be activated.
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 65 g
Further information	EL4102	EL4104

Analog output | 0…20 mA, 12 bit

	1-channel analog output terminal, 0…20 mA, 12 bit	2-channel analog output terminal, 0…20 mA, 12 bit	4-channel analog output terminal, 0…20 mA, 12 bit	8-channel analog output terminal, 0…20 mA, 12 bit
Technical data	**EL4011** | ES4011	**EL4012** | ES4012	**EL4014** | ES4014	**EL4018** | ES4018
Signal voltage	0…20 mA			
Resolution	12 bit			
Connection technology	3-wire, single-ended	3-wire, single-ended	2-wire, single-ended	1-wire, single-ended
Conversion time	~ 100 µs	~ 150 µs	~ 250 µs	~ 400 µs
Number of outputs	1	2	4	8

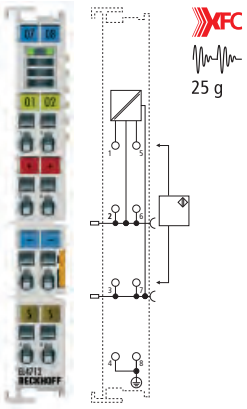
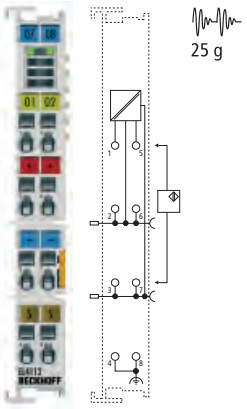
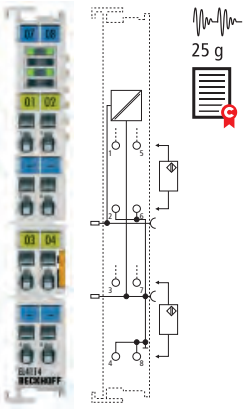
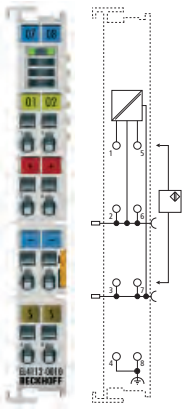


The EtherCAT Terminals of the EL401x series are analog output terminals with average conversion times and 12-bit resolution. The channels use the 0 V power contact as common reference potential. Apart from the 8-channel version EL4018, the terminals of the EL401x series are designed for 2-wire connection. User scaling can be set in the terminal.

Load	< 500 Ω (short-circuit-proof)	< 500 Ω (short-circuit-proof)	< 350 Ω (short-circuit-proof)	< 150 Ω
Current consumption E-bus	typ. 140 mA	typ. 140 mA	typ. 140 mA	typ. 100 mA
Distributed clocks	yes	yes	yes	yes
Distributed clock precision	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs
Oversampling factor	–	–	–	–
Output rate	–	–	–	–
Current consumption power contacts	typ. 25 mA	typ. 25 mA	typ. 25 mA	typ. 60 mA
Output error	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
Special features	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 65 g	approx. 65 g
Further information	EL4011	EL4012	EL4014	EL4018

We reserve the right to make technical changes.

Analog output | 0…20 mA/-10…+10 mA, 16 bit

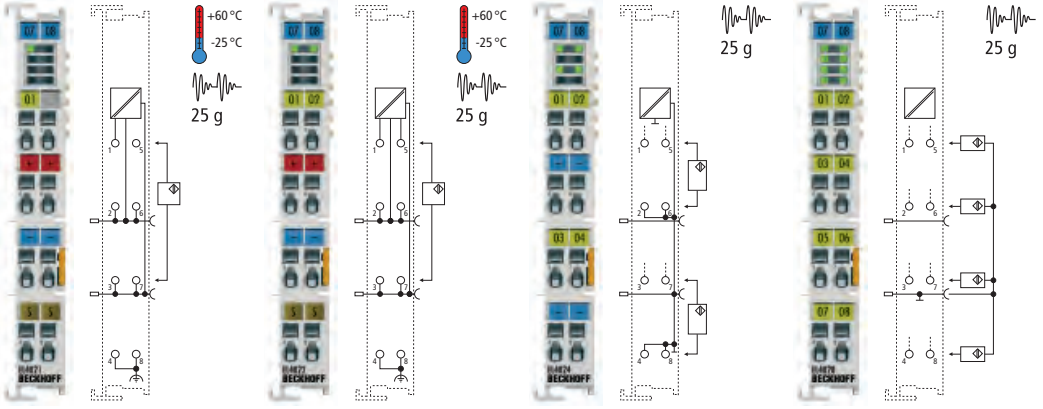
	2-channel analog output terminal, 0…20 mA, 16 bit, oversampling	2-channel analog output terminal, 0…20 mA, 16 bit	4-channel analog output terminal, 0…20 mA, 16 bit	2-channel analog output terminal, -10…+10 mA, 16 bit
Technical data	**EL4712** | ES4712	**EL4112** | ES4112	**EL4114** | ES4114	**EL4112-0010**
Signal voltage	0…20 mA			-10…+10 mA
Resolution	16 bit (incl. sign)			
Connection technology	3-wire, single-ended	3-wire, single-ended	2-wire, single-ended	3-wire, single-ended
Conversion time	~ 10 µs	~ 40 µs	~ 290 µs	~ 40 µs
Number of outputs	2	2	4	2
				
	The EL4712 EtherCAT Terminal can output up to 100 sequential output values (which have previously been supplied as a package) per EtherCAT cycle. The oversampling factor must be an integer multiple of the cycle time.	The EtherCAT Terminals of the EL411x series are analog output terminals with short conversion times and 16-bit resolution and are suitable for fast control tasks. The terminals are designed for 2-wire connection. The channels use the 0 V power contact as common reference potential. User scaling can be set in the terminal.		
Load	< 500 Ω (short-circuit-proof)	< 500 Ω (short-circuit-proof)	< 350 Ω (short-circuit-proof)	< 500 Ω (short-circuit-proof)
Current consumption E-bus	typ. 100 mA	typ. 160 mA	typ. 160 mA	typ. 160 mA
Distributed clocks	yes	yes	yes	yes
Distributed clock precision	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs
Oversampling factor	n = integer multiple of the cycle time, 1…100 selectable	–	–	–
Output rate	max. 100 ksamples/s	–	–	–
Current consum. pow. cont.	typ. 15 mA	typ. 15 mA	typ. 15 mA	typ. 15 mA
Output error	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
Special features	oversampling	Watchdog parameterisable; user synchronisation can be activated.	Watchdog parameterisable; user synchronisation can be activated.	Watchdog parameterisable; user synchronisation can be activated.
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 65 g	approx. 60 g	approx. 65 g	approx. 65 g
Further information	EL4712	EL4112	EL4114	EL4112
Special terminals			i EL4114-0020	
Distinguishing features			with calibration certificate	

Further information on XFC see page 298

i For availability status see Beckhoff website at: EL4114-0020

Analog output | 4…20 mA, 12 bit

	1-channel analog output terminal, 4…20 mA, 12 bit	2-channel analog output terminal, 4…20 mA, 12 bit	4-channel analog output terminal, 4…20 mA, 12 bit	8-channel analog output terminal, 4…20 mA, 12 bit
Technical data	**EL4021** | ES4021	**EL4022** | ES4022	**EL4024** | ES4024	**EL4028** | ES4028
Signal voltage	4…20 mA			
Resolution	12 bit			
Connection technology	3-wire, single-ended	3-wire, single-ended	2-wire, single-ended	1-wire, single-ended
Conversion time	~ 100 µs	~ 150 µs	~ 250 µs	~ 400 µs
Number of outputs	1	2	4	8



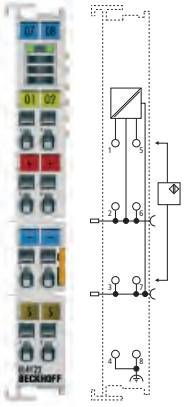
The EtherCAT Terminals of the EL402x series are analog output terminals with average conversion times and 12-bit resolution. The channels use the 0 V power contact as common reference potential. Apart from the 8-channel version EL4028, the terminals of the EL402x series are designed for 2-wire connection. User scaling can be set in the terminal.

Load	< 500 Ω (short-circuit-proof)	< 500 Ω (short-circuit-proof)	< 350 Ω (short-circuit-proof)	< 150 Ω
Current consumption E-bus	typ. 140 mA	typ. 140 mA	typ. 140 mA	typ. 100 mA
Distributed clocks	yes	yes	yes	yes
Distributed clock precision	<< 1 µs	<< 1 µs	<< 1 µs	<< 1 µs
Current consumption power contacts	typ. 25 mA	typ. 25 mA	typ. 25 mA	typ. 60 mA
Output error	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
Special features	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
Further information	EL4021	EL4022	EL4024	EL4028

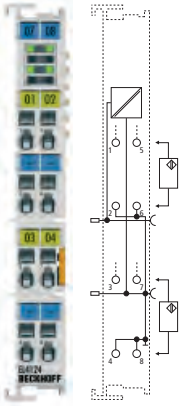
We reserve the right to make technical changes.

Analog output | 4…20 mA, 16 bit

	2-channel analog output terminal, 4…20 mA, 16 bit	4-channel analog output terminal, 4…20 mA, 16 bit
Technical data	**EL4122** | ES4122	**EL4124** | ES4124
Signal voltage	4…20 mA	
Resolution	16 bit (incl. sign)	
Connection technology	3-wire, single-ended	2-wire, single-ended
Conversion time	~ 40 µs	~ 290 µs
Number of outputs	2	4



25 g



25 g

The EL4122 and EL4124 EtherCAT Terminals are analog output terminals with short conversion times and 16-bit resolution and are suitable for fast control tasks. The terminals are designed for 2-wire connection. The channels have a common reference ground. The EL4122 uses the 0 V power contact as reference potential. User scaling can be set in the terminal.

Load	< 500 Ω (short-circuit-proof)	< 350 Ω (short-circuit-proof)
Current consumption E-bus	typ. 160 mA	typ. 190 mA
Distributed clocks	yes	yes
Distributed clock precision	<< 1 µs	<< 1 µs
Current consumption power contacts	typ. 15 mA	typ. 15 mA
Output error	< 0.1 % (relative to end value)	< 0.1 % (relative to end value)
Special features	Watchdog parameterisable; user synchronisation can be activated.	Watchdog parameterisable; user synchronisation can be activated.
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 65 g
Further information	EL4122	EL4124

Position measurement | **SSI encoder interfaces**

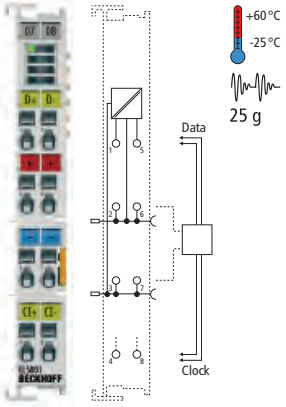
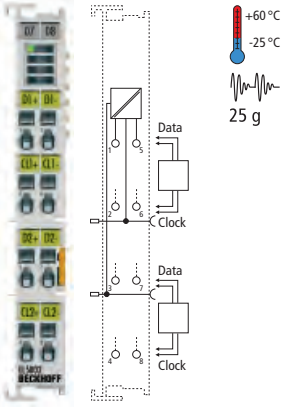
The EL5001 SSI interface EtherCAT Terminal enables the direct connection of an SSI encoder; two SSI encoders can be connected to the 2-channel EL5002 version.

SSI communication is normal for the connection of position encoders and needs two differential wire pairs as the clock and data line. Via the clock line, the master specifies the speed with which the SSI slave on the data line returns its position, e.g. with 24-bit length.

The interface circuit of the EL500x generates a pulse for reading the encoder, and makes the incoming data stream available to the controller as a data word in the process image. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register.

The EL5001 and EL5002 feature the distributed clocks function. Cyclic reading of the SSI encoder can thus be started with high precision, enabling detailed dynamic analysis of the axis in the control system. If the distributed clocks function is deactivated, the EL500x clocks the data synchronously with the EtherCAT cycle from the position encoder.

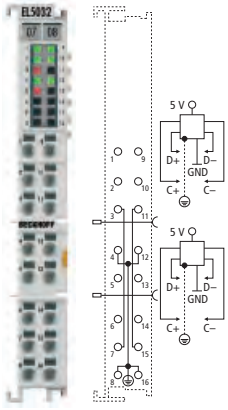
If the transmitted position data are also to be read by a second controller while an SSI master-slave connection already exists, the EL5001-0011 can be used as an SSI monitor, which passively and jointly reads the SSI data on the data lines.

	SSI encoder interface	SSI encoder interface
Technical data	**EL5001** | ES5001	**EL5002** | ES5002
Technology	SSI encoder interface	
Number of channels	1	2
		
Encoder supply	24 V DC via power contacts	external e.g. EL91xx
Current consumption power contacts	typ. 20 mA	typ. 20 mA
Current consumption E-bus	typ. 120 mA	typ. 130 mA
Distributed clocks	yes	yes
Signal output (pulse)	difference signal (RS422)	difference signal (RS422)
Signal input (data)	difference signal (RS422)	difference signal (RS422)
Encoder connection	binary input: D+, D-, binary output: Cl+, Cl-	binary input: D+, D-, binary output: Cl+, Cl-
Data transfer rates	variable up to 1 MHz, 250 kHz default	variable up to 1 MHz, 250 kHz default
Special features	adjustable baud rate, coding and data length	adjustable baud rate, coding and data length
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 55 g	approx. 55 g
Further information	EL5001	EL5002
Special terminals	**EL5001-0011**	
Distinguishing features	SSI monitor terminal, no clock output (simply listening)	

We reserve the right to make technical changes.

Position measurement | **EnDat 2.2 interface**

The EL5032 EnDat 2.2 EtherCAT Terminal is used for direct connection of two encoders with EnDat 2.2 interface. The EL5032 enables reading of position values, diagnosis encoder data, internal and external temperature values and the electronic identification plate. With the electronic identification plate all measuring device-specific information is directly available. In addition, user-defined data can be stored in the encoder. This enables cost-effective and quicker commissioning. The position value is output with up to 48 bits, depending on the resolution of the connected measuring device. In addition to the position value, further information such as status information, addresses and data can be transferred. A list of additional information supported by the encoder is stored in the parameters. The EL5032 features distributed clocks, which means that the position value can be read in exact synchrony with the system. If the distributed clock function is deactivated, the EL5032 cycles synchronous with the EtherCAT cycle.

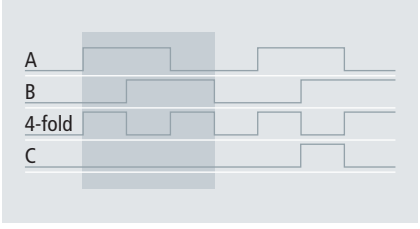
	2-channel EnDat 2.2 interface
Technical data	**EL5032**
Technology	EnDat 2.2 interface
Number of channels	2
	 25 g
Nominal voltage	24 V at power contact, built in encoder supply, max. 0.5 A
Encoder supply	optionally 5 V DC or 9 V DC
Current consumption power contacts	typ. 150 mA
Current consumption E-bus	typ. 120 mA
Commands	reading position values including additional information available for selection via MRS code (Memory Range Select), reading and writing parameters, reset functions
Distributed clocks	yes
Encoder connection	D+, D-, C+, C-
Resolution	max. 48 bit for position
Special features	saving the zero offset shift, electronic type plate, diagnostics, warning, including cable length compensation up to 100 m, reading the encoder temperature values
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 50 g
Further information	EL5032

Position measurement | **Incremental/SinCos encoder interfaces**

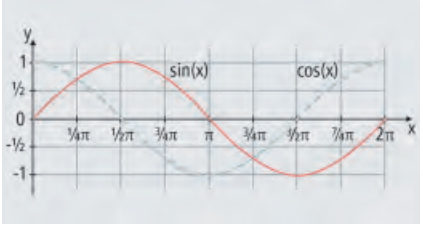
As opposed to absolute value encoders, incremental encoders do not provide a direct position, but rather two changing/pulsed signals that are phase-shifted by 90°, which can be used to calculate back to a position. To this end, digital position encoders subdivide a 360° rotation of the encoder axis into individual steps (increments). For position encoders with analog sin/cos interface it is subdivided into periods, with a period corresponding to a full revolution of the sine/cosine signal. A full revolution of the encoder axis is indicated by a special marker/zero pulse. The number of increments determines both the resolution of an encoder and the accuracy of the position.

The EL51xx terminals support micro-increment mode: By interpolating the signal voltages, the resolution is increased 256-fold and can be used for refining the positioning.

Using the EL5021, an n-times more precise position determination is achieved within one period through interpolation of the two 90° phase-shifted sine signals. Depending on the setting (8 to 13 bit), a micro-resolution of the period of 256 to 8192 times can be achieved.



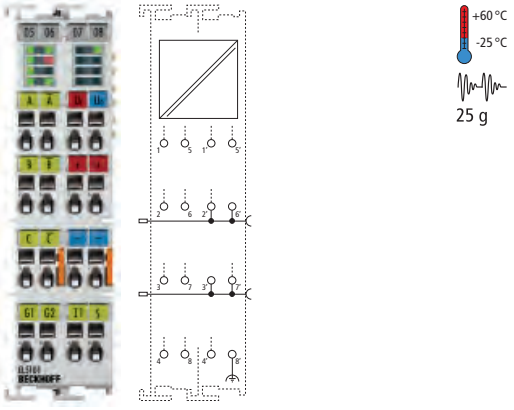
The quadruple evaluation of the signals A and B (quadrature encoder) produces a fine positional resolution and enables detection of the direction.



SinCos signal depending on the encoder position

1-channel incremental encoder interface, differential input (RS485)

Technical data	**EL5101** | ES5101	
Technology	incremental encoder interface RS485	
Number of channels	1	

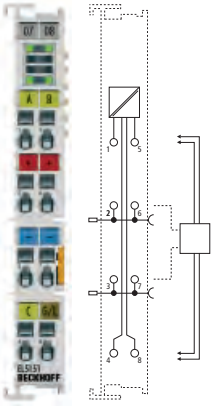
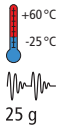
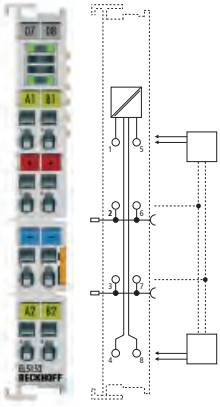
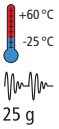
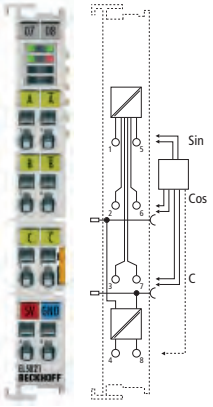


The EL5101 is an interface for the direct connection of incremental encoders with differential (RS485) or single-ended inputs. It supplies 5 V for the encoder supply.

Nominal voltage	24 V DC at power contact	
Current consum. pow. cont.	typ. 100 mA + load	
Current consumption E-bus	typ. 130 mA	
Distributed clocks	yes	
Input signal	difference signal (RS485), single-ended possible	
Encoder connection	A, A (inv), B, B (inv), C,C (inv), differential inputs (RS485); status input 5 V DC; gate/latch input 24 V DC	
Encoder operating voltage	5 V DC/max. 0.5 A	
Input frequency	max. 4 million increments/s (with 4-fold evaluation)	
Resolution	1/256 bit microincrements	
Counter	1 x 16/32 bit switchable	
Special features	wire breakage detection, latch and gate function, period duration and frequency measurement, microincrements, timestamping of edges, filters	
Operating temperature	-25…+60 °C	
Approvals	CE, UL, Ex	
Weight	approx. 100 g	
Further information	EL5101	
Special terminals	**EL5101-0010**	**EL5101-0090**
Distinguishing features	20 million increments/s (with 4-fold evaluation), no single-ended operation	TwinSAFE SC 324

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	1-channel incremental encoder interface, single-ended, 24 V DC	2-channel incremental encoder interface, single-ended, 24 V DC	1-channel SinCos encoder interface, 1 V_{PP}
	EL5151 | ES5151	**EL5152** | ES5152	**EL5021** | ES5021
	incremental encoder interface 24 V DC, EN 61131-2, type 1, "0": < 5 V DC, "1": > 15 V DC, typ. 5 mA		SinCos encoder interface for differential 1 V_{PP} signal
	2		1
	 	 	
	The EL5151 and EL5152 are interfaces with 24 V inputs for the direct connection of incremental encoders. For each channel a 32-bit counter with quadrature decoder can be read and set. In addition, the EL5151 offers a 32-bit latch for the zero pulse. Alternatively, both terminals can be used as forward/backward counters. Due to their support of distributed clocks, the EL515x terminals can detect the axis positions together with other slaves synchronously and with high temporal accuracy.		The EL5021 is an interface for the direct connection of a measuring sensor with sinusoidal voltage output 1 V_{PP}. The measuring signal is provided as a 32 bit value. The maximum resolution of the counter value is 24 bit, the maximum resolution of the signal period is 13 bit. The reference mark is stored in a 32 bit value.
	24 V DC at power contact		24 V DC at power contact
	typ. 100 mA + load		typ. 50 mA + load
	typ. 130 mA		typ. 120 mA
	yes		yes
	24 V DC		1 V_{PP}
	A, B, C, gate/latch input 24 V DC, 24 V/0 V	A1, B1, A2, B2, 24 V/0 V	A, A (inv), B, B (inv), C,C (inv)
	24 V DC		5 V DC/max. 0.5 A
	max. 400,000 increments/s (with 4-fold evaluation)		250 kHz @ 10 bit (sampling frequency 70 MHz)
	1/256 bit microincrements		max. 13 bit, 8192 steps per period
	1 x 16/32 bit switchable	2 x 32 bit	max. 24 bit
	gate or latch function, microincrements, timestamping of edges, period duration and frequency measurement, up/down counters	microincrements, period duration and frequency measurement, up/down counters	latch, reset, amplitude and frequency error recognition, frequency-dependent period resolution, frequency counter max. 24 bit
	-25…+60 °C		0…+55 °C
	CE, UL, Ex		CE, UL, Ex
	approx. 50 g		approx. 55 g
	EL5151	EL5152	EL5021
	EL5151-0021		**i EL5021-0090**
	with parameterisable 24 V DC output and workpiece measurement		TwinSAFE SC

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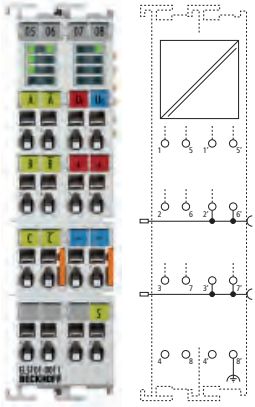
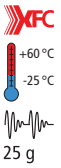
Position measurement | **Incremental encoder interface**

The EL5101-0011 EtherCAT Terminal is an interface for direct connection of incremental encoders with differential inputs (RS422) and it processes the signals for a finer resolution of position values according to the oversampling principle.

A conventional incremental encoder reads a counter value with each bus cycle and passes it on to the higher-level controller in the next fieldbus cycle. The EL5101-0011 reads the current counter value at several configurable and equidistant times between two fieldbus communication cycles with an adjustable whole number multiple (oversampling factor: n) of the bus cycle time. A packet of n position values of 32 bits each is then transmitted to the higher-level controller in the next fieldbus communication cycle. The minimum sampling time is 10 µs (100 ksps). The EL5101-0011 terminal is especially suitable for applications where high-resolution position detection is required.

The EL5101-0011 supports distributed clocks, i.e. input data can be synchronously acquired with data from other I/Os that, similarly distributed, are also connected to distributed slave clocks. A system accuracy of about < 100 ns can be achieved.

	1-channel incremental encoder interface (RS422), oversampling
Technical data	**EL5101-0011**
Technology	incremental encoder interface RS422
Number of channels	1
	 
Nominal voltage	24 V at power contact
Current consumption power contacts	typ. 100 mA + load
Current consumption E-bus	typ. 130 mA
Distributed clocks	yes
Oversampling factor	n = 1…100 selectable
Input signal	difference signal (RS422)
Encoder connection	A, A (inv), B, B (inv), C,C (inv) (RS422, differential inputs)
Encoder operating voltage	5 V DC/max. 0.5 A
Input frequency	max. 20 million increments/s (with 4-fold evaluation)
Conversion time	10 µs/100 ksps
Counter	1 x 32 bit
Special features	oversampling, wire breakage detection
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Weight	approx. 100 g
Further information	EL5101-0011

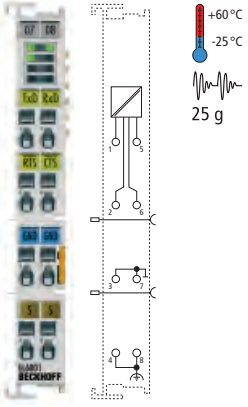
We reserve the right to make technical changes.

Communication | **Serial interfaces RS232/RS485**

The EL60xx serial interfaces enable the connection of devices with RS232 or RS422/RS485 interfaces to the control level. The devices connected to the EtherCAT Terminal communicate via the EtherCAT network with the automation device. The active communication channel works independently of the cycle of the higher-level EtherCAT system in full duplex mode at up to 115.2 kbaud. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

The RS232 interface allows for high immunity to interference through electrically isolated signals. In the EL6021 this is additionally supported by differential signal transmission according to RS422. The EL6022 can make 2 x 5 V/20 mA from the E-bus supply available for powering external devices.

The EL60xx can be used as a normal Windows COM interface in conjunction with the TwinCAT Virtual Serial COM Driver (see page 1041).

	1 x serial interface RS232/RS422/RS485		2 x serial interface RS232/RS422/RS485	
Technical data	**EL6001** | ES6001	**EL6021** | ES6021	**EL6002**	**EL6022**
Data transfer rates	2400…115,200 baud; default: 9600 baud, 8 data bits, no parity and one stop bit		300…115,200 baud; default: 9600 baud, 8 data bits, no parity and one stop bit	
Interfaces	1 x RS232	1 x RS422/ RS485	2 x RS232	2 x RS422/ RS485
Technology	terminal contact		D-sub, 9-pin	
				
Data buffer	864 bytes receive buffer, 128 bytes transmit buffer		864 bytes receive buffer, 128 bytes transmit buffer	
Current consumption power contacts	–		–	
Current consumption E-bus	typ. 120 mA	typ. 170 mA	typ. 170 mA	typ. 270 mA
Distributed clocks	–		–	
Cable length	max. 15 m	approx. 1000 m twisted pair	max. 15 m	approx. 1000 m twisted pair
Line impedance	–	120 Ω	–	120 Ω
Special features	–		–	2 x 5 V/ 20 mA for external supply
Operating temperature	-25…+60 °C		-25…+60 °C	
Approvals	CE, UL, Ex		CE, UL, Ex	
Weight	approx. 55 g		approx. 55 g	
Further information	EL6001		EL6002	

We reserve the right to make technical changes.

Communication | License key terminal for TwinCAT 3.1

With few exceptions, TwinCAT 3 Engineering is free of charge. The chargeable engineering products are licensed in the same way as chargeable runtime licenses. TwinCAT 3.1 offers the option of using a TwinCAT 3 license key (license dongle) for licensing.

License keys make exchange of a PC easy, since the TwinCAT 3 license is no longer tied to the PC hardware itself and the TwinCAT 3 license file can be directly stored on the TwinCAT 3 license key.

Beckhoff offers two types of TwinCAT 3 license key devices: the EL6070 EtherCAT license key terminal or the C9900-L100 license key USB stick.

The EL6070 EtherCAT Terminal enables direct integration into the EtherCAT I/O system and is available in two variants. The EL6070-0000 is an "empty" version for which users can activate any desired licenses themselves. The EL6070-0033 is delivered with pre-activated TwinCAT 3 licenses that have been specified by the user. Of course, users can also activate any additional desired licenses if desired.

An alternative is available in the C9900-L100 license key USB stick, likewise in the C9900-L100-0000 and C9900-L100-0033 variants.

For specifying in the order whether and how TwinCAT 3 licenses should be pre-activated, the TwinCAT 3 article number offers a corresponding option in the third-to-last digit:

0 = pre-activation for IPC
1 = pre-activation for license key (EL6070-0033 or C9900-L100-0033)
2 = no pre-activation (activation carried out by the user)

Examples of orders for a TC1200-0050 TwinCAT 3 PLC license:

Single, not pre-activated TwinCAT 3 license + empty license key:

– license key: EL6070-0000 or C9900-L100-0000
– not pre-activated TwinCAT license: TC1200-0250

Pre-activated TwinCAT 3 license with delivery on the associated license key:

– license key: EL6070-0033 or C9900-L100-0033
– pre-activated TwinCAT license: TC1200-0150

Pre-activated licenses can only be ordered in combination with the associated license key. When re-ordering licenses for an already existing license key, not pre-activated licenses must be ordered, which have to be activated by the user later.

Prerequisite for the use of a TwinCAT 3 license key and the memory function for the license files on the hardware memory of the license key is the current TwinCAT 3.1 version.

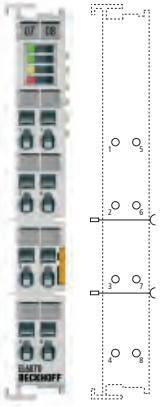
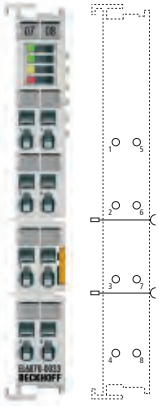
TwinCAT 3 see page 974

C9900-L100 | License key USB stick for TwinCAT 3.1

i C9900-L100-0033 | License key USB stick for TwinCAT 3.1, programmed according to customer specifications

TwinCAT 3 standard licenses are chargeable and are tied to a unique system ID (of the IPC or the license key) as well as to the performance level of the IPC hardware to be used.

We reserve the right to make technical changes.

	License key terminal for TwinCAT 3.1	License key terminal for TwinCAT 3.1 (programmed according to customer specifications)
Technical data	**EL6070**	**EL6070-0033**
Technology	EtherCAT license key terminal	
		
Current consumption power contacts	–	–
Current consumption E-bus	typ. 130 mA	typ. 130 mA
Distributed clocks	–	–
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE
Weight	approx. 50 g	approx. 50 g
Further information	EL6070	EL6070-0033

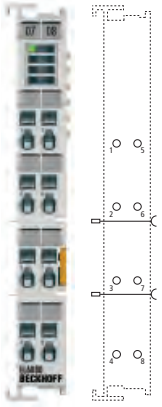
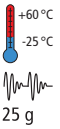
For availability status see Beckhoff website at:

Communication | **EtherCAT memory terminal 128 kbyte**

The EL6080 EtherCAT memory terminal has 128 KB of non-volatile memory (NOVRAM). The terminal can be used to store and read out parameters and recipes. Part of the memory can also be used for the cyclic storage of machine data such as operating hour meters or production numbers. The EtherCAT Terminal is used, for example, for storing module-related data in the machine module in modular machine concepts with a central controller.

Data is only stored in the RAM in the live terminal and is therefore not stored permanently. However, this allows unlimited access for reading and writing. In the event of a power failure, an internal buffer supplies the NOVRAM block until the entire contents of the RAM have been stored in a non-volatile memory.

The EL6080 supports memory access with cyclic process data or via acyclic SDO/CoE. The access time depends in both cases on the size of the data. For cyclic access, the user must create a set of process data with an arbitrary structure, which is then written to or read from the terminal in its entirety. This process takes several task cycles, depending upon the size of the data and the cycle time, and is controlled by a handshake.

	EtherCAT memory terminal 128 kbyte, NOVRAM
Technical data	**EL6080**
Technology	EtherCAT memory terminal
Memory	128 kbyte NOVRAM
	 
Number of write/read	arbitrary
Current consumption power contacts	–
Current consumption E-bus	typ. 130 mA
Distributed clocks	–
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Weight	approx. 50 g
Further information	EL6080

We reserve the right to make technical changes.

Communication | **Display terminal – operating hours counter**

The display terminal has an illuminated, low-reflection LC display with two lines of 16 characters. It can be used, for example, for displaying status messages or diagnostic information. A non-resettable operating hours counter is integrated and can be displayed and also read out via the controller.

Via the user program dynamic and static application-specific texts can be displayed, e.g. "Production counter: (count value)". If the output text is longer than 16 characters, the terminal automatically switches to scrolling text mode. Two special characters can be defined via a 5 x 8 pixel matrix.

The statuses of the navigation switch – up, down, left, right and enter – are transmitted to the controller as binary variables and can be used, for example, to control the display.

	Display terminal with navigation switch and operating hours counter
Technical data	**EL6090**
Technology	EtherCAT display terminal
Switch inputs	navigation switch: up, down, left, right, enter
Display	LC display, 2 x 16 characters (> 16 characters = scrolling text mode), switchable backlight
Special characters	2 characters (5 x 8 pixel matrix)
Operating hours counter	32 bit overflow after 136 years (no reset possible), secure data storage > 100 years (@15 minutes writing interval), accuracy: ±50 ppm
Time measuring	4 x 32 bit second counter (reset possible)
Counter	4 x 32 bit counter (reset possible)
Storage interval	manual/automatic every 15 minutes
Current consumption power contacts	–
Current consumption E-bus	typ. 80 mA
Distributed clocks	–
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 70 g
Further information	EL6090

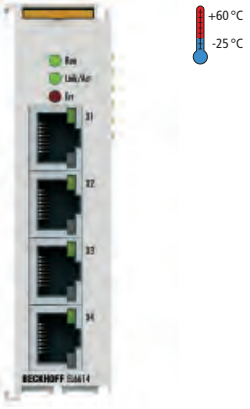
Communication | **Ethernet switch port terminals**

The EL6601 and EL6614 Ethernet switchport terminals serve the local connection of arbitrary Ethernet devices to the EtherCAT system. The EtherCAT system relays the Ethernet communication of the connected devices fully transparent and collision-free.

The EL6614 Ethernet switchport terminal has an integrated 5-port switch. It manages the data from the EtherCAT system and the four RJ45 ports. In full-duplex mode, the terminal enables the collision-free communication of the connected devices with one another.

The EL6601 and EL6614 are suitable for transmitting and receiving "normal" non-real-time-critical Ethernet frames, e.g. with TCP/IP contents. The throughput specified in the documentation must be observed. TwinCAT, as a "virtual switch", manages these frames at the IPC Ethernet port, which is configured as an EtherCAT device.

In addition, the EL6601 and EL6614 can appear as a publisher/subscriber like a real-time Ethernet device and can be configured as such in TwinCAT. Real-time data are preferred by the terminal and processed synchronously with the EtherCAT cycle. In this way, several hundred bytes of process data can be transmitted and received cyclically, up to < 1 ms.

Ethernet	Ethernet switch port terminal, 1 port	Ethernet switch port terminal, 4 ports, internal switch
Technical data	**EL6601**	**EL6614**
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 1 x RJ45	10BASE-T/100BASE-TX Ethernet with 4 x RJ45
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings	
Cable length	up to 100 m twisted pair	up to 100 m twisted pair
		
Protocol	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode
Current consumption power contacts	–	–
Current consumption E-bus	typ. 310 mA	typ. 450 mA
Distributed clocks	–	–
Special features	support of RT Ethernet, publisher/subscriber, DHCP/BootP address allovation (1 device)	support of RT Ethernet, publisher/subscriber, DHCP/BootP address allovation (1 device)
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 75 g	approx. 95 g
Further information	EL6601	EL6614

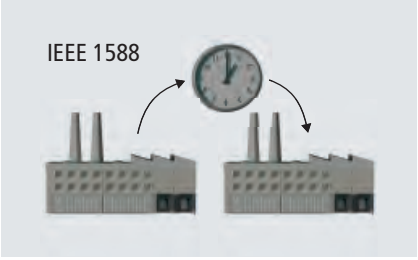
We reserve the right to make technical changes.

Communication | IEEE 1588 external synchronisation

The Precision Time Protocol can be used in order to generate an identical time base within an application, i.e. over several networks. PTP is a protocol that secures the synchronicity of the time settings of several devices in a network and which is defined in IEEE 1588 standard as the protocol standard for the synchronisation of distributed clocks in networks. As opposed to the NTP (Network Time Protocol), the emphasis in PTP is on higher accuracy. The applicational synchronisation can be implemented using TwinCAT and the EL6688 IEEE 1588 External Synchronisation Interface.

If the PTP Ethernet frames are routed by switches in a larger network, then PTP-compatible switches should to be used in order to attain the highest possible synchronisation accuracy. These enter the self-caused data delays into the correction values provided in the PTP data. In this way, the accuracy of the synchronisation of the master to the slave is not affected negatively by the transmission delays.

The EL6688 is the simplest way to synchronise an EtherCAT system with appropriate interface devices to the global world time via GPS or radio transmitters such as DFC77. If more than two EtherCAT systems are to be synchronised with one another, the EtherCAT Terminal is likewise the means of choice.



Applicational synchronicity in the network thanks to distributed clocks according to IEEE 1588

IEEE 1588 external synchronisation interface

Technical data	EL6688
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 1 x RJ45
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Cable length	up to 100 m twisted pair

The EL6688 EtherCAT Terminal is a device in the IEEE 1588 synchronisation system that supports the Ethernet-based precision time protocols PTPv1 (IEEE 1588-2002) and PTPv2 (IEEE 1588-2008). On the one hand, the EL6688 is an IEEE 1588 clock (master or slave), which is synchronised within the scope of the protocol accuracy. On the other hand, it is synchronised by the EtherCAT master as an EtherCAT Terminal in the distributed clocks system, or it provides the reference clock for the EtherCAT system. To do this, it only needs to be selected as the "reference clock" in the TwinCAT System Manager. This way, a consistent timebase can be created across applications for any number of spatially separated TwinCAT EtherCAT systems and machine sections, e.g. for applications with axes or measurement technology. The compact EtherCAT Terminal enables flexible deployment depending on the application requirements.

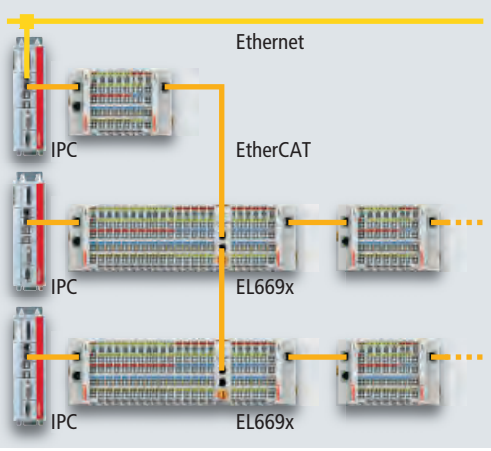
Protocol	PTPv1 (IEEE 1588-2002), PTPv2 (IEEE 1588-2008)
Current consumption power contacts	–
Current consumption E-bus	typ. 310 mA
Distributed clocks	yes
Cable length	up to 100 m twisted pair
Special features	usable in TwinCAT as a reference clock
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 75 g
Further information	EL6688

We reserve the right to make technical changes.

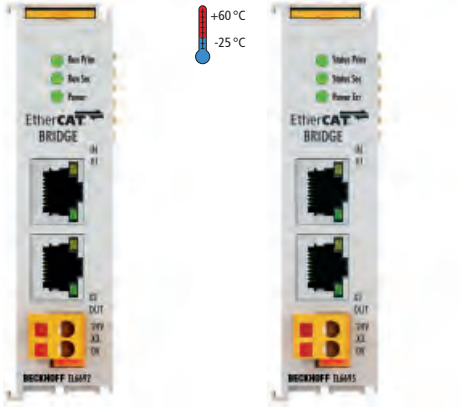
Communication | **EtherCAT bridge terminals**

The slaves within an EtherCAT system are synchronised by the distributed clocks system. In each slave capable of doing so, a local clock triggers the reading in of inputs and the output of outputs synchronously with all other slaves. A slave represents the reference clock, according to which the EtherCAT master/TwinCAT synchronises all other slaves. For event logging and axis synchronisation, the synchronous operation of several EtherCAT systems is useful. The EL669x, which serves as a crossover point between two EtherCAT systems, can be used for interconnection: it is an EtherCAT Terminal on the so-called primary side and an EtherCAT slave with an RJ45 connection on the so-called secondary side. The direction of the time synchronisation is selectable. TwinCAT can use this terminal as the reference clock in the synchronised system; this way, the entire lower-level system is operated synchronously with the primary system. With the same cycle times, both real-time tasks then work synchronously in TwinCAT.

The power supply for the secondary side (RJ45) of the EL6695 is via an external connection, the primary side is supplied via the E-bus. The bridge terminal can also be used for integrating a subordinate PC system as an EtherCAT slave.



Example topologies EL669x

	EtherCAT bridge terminal	EtherCAT bridge terminal
Technical data	**EL6692**	**EL6695**
Technology	primary side: E-bus (terminal strand), secondary side: 2 x 100 Mbit/s Ethernet, RJ45, In/Out	
Function	EtherCAT distributed clock synchronisation, data exchange	
	 The EL6692 and EL6695 are EtherCAT bridge terminals with different performance levels for the synchronous and asynchronous data transmission between two EtherCAT systems. The EL6695 differs from the EL6692 in a flexible CoE configuration, the possibility for device emulation and significantly higher data throughput rates. Apart from that, a reconfigurable partial transmission of the PDO can be offered through selective PDO mapping. Especially with modular or changing machine concepts this is a helpful function.	
Nominal voltage	24 V DC (secondary side)	24 V DC (secondary side)
Current consumption power contacts	–	–
Current consumption E-bus	E-bus: 120 mA, external: 60 mA/24 V typ.	E-bus: typ. 400 mA, external: 80 mA/24 V typ.
Distributed clocks	yes	yes
Power supply	primary: via the E-bus, secondary: via connector	primary: via the E-bus, secondary: via connector, 24 V
Cyclic process data per direction	max. 480 byte	max. 1400 byte
Special features	usable in TwinCAT as a reference clock, supports ADS over EtherCAT (AoE)	usable in TwinCAT as a reference clock, synchronous data exchange, flexible PDO mapping, supports AoE, EoE, FoE, VoE
Operating temperature	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL
Weight	approx. 85 g	approx. 85 g
Further information	EL6692	EL6695

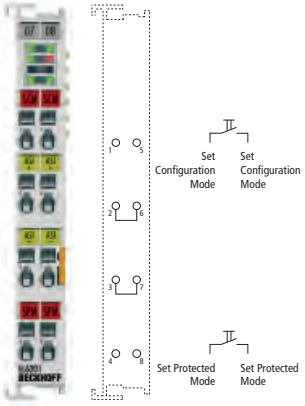
We reserve the right to make technical changes.

Communication | **AS-Interface master terminal**

The AS-Interface (AS-i = Actuator Sensor interface) is a fieldbus communication method for actuators and sensors. The master cyclically transmits telegrams to the individual slaves via a 2-core yellow ribbon cable, which serves at the same time for the 24 V power supply. Up to 62 slaves with a total of 496 inputs and 496 outputs are supported, depending on the protocol.

AS-Interface potential feed terminal
EL9520 see page 446

AS-Interface master terminal

Technical data	**EL6201** | ES6201
Technology	AS-Interface master terminal (M3, M4)
Specification version	AS-Interface V 2.0, V 2.11, V 3.0 (Rev. 4)
AS-Interface slaves	31 for V 2.0, 62 for V 2.1
Number of channels	1 (AS-Interface channel)
	 The EL6201 AS-Interface master terminal enables the direct connection of AS-Interface slaves. The AS-Interface compliant interface supports digital and analog slaves, versions 3.0 (master profile M3, M4). The connected devices are supplied via the EL9520 AS-Interface potential feed terminal with integrated filter.
Slave types	standard: digital and analog, extended: type 1 (CTT1): S-7.3, S-7.4, type 2 (CTT2): S-7.5.5, S-7.A.5, S-B.A.5, type 3 (CTT3): S-7.A.7, S-7.A.A, type 4 (CTT4): S-7.A.8, S-7.A.9, type 5 (CTT5): S-6.0, safety at work: S-0.B, S-7.B
Cycle time	max. 5 ms (at 31 or 62 slaves)
Current consumption power contacts	–
Current consumption	120 mA (E-Bus), typ. 40 mA/max. 60 mA (AS-Interface)
Distributed clocks	–
AS-Interface certificate	yes, ZU-No. 97701
AS-Interface diagnostics	power failure, slave failure, parameterisation error
Operating temperature	0…+55 °C
Approvals	CE
Weight	approx. 55 g
Further information	EL6201

Communication | IO-Link terminal

The EL6224 IO-Link terminal enables connection of up to four IO-Link devices, e.g. actuators, sensors or combinations of both. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the EtherCAT master. IO-Link is designed as an intelligent link between the fieldbus level and the sensor, allowing parameterisation information to be exchanged bidirectionally via the IO-Link connection. The parameterisation of the IO-Link devices with service data can be done from TwinCAT via ADS or very conveniently via the integrated IO-Link configuration tool.

In the standard setting, the EL6224 functions as a 4-channel input terminal, 24 V DC, which communicates with connected IO-Link devices, parameterises them and, if necessary, changes their operating mode.

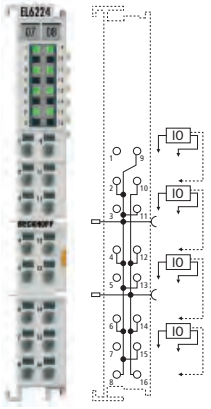
Integration into the HD housing with 16 connection points enables each IO-Link device to be operated in 3-wire connection mode.

Additional 24 V and 0 V connection points can be realised via the EL918x potential distributor terminal.

IO-Link

4-channel input/output,
IO-Link master terminal

Technical data	EL6224
Technology	IO-Link input/output
Specification version	IO-Link V1.1
Data transfer rates	4.8 kbaud, 38.4 kbaud and 230.4 kbaud
Number of channels	4 IO-Link interfaces



25 g

Supply current for devices	500 mA per device
Current consumption power contacts	typ. 20 mA + load
Current consumption E-bus	typ. 120 mA
Distributed clocks	–
Cable length	max. 20 m
Special features	each channel parameterisable in TwinCAT
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 60 g
Further information	EL6224
Special terminals	i EL6224-0090
Distinguishing features	TwinSAFE SC 324

i For availability status see Beckhoff website at: EL6224-0090

We reserve the right to make technical changes.

Communication | **PROFINET controller/device**

The EL6631 PROFINET RT controller (master) terminal supports the complete real-time function (RT) as well as extensive diagnostic possibilities. All services according to conformance class B are supported. Up to 15 PROFINET RT devices can be projected on the EL6631.

The EL6631-0010 PROFINET RT device (slave) terminal enables the simple exchange of data between EtherCAT and the PROFINET RT controllers. Within the EtherCAT strand it represents a slave that can consist of up to 65,535 devices. The EL6631-0010 contains a 3-port switch; two of these ports are fed externally to RJ45 sockets. This allows the construction of the I/O stations as a line topology, thus reducing wiring. The maximum distance between two devices is 100 m.

Protocols such as LLDP or SNMP can be used for network diagnostics.

The EL6632 PROFINET IRT Controller Terminal supports the complete RT (real-time) or IRT (isochronous real-time) function as well as providing extensive diagnostic options.

All services in accordance with Conformance Class C are supported. Depending on the cycle time, up to five PROFINET IRT or up to 15 PROFINET RT devices can be operated at the EL6632 in a line topology. The maximum distance between two devices is 100 m. Protocols such as LLDP or SNMP can be used for network diagnostics.

	PROFINET RT controller/device, 2 ports, internal switch	PROFINET IRT controller, 2 ports, internal switch
Technical data	**EL6631**	**i EL6632**
Technology	PROFINET RT	PROFINET IRT
Ethernet interface	100BASE-TX Ethernet with 2 x RJ45	
Protocol	RT	RT or IRT
Current consumption power contacts	–	–
Current consumption E-bus	typ. 400 mA	typ. 400 mA
Distributed clocks	–	–
Cable length	up to 100 m twisted pair	up to 100 m twisted pair
Special features	LLDP, SNMP, Conformance Class B, max. 15 RT devices, min. 1 ms RT cycle	Conformance Class C, max. 5 IRT devices, max. 15 RT devices, min. 500 µs IRT cycle, min. 1 ms RT cycle
Operating temperature	0…+55 °C (see documentation)	0…+55 °C (see documentation)
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 75 g	approx. 75 g
Further information	EL6631	EL6632
Special terminals	**EL6631-0010**	
Distinguishing features	PROFINET RT device	

i For availability status see Beckhoff website at: EL6632

Communication | **EtherNet/IP master/slave terminal**

The EL6652 EtherNet/IP master terminal and the EL6652-0010 EtherNet/IP slave terminal have a switched 2-port Ethernet connection and can thus be operated in a line with further Ethernet/IP nodes. The process data are configured by an EtherCAT master, allowing different process data and different sizes.

The EL6652 and EL6652-0010 support both multicast and unicast connections. With the EL6652, up to 16 simple EtherNet/IP slave devices can be connected via one generic node. The EL6652-0010 is optionally available for connecting EtherCAT with an EtherNet/IP master.

EtherNet/IP

EtherNet/IP master/slave terminal,
2 x RJ45 switch

Technical data	EL6652	EL6652-0010
Technology	EtherNet/IP master terminal	EtherNet/IP slave terminal
Ethernet interface	100BASE-TX Ethernet with 2 x RJ45	

Protocol	EtherNet/IP	EtherNet/IP slave
Number of possible slave devices	max. 16 slave nodes	–
Current consumption power contacts	–	
Current consumption E-bus	typ. 400 mA	
Distributed clocks	–	
Cable length	up to 100 m twisted pair	
Special features	multicast/unicast connection	
Operating temperature	0…+55 °C (see documentation)	
Approvals	CE, UL	
Weight	approx. 75 g	
Further information	EL6652	

We reserve the right to make technical changes.

Communication | **PROFIBUS master/slave terminal**

The EL6731 PROFIBUS master terminal corresponds to the FC3101 PROFIBUS PCI card. Connection via EtherCAT allows PCI slots in the PC to be dispensed with; instead, any desired number of PROFIBUS master terminals (EL6731) or slave terminals (EL6731-0010) can be used in the field. This reduces cabling and facilitates the connection of existing fieldbus installations to the high-performance EtherCAT fieldbus.

The terminal can handle the PROFIBUS protocol with all features and enables the integration of arbitrary PROFIBUS devices in the EtherCAT Terminal network. The terminal has a PROFIBUS chip with the latest PROFIBUS technology – including a high-precision isochronous mode for axis control and advanced diagnostic options.

The EL6731 allows the operation of PROFIBUS slaves with different polling rates and is distinguished by the following characteristics:

- Cycle times from 200 µs are possible.
- PROFIBUS DP, PROFIBUS DP-V1, PROFIBUS DP-V2
- master and slave monitor up to 12 Mbit/s
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- It is possible to read the bus configuration and automatically assign the "GSD" files.

PROFIBUS master/slave terminal

Technical data	EL6731	EL6731-0010
Technology	PROFIBUS master terminal	PROFIBUS slave terminal
Data transfer rates	9.6 kbaud…12 Mbaud	
Interfaces	1 x D-sub socket, 9-pin, galvanically decoupled	
Number of channels	1	

+60 °C
-25 °C

Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1 (Cl. 1+2: acyclic services, alarms), DP-V2, PROFIBUS MC (equidistant)	
Cycle time	differing DP cycle times per slave are possible using the CDL concept	
Current consumption power contacts	–	
Current consumption E-bus	typ. 350 mA	
Distributed clocks	yes	–
Bus device	max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	
Special features	status LEDs, total max. 7 kbyte input and output data	
Operating temperature	-25…+60 °C	
Approvals	CE, UL, Ex	
Weight	approx. 70 g	
Further information	EL6731	

We reserve the right to make technical changes.

Communication | **CANopen master/slave terminal**

The EL6751 CANopen master terminal corresponds to the FC5101 CANopen PCI card. Connection via EtherCAT allows PCI slots in the PC to be dispensed with; instead, any desired number of CANopen master or slave terminals can be used in the field.
The EL6751 enables the integration of arbitrary CANopen devices in the EtherCAT Terminal network. It is alternatively available as a master (EL6751) or slave (EL6751-0010). In addition, general CAN messages can be sent or received – without having to bother with CAN frames in the applications program. The terminal has a powerful protocol implementation with many features:

- support for all CANopen PDO communication modes: event-controlled, time-controlled (event timer), synchronous, polling
- synchronisation with the task cycle of the PC controller
- SYNC cycle with quartz precision for drive synchronisation, zero cumulative jitter
- parameter communication (SDO) at start-up and when running
- emergency message handling, guarding and heartbeat
- powerful parameter and diagnostics interfaces
- online bus load display

CANopen

CANopen master/slave terminal

Technical data	EL6751	EL6751-0010
Technology	CANopen master terminal	CANopen slave terminal
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbaud	
Interfaces	D-sub connector, 9-pin according to CANopen specification, galvanically decoupled	
Number of channels	1	

Fieldbus	CANopen	
Current consumption power contacts	–	
Current consumption E-bus	typ. 300 mA	
Distributed clocks	–	
Bus device	max. 127 slaves	–
Special features	status LEDs, CANopen network master, CANopen Manager, supports RAW-CAN	status LEDs, CANopen slave
Operating temperature	-25…+60 °C	
Approvals	CE, UL, Ex	
Weight	approx. 70 g	
Further information	EL6751	

We reserve the right to make technical changes.

Communication | DeviceNet master/slave terminal

The EL6752 DeviceNet master terminal corresponds to the FC5201 DeviceNet PCI card. Connection via EtherCAT allows PCI slots in the PC to be dispensed with; instead, any desired number of DeviceNet master or slave terminals can be used in the field. The EL6752 allows the integration of arbitrary DeviceNet devices in the EtherCAT Terminal network. It is alternatively available as a master (EL6752) or slave (EL6752-0010). The DeviceNet terminal has a powerful protocol implementation with many features:

- support of all DeviceNet I/O modes: polling, change of state, cyclic, strobed
- Unconnected Message Manager (UCMM)
- offline connection set, Device Heartbeat Messages, Device Shutdown Messages
- Auto Device Replacement (ADR)
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.

DeviceNet

DeviceNet master/slave terminal

Technical data	EL6752	EL6752-0010
Technology	DeviceNet master terminal	DeviceNet slave terminal
Data transfer rates	125, 250, 500 kbaud	
Interfaces	open style connector, 5-pin, according to DeviceNet specification, galvanically decoupled (Connector is supplied.)	
Number of channels	1	

Fieldbus	DeviceNet
Current consumption power contacts	–
Current consumption E-bus	typ. 260 mA
Distributed clocks	–
Bus device	max. 63 slaves
Special features	DeviceNet scanner
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Weight	approx. 70 g
Further information	EL6752

Communication | Lightbus master/Interbus slave terminal

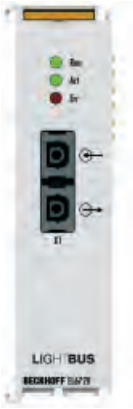
Lightbus
The EL6720 Lightbus master terminal enables the connection to Lightbus devices just as the Beckhoff FC2001 Lightbus PCI card. Due to the connection via EtherCAT, no PCI slots are required in the PC. The terminal controls the Lightbus protocol with all its features. Within an EtherCAT Terminal network, the EL6720 enables the integration of any Lightbus slaves. The terminal has a powerful protocol implementation with many features:

– Cycle times up to 100 µs are possible.
– Process data communication can either be free running or synchronised.
– powerful parameter and diagnostics interfaces (ADS)

Lightbus accessories see page 800

Interbus
Interbus is a ring system, i.e. all devices are actively integrated into a closed transmission path. Each device regenerates the incoming signal and passes it on. In the Interbus system, both the data line and the return line are fed through all devices inside one cable. This results in the physical appearance of a line or tree structure. The master-slave system allows the connection of a maximum of 512 devices, which form the structure of a spatially distributed shift register. Each device, with its registers of different lengths, is part of the shift register ring. The master pushes data through the ring serially. Due to the point-to-point connection method, termination resistors do not have to be installed.

The EL6740-0010 Interbus slave terminal enables data exchange between EtherCAT and Interbus. For both bus systems the terminal "mirrors" up to 32 word input and 32 word output to the respective other system. The outputs are written to the inputs of the other bus with minimum delay. The terminal can use the Interbus protocol up to a baud rate of 2 Mbits. Due to the connection via EtherCAT, no PCI slots are required in the PC.

LIGHTBUS / INTERBUS	Lightbus master terminal	Interbus slave terminal
Technical data	**EL6720**	**EL6740-0010**
Technology	Lightbus master terminal	Interbus slave terminal
Data transfer rates	2.5 Mbaud	500 kbits, 2 Mbits (default)
Interfaces	2 x fibre optic standard connector Z1000 (plastic fibre), Z1010 (HCS fibre)	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock
Number of channels	1	1
		
Fieldbus	Lightbus	Interbus, max. 400 m between 2 stations at 500 kbit/s
Type of connection	fibre optic standard connector	only remote bus
Current consumption power contacts	–	–
Current consumption E-bus	typ. 240 mA	typ. 450 mA
Distributed clocks	–	–
Bus device	max. 254 nodes with a max. of 65,280 I/O points per fieldbus connection	–
Special features	3 priority-controlled logical communication channels	status LEDs
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 70 g	approx. 80 g
Further information	EL6720	EL6740

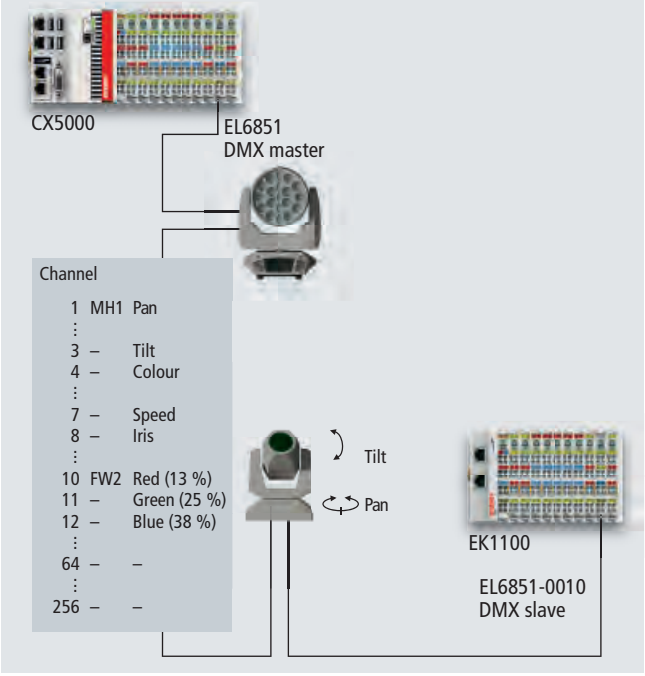
We reserve the right to make technical changes.

Communication | DMX master/slave terminal

DMX is the standard protocol for controlling professional stage and effect lighting equipment, which is used, for example, for the dynamic lighting of showrooms and salesrooms as well as for exclusive displays of light and colour in high-profile buildings, such as hotels and event centres. For static DMX light sources (e.g. spotlights), colour mixing and brightness values are transmitted, while moving DMX light sources (e.g. moving heads and scanners) receive additional spatial coordinates. The high data transfer rate of EtherCAT permits higher update rates of light settings, resulting in more harmonious changes of light and colour as perceived by the human eye.

The EL6851 DMX master terminal allows the direct connection of up to 32 DMX devices and supports the transmission of the full DMX protocol width of 512 bytes in just one control cycle using EtherCAT. This way, random devices, such as scanners, moving heads or spotlights can be controlled (see illustration below).

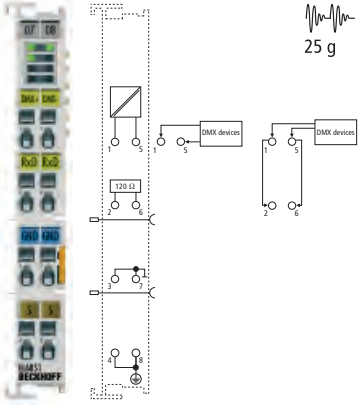
The EL6851-0010 DMX slave terminal acts as a link to the DMX world and enables professional stage and effect lighting to be implemented in conjunction with standard hardware. It takes on the information from the DMX master for the assigned automation equipment. This way, theatre and show stages can be constructed with standard hardware at reduced cost, but with full flexibility. The data from the DMX telegram are output on simple digital outputs, stepper motors or dimmer terminals. Furthermore, it is possible to transmit the DMX data to a DALI network and in this way to indirectly operate DALI ballasts with DMX.



DMX

DMX master/slave terminal

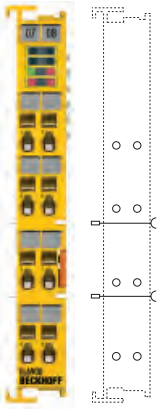
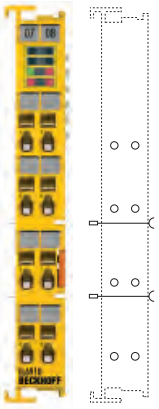
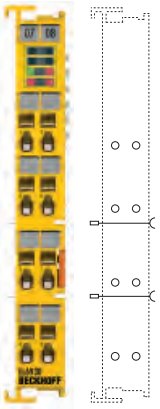
Technical data	EL6851	EL6851-0010
Technology	DMX master terminal	DMX slave terminal
Data transfer rates	250 kbit, one start bit, two stop bits	
Interfaces	RS485, termination resistor can be switched, half duplex	
Number of channels	1	



The EL6851 EtherCAT Terminal is a DMX master terminal and enables connection of up to 32 devices without repeater. The DMX master terminal can send up to 512 bytes of data. At 250 kbit/s a maximum data rate of 44 kHz is thus possible.

Data length	max. 512 bytes	
Protocol	DMX512	
Current consumption power contacts	–	
Current consumption E-bus	typ. 130 mA	
Distributed clocks	–	
Bus device	max. 32 without repeater	–
Line impedance	120 Ω	
Special features	supports RDM protocol, library available; electrically isolated	start address and data length can be set
Operating temperature	0…+55 °C	
Approvals	CE, UL, Ex	
Weight	approx. 55 g	
Further information	EL6851	

Communication | **TwinSAFE, PROFIsafe**

	TwinSAFE Logic	TwinSAFE Logic	TwinSAFE/PROFIsafe logic and gateway terminal
Technical data	**EL6900**	**i EL6910**	**EL6930**
Technology	TwinSAFE Logic		TwinSAFE/PROFIsafe logic and gateway terminal
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
	 The TwinSAFE Logic can establish 128 connections to other TwinSAFE devices.	 The TwinSAFE Logic can establish 212 connections to other TwinSAFE devices.	 The EL6930 logic terminal can establish 127 connections to other TwinSAFE/Safety over EtherCAT devices and one PROFIsafe slave connection to a PROFIsafe master.
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT, PROFIsafe
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	–	–	–
Current consumption E-bus	approx. 188 mA	approx. 160 mA	approx. 188 mA
Cycle time	500 µs…~25 ms	500 µs…~10 ms	500 µs…~25 ms
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Special features	backup restore	backup restore	1 PROFIsafe slave connection
Operating/storage temperature	-25…+55 °C/-40…+70 °C	-25…+55 °C/-40…+70 °C	-25…+55 °C/-40…+70 °C
Approvals	CE, UL, Ex, TÜV SÜD	CE, UL	CE, TÜV SÜD
Weight	approx. 50 g	approx. 50 g	approx. 50 g
Further information	EL6900	EL6910	EL6930

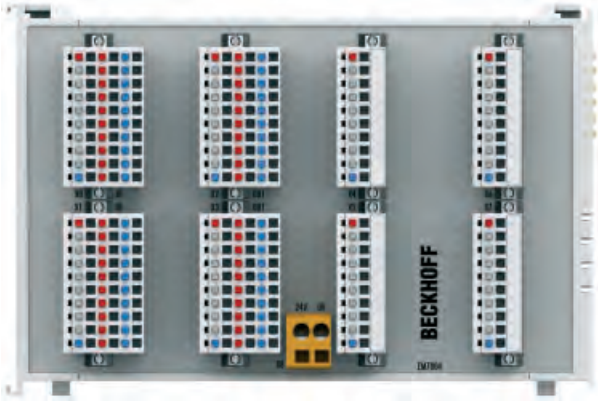
For TwinSAFE products and further information on the TwinSAFE technology see page 1044

i For availability status see Beckhoff website at: EL6910

We reserve the right to make technical changes.

Motion | 4-axis interface

The EM7004 interface module is designed for direct connection of servo drives with ±10 V DC interface and incremental encoder output for position feedback and represents a cost-effective solution for drives in the lower and medium speed range. The individual servo interfaces are electrically isolated from each other. The analog I/Os and the incremental encoder connections have a common reference potential. Further digital inputs and outputs turn the compact module into a complete – and sole – link between the control and application level. Internal preprocessing of the signals enables users to modify outputs with short reaction times, depending on the position.

	4-axis interface
Technical data	**EM7004**
Technology	4-axis interface
Number of channels	4 encoder inputs, 4 analog outputs, 16 digital inputs and 16 digital outputs
Cycle time	min. 1 ms
	 The EM7004 module is available with different connectors: EM7004-0000 without connectors EM7004-0002 4 x ZS2001-0002 (1-wire, LED), 4 x ZS2001-0005 (1-wire, LED) EM7004-0004 4 x ZS2001-0005 (1-wire), 4 x ZS2001-0004 (3-wire, LED) Plug X8 is included in the scope of supply.
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	– (no power contacts)
Current consumption E-bus	typ. 280 mA
Distributed clocks	–
Digital inputs	16 x 24 V DC
Digital outputs	16 (8 x 0.5 A, 8 x 1.5 A), 24 V DC
Analog outputs	4 x ±10 V (2 mA)
Encoder inputs	4 x (A, /A, B, /B, gate, latch, ground); A B – isolated RS485 inputs (RS422); 4 x 16 bit quadrature encoder; < 400 kHz
Special features	outputs switchable in relation to counter states, user scaling parameterisable, watchdog parameterisable
Operating temperature	0…+55 °C
Approvals	CE
Weight	approx. 260 g
Further information	EM7004

We reserve the right to make technical changes.

Motion | Stepper motor terminals

Stepper motors are often used in positioning drives. They allow, by the combination of single steps, a positioning process without feedback of the rotor positions. This "open control chain" mode of operation and the longevity of a stepper motor are particularly interesting for price-sensitive fields of application.

In contrast with a DC motor the control of a stepper motor is carried out by the different energisation of the individual motor windings following a defined pattern of pulses. The electromagnetic field of the stator is switched intermittently so that the shaft turns through the step angle α. The motor follows the impulse pattern of the control unit, until the coupled momentum exceeds its holding momentum or the impulse demand is too dynamic, which leads to standstill of the motor. The EL703x and EL704x EtherCAT stepper motor terminals, which are suitable for highly dynamic movement, solve this problem also in areas of higher speeds of rotation.

The EL703x and EL704x stepper motor terminals are designed for direct connection of medium capacity stepper motors. A high frequency clocked PWM output stage regulates the currents through the motor coils.

The stepper motor terminals are synchronised with the motor by parameterising. Unipolar as well as bipolar stepper motors can be driven. Additional inputs support functions like homing and final position monitoring. 64-fold micro stepping ensures particularly quiet and precise motor operation even with standard technology. Together with a stepper motor, the stepper motor terminals represent an inexpensive small servo axis. The EL7037 and EL704x also include an incremental encoder interface to read position data.

The stepper motor terminals can be controlled like a servo drive by a speed interface from a Motion Control software such as TwinCAT for example. In applications with a less complex and less powerful CPU the control is also possible via a position interface (travel distance control). The stepper motor terminals move the motor themselves to a desired position. Ramp steepness and maximum speed can be entered as parameters.

Irregular operation at certain speed ranges with standard technology, particularly without coupled load, indicates that the stepper motor is being run at its resonance frequency. Under certain circumstances the motor may even stop. Resonances in the lower frequency range essentially result from the mechanical motor parameters. Apart from their impact on smooth running, such resonances can lead to significant loss of torque, or even loss of step of the motor, and are therefore particularly undesirable. The EL7041-1000 special version is particularly well suited for such low-mass and therefore resonance-critical applications and it is compatible to the KL2541.

In combination with the Beckhoff stepper motor series ASxxxx, the EL7037 and EL7047 EtherCAT Terminals support vector control. The advantages of this operating mode are:

- low power consumption (almost entirely load-dependent)
- high efficiency
- consistent dynamics compared with standard mode
- Step losses are inherently eliminated.

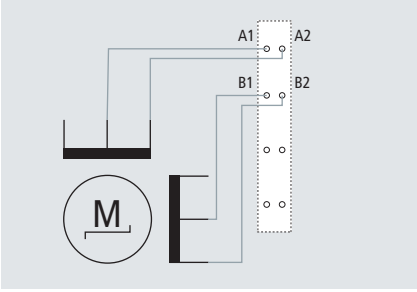
The EL703x stepper motor terminal is designed exclusively for 24 V supply voltage. The motor current can reach up to 1.5 A. The EL704x covers a supply voltage range from 8 V DC to 50 V DC and also needs a 24 V supply from the power contacts. The motor current can be set from 1 to 5 A.

The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative acceleration causes the feedback of energy, which leads to voltage peaks at the power supply unit. An EL9576 brake chopper terminal protects from the effects of overvoltage, in that it absorbs some of the energy. For voltage values exceeding the capacity of the terminal, an external resistor has to be connected to eliminate surplus energy.

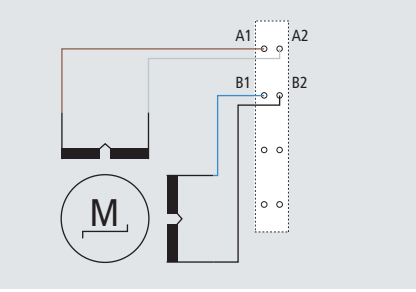
AS20xx | Stepper motors see page 933

AS10xx | Stepper motors see page 936

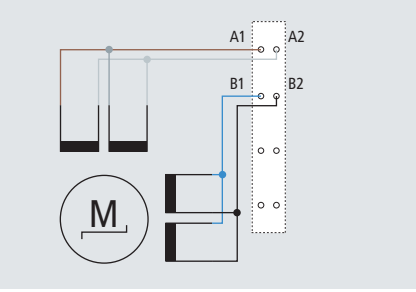
EL9576 | Brake chopper terminal see page 449



Connection of a unipolar stepper motor

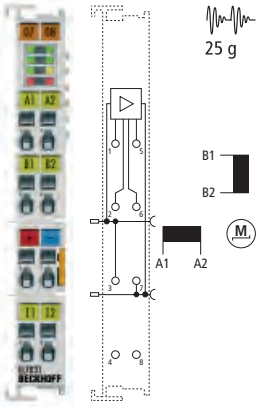
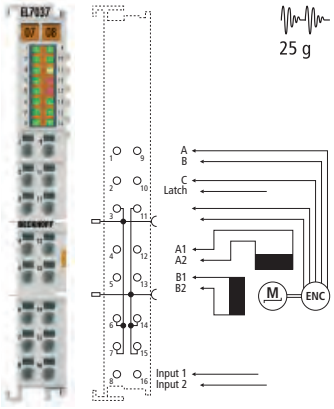
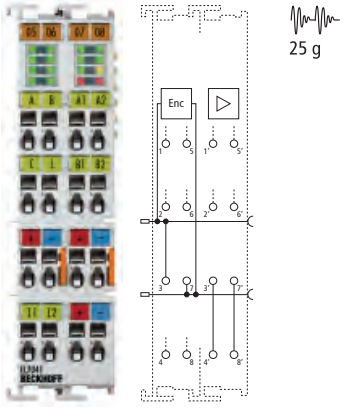


Connection of a bipolar AS10xx stepper motor, serial



Connection of a bipolar AS10xx stepper motor, parallel

We reserve the right to make technical changes.

	Stepper motor terminal 24 V DC, 1.5 A	Stepper motor terminal 24 V DC, 1.5 A, with incremental encoder, vector control	Stepper motor terminal 50 V DC, 5 A, with incremental encoder	Stepper motor terminal 50 V DC, 5 A, with incremental encoder, vector control
Technical data	**EL7031** | ES7031	**EL7037**	**EL7041** | ES7041	**EL7047**
Technology	direct motor connection			
Load type	uni- or bipolar stepper motors			
Output current	max. 1.5 A (overload- and short-circuit-proof)		max. 5 A (overload- and short-circuit-proof)	
Number of channels	1 stepper motor, 2 digital inputs	1 stepper motor, encoder input, 2 digital inputs	1 stepper motor, encoder input, 2 digital inputs	
				
Nominal voltage	24 V DC (-15 %/+20 %)		8…50 V DC	
Current consumption power contacts	typ. 30 mA + motor current	typ. 50 mA	typ. 50 mA	
Current consumption E-bus	typ. 120 mA	typ. 100 mA	typ. 140 mA	typ. 100 mA
Distributed clocks	yes		yes	
Maximum step frequency	1000, 2000, 4000 or 8000 full steps/s (configurable)	1000, 2000, 4000, 8000 or 16,000 full steps/s (configurable)	1000, 2000, 4000 or 8000 full steps/s (configurable)	1000, 2000, 4000, 8000 or 16,000 full steps/s (configurable)
Step pattern	64-fold micro stepping		64-fold micro stepping	
Current controller frequency	approx. 25 kHz	approx. 30 kHz	approx. 30 kHz	
Control resolution	approx. 5000 positions in typ. applications (per revolution)		approx. 5000 positions in typ. applications (per revolution)	
Encoder input signal	–	5…24 V DC, 5 mA, single-ended	5…24 V DC, 5 mA, single-ended	
Pulse frequency	–	max. 400,000 increments/s (with 4-fold evaluation)	max. 400,000 increments/s (with 4-fold evaluation)	
Special features	travel distance control	travel distance control, encoder input, vector control	travel distance control, encoder input	travel distance control, encoder input, vector control
Weight	approx. 50 g		approx. 90 g	
Operating temperature	0…+55 °C		0…+55 °C	
Approvals	CE		CE, UL	CE
Further information	EL7031	EL7037	EL7041	EL7047
Special terminals			**EL7041-1000**	
Distinguishing features			for resonance-critical applications	

Motion | Servomotor terminals

The EL72xx servomotor terminals are complete servo drives for the direct control of servomotors in a standard HD (High Density) terminal housing. The fast control technology, based on field-oriented current and PI speed control, supports highly dynamic and frequently changing positioning tasks. The monitoring of important load criteria, which are derived from the calculation of an I²T model, ensures maximum operational reliability.

For the feedback system there is a choice of either resolver feedback or else absolute feedback integrated in the motor cable by OCT (One Cable Technology). With OCT, the encoder signals are digitally transmitted via the existing motor cable, thus eliminating the need for an encoder cable.

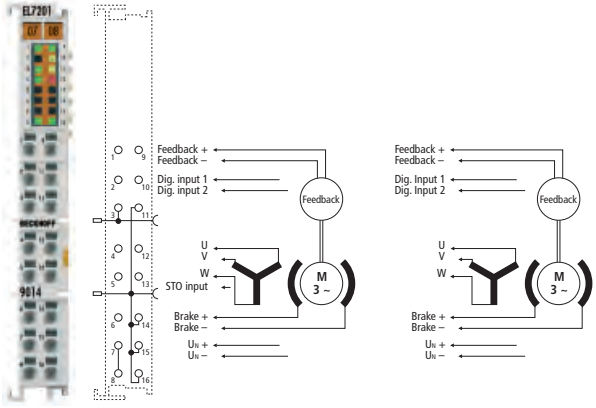
Since the servomotor terminals are completely integrated into the EtherCAT Terminal network, there is no wiring to the controller required; space requirements are significantly reduced. For highly dynamic applications and for supplying several servomotors from one power supply unit, the additional use of an EL9576 brake chopper terminal is recommended. It protects against overvoltage by absorbing part of the energy. The EL72xx terminals are tested and pre-parameterised for use with the AM81xx and AM31xx servomotor series. In combination with these motors, they enable highly dynamic, precise and compact drive applications.

Moreover, the EL721x-9014 enable the user to implement STO (Safe Torque Off) safety functions corresponding to a Cat 3/PL d safety level according to DIN EN ISO 13849-1:2015.

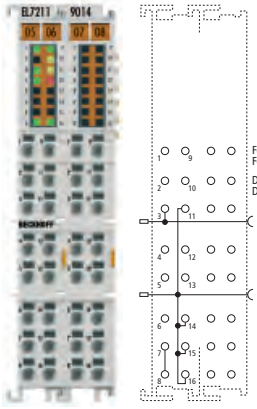
AM81xx | Servomotors with OCT
see page 928

EL9576 | Brake chopper terminal
see page 449

ZB85xx | Shielding connection system
see page 846

	Servomotor terminal for OCT, with STO, 50 V DC, 2.8 A$_{RMS}$	Servomotor terminal for OCT, 50 V DC, 2.8 A$_{RMS}$
Technical data	**EL7201-9014**	**EL7201-0010**
Connection method	direct motor connection	
Load type	permanent-magnet synchronous motors	
Number of channels	1 servomotor, absolute feedback, motor brake, 2 digital inputs, 1 STO input	1 servomotor, absolute feedback, motor brake, 2 digital inputs
		
Nominal voltage	8…50 V DC	
Current consumption power contacts	typ. 50 mA + holding current motor brake	
Current consumption E-bus	120 mA	
Current controller frequency	32 kHz	
Output current I_N	2.8 A (rms)	
Peak current I_N	5.7 A (rms) for 1 s	
Frequency range	0…599 Hz	
PWM clock frequency	16 kHz	
Rated speed controller frequency	16 kHz	
Output voltage motor brake	24 V DC (+6 %/-10 %)	
Output current motor brake	max. 0.5 A	
Special features	compact (only 12 mm wide), system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play, STO (Safe Torque Off)	compact (only 12 mm wide), system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play
Weight	approx. 60 g	
Operating temperature	0…+55 °C	
Approvals	CE, TÜV SÜD	CE
Further information	EL7201-9014	EL7201-0010

We reserve the right to make technical changes.

	Servomotor terminal for resolver, 50 V DC, 2.8 A_{RMS}	Servomotor terminal for OCT, with STO, 50 V DC, 4.5 A_{RMS}	Servomotor terminal for OCT, 50 V DC, 4.5 A_{RMS}	Servomotor terminal for resolver, 50 V DC, 4.5 A_{RMS}
	EL7201	**EL7211-9014**	**EL7211-0010**	**EL7211**
	1 servomotor, resolver, motor brake	1 servomotor, absolute feedback, motor brake, 2 digital inputs, 1 STO input	1 servomotor, absolute feedback, motor brake, 2 digital inputs	1 servomotor, resolver, motor brake
	25 g			25 g
		8…50 V DC		
		typ. 50 mA + holding current motor brake		
		typ. 120 mA		
		32 kHz		
		4.5 A (rms)		
		9.0 A (rms) for 1 s		
		0…599 Hz		
		16 kHz		
		16 kHz		
		24 V DC (+6 %/-10 %)		
		max. 0.5 A		
	compact (only 12 mm wide), system-integrated	compact and system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play, STO (Safe Torque Off)	compact and system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play	compact and system-integrated
		approx. 95 g		
		0…+55 °C		
	CE	CE, TÜV SÜD	CE	CE
	EL7201	EL7211-9014	EL7211-0010	EL7211

Motion | 2-channel DC motor output stages

DC motors can replace the servomotors in many applications if they are operated with an intelligent controller. A DC motor can be integrated very simply into the control system using the EL7332 and EL7342 EtherCAT Terminals. All parameters are adjustable via the fieldbus. The small, compact design and DIN rail mounting make the EtherCAT DC motor output stages suitable for a wide range of applications. The output stages are protected against overload and short circuit and offer an integrated feedback system for incremental encoders on a case-by-case basis. Two DC motors can be controlled by one terminal.

Two areas of application are particularly well supported by the output stages:

– Simple controller for low demands on the cycle time at inexpensive processor power: by the use of the integrated travel distance control, the EL73x2 EtherCAT Terminal can perform positioning travels independently without the use of NC. Nothing further is required apart from a DC motor and a terminal.
– High-end positioning by means of integration in TwinCAT NC: in conjunction with the EtherCAT DC motor output stage, the DC motor is used with TwinCAT for the application without further changes – analogous to a servo-axis.

The control of a DC motor is simple to implement in comparison with other motors, since the speed of rotation is proportional to the voltage. It can be adjusted directly via the process data with the EL7332 and EL7342 EtherCAT Terminals. The integrated compensation of the internal resistance keeps the motor at the desired speed for load changes. Thus a simple drive task can be solved using a simple controller.

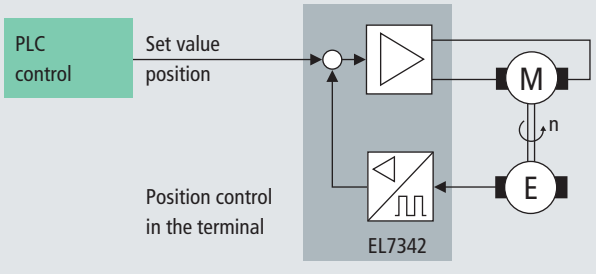
The EL7332 EtherCAT Terminal enables direct operation of two DC motors. It is electrically isolated from the E-bus. The speed is preset by a 16 bit value from the automation unit. The EtherCAT Terminal contains two channels whose signal state is indicated by LEDs. The LEDs enable quick local diagnosis.

For demanding positioning tasks a closed speed control loop with a feedback system is needed. Apart from the operation of two DC motors, the EL7342 EtherCAT Terminal enables the connection of an incremental encoder. The control loop can be closed either by the EtherCAT Terminal itself or by higher-level controller (see illustration).

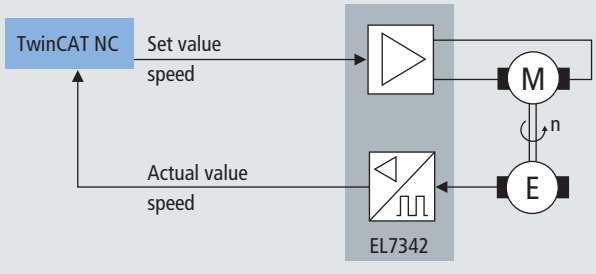
The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative acceleration causes the feedback of energy, which leads to voltage peaks at the power supply unit. The EL9576 brake chopper terminal protects from the effects of overvoltage, in that it absorbs some of the energy. If the voltage exceeds the capacity of the terminal, it gets rid of the excess energy via an external resistance.

EL9576 | Brake chopper terminal
see page 449

Control of a DC motor with travel distance control

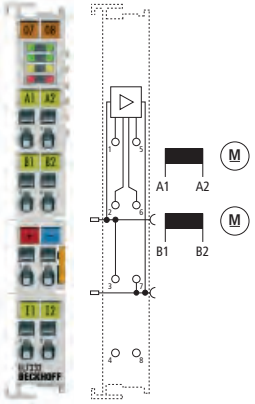
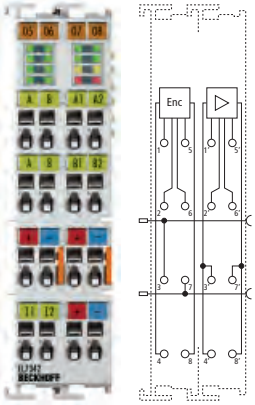


Control of a DC motor with encoder feedback



Realisation possibilities for position control loops

We reserve the right to make technical changes.

	2-channel DC motor output stage 24 V DC, 1.5 A	2-channel DC motor output stage 50 V DC, 3.5 A
Technical data	**EL7332** | ES7332	**EL7342** | ES7342
Technology	direct motor connection	
Load type	DC brush motors, inductive	
Output current	per channel max. 1 A	per channel max. 3,5 A
Number of channels	2 DC motors, 2 digital inputs	2 DC motors, 2 digital inputs, encoder input
	 25 g	
Nominal voltage	24 V DC (-15 %/+20 %)	8…50 V DC
Current consumption power contacts	typ. 40 mA + motor current	typ. 70 mA
Current consumption E-bus	typ. 140 mA	typ. 140 mA
Distributed clocks	yes	yes
PWM clock frequency	32 kHz with 180° phase shift each	32 kHz with 180° phase shift each
Duty factor	0…100 % (voltage-controlled)	0…100 % (voltage-controlled)
Control resolution	max. 10 bits current, 16 bits speed	max. 10 bits current, 16 bits speed
Encoder input signal	–	5…24 V, 5 mA, single-ended
Pulse frequency	–	max. 400,000 increments/s (with 4-fold evaluation)
Current consumption sensor supply	–	typ. 20 mA
Special features	travel distance control	travel distance control, encoder input
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE	CE, UL
Weight	approx. 50 g	approx. 90 g
Further information	EL7332	EL7342

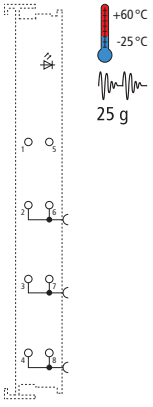
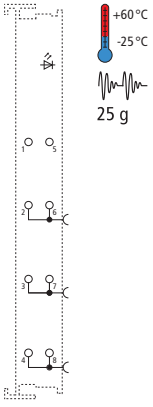
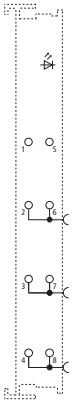
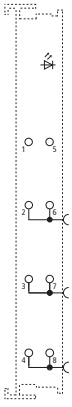
System terminals | **Function terminals**

The power feed terminals make it possible to set up various potential groups with any desired voltages (EL9190) or with the standard voltages of 24 V DC or 230 V AC (120 V AC). They are available with or without fine-wire fuse. In order to monitor the supply voltage, the terminals with diagnostics function report the status of the power feed terminal to the EtherCAT Coupler through two input bits. It is thus possible for the controller to check the distributed peripheral voltage over the fieldbus. The operating point performance conforms to the input terminals EL1002 (24 V) and EL1702 (230 V).

The EL9180, EL9185 and EL9195 EtherCAT Terminals allow the supply voltage to be accessed a number of times via spring force terminals. They make it unnecessary to use additional terminal blocks on the terminal strip.

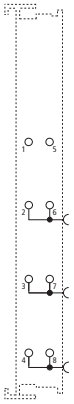
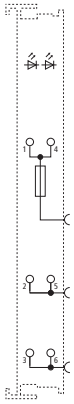
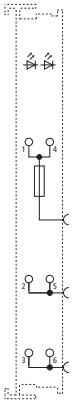
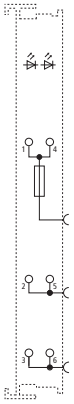
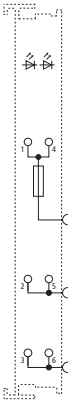
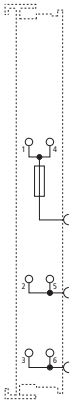
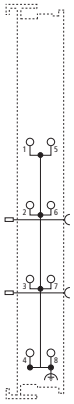
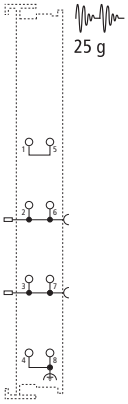
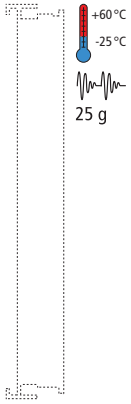
The EL9195 or EL9070 EtherCAT Terminal can be used for the connection of screens. It connects the spring force contacts directly to the DIN rail and can optimally ground incoming electromagnetic radiation. The two power contacts are looped through by the EL9195, allowing two wires to be connected to each.

The EL9080 is used to identify potential groups (e.g. 230 V AC/ 24 V DC). It is inserted between two potential groups, and indicates the separation through an orange coloured cover.

	Potential supply terminal, 24 V DC	Potential supply terminal, 24 V DC, with diagnostics	Potential supply terminal, 120…230 V AC	Potential supply terminal, 120…230 V AC, with diagnostics
Technical data	**EL9100** | ES9100	**EL9110** | ES9110	**EL9150** | ES9150	**EL9160** | ES9160
Technology	potential supply terminal	potential supply terminal with diagnostics	potential supply terminal	potential supply terminal with diagnostics
Diagnostics in the process image	–	yes	–	yes
				
Nominal voltage	24 V DC	24 V DC	120 V AC/ 230 V AC	120 V AC/ 230 V AC
Integrated fine-wire fuse	–	–	–	–
Current load	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
Power LED	green	green	green	green
Defect LED	–	–	–	–
PE contact	yes	yes	yes	yes
Shield connection	–	–	–	–
Current consumption E-bus	–	typ. 90 mA	–	typ. 90 mA
Connection to DIN rail	–	–	–	–
Electrical isolation	yes	yes	yes	yes
Special features	–	–	–	–
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL	CE, UL
Weight	approx. 50 g	approx. 50 g	approx. 50 g	approx. 50 g

For availability status see Beckhoff website at:

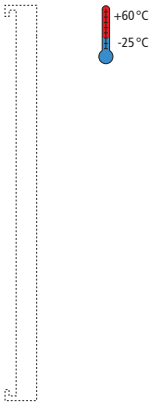
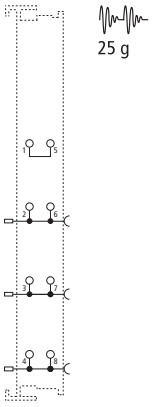
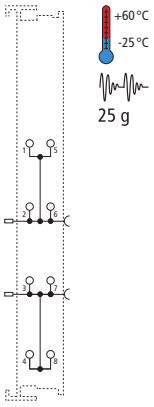
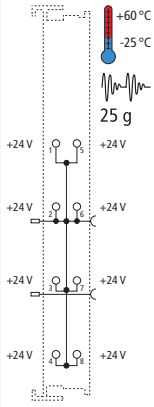
We reserve the right to make technical changes.

	Potential supply terminal, any voltage up to 230 V AC	Potential supply terminal, 24 V DC, with fuse	Potential supply terminal, 24 V DC, with diagnostics and fuse	Potential supply terminal, 120…230 V AC, with fuse	Potential supply terminal, 120…230 V AC, with diagnostics and fuse	Potential supply terminal, arbitrary, with fuse	Shield terminal	Shield terminal	Separation terminal
	EL9190 | ES9190	**EL9200**	**EL9210**	**i EL9250**	**i EL9260**	**i EL9290**	**EL9070**	**EL9195 | ES9195**	**EL9080**
	potential supply terminal	potential supply terminal with fuse	potential supply terminal with diagnostics and fuse	potential supply terminal with fuse	potential supply terminal with diagnostics and fuse	potential supply terminal with fuse	shield terminal		separation terminal
	–		yes	–	yes	–			
									
	arbitrary up to 230 V AC/DC	24 V DC	24 V DC	120 V AC/ 230 V AC	120 V AC/ 230 V AC	arbitrary up to 230 V AC/DC	arbitrary up to 230 V AC	arbitrary up to 230 V AC/DC	separation terminal
	–	…6.3 A	…6.3 A	…6.3 A	…6.3 A	…6.3 A	–	–	–
	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
	–	green	green	green	green	–	–	–	–
	–	red	red	red	red	–	–	–	–
	yes	yes	yes	yes	yes	yes	–	–	–
	–	–	–	–	–	–	8 x	2 x	–
	–	–	typ. 90 mA	–	typ. 90 mA	–	–	–	–
	–	–	–	–	–	–	yes	yes	–
	yes	yes	yes	yes	yes	yes	–	–	yes
	–	–	–	–	–	–	dissipation of EMC interference via large copper surfaces on the DIN rail	dissipation of EMC interference	placeholder terminal with E-bus transmission
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	-25…+60 °C
	CE, UL	CE, UL, Ex	CE, UL, Ex	CE	CE	CE	CE, UL	CE, UL, Ex	CE, UL, Ex
	approx. 50 g	approx. 50 g	approx. 55 g	approx. 55 g	approx. 55 g	approx. 50 g	approx. 50 g	approx. 50 g	approx. 50 g

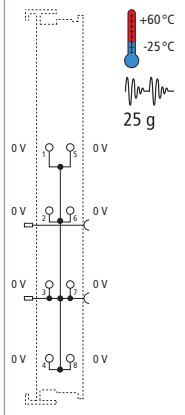
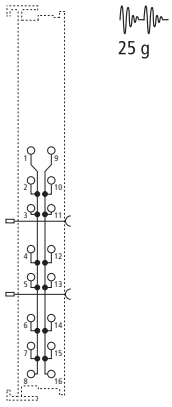
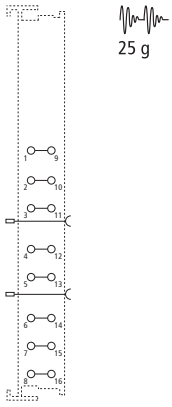
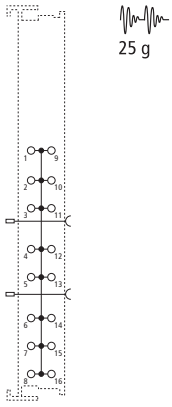
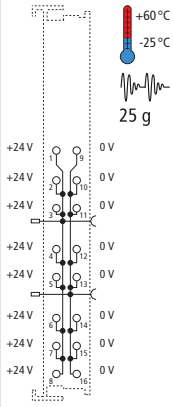
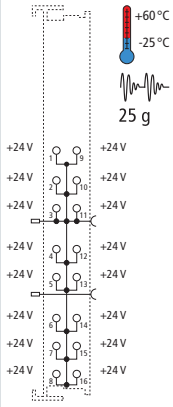
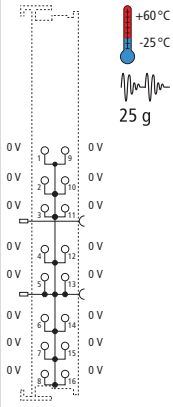
System terminals | **Function terminals**

The EL918x potential distribution terminals enable – depending upon the type – the distribution of ground or supply potentials to external devices. Wiring work and separate potential distributors are saved. Eight ground points are required for the ground connection of 8-channel output terminals in 2-wire operating mode, e.g. EL2008, for which the EL9187 can be used. The EL9184 and EL9188 HD EtherCAT Terminals (High Density) even make 16 connection points available in a compact housing.

Each assembly must be terminated at the right hand end with an EL9011 bus end cap.

	End cap	Potential distribution terminal, 2 terminal points per power contact	Potential distribution terminal, 4 terminal points at 2 power contacts	Potential distribution terminal, 8 x 24 V
Technical data	**EL9011**	**EL9180 |** ES9180	**EL9185 |** ES9185	**EL9186 |** ES9186
Technology	end cap	potential distribution terminal		
Diagnostics in the process image	–			
				
Nominal voltage	end cap	arbitrary up to 230 V AC/DC	arbitrary up to 230 V AC/DC	≤ 60 V
Integrated fine-wire fuse	–	–	–	–
Current load	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
Power LED	–	–	–	–
Defect LED	–	–	–	–
PE contact	–	yes	–	–
Shield connection	–	–	–	–
Current consumption E-bus	–	–	–	–
Electrical connection to DIN rail	–	–	–	–
Electrical isolation	yes	–	–	–
Special features	cover for the E-bus contacts	–	–	–
Operating temperature	-25…+60 °C	0…+55 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 10 g	approx. 50 g	approx. 50 g	approx. 50 g

We reserve the right to make technical changes.

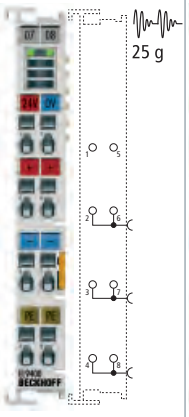
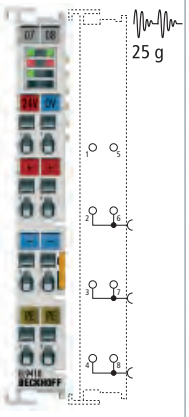
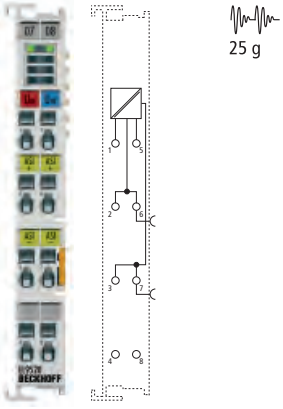
	Potential distribution terminal, 8 x 0 V	Potential distribution terminal, 2 x 8 terminal points	Potential distribution terminal, 8 x 2 terminal points	Potential distribution terminal, 1 x 16 terminal points	Potential distribution terminal, 8 x 24 V, 8 x 0 V	Potential distribution terminal, 16 x 24 V	Potential distribution terminal, 16 x 0 V
	EL9187 | ES9187	**EL9181**	**EL9182**	**EL9183**	**EL9184**	**EL9188**	**EL9189**
							
	≤ 60 V	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V	≤ 60 V	≤ 60 V
	–	–	–	–	–	–	–
	≤ 10 A	max. 10 A (per terminal point)	max. 10 A (per terminal point)	max. 10 A (per terminal point)	≤ 10 A	≤ 10 A	≤ 10 A
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	500 V (E-bus/ field potential)	500 V (E-bus/ field potential)	500 V (E-bus/ field potential)	–	–	–
	–	2 x 8-way bridge	8 x 2-way bridge	16-way bridge	direct plug-in technique	direct plug-in technique	direct plug-in technique
	-25…+60 °C	0…+55 °C	0…+55 °C	0…+55 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL, Ex	CE, UL	CE, UL	CE, UL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 50 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g

System terminals | **Power supply terminals**

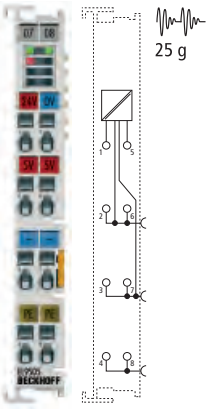
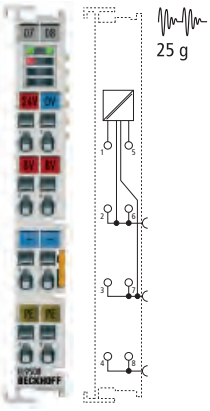
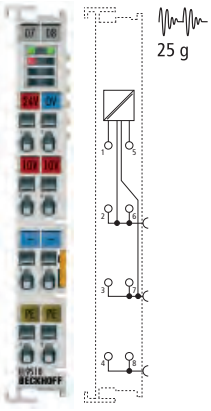
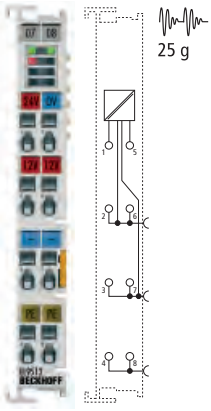
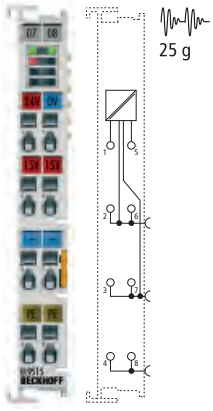
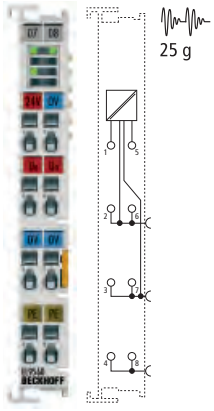
The EL94xx and EL95xx terminal series are designed for the modified feeding of the operating voltage into the terminal strand. The EL9400 ane EL9410 power supply terminals enable the refreshment of the E-bus, via which data exchange takes place between the EtherCAT Coupler and the EtherCAT Terminals. Each EtherCAT Terminal requires a certain amount of current from the E-bus (see technical data: "Current consumption E-bus"). This current is fed into the E-bus by the relevant EtherCAT Coupler's power supply unit. When configuring a large number of EtherCAT Terminals, the 5 V power supply to the E-bus can be increased by 2 A via the EL9400/EL9410. As opposed to the EL9400, the EL9410 has a diagnostic function which is displayed by LED and on the process image.

The EL9520 potential feed terminal uncouples the input and output signal through an integrated filter and enables the supply of AS-Interface networks from standard power supply units or another AS-Interface network.

The EL95xx power supply terminals produce different output voltages from the input voltage (24 V DC) that can be accessed at the terminals. The following EtherCAT Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the operating states of the terminals; short-circuits or overloads are indicated by the overcurrent LEDs. There is no electrical isolation of the input and output voltage.

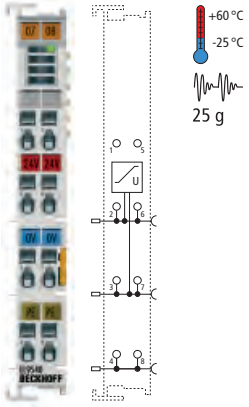
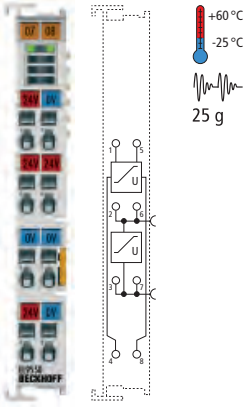
	Power supply terminal for refreshing the E-bus	Power supply terminal for refreshing the E-bus, with diagnostics	AS-Interface potential feed terminal, with filter
Technical data	**EL9400** | ES9400	**EL9410** | ES9410	**EL9520** | ES9520
Technology	power supply terminal		AS-Interface potential feed terminal
Diagnostics in the process image	–	yes	–
			
Input voltage	24 V DC	24 V DC	up to 35 V
Output voltage	5 V for E-bus supply	5 V for E-bus supply	up to 35 V
Input current	approx. 70 mA + (E-bus/4)	approx. 70 mA + (E-bus/4)	load-dependent
Output current	2 A	2 A	2 A
Short-circuit-proof	–	yes	–
Residual ripple	–	–	–
Current consumption E-bus	–	–	typ. 100 mA
Electrical isolation	–	–	–
Insulation voltage input/output	–	–	–
Special features	for new projects: please use EL9410	standard EL supply	no electrical isolation
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE
Weight	approx. 65 g	approx. 65 g	approx. 90 g
Further information	EL9400	EL9410	EL9520

We reserve the right to make technical changes.

	Power supply terminal, 5 V DC, with diagnostics	Power supply terminal, 8 V DC, with diagnostics	Power supply terminal, 10 V DC, with diagnostics	Power supply terminal, 12 V DC, with diagnostics	Power supply terminal, 15 V DC, with diagnostics	Power supply terminal, 24 V DC, electrical isolation
	EL9505 | ES9505	**EL9508** | ES9508	**EL9510** | ES9510	**EL9512** | ES9512	**EL9515** | ES9515	**EL9560** | ES9560
	power supply terminal with diagnostics and overcurrent LED					power supply terminal
	yes					
	 25 g	 25 g	 25 g	 25 g	 25 g	 25 g
	The EL9505 generates 5 V from the fed-in 24 V without electrical isolation.	The EL9508 generates 8 V from the fed-in 24 V without electrical isolation.	The EL9510 generates 10 V from the fed-in 24 V without electrical isolation.	The EL9512 generates 12 V from the fed-in 24 V without electrical isolation.	The EL9515 generates 15 V from the fed-in 24 V without electrical isolation.	24 V generation from the 24 V fed-in with electrical isolation, potential-free
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	5 V DC ±1 %	8 V DC ±1 %	10 V DC ±1 %	12 V DC ±1 %	15 V DC ±1 %	24 V DC (-15 %/+5 %)
	load-dependent	load-dependent	load-dependent	load-dependent	load-dependent	load-dependent
	0.5 A	0.5 A	0.5 A	0.5 A	0.5 A	≤ 0.1 A
	yes	yes	yes	yes	yes	yes
	< 5 mV	< 5 mV	< 5 mV	< 5 mV	< 5 mV	–
	90 mA	90 mA	90 mA	90 mA	90 mA	90 mA
	–	–	–	–	–	1500 V AC constant load field side/E-bus
	–	–	–	–	–	500 V AC permanent load (field side)
	stabilised output voltage	stabilised output voltage	stabilised output voltage	stabilised output voltage	stabilised output voltage	automatic restart after short-circuit, diagnostics U_{IN}/U_{OUT}
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL
	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g

System terminals | **Surge filter system and field supply**

The EL9540 system terminal contains an overvoltage filter for the 24 V field supply, the EL9550 for the 24 V field and system supply. The filter protects the EtherCAT Terminals from line-bound surge voltages that can occur due to high-energy disturbances such as switching overvoltages at inductive consumers or lightning strikes at the supply lines. The EtherCAT Terminals EL9540 or EL9550 protect the terminal station from damage in particularly harsh environments. The ship classification organisations require the use in shipbuilding applications and in the onshore/offshore sector.

	Surge filter field supply	Surge filter system and field supply
Technical data	**EL9540** | ES9540	**EL9550** | ES9550
Technology	surge filter field supply	surge filter system and field supply
Diagnostics	–	
		
Nominal voltage	24 V (-15 %/+20 %)	24 V (-15 %/+20 %)
Surge filter field supply	yes	yes
Surge filter system supply	–	yes
Rated current field supply	≤ 10 A	≤ 10 A
Rated current system supply	–	≤ 1.5 A
PE connection	yes	–
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 50 g	approx. 50 g
Further information	EL9540	EL9550

We reserve the right to make technical changes.

System terminals | **Brake chopper terminal**

The EL9576 EtherCAT Terminal contains high-performance capacitors for stabilising supply voltages. It can be used in connection with the motion terminals (EL7xxx), e.g. the EL70xx stepper motor terminals, the EL73xx DC motor terminals or the EL72xx servomotor terminals.

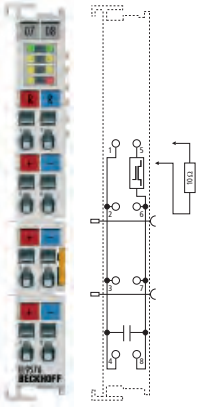
Low internal resistance and high pulsed current capability enable good buffering in parallel with a power supply unit. Return currents are stored, particularly in the context of drive applications, thereby preventing overvoltages. If the fed back energy exceeds the capacity of the capacitors, the EL9576 switches the load voltage through to the terminal points 1 and 5. The energy is dissipated by the connection of the ZB8110 external ballast resistor (10 Ω, 100 W).

The EL9576 is characterised in particular by adjustable threshold values and various diagnostic possibilities.

EL7xxx | Motion terminals
see page 437

ZB8110 | External ballast resistor
see page 848

	Brake chopper terminal, 72 V, 155 µF
Technical data	**EL9576** | ES9576
Technology	brake chopper
Diagnostics	temperature on board, over-/undervoltage



25 g

The EL9576 buffers the connected voltage via its integrated capacitors and connects the external brake resistor if the preset threshold of the internal voltage is exceeded.

Nominal voltage	arbitrary up to 72 V
Capacity	155 µF
Ripple current (max.)	10 A
Internal resistance	< 5 mΩ
Chopper voltage	adjustable
Recommended ballast resistor	10 Ω, typ. 100 W (dependent on application)
Overvoltage control range	typ. 1 V, parametrisable by CoE data
Ballast resistor clock rate	load-dependent, max. 100 µs, 2-point control
Electrical isolation	1500 V (E-bus/field potential)
Special features	adjustabel threshold
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 90 g
Further information	EL9576

We reserve the right to make technical changes.

EtherCAT®

Highlights

- Robust, sealed, small
- Ultra high-speed in IP 67
- Quickly wired and flexible
- Complete and compatible
- For extreme climatic zones

EtherCAT Box

High performance for harsh environments

▸ EtherCAT-Box

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484 Digital combi EP23xx
490 Analog input EP3xxx
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497 Position measurement EP5xxx
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542 EtherCAT Box (stainless steel housing)

544 Digital input EQ1xxx
545 Digital output EQ2xxx
546 Digital combi EQ23xx
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468 EtherCAT Box (zinc die-cast housing)

470 Digital input ER1xxx
477 Digital output ER2xxx
484 Digital combi ER23xx
490 Analog input ER3xxx
496 Analog output ER4xxx
498 Position measurement ER5xxx
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510 EtherCAT P Box (industrial housing)

512 Digital input EPP1xxx
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Product overview
EtherCAT Box

EtherCAT Box | Digital I/O

Input		8 x M8	16 x M8	4 x M12	8 x M12	Other
24 V DC	8-channel filter 3.0 ms	EP1008-0001 470 ER1008-0001 470		EP1008-0002 471 EQ1008-0002 544 ER1008-0002 471	EP1008-0022 471 ER1008-0022 471	
	8-channel filter 10 µs	EP1018-0001 470 ER1018-0001 470		EP1018-0002 471 ER1018-0002 471		
	8-channel filter 10 µs, negative switching	EP1098-0001 471 ER1098-0001 471				
	8-channel 2-channel timestamp	EP1258-0001 475 ER1258-0001 475		EP1258-0002 475 ER1258-0002 475		
	8-channel multi-function input			EP1518-0002 472 ER1518-0002 472		
	8-channel TwinSAFE, 8 safe inputs			EP1908-0002 476		
	16-channel filter 3.0 ms		EP1809-0021 474 ER1809-0021 474		EP1809-0022 474 EQ1809-0022 544 ER1809-0022 474	
	16-channel filter 10 µs		EP1819-0021 474 ER1819-0021 474		EP1819-0022 474 ER1819-0022 474	
	16-channel filter 10 µs, D-sub socket, 25-pin					EP1816-0008 473
	16-channel filter 10 µs, D-sub socket, 25-pin, acceleration sensor					EP1816-3008 473

Output		8 x M8	16 x M8	4 x M12	8 x M12	Other
24 V DC	8-channel I_{MAX} = 0.5 A	EP2008-0001 477 ER2008-0001 477		EP2008-0002 477 EQ2008-0002 545 ER2008-0002 477	EP2008-0022 481 ER2008-0022 481	
	8-channel I_{MAX} = 2 A, ∑ 4 A	EP2028-0001 478 ER2028-0001 478		EP2028-0002 478 ER2028-0002 478		
	8-channel I_{MAX} = 2.8 A, ∑ 16 A				EP2028-0032 479 ER2028-1032 479	
	8-channel I_{MAX} = 2 A, ∑ 4 A, with diagnostics	EP2038-0001 480 ER2038-0001 480		EP2038-0002 480 ER2038-0002 480		
	16-channel I_{MAX} = 0.5 A, ∑ 4 A		EP2809-0021 481 ER2809-0021 481		EP2809-0022 481 EQ2809-0022 545 ER2809-0022 481	
	16-channel I_{MAX} = 0.5 A, ∑ 4 A, D-sub socket, 25-pin					EP2816-0008 482
	16-channel I_{MAX} = 0.5 A, ∑ 4 A, 2 x D-sub socket, 9-pin					EP2816-0010 483
	16-channel I_{MAX} = 0.5 A, ∑ 4 A, M16, 19-pin					EP2816-0004 482
	24-channel I_{MAX} = 0.1 A, D-sub socket, 25-pin					EP2817-0008 483
25 V AC/ 30 V DC	4-channel relay output			EP2624-0002 483 ER2624-0002 483		

EPxxxx: industrial housing in IP 67, EQxxxx: stainless steel housing in IP 69K, ERxxxx: zinc die-cast housing in IP 67

We reserve the right to make technical changes.

EtherCAT Box | Digital I/O

Combi		8 x M8	16 x M8	4 x M12	8 x M12	Other
24 V DC	**8-channel** 4 inputs + 4 outputs, filter 3.0 ms, I_{MAX} = 0.5 A	**EP2308-0001** 484 ER2308-0001 484		**EP2308-0002** 485 ER2308-0002 485		
	8-channel 4 inputs + 4 outputs, filter 10 µs, I_{MAX} = 0.5 A	**EP2318-0001** 484 ER2318-0001 484		**EP2318-0002** 485 ER2318-0002 485		
	8-channel 4 inputs + 4 outputs, filter 3.0 ms, I_{MAX} = 2 A	**EP2328-0001** 487 ER2328-0001 487		**EP2328-0002** 487 ER2328-0002 487		
	8-channel 8 inputs/outputs, filter 10 µs, I_{MAX} = 0.5 A	**EP2338-0001** 486 ER2338-0001 486		**EP2338-0002** 487 ER2338-0002 487		
	8-channel 8 inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A	**EP2338-1001** 486 ER2338-1001 486		**EP2338-1002** 487 ER2338-1002 487		
	16-channel 16 inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A, ∑ 4 A		**EP2339-0021** 488 ER2339-0021 488		**EP2339-0022** 488 EQ2339-0022 546 ER2339-0022 488	
	16-channel 16 inputs/outputs, filter 10 µs, I_{MAX} = 0.5 A, ∑ 4 A		**EP2349-0021** 489 ER2349-0021 489		**EP2349-0022** 489 ER2349-0022 489	
	16-channel 8 inputs + 8 outputs, filter 10 µs, I_{MAX} = 0.5 A, D-sub socket, 25-pin					**EP2316-0008** 485
	16-channel 8 inputs + 8 outputs, filter 10 µs, I_{MAX} = 0.5 A, IP 20 plug					**EP2316-0003** 486

EtherCAT Box | Analog I/O

Input		M8	M12
±10 V, 0/4…20 mA	**2-channel** parameterisable, with galvanic isolation, single-ended, 16 bit		EP3162-0002 490
	4-channel parameterisable, differential input, 16 bit		EP3174-0002 491 EQ3174-0002 548 ER3174-0002 491
	4-channel parameterisable, differential input, 16 bit, TwinSAFE SC		EP3174-0092 491
	2-channel 2 analog inputs, parameterisable, single-ended, 16 bit, 2 digital control outputs (sink/source type), 24 V DC, short-circuit-proof		EP3182-1002 491
	4-channel parameterisable, single-ended, 16 bit		EP3184-0002 491 ER3184-0002 491
	4-channel parameterisable, single-ended, 16 bit, 2 channels per socket		EP3184-1002 491 ER3184-1002 491
Resistance thermometer	**4-channel** resistance thermometer (RTD), PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000, 16 bit		EP3204-0002 492 EQ3204-0002 549 ER3204-0002 492
Thermo-couple/mV	**4-channel** thermocouple, type J, K, L, B, E, N, R, S, T, U, 16 bit		EP3314-0002 493 EQ3314-0002 549 ER3314-0002 493
Resistor bridge	**1-channel** resistor bridge, 24 bit, self-calibration		EP3356-0022 494
Pressure measuring	**4-channel** differential/absolute pressure measurement, 6 digital inputs, 2 digital outputs, 4 pressure inputs -1…1 bar (differential pressure to fifth connection)	EP3744-0041 495	
	4-channel differential/absolute pressure measurement, 6 digital inputs, 2 digital outputs, 4 pressure inputs 0…7 bar (differential pressure to fifth connection)	EP3744-1041 495	
Output		**M8**	**M12**
±10 V, 0/4…20 mA	**4-channel** parameterisable, 16 bit		EP4174-0002 496 ER4174-0002 496
	4-channel 2 inputs + 2 outputs, parameterisable, 16 bit		EP4374-0002 496 ER4374-0002 496

EPxxxx: industrial housing in IP 67, EQxxxx: stainless steel housing in IP 69K, ERxxxx: zinc die-cast housing in IP 67

We reserve the right to make technical changes.

EtherCAT Box | Special functions

Function		M8	M12	Other
Position measurement	**SSI encoder interface** 1-channel		EP5001-0002 497	
	Incremental encoder interface 32 or 16 bit, binary, RS485		EP5101-0002 498 ER5101-0002 498	EP5101-0011 D-sub 499
	Incremental encoder interface 32 or 16 bit, binary, 24 V sensor supply		EP5101-1002 499 ER5101-1002 499	
	Incremental encoder interface 32 or 16 bit, binary, 24 V		EP5151-0002 499 ER5151-0002 499	
Communi-cation	**Serial interface** 1-channel, RS232, RS422/RS485, 5 V DC/1 A		EP6001-0002 500 ER6001-0002 500	
	Serial interface 2-channel, RS232, RS422/RS485		EP6002-0002 500 ER6002-0002 500	
	IO-Link master Class A, 4 ports		EP6224-2022 501	
	IO-Link master Class B, 4 ports		EP6224-3022 501	
	IO-Link master Class A, 8 ports		EP6228-0022 501	
Motion	**Stepper motor module** I_{MAX} = 1.5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output		EP7041-1002 502 ER7041-1002 502	
	Stepper motor module I_{MAX} = 5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output		EP7041-0002 502 ER7041-0002 502 EP7041-2002 503 ER7041-2002 503 EP7041-3002 503 ER7041-3002 503 EP7041-3102 503	
	DC motor output stage I_{MAX} = 3.5 A, 50 V DC		EP7342-0002 504 ER7342-0002 504	
Special functions	**Multi-functional I/O box** 8 digital inputs/outputs, 2 x tacho input, 2 x 0/4…20 mA input, 1 x 0/4…20 mA output, 1 x 1.2 A PWMi output		EP8309-1022 505 ER8309-1022 505	
System	**EtherCAT Box** 3 decimal ID switches	EP1111-0000 506		
	EtherCAT junction 2-channel	EP1122-0001 506		
	EtherCAT P junction 2 ports	EP1312-0001 507		
	EtherCAT junction 8 ports	EP9128-0021 798		
	Power distribution 4/4-channel			EP9214-0023 508 7/8" plug, 7/8" socket
	Power distribution **with current measurement/data logging** 4/4-channel			EP9224-0023 508 7/8" plug, 7/8" socket
	PROFINET RT EtherCAT Box EtherCAT Box interface with PROFINET RT		EP9300-0022 509	
	EtherCAT media converter fibre optic 1-channel			EP9521-0020 799

Product overview EtherCAT P Box

EPPxxxx

EtherCAT P Box | Digital I/O

Input		4 x M8	8 x M8	16 x M8	4 x M12	8 x M12	Other
24 V DC	4-channel filter 3.0 ms	EPP1004-0061 512					
	8-channel filter 3.0 ms		EPP1008-0001 513		EPP1008-0002 513	EPP1008-0022 513	
	8-channel filter 10 µs		EPP1018-0001 513		EPP1018-0002 513		
	8-channel 2-channel timestamp		EPP1258-0001 517		EPP1258-0002 517		
	8-channel multi-function input				EPP1518-0002 514		
	16-channel filter 3.0 ms			EPP1809-0021 516		EPP1809-0022 516	
	16-channel filter 10 µs			EPP1819-0021 516		EPP1819-0022 516	
	16-channel filter 10 µs, D-sub socket, 25-pin						EPP1816-0008 515
	16-channel filter 10 µs, D-sub socket, 25-pin, acceleration sensor						EPP1816-3008 515

Output		4 x M8	8 x M8	16 x M8	4 x M12	8 x M12	Other
24 V DC	8-channel I_{MAX} = 0.5 A, ∑ 3 A		EPP2008-0001 518		EPP2008-0002 519	EPP2008-0022 521	
	8-channel I_{MAX} = 2 A, ∑ 3 A		EPP2028-0001 519		EPP2028-0002 519		
	8-channel I_{MAX} = 2 A, ∑ 3 A, with diagnostics		EPP2038-0001 520		EPP2038-0002 520		
	16-channel I_{MAX} = 0.5 A, ∑ 3 A			EPP2809-0021 521		EPP2809-0022 521	
	16-channel I_{MAX} = 0.5 A, ∑ 3 A, D-sub socket, 25-pin						EPP2816-0008 522
	16-channel I_{MAX} = 0.5 A, ∑ 3 A, 2 x D-sub socket, 9-pin						EPP2816-0010 523
	16-channel I_{MAX} = 0.5 A, ∑ 3 A, M16, 19-pin						EPP2816-0004 522
	24-channel I_{MAX} = 0.1 A, D-sub socket, 25-pin						EPP2817-0008 523
25 V AC/ 30 V DC	4-channel relay output				EPP2624-0002 523		

We reserve the right to make technical changes.

EtherCAT P Box | Digital I/O

Combi		4 x M8	8 x M8	16 x M8	4 x M12	8 x M12	Other
24 V DC	**4-channel** 4 inputs/outputs, filter 10 µs, I_{MAX} = 0.5 A	EPP2334-0061 526					
	8-channel 4 inputs + 4 outputs, filter 3.0 ms, I_{MAX} = 0.5 A		EPP2308-0001 524		EPP2308-0002 524		
	8-channel 4 inputs + 4 outputs, filter 10 µs, I_{MAX} = 0.5 A		EPP2318-0001 524		EPP2318-0002 524		
	8-channel 4 inputs + 4 outputs, filter 3.0 ms, I_{MAX} = 2 A, ∑ 3 A		EPP2328-0001 527		EPP2328-0002 527		
	8-channel 8 inputs/outputs, filter 10 µs, I_{MAX} = 0.5 A, ∑ 3 A		EPP2338-0001 526		EPP2338-0002 527		
	8-channel 8 inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A, ∑ 3 A		EPP2338-1001 526		EPP2338-1002 527		
	16-channel 16 inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A, ∑ 3 A			EPP2339-0021 528		EPP2339-0022 528	
	16-channel 16 inputs/outputs, filter 10 µs, I_{MAX} = 0.5 A, ∑ 3 A			EPP2349-0021 529		EPP2349-0022 529	
	16-channel 8 inputs + 8 outputs, filter 10 µs, I_{MAX} = 0.5 A, ∑ 3 A, D-sub socket, 25-pin						EPP2316-0008 525
	16-channel 8 inputs + 8 outputs, filter 10 µs, I_{MAX} = 0.5 A, ∑ 3 A, IP 20 plug						EPP2316-0003 525

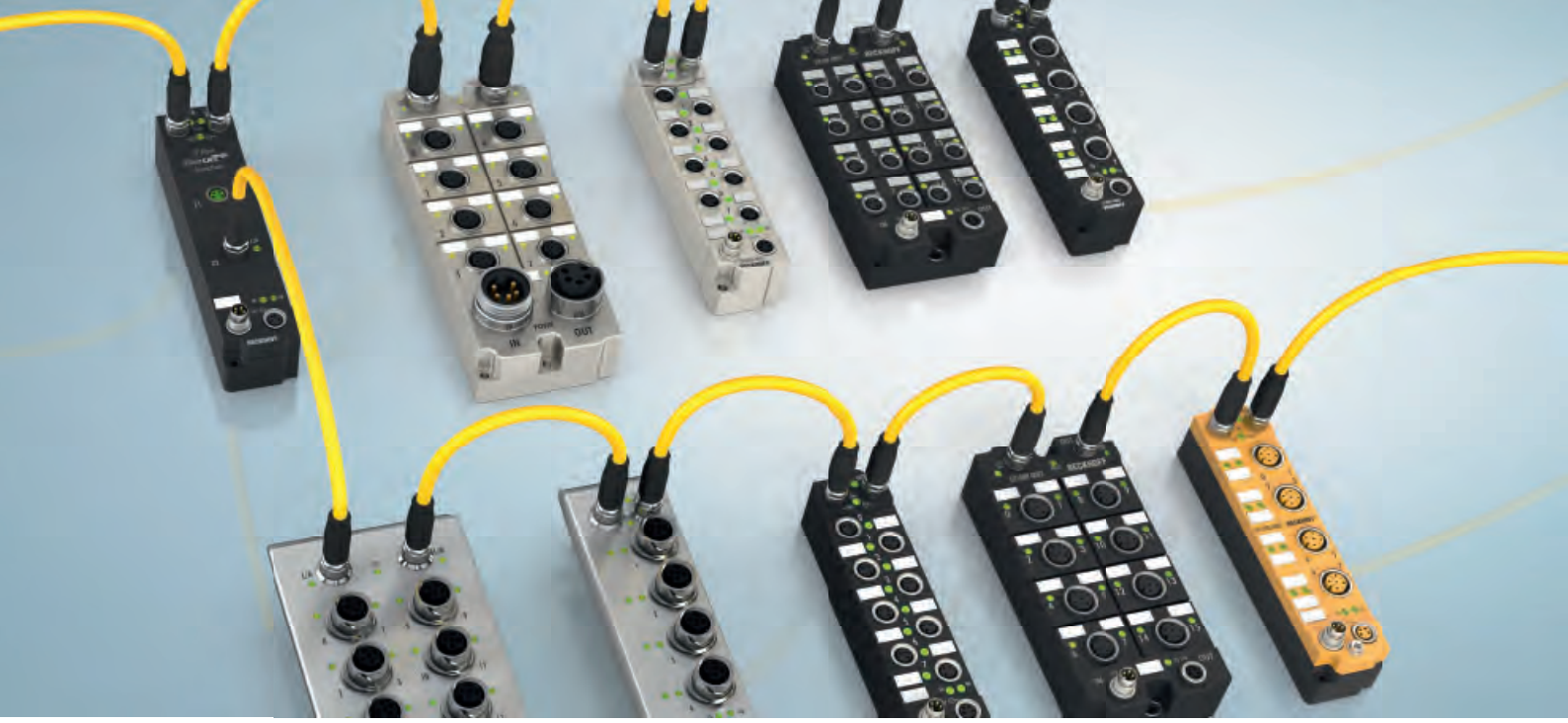
EtherCAT P Box | Analog I/O

Input		M8	M12
±10 V, 0/4…20 mA	**4-channel** parameterisable, differential input, 16 bit		EPP3174-0002 530
	4-channel parameterisable, single-ended, 16 bit		EPP3184-0002 530
Resistance thermometer	**4-channel** resistance thermometer (RTD), PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000, 16 bit		EPP3204-0002 531
Thermo-couple/mV	**4-channel** thermocouple, type J, K, L, B, E, N, R, S, T, U, 16 bit		EPP3314-0002 531
Pressure measuring	**4-channel** differential/absolute pressure measurement, 6 digital inputs, 2 digital outputs, 4 pressure inputs -1…1 bar (differential pressure to fifth connection)	EPP3744-0041 532	
	4-channel differential/absolute pressure measurement, 6 digital inputs, 2 digital outputs, 4 pressure inputs 0…7 bar (differential pressure to fifth connection)	EPP3744-1041 532	
Output		**M8**	**M12**
±10 V, 0/4…20 mA	**4-channel** parameterisable, 16 bit		EPP4174-0002 533
	4-channel 2 inputs + 2 outputs, parameterisable, 16 bit		EPP4374-0002 533

We reserve the right to make technical changes.

EtherCAT P Box | Special functions

Function		M8	M12	Other
Position measurement	**Incremental encoder interface** 32 or 16 bit, binary, RS485		EPP5101-0002 534	EPP5101-0011 D-sub 535
	Incremental encoder interface 32 or 16 bit, binary, 24 V sensor supply		EPP5101-1002 535	
	Incremental encoder interface 32 or 16 bit, binary, 24 V		EPP5151-0002 535	
Communi-cation	**Serial interface** 1-channel, RS232, RS422/RS485, 5 V DC/1 A		EPP6001-0002 536	
	Serial interface 2-channel, RS232, RS422/RS485		EPP6002-0002 536	
Motion	**Stepper motor module** I_{MAX} = 1.5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output		EPP7041-1002 537	
	Stepper motor module I_{MAX} = 5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output		EPP7041-3002 537	
	DC motor output stage I_{MAX} = 3.5 A, 50 V DC		EPP7342-0002 538	
System	**EtherCAT P Box** 3 decimal ID switches	EPP1111-0000 539		
	EtherCAT P junction 3 ports, with feed-in	EPP1322-0001 540		
	EtherCAT P junction 3 ports, with refresh	EPP1332-0001 540		
	EtherCAT P junction 3 ports	EPP1342-0001 540		
	EtherCAT P Box EtherCAT P/EtherCAT connector with power transmission	EPP9001-0060 541		
	EtherCAT P Box 2 x diagnostics (U_S, U_P)	EPP9022-0060 541		



The EtherCAT Box

High performance, compact and waterproof design

Robust
Robust construction allows fieldbus modules to be fitted directly to machines. Control cabinets and terminal boxes are now no longer required.

Sealed
The modules in industrial housing meet the protection class IP 65, IP 66 and IP 67, are fully casted and thus ideally prepared for use in wet, dirty and dusty working environments. For use in extreme, corrosive industrial environments, modules in stainless steel housing in IP 69K protection are available. For harsh industrial and process environments the modules with zinc die-cast housing offer enhanced load capacity and protection e.g. against weld spatter.

Small
The modules are extremely small and are thus suitable for use in applications where there is very little space available. The low weight of the EtherCAT Box modules makes them useful in applications where the I/O interface is in motion (e.g. on a robot arm).

Ultra high-speed
The EtherCAT Box modules have a direct EtherCAT port. Virtually all sensors and actuators can be connected to the control system directly via the 100BASE-TX. XFC boxes are available for additional requirements, e.g. timestamp inputs.

Quickly wired
The wiring of EtherCAT and of signals is significantly simplified through the use of pre-assembled cables. Wiring errors are minimised and the system setup is finished quickly.

Flexible
In addition to the pre-assembled cables, field wireable connectors and cables are also available for maximum flexibility.

Economical
Combined I/O modules and fine signal granularity lead to low system costs – you only have to buy what you really need. Due to the doubling of the number of channels per EtherCAT Box, the 16-channel series also saves time and costs with both the EtherCAT cabling and the power cabling.

Complete
The wide variety of signal types allows the connection of almost any kind of sensor or actuator. The communication modules enable decentralised connection of, e.g., label printers, identification systems or special equipment. Stepper Motor Box modules are also available.

Fitting
Sensors and actuators are connected through screw type connectors (M8 or M12).

Compatible
The EtherCAT Box devices behave very much like the Beckhoff EtherCAT Terminals – this means that the ideal distributed peripheral device can be used, whatever the particular application.

For extreme climatic zones

The majority of the EtherCAT Box modules are approved for the extended temperature range of -25…+60 °C (storage temperature -40…+85 °C).

The EtherCAT Box modules have an integrated direct EtherCAT interface and can be connected directly to an EtherCAT network.

EtherCAT topology and system description
see page 282

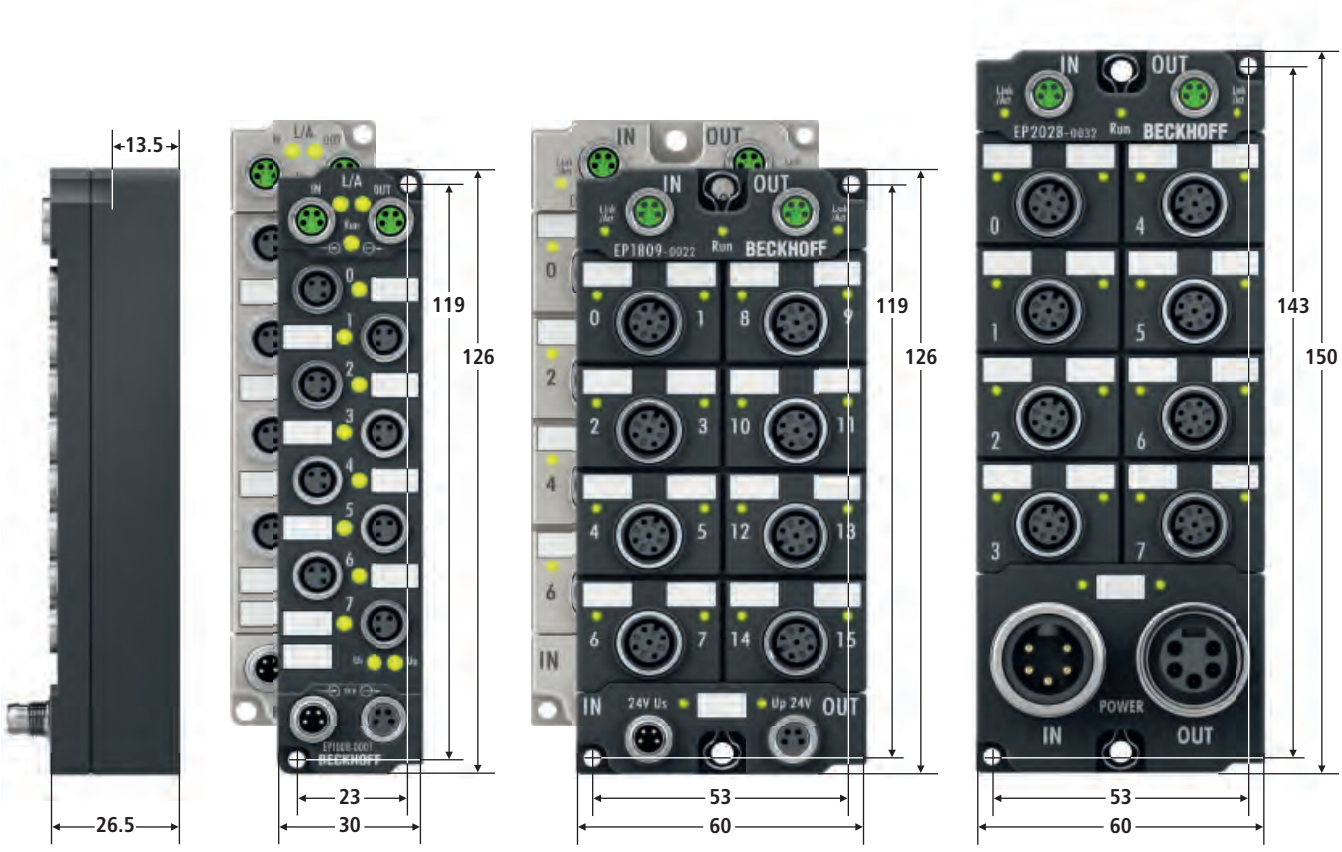
Infrastructure Components in IP 67
see page 798

For further information on EtherCAT see ▶EtherCAT

We reserve the right to make technical changes.

Housing types EtherCAT Box

Industrial and zinc die-cast housing

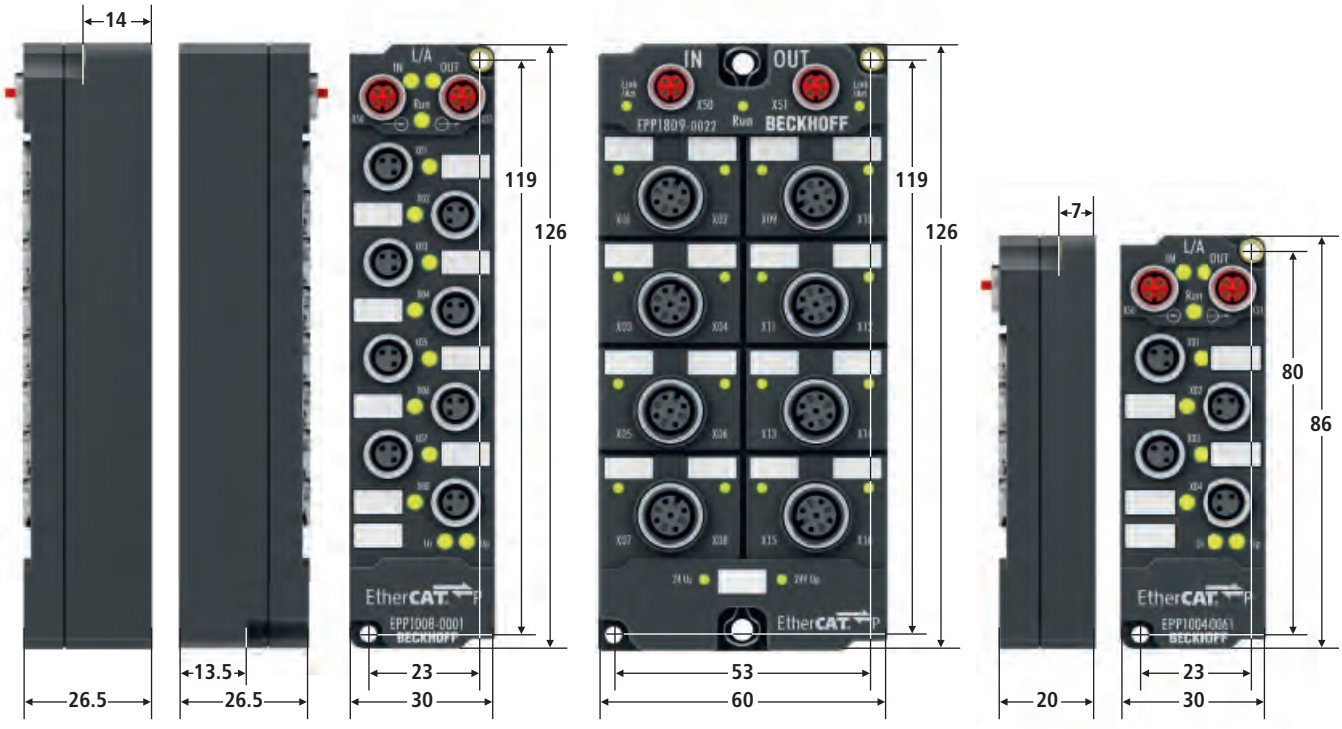


Technical data	8 x M8, 4 x M12	16 x M8, 8 x M12	7/8" infeed
Dimensions (W x H x D)	30 mm x 126 mm x 26.5 mm	60 mm x 126 mm x 26.5 mm	60 mm x 150 mm x 26.5 mm
Weight	depending on device (typ. 165 g)	depending on device (typ. 250 g)	depending on device (typ. 440 g)
Material	PA6 (polyamide) for EPxxxx or zinc die-cast for ERxxxx		
Installation	2 fixing holes 3 mm diameter for M3	2 fixing holes 3 mm diameter for M3; 2 fixing holes 4.5 mm diameter for M4	2 fixing holes 3 mm diameter for M3; 2 fixing holes 4.5 mm diameter for M4
Operating/storage temperature	0…+55 °C/-25…+85 °C (extended temperature range: -25…+60 °C/-40…+85 °C)		
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)		
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 35 g, 11 ms); 1000 shocks per direction, 3 axes		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Bus interface	2 x M8 socket, shielded, screw type		
Power infeed/feed through	I_{MAX} = 4 A	I_{MAX} = 4 A	I_{MAX} = 16 A

We reserve the right to make technical changes.

Housing types EtherCAT P Box

Industrial housing

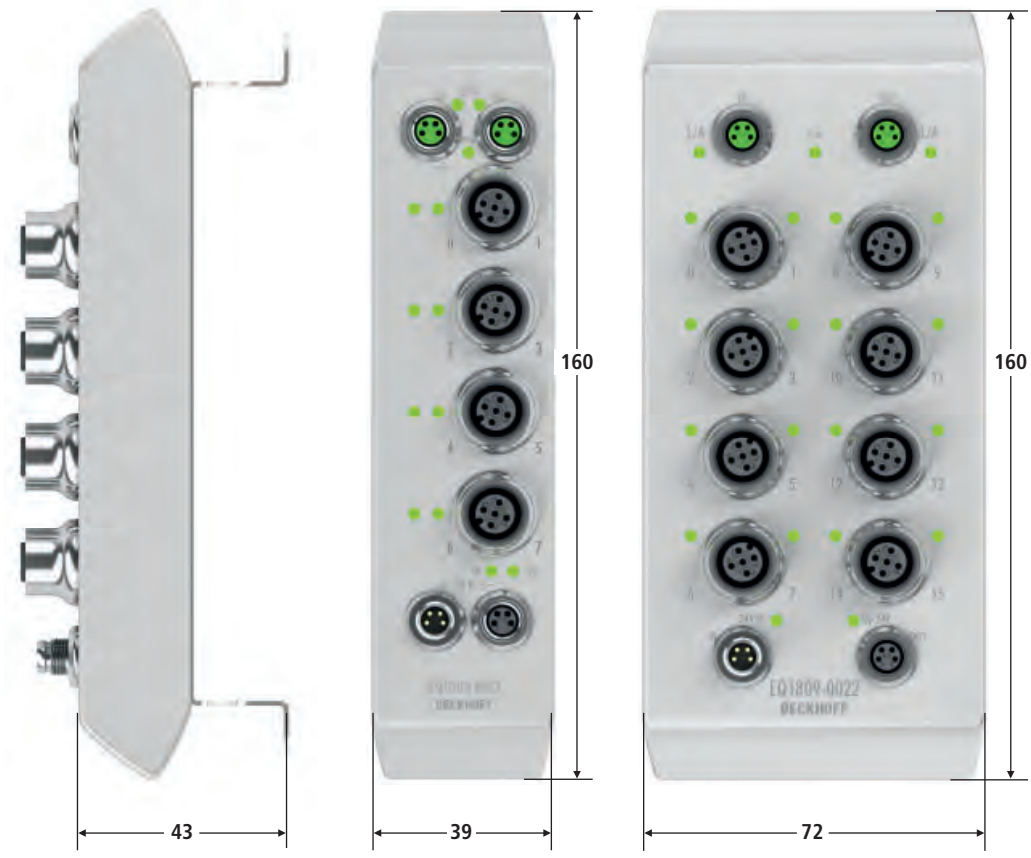


Technical data	8 x M8, 4 x M12	16 x M8, 8 x M12	EPPxxxx-006x
Dimensions (W x H x D)	30 mm x 126 mm x 26.5 mm	60 mm x 126 mm x 26.5 mm	30 mm x 86 mm x 20 mm
Weight	depending on device (typ. 165 g)	depending on device (typ. 250 g)	depending on device (typ. 80 g)
Material	PA6 (polyamide)		
Installation	2 fixing holes 3 mm diameter for M3	2 fixing holes 3 mm diameter for M3; 2 fixing holes 4.5 mm diameter for M4	2 fixing holes 3 mm diameter for M3
Operating/storage temperature	-25…+60 °C/-40…+85 °C		
Vibration resistance	conforms to EN 60068-2-6		
Shock resistance	conforms to EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		

We reserve the right to make technical changes.

Housing types EtherCAT Box

Stainless steel housing



Technical data	4 x M12	8 x M12
Dimensions (W x H x D)	39 mm x 160 mm x 43 mm	72 mm x 160 mm x 43 mm
Weight	depending on device (typ. 340 g)	depending on device (typ. 480 g)
Material	stainless steel	
Installation	2 fixing lugs for M5	
Operating/storage temperature	-25…+60 °C/-40…+85 °C	
Vibration resistance	conforms to EN 60068-2-6	
Shock resistance	conforms to EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 69K (according to EN 60529)/variable	
Bus interface	2 x M8 socket, shielded, screw type	
Power infeed/feed through	I_{MAX} = 4 A	

We reserve the right to make technical changes.

EtherCAT Box

▶ EtherCAT-Box

EPxxxx | **EtherCAT Box (industrial housing)**

- EtherCAT I/O system in IP 67
- high performance for harsh environments
- compact and robust
- can be mounted directly on machines, outside of control cabinets and terminal boxes

See page 466

We reserve the right to make technical changes.

EPPxxxx | **EtherCAT P Box (industrial housing)**

- comprehensive I/O range in IP 67
- integrated sensor/actuator supply directly via EtherCAT P
- lower wiring effort and highly flexible decentralised signal acquisition
- based on the EtherCAT P one cable solution
- no incorrect bus interface connections thanks to EtherCAT-P-coded M8 connector

See page 510

EP1908 | **EtherCAT Box for TwinSAFE (industrial housing)**

- TwinSAFE for the IP 67 world
- acquisition of safety sensors directly on the machine
- 8 fail-safe inputs
- connection via standard M12 connectors

See page 1056

ERxxxx | **EtherCAT Box (zinc die-cast housing)**

- particularly robust zinc die-cast housing
- for heavy-duty applications in extremely harsh industrial and process environments
- numerous I/O functions
- fully sealed design and metal surfaces: ideal for enhanced load capacity and protection against weld spatter

See page 468

EQxxxx | **EtherCAT Box (stainless steel housing)**

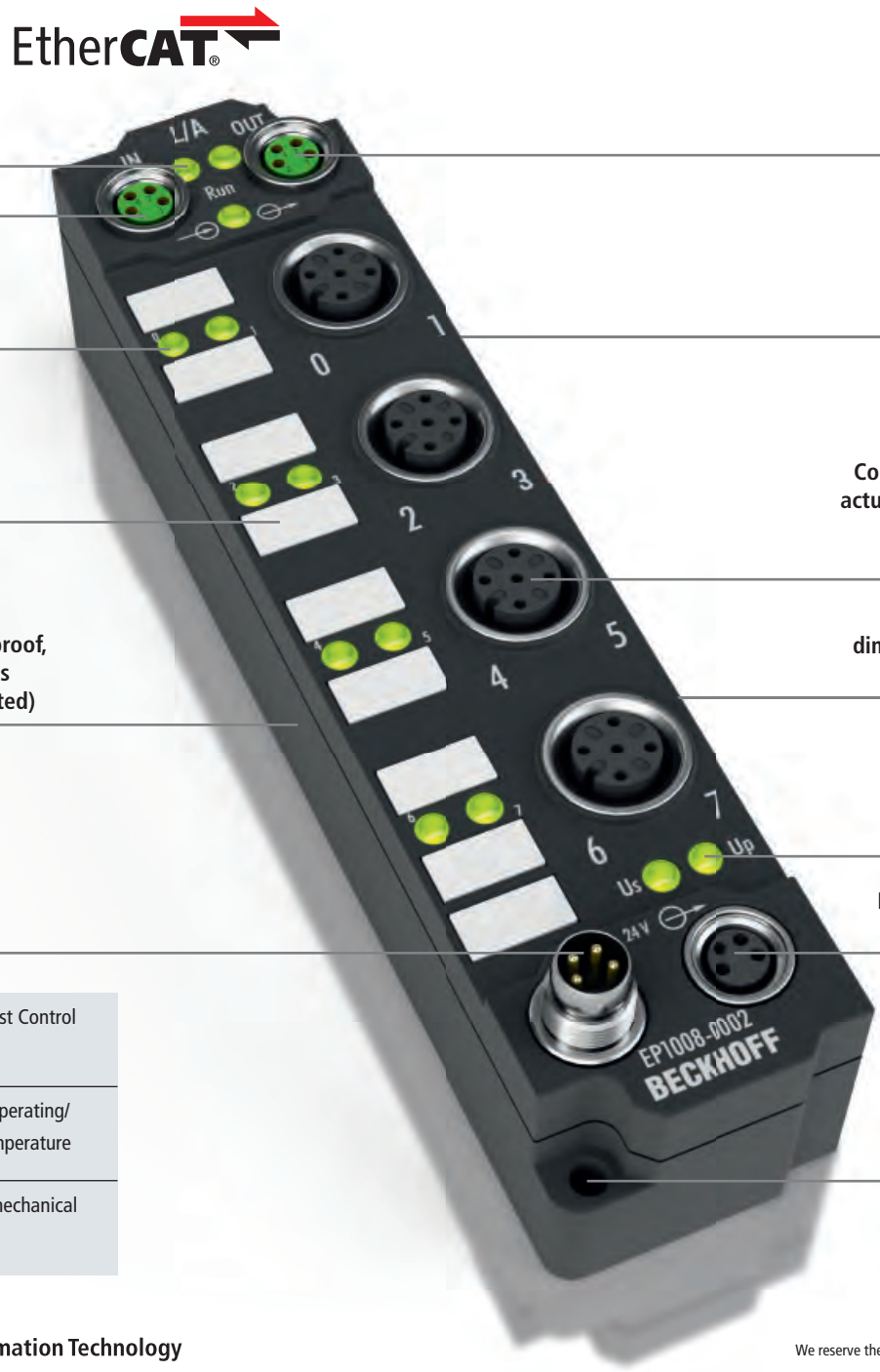
- EtherCAT in Hygienic Design
- EtherCAT Box in IP 69K
- for applications in the food, chemical or pharmaceutical industries
- gap-free and flush fitting housing design
- wide range of digital and analog modules
- matching cables according to protection class available

See page 542

We reserve the right to make technical changes.

EPxxxx | EtherCAT Box (industrial housing)

▶ **EPxxxx**



Signal status

EtherCAT input

Signal status display

Standard labels

Watertight and dust-proof, due to protection class IP 65/66/67 (fully potted)

Power supply input
- **box supply**
- **auxiliary voltage**

EtherCAT output

Robust housing for industrial application

Connection of sensors/ actuators via connector:
- **M8, screw type**
- **M12, screw type**

Ultra compact dimensions (H x W x D) 126 x 30 x 26.5 mm

Power supply status display: box supply and auxiliary voltage

Power supply down-stream connection

Mounting holes

XFC	eXtreme Fast Control Technology
+60 °C -25 °C	Extended operating/ storage temperature
35 g	Extended mechanical load

We reserve the right to make technical changes.

8 x M8, 4 x M12
(126 x 30 x 26.5 mm)

16 x M8, 8 x M12
(126 x 60 x 26.5 mm)

I/O connections

Connector M8,
screw type, 3-pin

Connector M12,
screw type, 5-pin

The robust design of the EtherCAT Box modules enables them to be used directly at the machine. Control cabinets and terminal boxes are now no longer required. The modules are fully sealed and therefore ideally prepared for wet, dirty or dusty conditions. Pre-assembled cables significantly simplify EtherCAT and signal wiring. Commissioning is optimised. In addition to pre-assembled EtherCAT, power and sensor cables, field-configurable connectors and cables are available for maximum flexibility. Depending on the application, the sensors and actuators are connected via M8 or M12 screw-type connectors or D-sub plugs.

The EtherCAT modules cover the typical range of requirements for IP 67 I/O signals: digital inputs with different filters (3.0 ms or 10 µs), digital outputs with 0.5 and 2 A output current, combination modules with freely selectable inputs or outputs, analog inputs and outputs with 16-bit resolution, thermocouple and RTD inputs, and stepper motor modules. XFC (eXtreme Fast Control) modules, including inputs with timestamp, are also available. The availability of XFC EtherCAT Box modules enables a wide range of new applications that were not possible in the past with an IP 67 module.

In addition, various EtherCAT Box modules are available for system tasks, e.g. media converters, EtherCAT hubs or power distribution.

EPxxxx-00yz

- 0 = no connectors
- 1 = connector M8, screw type, 3-pin
- 2 = connector M12, screw type, 5-pin
- 3 = special connectors
- 4 = connector M16, screw type, 19-pin
- 8 = D-sub, 25-pin
- 10 = 2 x D-sub, 9-pin
- 11 = D-sub, 15-pin

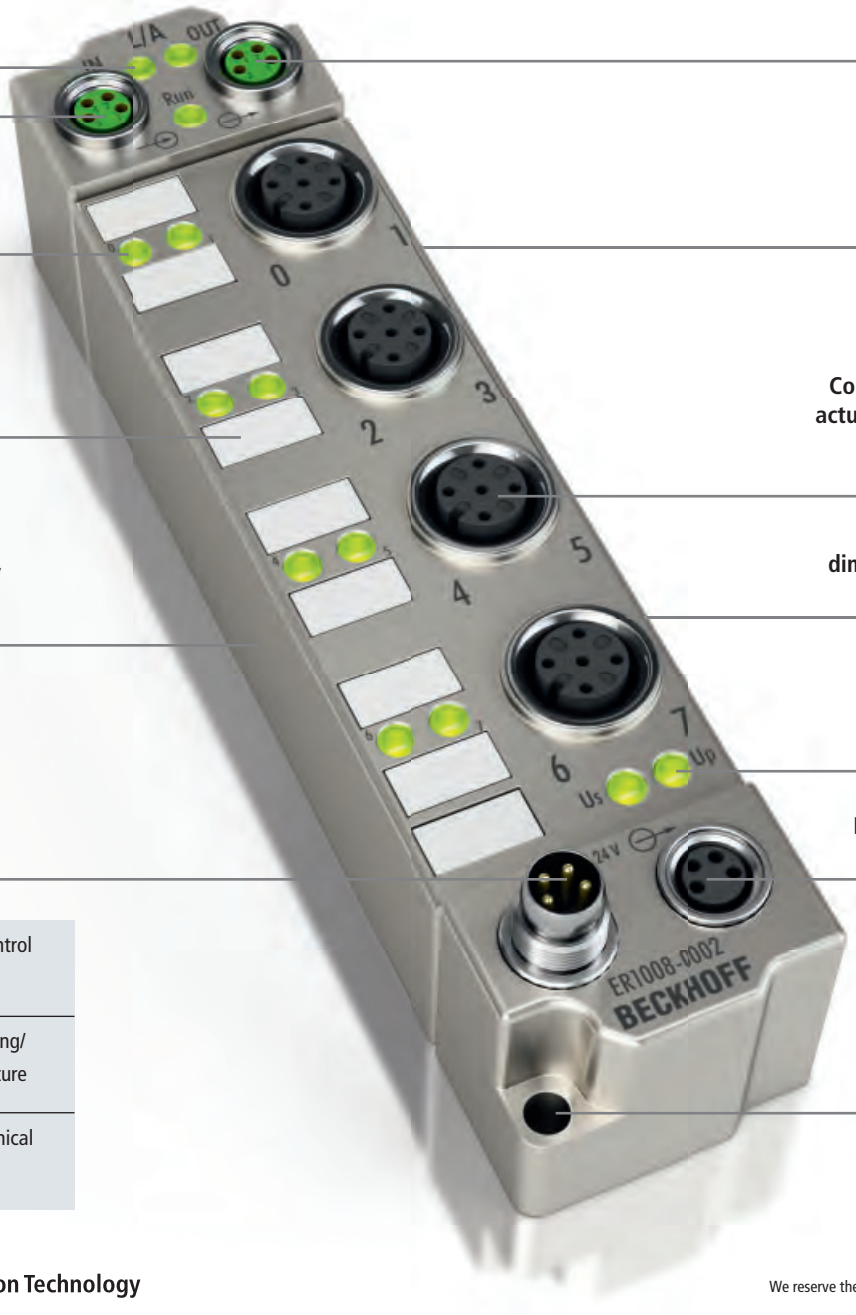
- 0 = width: 30 mm
- 2 = width: 60 mm
- 3 = 7/8" infeed
- 4 = pressure inputs

Signals see page 470

ERxxxx | EtherCAT Box (zinc die-cast housing)

▶ **ERxxxx**

EtherCAT



Signal status

EtherCAT input

Signal status display

Standard labels

Watertight and dust-proof, due to protection class IP 65/66/67 (fully potted)

Power supply input
- **box supply**
- **auxiliary voltage**

EtherCAT output

Metal housing for industrial application

Connection of sensors/ actuators via connector:
- **M8, screw type**
- **M12, screw type**

Ultra compact dimensions (H x W x D) 126 x 30 x 26.5 mm

Power supply status display: box supply and auxiliary voltage

Power supply downstream connection

Mounting holes

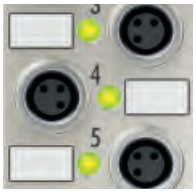
XFC	eXtreme Fast Control Technology
+60 °C -25 °C	Extended operating/ storage temperature
35 g	Extended mechanical load

We reserve the right to make technical changes.

8 x M8, 4 x M12
(126 x 30 x 26.5 mm)

16 x M8, 8 x M12
(126 x 60 x 26.5 mm)

I/O connections



Connector M8,
screw type, 3-pin

Connector M12,
screw type, 5-pin

The EtherCAT Box system is complemented by the ERxxxx modules with zinc die-cast housing. The housing shape of the ER series modules is identical to the plastic housings of the EP series. The zinc die-cast housing makes the IP 67 modules particularly robust, so that they are ready for use in harsh industrial and process environments. With the fully sealed design and metal surfaces the ER series is ideal for applications requiring enhanced load capacity and protection against weld spatter, for example. The ER series is the optimum complement to the plastic and stainless steel housing versions. All modules are compatible.

The EtherCAT Box modules with zinc die-cast housing cover the typical I/O signals: digital inputs with various filters, digital outputs with 0.5 A output current, and combi modules with freely configurable digital inputs or outputs. In addition, analog input modules for current/voltage measurement are available. Temperature measurement modules, serial interfaces, encoder inputs and motion modules complement the product range. The modules are available in a slim 30 mm or the broader 60 mm format with different channel options, covering a wide I/O range. Signals can be connected via M8 or M12 connectors.

The modules of the ER series have an EtherCAT interface. Power supply and transmission takes place via M8 connectors or sockets. For high-current outputs, modules with 7/8" power supply and M12 EtherCAT sockets are available.

ERxxxx-00yz

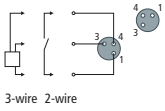
- 1 = connector M8, screw type, 3-pin
- 2 = connector M12, screw type, 5-pin
- 0 = width: 30 mm
- 2 = width: 60 mm
- 3 = 7/8" infeed
- Signals see page 470

Digital input | 24 V DC

The digital inputs on a 24 V supply are among the most frequently used signals. The EN 61131-2 standard describes the input characteristic and differentiates between three types. Type 1 has a low input current with low power loss. This input is optimised for mechanical switches and actively switched electronic outputs. Type 2 has a significantly higher input current and is optimised for 2-wire sensors with high quiescent current consumption. When switched on, however, the current consumption of this input is high and the associated power loss is generally inacceptable. Type 3 is a mixture of type 1 with low current when switched on and a sufficiently high quiescent current for most modern 2-wire sensors. The type 3 input can be used in nearly all applications in place of type 1.

The input circuits differ in their filter function. The task of the filtering is to suppress electromagnetic interference. It is opposed by the disadvantage of signal delay. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and supplies a stable signal for simple PLC applications. Filter times of 10 µs are suitable for applications with the shortest possible reaction times and can only be used for mechanical switches to a limited extent.

	8-channel digital input, 24 V DC, M8, type 1/3, positive switching	
Industrial housing **Zinc die-cast housing**	**EP1008-0001** **ER1008-0001**	**EP1018-0001** **ER1018-0001**
Connection technology	M8, screw type	
Specification	EN 61131-2, type 1/3	
Input filter	3.0 ms	10 µs
Number of inputs	8	

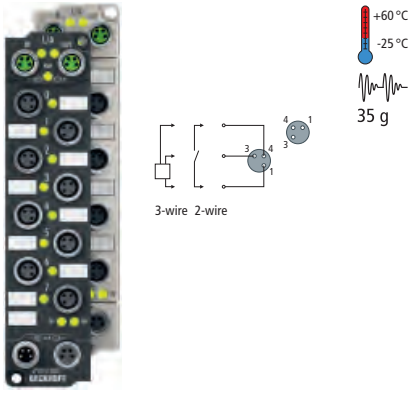
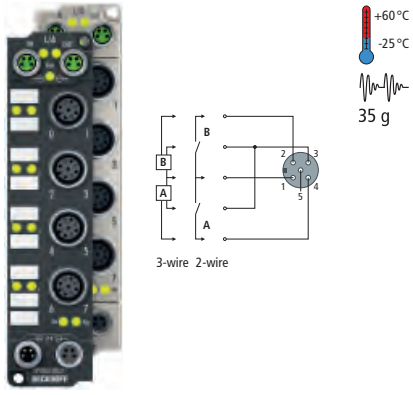
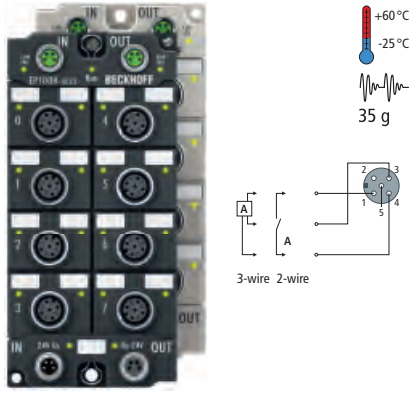


The EP1008/ER1008 and EP1018/ER1018 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The signals are connected via M8 screw type connectors.

The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.

Nominal voltage	24 V DC (-15 %/+20 %)
Protocol	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type
Distributed clocks	–
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	120 mA
Electrical isolation	500 V
Special features	–
Operating temperature	-25…+60 °C
Approvals	EP10x8: CE, UL, Ex; ER10x8: CE, UL
Further information	EP1008 ER1008

We reserve the right to make technical changes.

	8-channel digital input, 24 V DC, M8, type 1/3, negative switching	8-channel digital input, 24 V DC, M12, type 1/3, positive switching	8-channel digital input, 24 V DC, M12, type 1/3, positive switching
	EP1098-0001 **ER1098-0001**	**EP1008-0002** **ER1008-0002**	**EP1018-0002** **ER1018-0002**	**EP1008-0022** **ER1008-0022**
	M8, screw type	M12, screw type		M12, screw type
	negative switching "0": 11…30 V DC, "1": 0…7 V DC, typ. 2.5 mA input current	EN 61131-2, type 1/3		EN 61131-2, type 1/3
	10 µs	3.0 ms	10 µs	3.0 ms
	8	8		8
				
	The EP1098-0001/ER1098-0001 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M8 screw type connectors. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.	The EP1008/ER1008 and EP1018/ER1018 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The signals are connected via M12 screw type connectors. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.		The EP1008-0022/ER1008-0022 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M12 screw type connectors. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.
	24 V (-15 %/+20 %)	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
	EtherCAT	EtherCAT		EtherCAT
	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type		2 x M8 socket, shielded, screw type
	–	–		–
	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof
	120 mA	120 mA		120 mA
	control voltage/fieldbus: yes	500 V		500 V
	negative switching	–		1 input per M12 plug
	-25…+60 °C	-25…+60 °C		-25…+60 °C
	CE, UL	EP10x8: CE, UL, Ex; ER10x8: CE, UL		CE, UL
	EP1098 ER1098	EP1008 ER1008		EP1008-0022 ER1008-0022

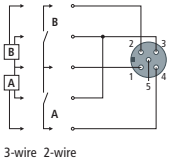
Digital input | 24 V DC

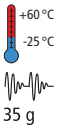
Pulses often need to be captured in technical control applications. This can be done with fast inputs such as the EP1018 and a central pulse counter. If the pulse length is the order of magnitude of the control cycle time or less, the controller cannot record these signals correctly any more. Pre-processing counter modules can then be used to count the number and direction of the pulses, which enables the controller to determine reliable values. The counter is adapted to the individual requirements, such as up/down counter or Gate/Latch-controlled, by fieldbus parameterisation. With a counting depth of 32 bit any overflow can be controlled reliably, even at high frequencies.

The multi-functional EP1518/ER1518 EtherCAT Box supports the following operating modes:

– 1 x 32 bit up/down counter (the counting direction is specified via the input)
– 1 x 32 bit gated counter (the counter is enabled via the input)
– 2 x 32 bit forward counter (no direction detection)

	2-channel up/down counter 24 V DC, 1 kHz, 32 bit, adjustable input filters 0…100 ms, M12
Industrial housing **Zinc die-cast housing**	**EP1518-0002** **ER1518-0002**
Connection technology	M12, screw type
Specification	EN 61131-2, type 1/3
Input filter	adjustable 0…100 ms
Number of inputs	8, 2 of which can be used as 32 bit up/down counters



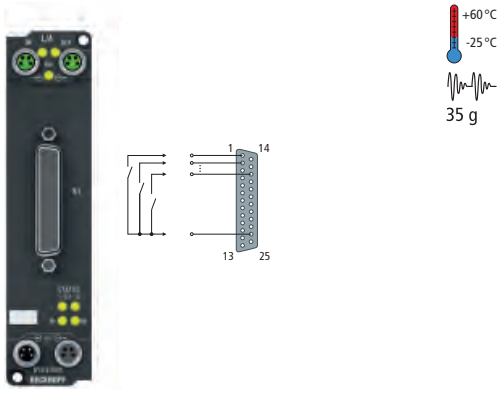
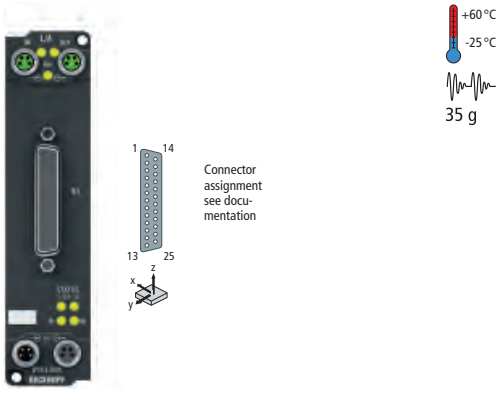


The EP1518/ER1518 EtherCAT Box with digital inputs acquires binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signal state is displayed by light emitting diodes. The signals are connected via M12 screw type connectors. The input filters can be set between 0 and 100 ms via EtherCAT. Inputs 0 and 4 can be used as 32-bit up/down counters. The sensors are supplied via the control voltage U_S in two groups of four sensors each. Any short circuits on the sensor side are detected and reported to the controller. The load voltage U_P is not used in the input module, but may optionally be connected in order to be relayed downstream.

Nominal voltage	24 V DC (-15 %/+20 %)
Counting frequency	max. 1 kHz
Protocol	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type
Distributed clocks	yes
Sensor supply	from control voltage, max. 0.5 A per 4 sensors, short-circuit-proof
Current consumption from U_S	120 mA
Electrical isolation	500 V
Special features	adjustable filters
Operating temperature	-25…+60 °C
Approvals	EP1518: CE, UL, Ex; ER1518: CE, UL
Further information	EP1518 ER1518

We reserve the right to make technical changes.

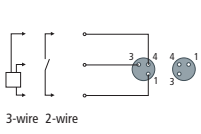
Digital input | 24 V DC, positive switching, D-sub

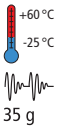
	16-channel digital input, 24 V DC, D-sub, type 1/3, positive switching	16-channel digital input, 24 V DC, D-sub, type 1/3, positive switching, 2 x 3-axis accelerometers
Industrial housing	**EP1816-0008**	**EP1816-3008**
Connection technology	D-sub socket, 25-pin	D-sub socket, 25-pin
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3
Input filter	10 µs	10 µs
Number of inputs	16	16
		
	The EP1816 EtherCAT Box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are connected via 25-pin D-sub socket. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.	The EP1816-3008 EtherCAT Box with 16 digital inputs acquires the binary control signals from the process level. The state of the signals is indicated by light emitting diodes. The signals are connected via 25-pin D-sub socket. The EtherCAT Box has 2 internal 3-axis accelerometers with 16 bit and a selectable resolution of ±2 g, ±4 g, ±8 g and ±16 g. Possible applications include the recording of vibrations and shocks/oscillations, and furthermore inclination measurements. The sensors are supplied from the box supply voltage U_S. Undervoltage detection (U_S and U_P) is integrated and is signalled to the controller.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Protocol	EtherCAT	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
Distributed clocks	yes	yes
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	120 mA	120 mA
Electrical isolation	500 V	500 V
Special features	compact design	integrated accelerometers
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL
Further information	EP1816	EP1816-3008

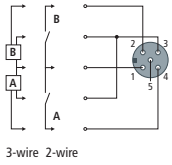
We reserve the right to make technical changes.

Digital input | 24 V DC, positive switching

	16-channel digital input, 24 V DC, M8, type 1/3		16-channel digital input, 24 V DC, M12, type 1/3	
Industrial housing **Zinc die-cast housing**	**EP1809-0021** **ER1809-0021**	**EP1819-0021** **ER1819-0021**	**EP1809-0022** **ER1809-0022**	**EP1819-0022** **ER1819-0022**
Connection technology	M8, screw type		M12, screw type	
Specification	EN 61131-2, type 1/3		EN 61131-2, type 1/3	
Input filter	3.0 ms	10 µs	3.0 ms	10 µs
Number of inputs	16		16	







The EP1809/ER1809 and EP1819/ER1819 EtherCAT Box modules with digital inputs acquire the binary control signals from the process level and transmit them, in an electrically isolated form, to the controller. The signals are connected via M8 or M12 screw type connectors.

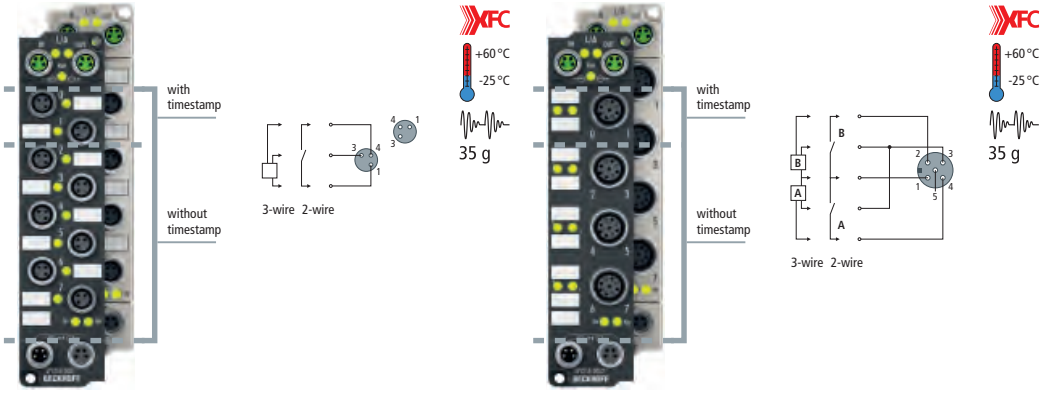
The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.

Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Protocol	EtherCAT	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
Distributed clocks	–	–
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	130 mA	130 mA
Electrical isolation	500 V	500 V
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL
Further information	EP1809 ER1809	EP1809 ER1809

We reserve the right to make technical changes.

XFC digital input | **24 V DC, positive, fast inputs**

	8-channel digital input with 2-channel timestamp, 24 V DC, M8, type 1/3	8-channel digital input with 2-channel timestamp, 24 V DC, M12, type 1/3
Industrial housing **Zinc die-cast housing**	**EP1258-0001** **ER1258-0001**	**EP1258-0002** **ER1258-0002**
Connection technology	M8, screw type	M12, screw type
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3
Input filter	10 µs	10 µs
Number of inputs	8 (2 with timestamp)	8 (2 with timestamp)



The EP1258/ER1258 EtherCAT Box with digital inputs acquires the fast binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are furnished with a timestamp that identifies the time of the last edge change with a resolution of 1 ns. This technology enables signals to be traced exactly over time and synchronised with the distributed clocks across the system. With this technology, machine-wide parallel hardware wiring of digital inputs or encoder signals for synchronisation purposes is often no longer required. In this way, the EP1258 enables responses with equidistant time intervals, largely independent of the bus cycle time.

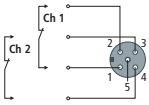
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Protocol	EtherCAT	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
Resolution timestamp	1 ns (channel 0/1)	1 ns (channel 0/1)
Precision of timestamp	10 ns (+ input delay) (channel 0/1)	10 ns (+ input delay) (channel 0/1)
Distributed clocks	yes	yes
Distributed clock precision	< 100 ns (channel 0/1)	< 100 ns (channel 0/1)
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	120 mA	120 mA
Electrical isolation	500 V	500 V
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	EP1258: CE, UL, Ex; ER1258: CE, UL	EP1258: CE, UL, Ex; ER1258: CE, UL
Further information	EP1258 ER1258	EP1258 ER1258

Further information on XFC see page 298

Digital input | **TwinSAFE**

The EP1908 Safety Module is a digital input module for sensors with potential-free 24 V DC contacts and has eight fail-safe inputs. It conforms to the requirements of IEC 61508:2010 SIL 3 and DIN EN ISO 13849-1:2008 PL e.

For further information on TwinSAFE and the TwinSAFE products see page 1044

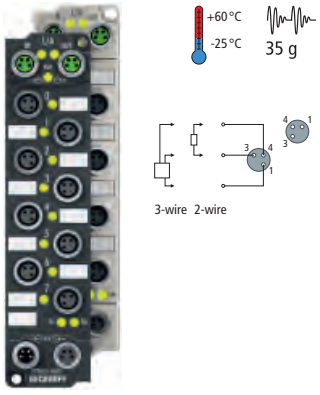
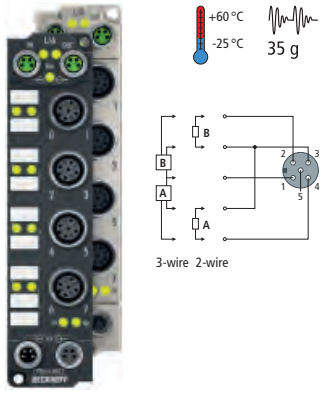
	8-channel digital input module, TwinSAFE, 24 V DC
Industrial housing	**EP1908-0002**
Connection technology	M12, screw type
Safety standard	IEC 61508:2010 SIL 3 and DIN EN ISO 13849-1:2008 PL e
Number of inputs	8
	
Protocol	TwinSAFE/Safety over EtherCAT
Current consumption from U_S/U_P	80 mA/40 mA
Response time	typ. 4 ms (read input/write to bus)
Fault response time	≤ watchdog time (parameterisable)
Special features	8 safe inputs
Operating/storage temperature	-25…+60 °C/-40…+85 °C
Approvals	CE, UL, TÜV SÜD
Weight	approx. 165 g
Further information	EP1908

We reserve the right to make technical changes.

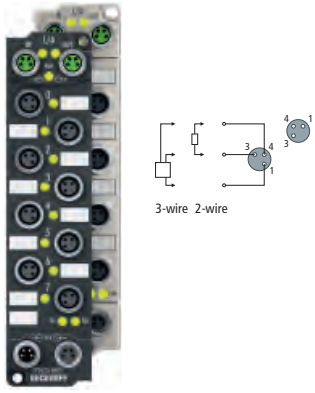
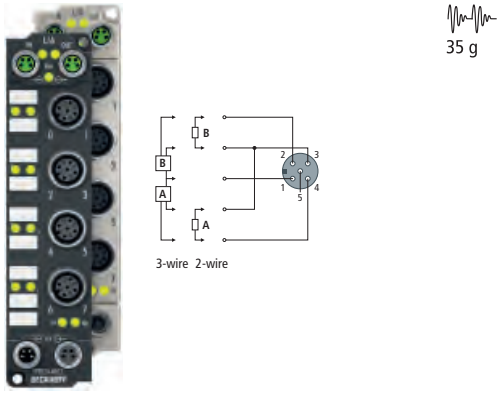
Digital output | 24 V DC, positive switching

Many actuators are operated or actuated with 24 V DC. The EtherCAT Box modules in the category "positive switching" switch all output channels to 24 V DC. Beyond that, the output circuit offers functions such as short circuit current limitation, short circuit power-off and the dissipation of inductive energy from the coil.

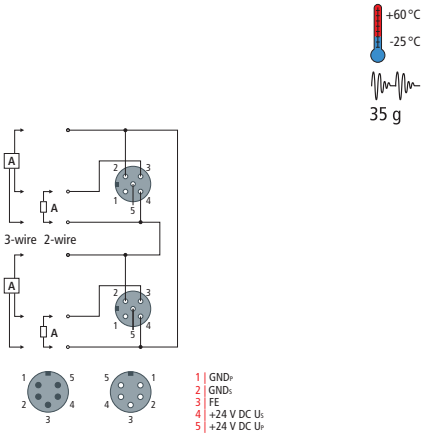
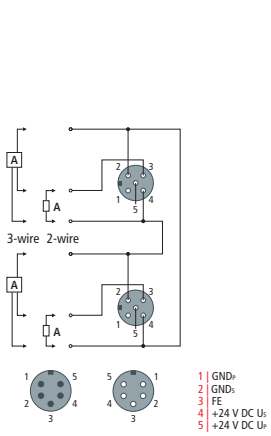
The most common output circuit supplies a max. continuous current of 0.5 A. Special EtherCAT Box modules are available for higher currents. Any type of load (resistive, capacitive or inductive) can be connected to an output module.

	8-channel digital output, 24 V DC, M8, I_{MAX} = 0.5 A	8-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A
Industrial housing **Zinc die-cast housing**	**EP2008-0001** **ER2008-0001**	**EP2008-0002** **ER2008-0002**
Connection technology	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Number of outputs	8	8
		
	The EP2008/ER2008 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A. The signals are connected via M8 or M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.	
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption from U_S	120 mA	120 mA
Distributed clocks	–	–
Short circuit current	typ. 1.5 A	typ. 1.5 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Electrical isolation	500 V	500 V
Special features	–	–
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	EP2008: CE, UL, Ex; ER2008: CE, UL	EP2008: CE, UL, Ex; ER2008: CE, UL
Further information	EP2008 ER2008	EP2008 ER2008

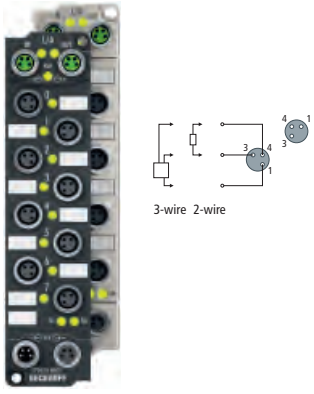
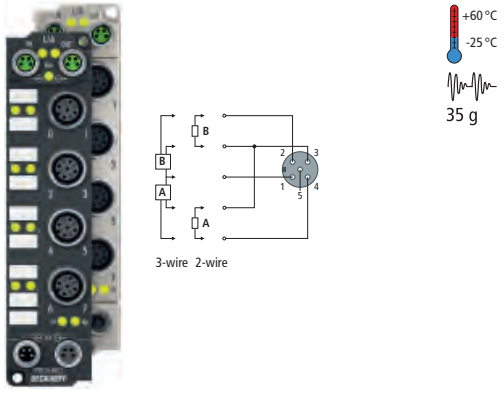
Digital output | 24 V DC, positive switching

	8-channel digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 4 A)	8-channel digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 4 A)
Industrial housing **Zinc die-cast housing**	**EP2028-0001** **ER2028-0001**	**EP2028-0002** **ER2028-0002**
Connection technology	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	2 A per channel, individually short-circuit safe, total current max. 4 A	2 A per channel, individually short-circuit safe, total current max. 4 A
Number of outputs	8	8
		
	The EP2028/ER2028 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The signals are connected via M8 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.	The EP2028/ER2028 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The signals are connected via M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption from U_S	120 mA	120 mA
Distributed clocks	–	–
Short circuit current	max. 7 A	max. 7 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Electrical isolation	500 V	500 V
Special features	load current up to 2 A	load current up to 2 A
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	EP2028: CE, UL, Ex; ER2028: CE, UL	EP2028: CE, UL, Ex; ER2028: CE, UL
Further information	EP2028 ER2028	EP2028 ER2028

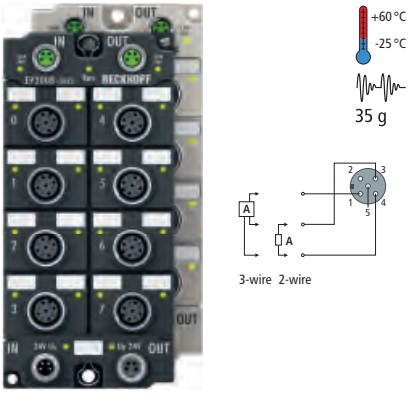
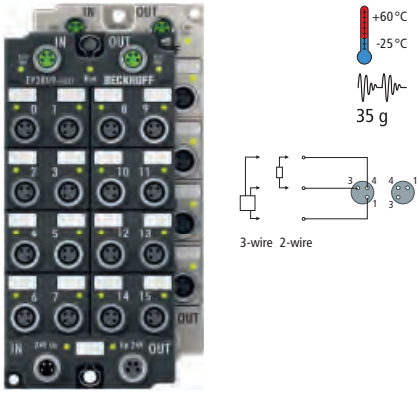
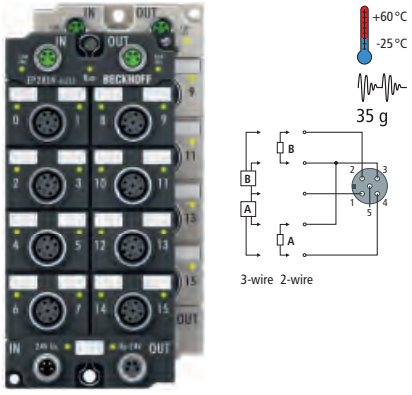
We reserve the right to make technical changes.

	8-channel digital output, 24 V DC, M12, I_{MAX} = 2.8 A (∑ 16 A)	8-channel digital output, 24 V DC, M12, I_{MAX} = 2.8 A (∑ 16 A)
	EP2028-0032	**ER2028-1032**
	M12, screw type	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	2.8 A each channel, individually short-circuit-proof, total current max. 16 A	2.8 A each channel, individually short-circuit-proof, total current max. 16 A
	8	8
		
	The EP2028-0032 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2.8 A each, although the total current is limited to 16 A. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.	The ER2028-1032 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2.8 A each, although the total current is limited to 16 A. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	130 mA	130 mA
	–	–
	max. 14 A	max. 14 A
	typ. 20 mA + load	typ. 20 mA + load
	500 V	500 V
	1 output per M12 plug, 16 A total current	1 output per M12 plug, 16 A total current
	-25…+60 °C	-25…+60 °C
	CE, UL in preparation	CE, UL in preparation
	EP2028-0032	ER2028-1032

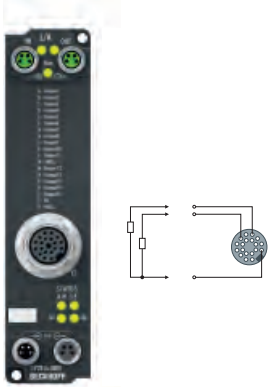
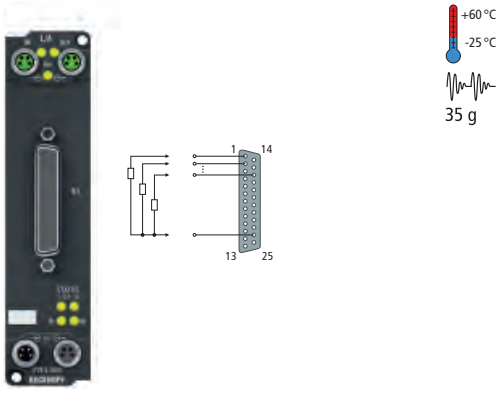
Digital output | 24 V DC, positive switching

	8-channel digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 4 A), with diagnostics	8-channel digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 4 A), with diagnostics
Industrial housing **Zinc die-cast housing**	**EP2038-0001** **ER2038-0001**	**EP2038-0002** **ER2038-0002**
Connection technology	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	2 A per channel, individually short-circuit safe, total current max. 4 A	2 A per channel, individually short-circuit safe, total current max. 4 A
Number of outputs	8	8
	 The EP2038/ER2038 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The EP2038 offers output diagnostics in the form of short circuit and open circuit detection per channel. The signals are connected via M8 screw type connectors.	 The EP2038/ER2038 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 2 A each, although the total current is limited to 4 A. The EP2038 offers output diagnostics in the form of short circuit and open circuit detection per channel. The signals are connected via M12 screw type connectors.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption from U_S	120 mA	120 mA
Distributed clocks	–	–
Short circuit current	max. 7 A	max. 7 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Electrical isolation	500 V	500 V
Special features	load current up to 2 A	load current up to 2 A
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL
Further information	EP2038 ER2038	EP2038 ER2038

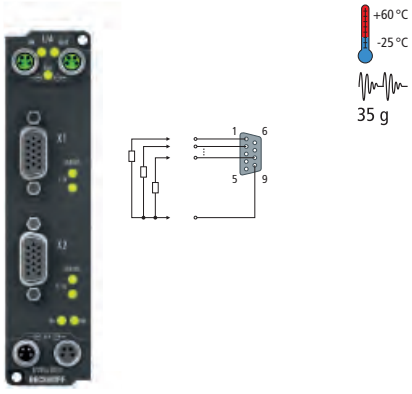
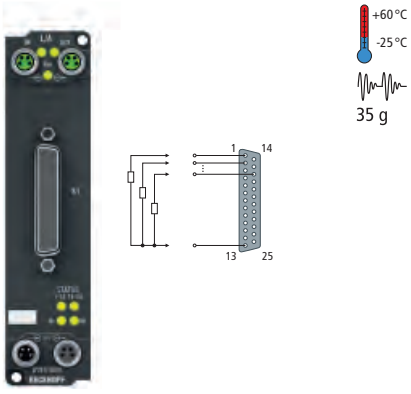
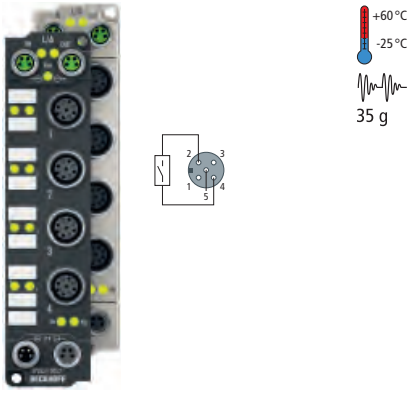
We reserve the right to make technical changes.

	8-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 4 A)	16-channel digital output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 4 A)	16-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 4 A)
	EP2008-0022 **ER2008-0022**	**EP2809-0021** **ER2809-0021**	**EP2809-0022** **ER2809-0022**
	M12, screw type	M8, screw type	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
	8	16	16
			
	The EP2008-0022/ER2008-0022 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.	The EP2809/ER2809 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. The signals are connected via M8 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.	The EP2809/ER2809 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. The signals are connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	130 mA	130 mA	130 mA
	–	–	–
	max. 1.5 A	max. 1.5 A	max. 1.5 A
	typ. 20 mA + load	typ. 20 mA + load	typ. 20 mA + load
	500 V	500 V	500 V
	1 output per M12 plug	–	–
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL	CE, UL	CE, UL
	EP2008-0022 ER2008-0022	EP2809 ER2809	EP2809 ER2809

Digital output | 24 V DC, positive switching

	16-channel digital output, 24 V DC, M16, I_{MAX} = 0.5 A (∑ 4 A)	16-channel digital output, 24 V DC, D-sub, I_{MAX} = 0.5 A (∑ 4 A)
Industrial housing Zinc die-cast housing	**EP2816-0004**	**EP2816-0008**
Connection technology	M16, 19-pin	D-sub socket, 25-pin
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
Number of outputs	16	16
		
	The EP2816-0004 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by a 19-pin M16 socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.	The EP2816-0008 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by a 25-pin D-sub socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption from U_S	120 mA	120 mA
Distributed clocks	yes	yes
Short circuit current	max. 1.5 A	max. 1.5 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Ohmic switching current	–	–
Operat. cycles mech. (min.)	–	–
Operat. cycles electr. (min.)	–	–
Minimum permitted load	–	–
Electrical isolation	500 V	500 V
Special features	ideal for multi-pin connector valve terminals	ideal for multi-pin connector valve terminals
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL
Further information	EP2816	EP2816

We reserve the right to make technical changes.

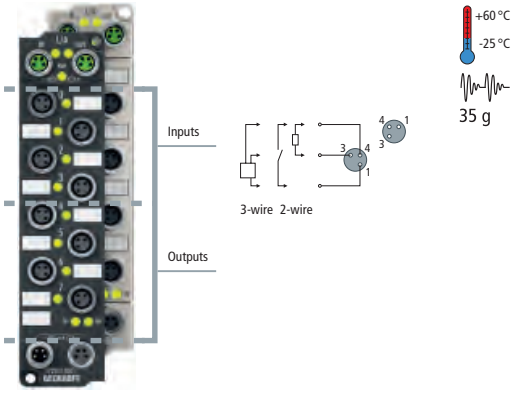
	16-channel digital output, 24 V DC, 2 x D-sub, I_{MAX} = 0.5 A (∑ 4 A)	24-channel digital output, 24 V DC, D-sub, I_{MAX} = 0.1 A	4-channel relay output, 25 V AC/30 V DC, M12
	EP2816-0010	**EP2817-0008**	**EP2624-0002 ER2624-0002**
	2 x D-sub socket, 9-pin	D-sub socket, 25-pin	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.1 A each channel, individually short-circuit-proof	potential-free switch
	16	24	4 x make contacts
			
	The EP2816-0010 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by two 9-pin D-sub sockets. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.	The EP2817-0008 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 24 outputs handle load currents of up to 0.1 A each. An output short-circuit is recognised and passed on to the controller. The signal connection is realised by a 25-pin D-sub socket. All outputs are short-circuit-proof, protected against inverse connection and can be diagnosed.	The EP2624/ER2624 EtherCAT Box has four relays each of which has a single contact. The relay contact is suitable for use at up to 25 V AC or 30 V DC. The EP2624/ER2624 has potential-free contacts. The power supply is looped through.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	120 mA	120 mA	120 mA
	yes	yes	–
	max. 1.5 A	max. 1.0 A	–
	typ. 20 mA + load	typ. 20 mA + load	typ. 20 mA + load
	–	–	0.5 A AC/2 A DC
	–	–	1 x 10^8
	–	–	2 x 10^5 (1 A/30 V DC)
	–	–	10 µA at 10 mV DC
	500 V	500 V	500 V
	ideal for multi-pin connector valve terminals	undervoltage detection for U_S and U_P < 18 V	potential-free switching
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL	CE, UL	EP2624: CE, UL, Ex; ER2624: CE, UL
	EP2816	EP2817	EP2624 ER2624

Digital combi | 24 V DC, positive switching

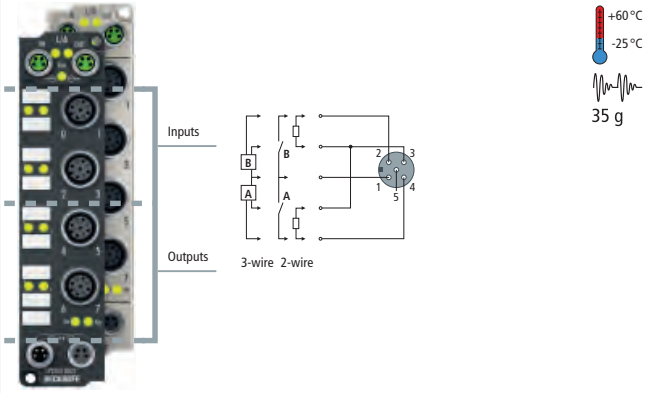
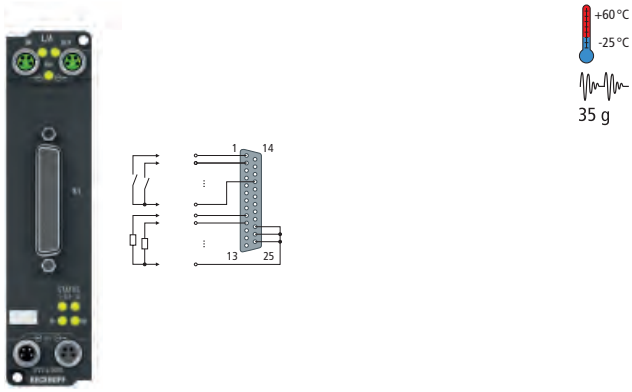
The digital combination modules combine inputs and outputs in one module. The input circuits differ in their filter function. The task of the filtering is to suppress electromagnetic interference. It is opposed by the disadvantage of signal delay. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and supplies a stable signal for simple PLC applications. Filter times of 10 µs are suitable for applications with the shortest possible reaction times and can only be used to a limited extent for mechanical switches.

The output channels supply a max. continuous current of 0.5 A. Special output modules are available for higher currents. Any type of load (resistive, capacitive or inductive) can be connected to an output module. Since lamp loads and capacitive loads are critical due to their high starting currents, they are limited by the output circuits of the modules. This ensures that the upstream circuit breaker does not trip. Inductive loads cause problems when switching off, since high induction voltages develop if the current is interrupted too quickly. An integrated freewheeling diode prevents this voltage peak. However, the current reduces so slowly that malfunctions occur in many control applications. A valve remains open for several milliseconds. The modules represent a compromise between the avoidance of overvoltage and switch-off. They suppress the induction voltage to approx. 24 V DC and achieve switch-off times that roughly correspond to the switch-on time of the coil.

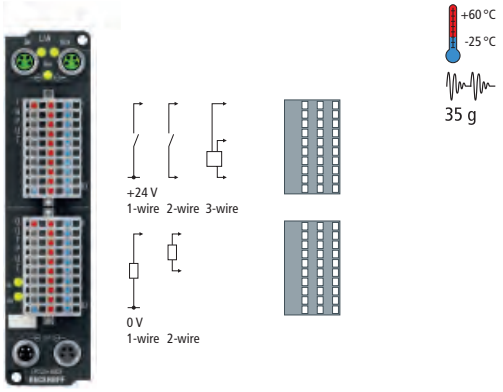
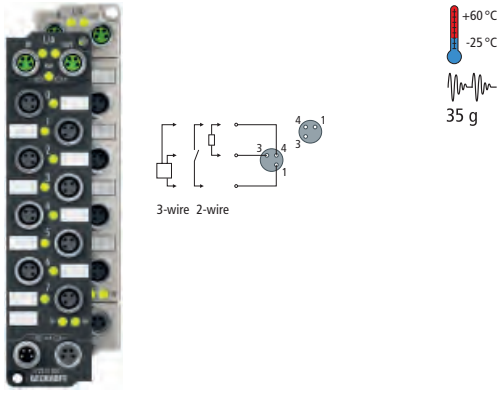
In the event of a short circuit, the module switches the corresponding output off and cyclically attempts to switch it on again. This continues until either the short circuit is eliminated or the controller resets the output. The clock frequency depends on the ambient temperature and the loads on the other channels. The specification for the total current must be observed.

	4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 0.5 A	
Industrial housing **Zinc die-cast housing**	**EP2308-0001** **ER2308-0001**	**EP2318-0001** **ER2318-0001**
Connection technology	M8, screw type	
Specification	EN 61131-2, type 1/3	
Input filter	3.0 ms	10 µs
Number of channels	4 inputs + 4 outputs	
		
	The EP2308/ER2308 and EP2318/ER2318 EtherCAT Box modules combine four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via screw type M8 connectors.	
Nominal voltage	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A per channel, individually short-circuit-proof	
Load type	ohmic, inductive, lamp load	
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof	
Short circuit current	typ. 1.5 A	
Auxiliary power current	typ. 20 mA + load	
Current consumption from U_S	120 mA	
Electrical isolation	500 V	
Special features	–	
Operating temperature	-25…+60 °C	
Approvals	EP23x8: CE, UL, Ex; ER23x8: CE, UL	
Further information	EP2308 ER2308	

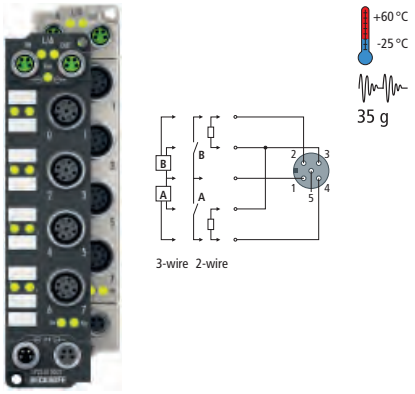
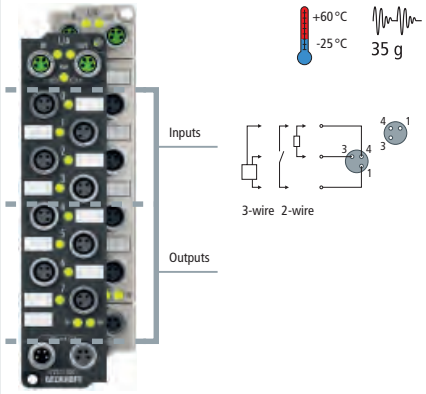
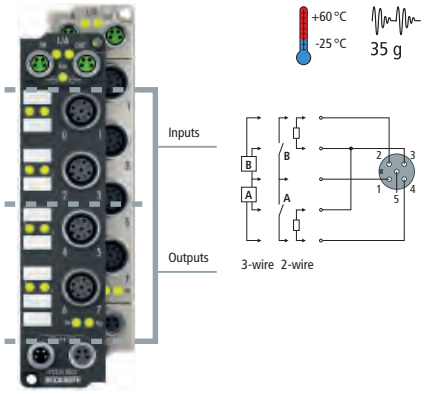
We reserve the right to make technical changes.

	4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 0.5 A		8 x digital input + 8 x digital output, 24 V DC, D-sub, I_{MAX} = 0.5 A
	EP2308-0002 **ER2308-0002**	**EP2318-0002** **ER2318-0002**	**EP2316-0008**
	M12, screw type		D-sub socket, 25-pin
	EN 61131-2, type 1/3		EN 61131-2, type 1/3
	3.0 ms	10 µs	10 µs
	4 inputs + 4 outputs		8 inputs + 8 outputs
			
	The EP2308/ER2308 and EP2318/ER2318 EtherCAT Box modules combine four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via screw type M12 connectors.		The EP2316 EtherCAT Box combines eight digital inputs and eight digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via a 25-pin D-sub socket.
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
	0.5 A per channel, individually short-circuit-proof		0.5 A per channel, individually short-circuit-proof
	ohmic, inductive, lamp load		ohmic, inductive, lamp load
	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof
	typ. 1.5 A		typ. 1.5 A
	typ. 20 mA + load		typ. 20 mA + load
	120 mA		120 mA
	500 V		500 V
	–		ideal for high number of channels
	-25…+60 °C		-25…+60 °C
	EP23x8: CE, UL, Ex; ER23x8: CE, UL		CE, UL
	EP2308 ER2308		EP2316

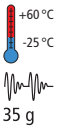
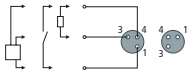
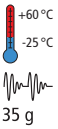
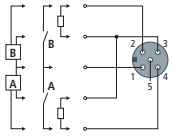
Digital combi | 24 V DC, positive switching

	8 x digital input + 8 x digital output, 24 V DC, I_{MAX} = 0.5 A, IP 20 connector	8-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A	
Industrial housing Zinc die-cast housing	**EP2316-0003**	**EP2338-0001 ER2338-0001**	**EP2338-1001 ER2338-1001**
Connection technology	connector with spring-loaded system	M8, screw type	
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3	
Input filter	10 µs	10 µs	3.0 ms
Number of channels	8 inputs + 8 outputs	8 digital inputs or outputs	
			
	The EP2316-0003 EtherCAT Box combines eight digital inputs and eight digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. For the signal connection connectors with a spring-loaded system are used, optionally available with 1 or 3 pins. The module is supplied without connectors. Accessories: – ZS2001-0001: connector, 1-pin, without LED – ZS2001-0002: connector, 1-pin, with LED – ZS2001-0004: connector, 3-pin, with LED	The EP2338/ER2338 EtherCAT Box has eight digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.	
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A per channel, individually short-circuit-proof	0.5 A per channel, individually short-circuit-proof	
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load	
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof	
Short circuit current	typ. 1.5 A	typ. 1.5 A	
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load	
Current consumption from U_S	120 mA	120 mA	
Electrical isolation	500 V	500 V	
Special features	IP 20, ideal for e.g. operating desks	–	
Operating temperature	-25…+60 °C	-25…+60 °C	
Approvals	CE	EP2338: CE, UL, Ex; ER2338: CE, UL	
Further information	EP2316-0003	EP2338 ER2338	

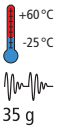
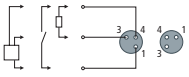
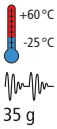
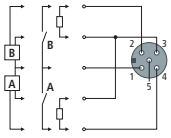
We reserve the right to make technical changes.

	8-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A		4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 4 A)	4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 4 A)
	EP2338-0002 ER2338-0002	**EP2338-1002 ER2338-1002**	**EP2328-0001 ER2328-0001**	**EP2328-0002 ER2328-0002**
	M12, screw type		M8, screw type	M12, screw type
	EN 61131-2, type 1/3		EN 61131-2, type 1/3	EN 61131-2, type 1/3
	10 µs	3.0 ms	3.0 ms	3.0 ms
	8 digital inputs or outputs		4 inputs + 4 outputs	4 inputs + 4 outputs
				
	The EP2338/ER2338 EtherCAT Box has eight digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.		The EP2328/ER2328 EtherCAT Box combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to to 2 A each, although the total current is limited to 4 A. The signals are connected via screw type M8 connectors. The sensors are powered by the box supply U_S.	The EP2328/ER2328 EtherCAT Box combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to to 2 A each, although the total current is limited to 4 A. The signals are connected via screw type M12 connectors. The sensors are powered by the box supply U_S.
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	0.5 A per channel, individually short-circuit-proof		2 A per channel, individually short-circuit safe, total current max. 4 A	2 A per channel, individually short-circuit safe, total current max. 4 A
	ohmic, inductive, lamp load		ohmic, inductive, lamp load	ohmic, inductive, lamp load
	from load supply voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
	typ. 1.5 A		typ. 4 A	typ. 4 A
	typ. 20 mA + load		typ. 20 mA	typ. 20 mA
	120 mA		typ. 120 mA	typ. 120 mA
	500 V		500 V	500 V
	–		–	–
	-25…+60 °C		-25…+60 °C	-25…+60 °C
	EP2338: CE, UL, Ex; ER2338: CE, UL		EP2328: CE, UL, Ex; ER2328: CE, UL	EP2328: CE, UL, Ex; ER2328: CE, UL
	EP2338 ER2338		EP2328 ER2328	EP2328 ER2328

Digital combi | 24 V DC, positive switching

	16-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 4 A)	16-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 4 A)
Industrial housing **Zinc die-cast housing**	**EP2339-0021** **ER2339-0021**	**EP2339-0022** **ER2339-0022**
Connection technology	M8, screw type	M12, screw type
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3
Input filter	3.0 ms	3.0 ms
Number of channels	16 digital inputs or outputs	16 digital inputs or outputs
	   35 g  3-wire 2-wire	  35 g  3-wire 2-wire
	The EP2339/ER2339 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.	The EP2339/ER2339 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Max. output current	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
Short circuit current	typ. 1.5 A	typ. 1.5 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Current consumption from U_S	120 mA	120 mA
Electrical isolation	500 V	500 V
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL
Further information	EP2339 ER2339	EP2339 ER2339

We reserve the right to make technical changes.

	16-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 4 A)	16-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 4 A)
	EP2349-0021 **ER2349-0021**	**EP2349-0022** **ER2349-0022**
	M8, screw type	M12, screw type
	EN 61131-2, type 1/3	EN 61131-2, type 1/3
	10 µs	10 µs
	16 digital inputs or outputs	16 digital inputs or outputs
	   35 g  	  35 g 
	The EP2349/ER2349 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.	The EP2349/ER2349 EtherCAT Box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
	typ. 1.5 A	typ. 1.5 A
	typ. 20 mA + load	typ. 20 mA + load
	130 mA	130 mA
	500 V	500 V
	-25…+60 °C	-25…+60 °C
	CE, UL	CE, UL
	EP2349 ER2349	EP2349 ER2349

Analog input | -10…+10 V, 0/4…20 mA

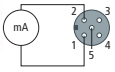
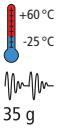
The EP3162, EP3174/ER3174, EP3182 and EP3184/ER3184 EtherCAT Box modules evaluate analog standard signals within the range of -10/0 V to +10 V or 0/4 mA to 20 mA with 16-bit resolution. The signal form is separately configurable for each channel. The EP3174/ER3174 and EP3184/ER3184 each have four, the EP3182 two galvanically connected analog inputs. The EP3162 has two analog inputs with galvanic isolation.

The EP3174/ER3174 evaluates the difference between the two input signals Input+ and Input-. These must be referred to the ground potential of the load voltage U_P. The DC component does not affect the measurement, as long as it is in the common mode range. The measurement in the EP3184/ER3184 is single-ended and the negative reference potential is fixed to the ground potential of the supply voltage U_P. In the EP3162 the supply for each channel is galvanically isolated.

In addition, the EP3182 has two digital outputs to connect binary control signals from the controller to the actuators at the process level. These two outputs (sink/source type) are intended to switch logic inputs or outputs with a minimum impedance of 10 kΩ (e.g. reset inputs of digital sensors). They handle load currents of up to 2 mA.

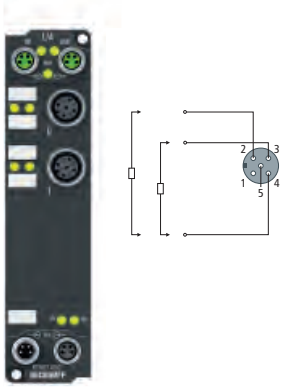
EP3174-0092 with TwinSAFE SC

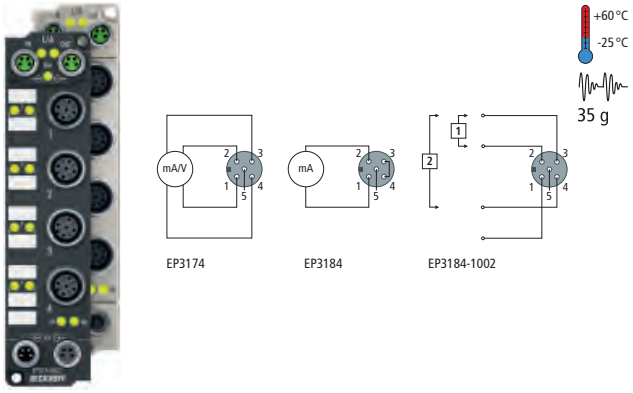
With the aid of the TwinSAFE SC technology it is possible to make use of standard signals for safety tasks in any network or fieldbus. To do this, EtherCAT I/Os from the areas of analog input, postition measurement or communication (4 to 20 mA, incremental encoder, IO-Link, etc.) are extended by the TwinSAFE SC function. The data from these extended EtherCAT I/Os is fed to the TwinSAFE Logic, where they undergo safety-related multi-channel processing.

	2-channel analog input, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit, with galvanic isolation
Industrial housing Zinc die-cast housing	**EP3162-0002**
Connection technology	M12, screw type
Signal type	-10/0…+10 V | 0/4…20 mA
Resolution	16 bit (incl. sign)
Conversion time	~ 100 µs
Number of inputs	2 (single-ended)
	    +60 °C -25 °C 35 g The EP3162 has two analog inputs which can be individually parameterised, so that they process signals either in the -10/0 to +10 V or the 0/4 to 20 mA range. The voltage or input current is digitised with a resolution of 16 bits, and is transmitted (electrically isolated) to the higher-level automation device. The two input channels are single-ended inputs with galvanic isolation. The input filter and therefore the conversion times are configurable in a wide range.
Measuring error	< ±0.3 % (relative to full scale value)
Distributed clocks	yes
Internal resistance	> 200 kΩ | 85 Ω typ. + diode voltage
Sensor supply	from load supply voltage U_P, DC, any value up to 30 V
Current consumption from U_S	120 mA
Special features	galvanic isolation of the channels
Operating temperature	-25…+60 °C
Approvals	CE, UL
Further information	EP3162
Special modules	
Distinguishing features	

We reserve the right to make technical changes.

	2-channel analog input, -10/0…+10 V or 0/4…20 mA, parameterisable, single-ended, 16 bit, 2 digital control outputs, 24 V DC	4-channel analog input, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit		
	EP3182-1002	**EP3174-0002** **ER3174-0002**	**EP3184-0002** **ER3184-0002**	**EP3184-1002** **ER3184-1002**
	M12, screw type	M12, screw type		
	-10/0…+10 V | 0/4…20 mA	-10/0…+10 V | 0/4…20 mA		
	16 bit (incl. sign)	16 bit (incl. sign)		
	~ 100 µs	~ 100 µs		
	2 (single-ended)	4 (differential)	4 (single-ended), 1 per socket	4 (single-ended), 2 per socket, sockets 2 and 4 not allocated





The EP3182 EtherCAT Box has two analog inputs which can be individually parameterised, so that they process signals either in the -10/0 to +10 V or the 0/4 to 20 mA range. The voltage or input current is digitised with a resolution of 16 bits, and is transmitted (electrically isolated) to the higher-level automation device. The two input channels are single-ended inputs and possess a common, internal ground potential. The EP3182 has two digital outputs (sink/source type) to connect binary control signals from the controller to the actuators at the process level.

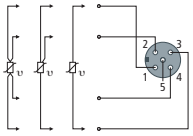
The EP3174/ER3174 and EP3184/ER3184 have four analog inputs which can be individually parameterised, so that they process signals either in the -10/0 to +10 V or the 0/4 to 20 mA range. The voltage or input current is digitised with a resolution of 16 bits, and is transmitted (electrically isolated) to the higher-level automation device. The four input channels have a common, internal ground potential. The input filter/conversion times are configurable in a wide range.

	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)		
	yes	yes		
	> 200 kΩ | 85 Ω typ. + diode voltage	> 200 kΩ | 85 Ω typ. + diode voltage		
	from load supply voltage U_P, DC, any value up to 30 V	from load supply voltage U_P, DC, any value up to 30 V		
	120 mA	120 mA		
	current or voltage parameterisable, 2 digital outputs (sink/source type)	current or voltage parameterisable		
	0…+55 °C	-25…+60 °C		
	CE, UL	EP31x4: CE, UL, Ex; ER31x4: CE, UL		
	EP3182	EP3174 EP3184 ER3174		ER3184
		EP3174-0092		
		TwinSAFE SC 324		

For availability status see Beckhoff website at: EP3174-0092

Analog input | **RTD**

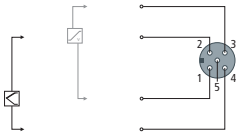
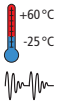
The EP3204/ER3204 analog input module is intended for the direct connection of resistance thermometers. The resistance is measured with a low measuring current, linearised and represented in 0.1 °C. The EtherCAT Box supports 2-, 3- and 4-wire measurement on all four channels. The measurements serve to eliminate or deduct the parasitic resistance of the sensor cable. All inputs are separately configurable for a wide range of sensors, for the three measurement procedures and for the direct measurement of resistance.

	4-channel analog input, PT100 (RTD), parameterisable, 16 bit
Industrial housing **Zinc die-cast housing**	**EP3204-0002** **ER3204-0002**
Connection technology	M12, screw type
Signal type	PT100
Resolution	0.1 °C per digit
Conversion time	800 ms up to 2 ms, see documentation, default: approx. 85 ms
Number of inputs	4
	 The EP3204/ER3204 with analog inputs allows resistance sensors to be connected directly. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement. Standard settings: resolution 0.1°C in the temperature range of PT100 sensors, 2-wire.
Measuring error	< ±0.5 °C for PT sensors (further types see documentation)
Distributed clocks	–
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ)
Measuring range	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)
Current consumption from U_S	120 mA
Special features	open-circuit recognition
Operating temperature	-25…+60 °C
Approvals	EP3204: CE, UL, Ex; ER3204: CE, UL
Further information	EP3204 ER3204

We reserve the right to make technical changes.

Analog input | **Thermocouple**

The EP3314/ER3314 EtherCAT Box enables the measurement of temperature using thermocouples. The measured thermovoltage is linearised in accordance with the characteristic of the respective type and transferred to the controller as a temperature value in 1/10 °C or 1/100 °C. The inputs are separately configurable for a wide range of different sensor types. Parasitic thermovoltages arise at the interface of the measuring cable and the module, significantly falsifying the measurement. This error is eliminated by the ZS2000-3712 compensation connector.

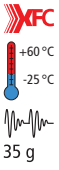
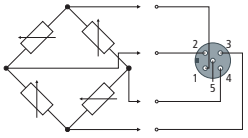
	4-channel analog input, thermocouple/mV, parameterisable, 16 bit
Industrial housing **Zinc die-cast housing**	**EP3314-0002** **ER3314-0002**
Connection technology	M12, screw type
Signal type	thermocouple
Resolution	0.1 °C per digit
Conversion time	2.5 s up to 20 ms, see documentation, default: approx. 250 ms
Number of inputs	4
	  35 g The EP3314/ER3314 with analog inputs permits four thermocouples to be connected directly. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. The EP3314/ER3314 can also be used for mV measurement.
Measuring error	< ±0.3 % for type K (relative to full scale value), further types see documentation
Distributed clocks	–
Sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Measuring range	depending on sensor type; preset value is type K, -100…+1370 °C
Current consumption from U_S	120 mA
Special features	open-circuit recognition
Operating temperature	-25…+60 °C
Approvals	EP3314: CE, UL, Ex; ER3314: CE, UL
Further information	EP3314 ER3314

XFC analog input | **Load cell analysis**

The EP3356 EtherCAT Box enables direct connection of a resistor bridge or load cell in a 4-wire connection technology. The ratio between the bridge voltage U_D and the supply voltage U_{REF} is determined simultaneously in the input circuit and the final load value is calculated as a process value on the basis of the settings in the EP3356. With automatic self-calibration (can be deactivated), dynamic filters and distributed clock support, the EP3356 with measuring cycles of 100 µs can be used for fast and precise monitoring of torque or vibration sensors.

All four M12 sockets are connected, so that parallel operation of several strain gauges is possible.

For further information on XFC see page 298

XFC	1-channel precise load cell analysis (resistor bridge), 24 bit
Industrial housing	**EP3356-0022**
Connection technology	M12, screw type
Signal type	resistor bridge, strain gauge
Resolution	24 bit, 32 bit presentation
Conversion time	0.1…250 ms, configurable, max. 10,000 samples/s
Number of inputs	2, for 1 resistor bridge in full bridge technology
	 
Measuring error	< ±0.01 % for the calculated load value in relation to the final load value with a 12 V feed and 24 mV bridge voltage (hence nominal strain gauge characteristic value of 2 mV/V), self-calibration active, 50 Hz filter active
Distributed clocks	yes
Sensor types	–
Measuring range	U_D: max. -25…+25 mV rated voltage U_{REF}: max. -12…+12 V rated voltage
Internal resistance	> 200 kΩ (U_{REF}), > 1 MΩ (U_D)
Sensor supply	10 V (supplied by the EP3356)
Current consumption from U_S	120 mA
Special features	self-calibration, quadruple averager, dynamic filters, fast data sampling, parallel connection
Operating temperature	-25…+60 °C
Approvals	CE, UL
Further information	EP3356

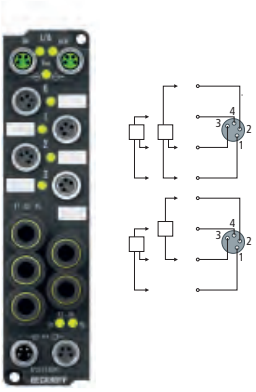
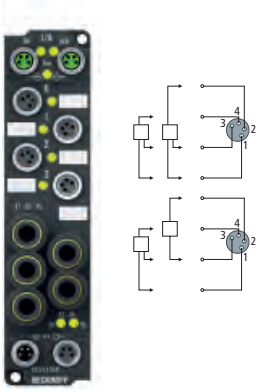
We reserve the right to make technical changes.

Analog input | **Pressure measuring**

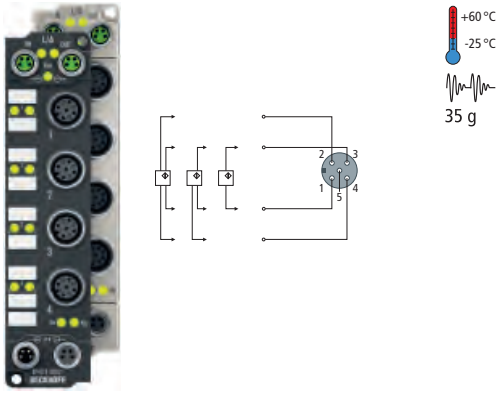
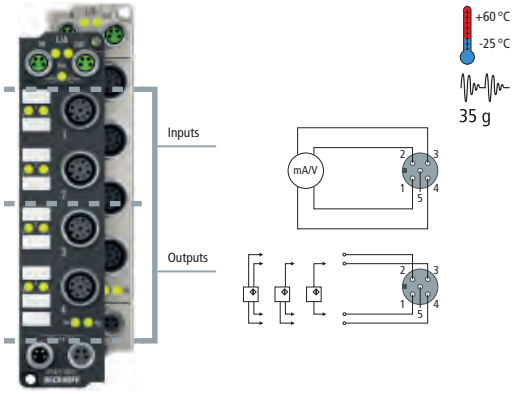
The EP3744 EtherCAT Box, equipped with six digital inputs, two digital outputs and four pressure inputs, acquires these signals and transmits them – electrically isolated – to the controller. The signal status is indicated by LEDs; the digital signals are connected via 4-pin M8 plug connectors.

The pressure is measured as the differential pressure to the fifth connection by an integrated 6 mm fitting. The pressure values are available as 16-bit values. Measurement can be made between -1 to +1 bar (EP3744-0041) or -7 to +7 bar (EP3744-1041), with the value being output in relation to the fifth connection, e.g. for vacuum measurement in relation to the ambient pressure at suction grippers.

In absolute-pressure mode it is possible to measure pressures between 0 to 1 bar (EP3744-0041) or 0 to 7 bar (EP3744-1041).

	Pressure measuring box, 6 digital inputs 24 V DC, 2 digital outputs 24 V DC, 0.5 A, 4 pressure inputs 0…1 bar/-1…1 bar	Pressure measuring box, 6 digital inputs 24 V DC, 2 digital outputs 24 V DC, 0.5 A, 4 pressure inputs 0…7 bar/-7…7 bar
Industrial housing	**EP3744-0041**	**EP3744-1041**
Connection technology	digital signals: 4-pin M8; pressure measurement: 6 mm fitting	digital signals: 4-pin M8; pressure measurement: 6 mm fitting
Signal type	air pressure	air pressure
Conversion time	~ 3.5 ms	~ 3.5 ms
Number of inputs	6 dig. and 4 pressure inputs, 2 dig. outputs	6 dig. and 4 pressure inputs, 2 dig. outputs
		
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Measuring range	0…1 bar (0…15 psi)/ -1…1 bar (-15…15 psi)	0…7 bar (0…100 psi)/ -7…7 bar (-100…100 psi)
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	120 mA	120 mA
Special features	direct pressure measuring at the machine	direct pressure measuring at the machine
Operating temperature	-20…+60 °C	-20…+60 °C
Approvals	CE, UL	CE, UL
Further information	EP3744	EP3744-1041

Analog output | -10…+10 V, 0/4…20 mA

	4-channel analog output, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit	2-channel analog input + 2-channel analog output, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit
Industrial housing Zinc die-cast housing	**EP4174-0002 ER4174-0002**	**EP4374-0002 ER4374-0002**
Connection technology	M12, screw type	M12, screw type
Signal type	-10/0…+10 V | 0/4…20 mA	-10/0…+10 V | 0/4…20 mA
Resolution	16 bit	16 bit
Conversion time	~ 40 µs	input: ~ 100 µs, output: ~ 40 µs
Number of outputs	4	2
Number of inputs	–	2
		
	The EP4174/ER4174 EtherCAT Box has four analog outputs which can be individually parameterised, so that they generate signals either in the -10/0 to +10 V or the 0/4 to 20 mA range. The voltage or output current is supplied to the process level with a resolution of 15 bit (default), and is electrically isolated. The output scaling can be changed if required. Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are supplied from the load voltage (freely selectable up to 30 V DC). The applied load voltage is available for actuator supply of further EtherCAT Box modules.	The EP4374/ER4374 EtherCAT Box combines two analog inputs and two analog outputs which can be individually parameterised, so that they process/generate signals either in the -10/0 to +10 V or the 0/4 to 20 mA range. The resolution for the current and voltage signals is 16 bit (signed). The voltage or output current is supplied to the process level with a resolution of 15 bit (default), and is electrically isolated. Ground potential for the two output channels is common with the 24 V DC supply.
Measuring accuracy	< 0.1 % (relative to full scale value)	input: < 0.3 %, output: < 0.1 % (each relative to full scale value)
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	yes	yes
Load	> 5 kΩ | < 500 Ω	output: > 5 kΩ | < 500 Ω
Current consumption from U_S	120 mA	120 mA
Special features	current or voltage parameterisable per channel	combi module, current or voltage parameterisable per channel
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	EP4174: CE, UL, Ex; ER4174: CE, UL	EP4374: CE, UL, Ex; ER4374: CE, UL
Further information	EP4174 ER4174	EP4374 ER4374

We reserve the right to make technical changes.

Position measurement | **SSI encoder interface**

The EP5001 EtherCAT Box is an interface for the direct connection of SSI encoders with differential inputs (RS485).The interface circuit generates a pulse for reading the encoder and makes the incoming data stream available to the controller as a data word in the process image. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register. The encoder is connected via an 8-pin M12 socket.

	SSI encoder interface
Industrial housing	**EP5001-0002**
Connection technology	M12, screw type
Nominal voltage	24 V DC (-15 %/+20 %)
Number of channels	1
Signal type	differential (RS422)
	1 | GND 2 | Sensor supply 3 | Clock+ 4 | Clock- 5 | Data+ 6 | Data- 7 | Set 8 | Direction
Data transfer rates	variable up to 1 MHz, 250 kHz default
Distributed clocks	yes
Current consumption from U_S	typ. 130 mA + sensor supply
Electrical isolation	500 V
Special features	adjustable baud rate, coding and data length
Operating temperature	0…+55 °C (-25…+60 °C in preparation)
Approvals	CE
Further information	EP5001

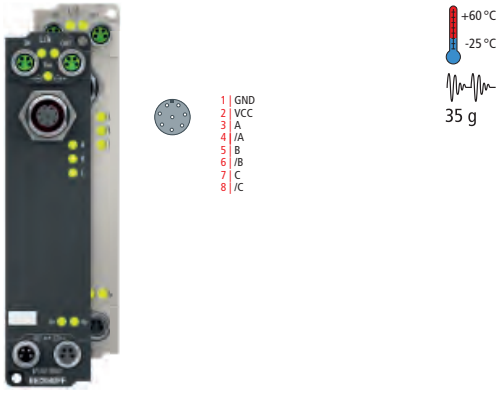
We reserve the right to make technical changes.

Position measurement | **Incremental encoder interfaces**

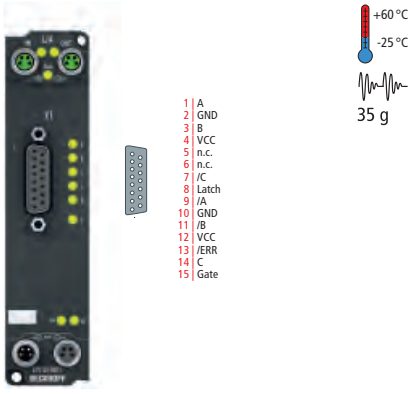
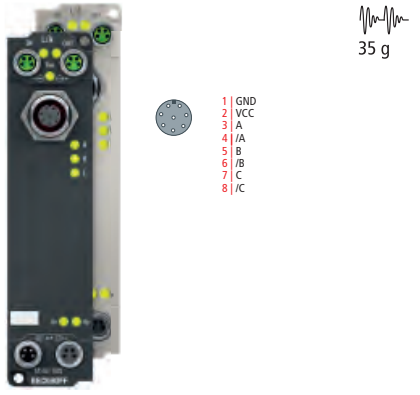
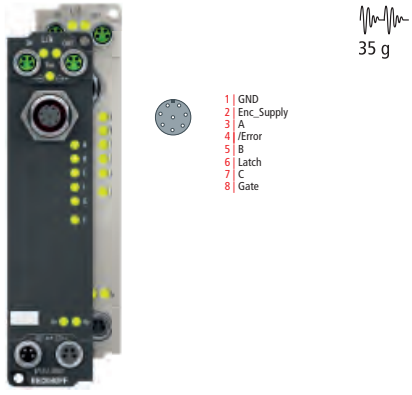
The EP51x1/ER51x1 EtherCAT Box is an interface for the direct connection of incremental encoders with differential inputs (RS485) (EP5101/ER5101) or 24 V DC inputs (EP5151/ER5151). A 32/16 bit counter with a quadrature decoder and a 32/16 bit latch for the zero pulse can be read, set or enabled. Incremental encoders with alarm outputs can be connected at the EP5101/ER5101's status input. Interval measurement with a resolution of up to 100 ns is possible for EP5101/ER5101 and EP5151/ER5151. The gate input allows the counter to be halted. The counter state is taken over with a rising edge at the latch input (EP5101-0011). The EP5101-1002/ER5101-1002 offers a 24 V DC sensor supply.

Due to the optional interpolating micro-increment function, the EP5101 can supply even more precise axis positions for dynamic axes. In addition, it supports the synchronous reading of the encoder value together with other input data in the EtherCAT system via high-precision EtherCAT distributed clocks (DC).

The encoder is connected via an 8-pin M12 socket (EP5101-0002, EP5151-0002) or via a 15-pin D-sub socket (EP5101-0011). In the M12 version not all signals are available.

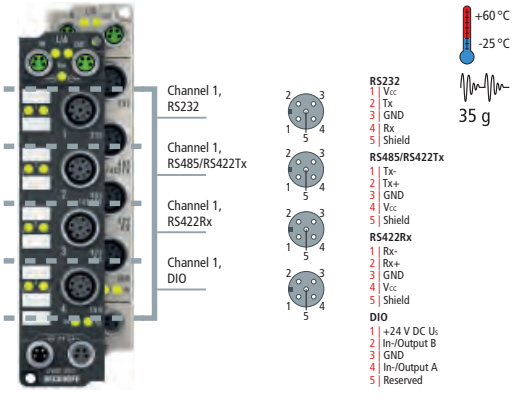
	Incremental encoder interface, M12, 8-pin
Industrial housing **Zinc die-cast housing**	**EP5101-0002** **ER5101-0002**
Connection technology	M12, 8-pin
Nominal voltage	24 V DC (-15 %/+20 %)
Number of channels	1
	
Encoder operating voltage	5 V DC
Counter	32 or 16 bit, binary
Limit frequency	4 million increments/s (with 4-fold evaluation)
Quadrature decoder	4-fold evaluation
Zero-pulse latch	16/32 bit
Commands	read, set, enable
Distributed clocks	yes
Sensor supply	+5 V DC, 150 mA (V_{CC})
Current consumption from U_S	typ. 130 mA + sensor supply
Electrical isolation	500 V
Operating temperature	-25…+60 °C
Approvals	EP5101: CE, UL, Ex; ER5101: CE, UL
Further information	EP5101 ER5101

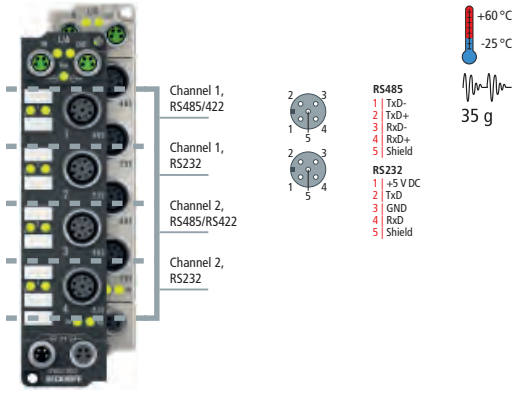
We reserve the right to make technical changes.

	Incremental encoder interface, D-sub socket, 15-pin	Incremental encoder interface, M12, 8-pin, 24 V DC sensor supply	Incremental encoder interface, M12, 8-pin
	EP5101-0011	**EP5101-1002** **ER5101-1002**	**EP5151-0002** **ER5151-0002**
	D-sub socket, 15-pin	M12, 8-pin	M12, 8-pin
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	1	1	1
			
	5 V DC	5 V DC	24 V DC
	32 or 16 bit, binary	32 or 16 bit, binary	32 or 16 bit, binary
	4 million increments/s (with 4-fold evaluation)	4 million increments/s (with 4-fold evaluation)	4 million increments/s (with 4-fold evaluation)
	4-fold evaluation	4-fold evaluation	4-fold evaluation
	16/32 bit	16/32 bit	16/32 bit
	read, set, enable	read, set, enable	read, set, enable
	yes	yes	yes
	+5 V DC, 150 mA (V_{CC})	24 V DC, 500 mA (V_{CC})	24 V DC/0.5 A, short-circuit-proof
	typ. 130 mA + sensor supply	typ. 130 mA + sensor supply	typ. 130 mA + sensor supply
	500 V	500 V	500 V
	-25…+60 °C	0…+55 °C (-25…+60 °C in preparation)	0…+55 °C (-25…+60 °C in preparation)
	CE, UL	CE, UL	CE, UL
	EP5101	EP5101 ER5101	EP5151 ER5151

Communication | **Serial interfaces RS232, RS422/RS485**

RS232 RS485	1-channel serial interface, RS232, RS422/RS485	2-channel serial interface, RS232, RS422/RS485
Industrial housing Zinc die-cast housing	**EP6001-0002 ER6001-0002**	**EP6002-0002 ER6002-0002**
Connection technology	M12, screw type	M12, screw type
Data transfer rates	300…115,200 baud; 9600 baud (8 bits, no parity, 1stop bit) is preset	300…115,200 baud; 9600 baud (8 bits, no parity, 1stop bit) is preset
Number of digital inputs/outputs	2, 24 V DC, 10 µs/0.5 A	–
Data transfer channels	1	2





The EP6001/ER6001 and EP6002/ER6002 serial interface modules allow the connection of devices with an RS232 or RS422/RS485 interface. The devices connected to the EP600x/ER600x communicate with the automation device via the coupler and the network. The modules transmit the data in a fully transparent manner to the higher-level automation device. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 864 byte receive buffer and a 128 byte send buffer are available. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

The 1-channel version EP6001/ER6001 has an increased end device power supply of up to 1 A, the connector assignment depends on the selected interface.The two integrated digital inputs/outputs allow the connection of additional sensors/actuators in order, for example, to trigger the reading process of the barcode reader or, depending on the result, to initiate an action. In the EP6002/ER6002 the connector assignment depends on the interface. For each channel, RS232 or RS422/RS485 can be selected.

In conjunction with the TwinCAT Virtual Serial COM Driver (see page 1041), the EP6001/ER6001 and EP6002/ER6002 can be used as normal Windows COM interfaces.

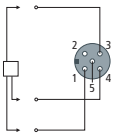
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	–
Bit distortion	< 3 %	< 3 %
Cable length	RS232: max. 15 m; RS422/RS485: approx. 1000 m	RS232: max. 15 m; RS422/RS485: approx. 1000 m
Data buffer	864 bytes receive buffer, 128 bytes transmit buffer	864 bytes receive buffer, 128 bytes transmit buffer
Sensor supply	+ 5 V DC, 1 A	+5 V DC, 20 mA each
Current consumption from U_s	typ. 130 mA + sensor supply	typ. 130 mA + sensor supply
Special features	easy integration of serial end devices	easy integration of serial end devices
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	EP6002: CE, UL, Ex; ER6002: CE, UL
Further information	EP6001 ER6001	EP6002 ER6002

We reserve the right to make technical changes.

Communication | IO-Link masters

IO-Link	4-channel input/output, IO-Link master module, Class A	4-channel input/output, IO-Link master module, Class B	8-channel input/output, IO-Link master module, Class A
Industrial housing	**EP6224-2022**	**EP6224-3022**	**EP6228-0022**
Connection technology	M12, screw type	M12, screw type	M12, screw type
Data transfer rates	4.8 kbaud, 38.4 kbaud and 230.4 kbaud	4.8 kbaud, 38.4 kbaud and 230.4 kbaud	4.8 kbaud, 38.4 kbaud and 230.4 kbaud
IO-Link interfaces	4	4	8

35 g

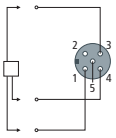


EP6224-2022
1 | 24 V DC
2 | n. c.
3 | GND
4 | C/Qx
5 | n. c.

EP6224-3022
1 | 24 V DC U_S
2 | 24 V DC U_P
3 | GND_S
4 | C/Qx
5 | GND_P

The EP6224 IO-Link module enables connection of up to four IO-Link devices, e.g. actuators, sensors or combinations of both. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the EtherCAT master. IO-Link is designed as an intelligent link between the fieldbus level and the sensor, wherein parameterisation information can be exchanged bidirectionally via the IO-Link connection. The parameterisation of the IO-Link devices with service data can be done from TwinCAT via ADS or very conveniently via the integrated IO-Link configuration tool.

The EP6224 accepts both IO-Link devices and standard 24 V DC sensors.



1 | 24 V DC
2 | n. c.
3 | GND
4 | C/Qx
5 | n. c.

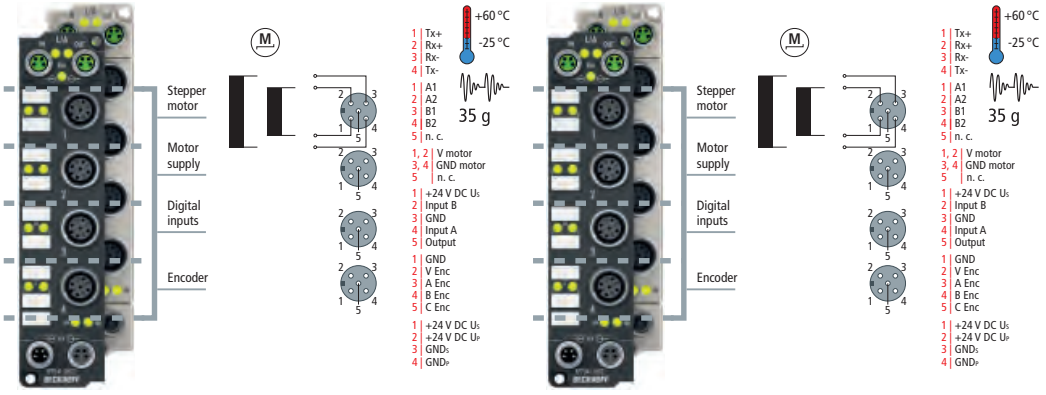
The EP6228 IO-Link module enables connection of up to eight IO-Link devices, e.g. IO-Link box modules, actuators, sensors or combinations thereof. A point-to-point connection is used between the module and the device. The terminal is parameterised via the EtherCAT master. IO-Link is designed as an intelligent link between the fieldbus level and the sensor, wherein parameterisation information can be exchanged bidirectionally via the IO-Link connection. The parameterisation of the IO-Link devices with service data can be done from TwinCAT via ADS or very conveniently via the integrated IO-Link configuration tool.

The EP6228 accepts both IO-Link devices and standard 24 V DC sensors.

Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	–	–
Specification version	IO-Link V1.1, Class A	IO-Link V1.1, Class B	IO-Link V1.1, Class A
Cable length	max. 20 m	max. 20 m	max. 20 m
Sensor supply	24 V DC, 1.4 A, for all 4 ports, port Class A	24 V DC, 1.4 A, for all 4 ports, port Class B (4 A)	24 V DC, 0.5 A per port, total current 4 A, port Class A
Current consumption from U_S	typ. 130 mA + load	typ. 130 mA + load	typ. 130 mA + load
Operating temperature	0…+55 °C (-25…+60 °C in preparation)	0…+55 °C (-25…+60 °C in preparation)	0…+55 °C (-25…+60 °C in preparation)
Approvals	CE, UL	CE, UL	CE, UL in preparation
Further information	EP6224	EP6224	EP6228

Motion | Stepper motor modules

	Stepper motor module, 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output	Stepper motor module, 50 V DC, 1.5 A, with incremental encoder, 2 digital inputs, 1 digital output
Industrial housing **Zinc die-cast housing**	**EP7041-0002** **ER7041-0002**	**EP7041-1002** **ER7041-1002**
Connection method	screw type M12	screw type M12
Load type	uni- or bipolar stepper motors	uni- or bipolar stepper motors
Number of outputs	1 stepper motor, 1 digital 24 V DC output	1 stepper motor, 1 digital 24 V DC output
Number of inputs	2 digital inputs, encoder system (24 V DC encoder)	2 digital inputs, encoder system (24 V DC encoder)



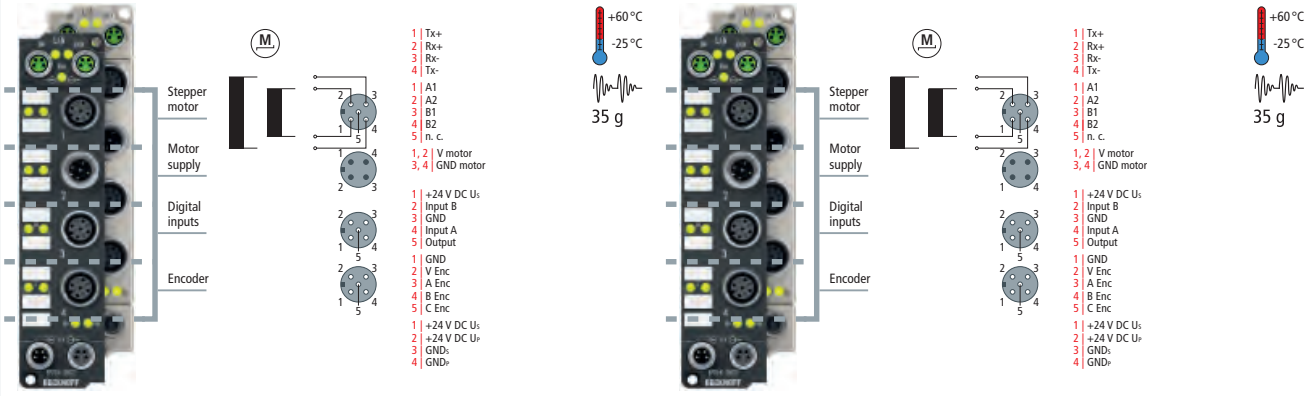
The EP7041-0002/ER7041-0002 and EP7041-1002/ER7041-1002 EtherCAT Box modules are intended for the direct connection of different stepper motors. The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range. The EP7041/ER7041 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. Connection of an incremental encoder enables a simple servo axis to be realised. Two digital inputs and a digital 0.5 A output enable connection of end switches and a motor brake.

Nominal voltage	8…50 V DC	8…50 V DC
Distributed clocks	yes	yes
Protocol	EtherCAT	EtherCAT
Output current	2 x 3.5 A, 2 x 5 A peak current (overload- and short-circuit-proof)	2 x 1 A, 2 x 1.5 A peak current (overload- and short-circuit-proof)
Maximum step frequency	1000, 2000, 4000 or 8000 full steps/s (configurable)	1000, 2000, 4000 or 8000 full steps/s (configurable)
Step pattern	64-fold micro stepping	64-fold micro stepping
Current controller frequ.	approx. 30 kHz	approx. 30 kHz
Resolution	approx. 5000 positions (per revolution, depending on motor and encoder type)	approx. 5000 positions (per revolution)
Encoder signal	5…24 V DC, 5 mA, single-ended	5…24 V DC, 5 mA, single-ended
Pulse frequency	max. 400,000 increments/s (with 4-fold evaluation)	max. 400,000 increments/s (with 4-fold evaluation)
Current consumption from U_s	120 mA	120 mA
Special features	travel distance control, encoder input	travel distance control, encoder input
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	EP7041: CE, Ex; ER7041: CE	EP7041: CE, Ex; ER7041: CE
Further information	EP7041-0002 ER7041-0002	EP7041-1002 ER7041-1002

Compact Drive Technology see page 926

We reserve the right to make technical changes.

	Stepper motor module, 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output, motor connection via plug	Stepper motor module, 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output, motor connection via plug, for high-speed applications
	EP7041-2002 **ER7041-2002**	**EP7041-3002** **ER7041-3002**
	screw type M12	screw type M12
	uni- or bipolar stepper motors	uni- or bipolar stepper motors
	1 stepper motor, 1 digital 24 V DC output	1 stepper motor, 1 digital 24 V DC output
	2 digital inputs, encoder system (24 V DC encoder)	2 digital inputs, encoder system (24 V DC encoder)



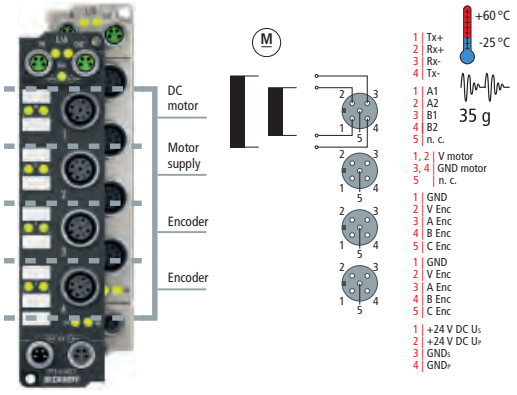
The EP7041-2002/ER7041-2002, EP7041-3002/ER7041-3002 and EP7041-3102 EtherCAT Box modules are intended for the direct connection of different stepper motors. The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range. The EP7041/ER7041 can be adjusted to the motor and the application by changing just a few parameters. 64-fold micro-stepping ensures particularly quiet and precise motor operation. Connection of an incremental encoder enables a simple servo axis to be realised. Two digital inputs and a digital 0.5 A output enable connection of end switches and a motor brake. The external motor is fed via an integrated plug.

	8…50 V DC	8…50 V DC	
	yes	yes	
	EtherCAT	EtherCAT	
	2 x 3.5 A, 2 x 5 A peak current (overload- and short-circuit-proof)	2 x 3.5 A, 2 x 5 A peak current (overload- and short-circuit-proof)	
	1000, 2000, 4000 or 8000 full steps/s (configurable)	1000, 2000, 4000 or 8000 full steps/s (configurable)	
	64-fold micro stepping	256-fold micro stepping	
	approx. 30 kHz	dynamic	
	approx. 5000 positions (per revolution, depending on motor and encoder type)	approx. 5000 positions (per revolution, depending on motor and encoder type)	
	5…24 V DC, 5 mA, single-ended	5…24 V DC, 5 mA, single-ended	5 V DC, integrated 5 V DC supply
	max. 400,000 increments/s (with 4-fold evaluation)	max. 400,000 increments/s (with 4-fold evaluation)	
	120 mA	120 mA	
	travel distance control, encoder input, motor supply via plug	for high-speed applications, travel distance control, encoder input, load indication, motor supply via plug	
	-25…+60 °C	-25…+60 °C	
	EP7041: CE, Ex; ER7041: CE	EP7041: CE, Ex; ER7041: CE	
	EP7041-2002 ER7041-2002	EP7041-3002 ER7041-3002	EP7041-3102

Motion | DC motor output stage

DC motors can replace the considerably more expensive servomotors in many applications if they are operated with an intelligent controller. A DC motor can be integrated very simply into the control system using the EP7342/ER7342 EtherCAT Box. All parameters are adjustable via the fieldbus. The small, compact design and the possibility to fit the modules directly to machines makes the EtherCAT DC motor output stage suitable for a wide range of applications. The output stage is protected against overload and short circuit and offers an integrated feedback system for incremental encoders. Two DC motors can be controlled by one module.

	2-channel DC motor output stage, 50 V DC, 3.5 A
Industrial housing **Zinc die-cast housing**	**EP7342-0002** **ER7342-0002**
Connection method	screw type M12
Load type	DC brush motors, inductive
Number of outputs	2



The EP7342/ER7342 EtherCAT Box enables direct operation of two DC motors. The speed or position is specified by the automation device via a 16 bit value. By connection of an incremental encoder, a simple servo axis can be realised. The output stage is protected against overload and short-circuit.

Nominal voltage	8…50 V DC
Distributed clocks	yes
Protocol	EtherCAT
Output current	per channel max. 3.5 A (short-circuit-proof, common thermal overload warning for both output stages)
PWM clock frequency	32 kHz with 180° phase shift each
Duty factor	0…100 % (voltage-controlled)
Resolution	max. 10 bits current, 16 bits speed
Current consumption from U_s	120 mA
Special features	travel distance control, encoder input
Operating temperature	-25…+60 °C
Approvals	EP7342: CE, Ex; ER7342: CE
Further information	EP7342 ER7342

We reserve the right to make technical changes.

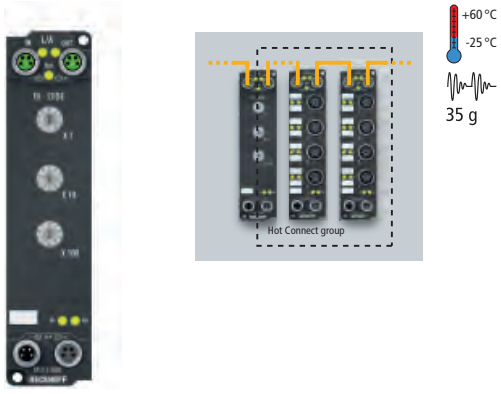
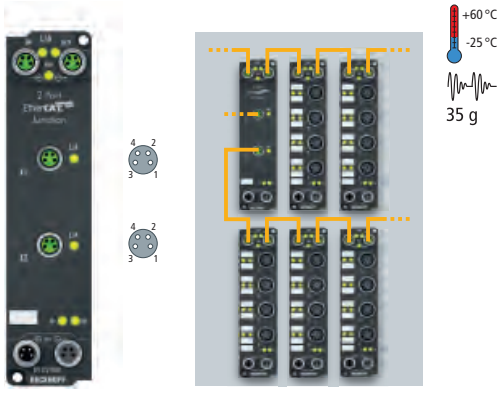
Special functions | **Multi-functional I/O box**

The EP8309-1022/ER8309-1022 EtherCAT Box has various digital and analog inputs and outputs: eight digital inputs/outputs, two digital tacho inputs, two analog inputs, one analog output and a 1.2 A PWMi output. The current signals have 12-bit resolution. The tacho outputs supply a speed-dependent velocity or frequency value via digital 24 V sensors. Proportional valves, for example, can be actuated directly using the PWMi output, while intelligent valves are switched by the analog output. With its combination of inputs and outputs, the EP8309-1022/ER8309-1022 offers a compact solution for the most diverse units that can be controlled over EtherCAT.

	Multi-functional I/O box, 8 digital inputs/outputs, 2 digital tacho inputs, 2 analog inputs, 1 analog output, 1 PWMi output
Industrial housing **Zinc die-cast housing**	**EP8309-1022** **ER8309-1022**
Signal connection	M12, screw type
	Connector assignment see documentation +60 °C -25 °C 35 g
Number of digital inputs/outputs	8, 24 V DC, 3 ms/0.5 A (6…13)
Number of special inputs	2 tacho inputs (4/5)
Number of analog inputs	2, single-ended, 12 bit, 0/4…20 mA (0/2)
Number of analog outputs	1, single-ended, 12 bit, 0/4…20 mA (15)
Number of PWMi outputs	1 x 1.2 A, max. 30 kHz (14)
Nominal voltage	24 V DC (-15 %/+20 %)
Measuring error	input: < 0.3 %, output: < 0.1 % (each relative to full scale value)
Limit frequency	2.5 kHz
Sensor supply	from control voltage U_S
Actuator supply	from the auxiliary voltage U_P
Special features	multi-functional I/O box for universal use
Operating temperature	-25…+60 °C
Approvals	CE, UL
Further information	EP8309 ER8309

We reserve the right to make technical changes.

System | EtherCAT Box with ID switch, EtherCAT junction

	EtherCAT Box with ID switch	2-port EtherCAT junction, Hot Connect
Industrial housing	**EP1111-0000**	**EP1122-0001**
Task within EtherCAT system	identification of any EtherCAT group in the EtherCAT network	coupling of EtherCAT junctions
Data transfer rates	100 Mbaud	100 Mbaud
Protocol	EtherCAT	EtherCAT
		
	The EP1111 has three decimal ID switches, with which a group of EtherCAT components can be assigned an ID. This group can be present in any position in the EtherCAT network, as a result of which variable topologies and Hot Connect groups can be realised in a simple manner. The EtherCAT connection is established via shielded M8 screw connectors with direct display of link and activity status.	The 2-port EtherCAT junction enables configuration of EtherCAT star topologies. A modular EtherCAT star can be realised by using several EP1122 units in a station. Individual devices or complete EtherCAT strands can be connected at the junction ports. The EtherCAT junctions are connected via shielded M8 screw connectors with direct display of link and activity status. Through TwinCAT and other suitable EtherCAT masters the EP1122 also supports coupling and uncoupling of EtherCAT strands during operation (Hot Connect).
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	–
Bus interface	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
Number of EtherCAT ports	–	2
Number of configurable IDs	999	–
Data transfer medium	EtherCAT cable	EtherCAT cable
Distance between stations	100 m (100BASE-TX)	100 m (100BASE-TX)
Current consumption from U_S	typ. 120 mA	typ. 120 mA
Sensor supply	–	–
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL, Ex
Further information	EP1111	EP1122

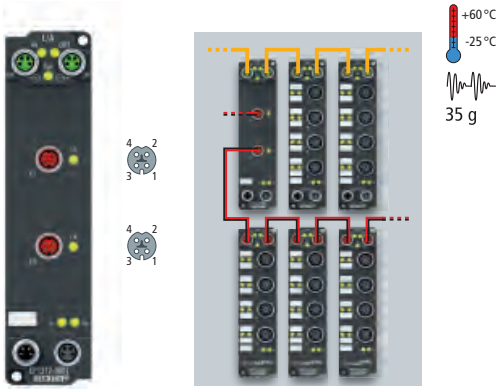
EP9128-0021 EtherCAT junction in IP 67 with Hot Connect see page 798

We reserve the right to make technical changes.

System | **EtherCAT P junction**

The 2-port EtherCAT P junction enables configuration of EtherCAT P topologies from an EtherCAT system. A modular EtherCAT P star can be realised by using several EP1312 in series. Individual devices or complete EtherCAT P strands can be connected at the junction ports. The EtherCAT P junctions are connected via shielded, screw type EtherCAT-P-coded M8 connectors with direct display of link and activity status. The Run LED indicates the status of the EP1312.

	2-port EtherCAT P junction
Industrial housing	**EP1312-0001**
Task within EtherCAT system	coupling of EtherCAT P junctions
Data transfer rates	100 Mbaud



Nominal voltage	24 V DC (-15 %/+20 %)
Distributed clocks	–
Bus interface	2 x M8 socket, shielded, screw type, 2 x EtherCAT-P-coded M8 socket, screw type
Number of EtherCAT ports	2 x EtherCAT, 2 x EtherCAT P
Total current	feed-in max. 3 A per U_S and U_P
Current consumption from U_S	typ. 120 mA
Distance between stations	100 m (100BASE-TX)
Current rating per port	max. 3 A per U_S and U_P
Operating temperature	-25…+60 °C
Approvals	CE
Further information	EP1312

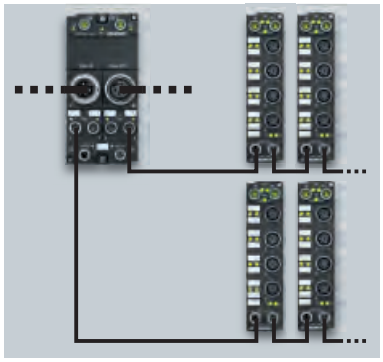
System | Power distribution for EtherCAT Box modules

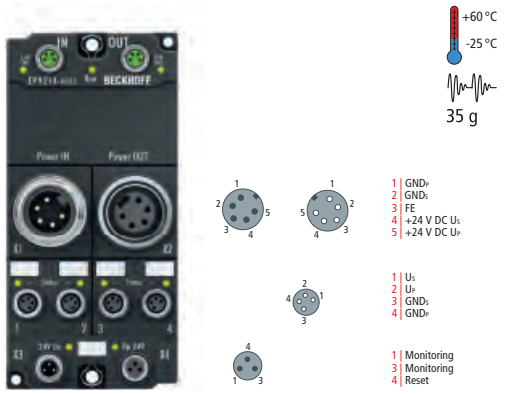
The EP9214-0023 and EP9224-0023 EtherCAT Box modules enable connection of four EtherCAT Box power supply branches. In each 24 V branch the current consumption for the control voltage U_S and the peripheral voltage U_P is monitored, limited, and, if necessary, switched off.

The power distribution is supplied via a 7/8" connector with up to 16 A (per voltage supply U_S/U_P). Several modules can be configured in a cascade arrangement. In the event of a short-circuit in one of the four (eight) outputs, the affected output is switched off. The supply for the other branches remains active. The switch-off and control is done in such a way that the input voltage does not fall below 21 V. During startup consumers with large capacities can be added without problem.

The master can read diagnostic messages from the individual channels via the EtherCAT interface. Independent switching of individual consumer branches is also possible via the EtherCAT master.

With the EP9224-0023 the input voltage and current values of all outputs can be evaluated via the process data. A continuous data log of the relevant data can be retrieved when an error occurs in order to localise the cause of the error.



	4/4-channel power distribution for EtherCAT Box modules	4/4-channel power distribution for EtherCAT Box modules with current measurement/data logging
Industrial housing	**EP9214-0023**	**EP9224-0023**
Number of outputs	4 x M8, 4-pin (per U_S/U_P)	4 x M8, 4-pin (per U_S/U_P)
Connection method	M8, 4-pin	M8, 4-pin
Max. output current	per M8: 4 A per U_S and U_P	per M8: 4 A per U_S and U_P
Load type	EtherCAT Box modules	EtherCAT Box modules
		
Protocol	EtherCAT	EtherCAT
Infeed	plug 7/8", max. 16 A per U_S/U_P	plug 7/8", max. 16 A per U_S/U_P
Power feed through	socket 7/8", max. 16 A per U_S/U_P	socket 7/8", max. 16 A per U_S/U_P
Signalling contact	potential-free make contact, M8	potential-free make contact, M8
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	–
Bus interface	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
Electrical isolation	500 V	500 V
Data logging	–	recording of relevant data in case of failure
Special features	energy-efficient switching on and off of EtherCAT devices	input voltages/currents, output currents via process data
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EP9214	EP9224

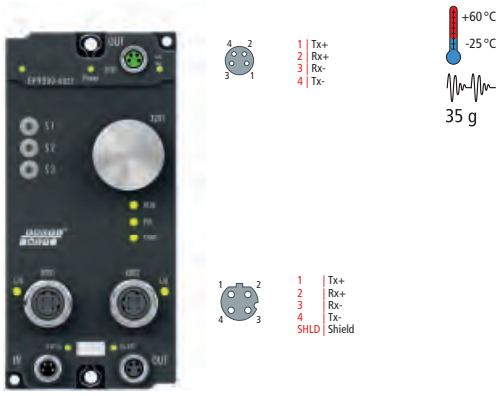
Accessories see page 814

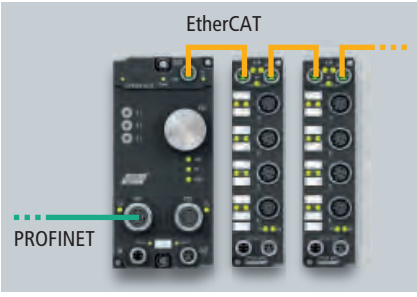
We reserve the right to make technical changes.

System | PROFINET RT EtherCAT Box

The EP9300-0022 EtherCAT Box connects PROFINET RT networks to the EtherCAT Box modules (EPxxxx, EQxxxx and ERxxxx) and converts the telegrams from PROFINET RT to EtherCAT. One station consists of an EP9300-0022 and any number of EtherCAT Box modules. The box is connected to PROFINET RT via a D-coded M12 socket. With EtherCAT, the PROFINET RT box can use the powerful and ultra-fast I/O system with its large selection of EtherCAT Box modules. The EP9300-0022 supports the PROFINET RT profile and seamlessly fits into PROFINET RT networks.

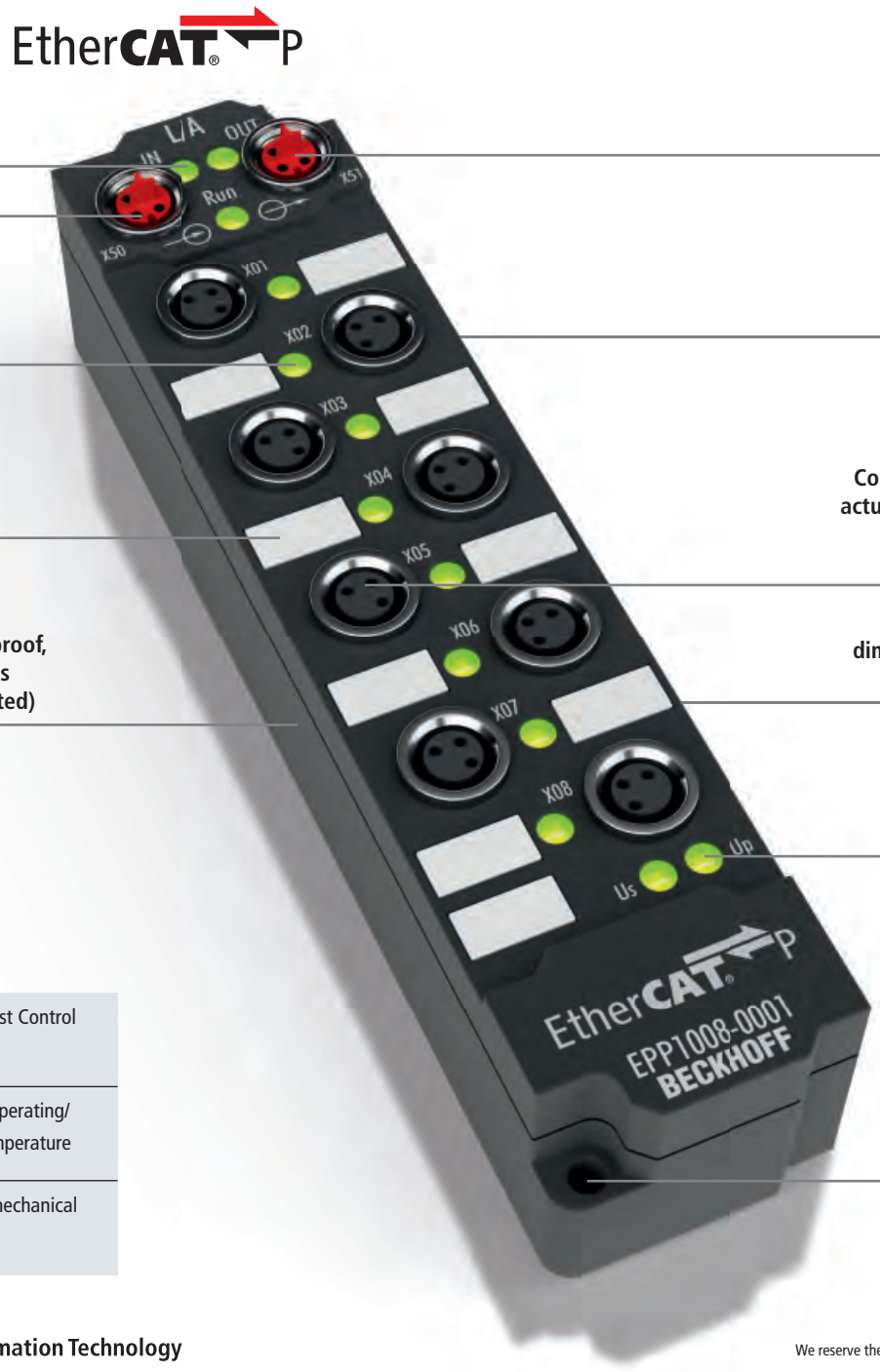
	PROFINET RT EtherCAT Box
Industrial housing	**EP9300-0022**
Task within EtherCAT system	coupling of standard digital and analog EtherCAT Box modules to PROFINET RT networks
Number of EtherCAT Box modules	depending on the process data size
Protocol	PROFINET RT
Data transfer rates	10/100 Mbaud
Nominal voltage	24 V DC (-15 %/+20 %)
Bus interface	2 x M12 socket, D-coded (switched)
Type/number of peripheral signals	depending on the process data size
Configuration	automatic
Power supply	24 V DC (-15 %/+20 %)
Electrical isolation	500 V
Special features	potted, shock- and vibration-resistant
Operating temperature	-25…+60 °C
Approvals	CE, UL
Further information	EP9300





EPPxxxx | EtherCAT P Box (industrial housing)

▶ **EPPxxxx**



Signal status

EtherCAT P input

Signal status display

Standard labels

Watertight and dust-proof, due to protection class IP 65/66/67 (fully potted)

EtherCAT P output

Robust housing for industrial application

Connection of sensors/ actuators via connector:
– M8, screw type
– M12, screw type

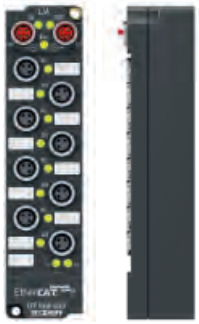
Ultra compact dimensions (H x W x D) 126 x 30 x 26.5 mm

Power supply status display: box supply and auxiliary voltage

Mounting holes

XFC	eXtreme Fast Control Technology
+60 °C -25 °C	Extended operating/ storage temperature
35 g	Extended mechanical load

We reserve the right to make technical changes.



8 x M8, 4 x M12
(126 x 30 x 26.5 mm)

16 x M8, 8 x M12
(126 x 60 x 26.5 mm)

I/O connections

Ground contact

Connector M8,
screw type, 3-pin

Connector M12,
screw type, 5-pin

EtherCAT P combines communication and power in a single 4-wire standard Ethernet cable. The 24 V DC supply of the EtherCAT P slaves and of the connected sensors and actuators is integrated: U_S (system and sensor supply) and U_P (peripheral voltage for actuators) are electrically isolated from each other and can each supply a current of up to 3 A to the connected components.

The EPPxxxx EtherCAT P modules in protection class IP 67 cover the typical range of requirements for I/O signals: digital inputs (3.0 ms or 10 µs filter), digital outputs with 0.5 A output current, combination modules with digital inputs and outputs, analog inputs and outputs with 16-bit resolution, thermocouple and RTD inputs. The EPP13xx EtherCAT P junctions are available for flexible topology configuration. The current carrying capacity of 3 A per EtherCAT P segment already enables a wide range of sensors/actuators to be used. If a power supply boost is required, the EPP1332-0001 EtherCAT P junction can be used to feed in both U_S and U_P at any point. The EPP1342-0001 should be used for branches without voltage boost.

Further information on EtherCAT P see page 294

EPPxxxx-00yz

- 0 = no connectors
- 1 = connector M8, screw type, 3-pin
- 2 = connector M12, screw type, 5-pin
- 3 = special connectors
- 4 = connector M16, screw type, 19-pin
- 8 = D-sub, 25-pin
- 10 = 2 x D-sub, 9-pin
- 11 = D-sub, 15-pin

- 0 = width: 30 mm
- 2 = width: 60 mm
- 4 = pressure inputs
- 6 = height: 86 mm

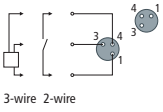
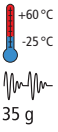
Signals see page 512

We reserve the right to make technical changes.

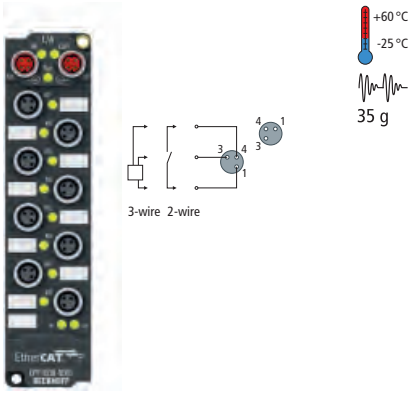
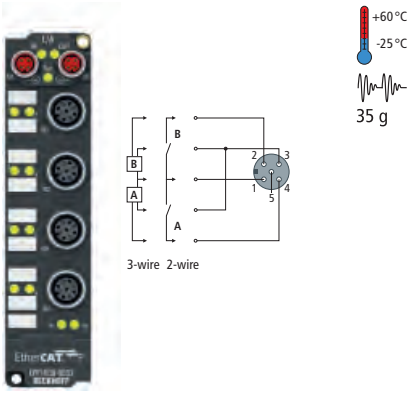
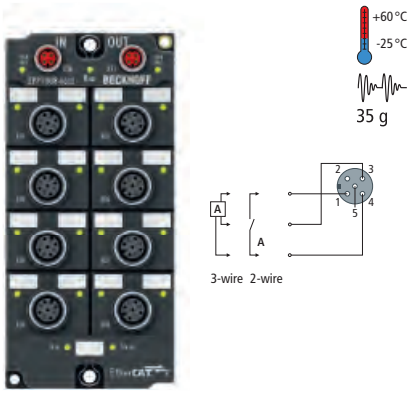
Digital input | 24 V DC

The digital inputs on a 24 V supply are among the most frequently used signals. The EN 61131-2 standard describes the input characteristic and differentiates between three types. Type 1 has a low input current with low power loss. This input is optimised for mechanical switches and actively switched electronic outputs. Type 2 has a significantly higher input current and is optimised for 2-wire sensors with high quiescent current consumption. When switched on, however, the current consumption of this input is high and the associated power loss is generally inacceptable. Type 3 is a mixture of type 1 with low current when switched on and a sufficiently high quiescent current for most modern 2-wire sensors. The type 3 input can be used in nearly all applications in place of type 1.

The input circuits differ in their filter function. The task of the filtering is to suppress electromagnetic interference. It is opposed by the disadvantage of signal delay. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and supplies a stable signal for simple PLC applications. Filter times of 10 µs are suitable for applications with the shortest possible reaction times and can only be used for mechanical switches to a limited extent.

	4-channel digital input, 24 V DC, M8, type 1/3, positive switching
Technical data	**EPP1004-0061**
Connection technology	M8, screw type
Specification	EN 61131-2, type 1/3
Input filter	3.0 ms
Number of inputs	4
	   3-wire 2-wire  +60 °C -25 °C 35 g
Nominal voltage	24 V DC (-15 %/+20 %)
Protocol	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type, EtherCAT-P-coded
Distributed clocks	–
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	typ. 100 mA
Electrical isolation	500 V
Special features	ultra-compact design
Operating temperature	-25…+60 °C
Approvals	CE, UL in preparation
Further information	EPP1004-0061

We reserve the right to make technical changes.

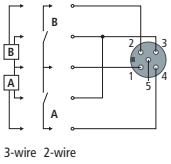
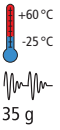
	8-channel digital input, 24 V DC, M8, type 1/3, positive switching		8-channel digital input, 24 V DC, M12, type 1/3, positive switching		8-channel digital input, 24 V DC, M12, type 1/3, positive switching
	EPP1008-0001	**EPP1018-0001**	**EPP1008-0002**	**EPP1018-0002**	**EPP1008-0022**
	M8, screw type		M12, screw type		M12, screw type
	EN 61131-2, type 1/3		EN 61131-2, type 1/3		EN 61131-2, type 1/3
	3.0 ms	10 µs	3.0 ms	10 µs	3.0 ms
	8		8		8
					
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
	EtherCAT		EtherCAT		EtherCAT
	2 x M8 socket, shielded, screw type, EtherCAT-P-coded		2 x M8 socket, shielded, screw type, EtherCAT-P-coded		2 x M8 socket, shielded, screw type, EtherCAT-P-coded
	–		–		–
	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof
	typ. 100 mA		typ. 100 mA		typ. 100 mA
	500 V		500 V		500 V
	–		–		1 input per M12 plug
	-25…+60 °C		-25…+60 °C		-25…+60 °C
	CE, UL in preparation		CE, UL in preparation		CE, UL in preparation
	EPP1008		EPP1008		EPP1008-0022

Digital input | 24 V DC, counter

Pulses often need to be captured in technical control applications. This can be done with fast inputs such as the EPP1018 and a central pulse counter. If the pulse length is the order of magnitude of the control cycle time or less, the controller cannot record these signals correctly any more. Pre-processing counter modules can then be used to count the number and direction of the pulses, which enables the controller to determine reliable values. The counter is adapted to the individual requirements, such as up/down counter or Gate/Latch-controlled, by fieldbus parameterisation. With a counting depth of 32 bit any overflow can be controlled reliably, even at high frequencies.

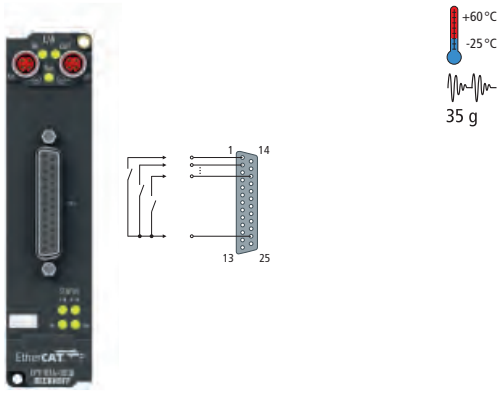
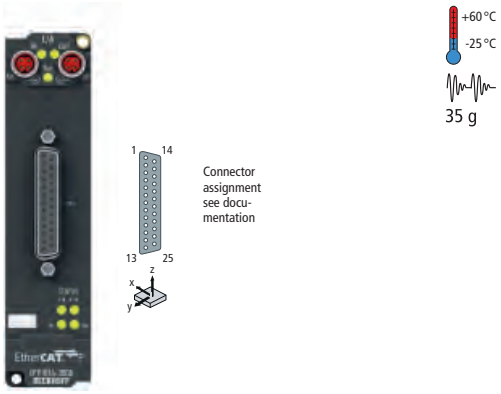
The multi-functional EPP1518 EtherCAT P Box supports the following operating modes:

– 1 x 32 bit up/down counter (the counting direction is specified via the input)
– 1 x 32 bit gated counter (the counter is enabled via the input)
– 2 x 32 bit forward counter (no direction detection)

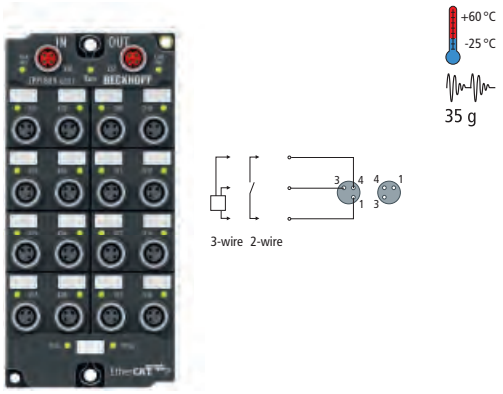
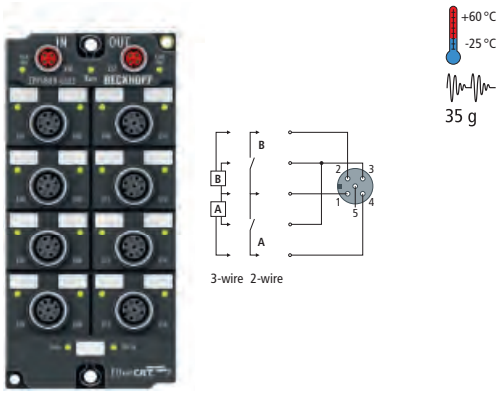
	2-channel up/down counter 24 V DC, 1 kHz, 32 bit, adjustable input filters 0…100 ms, M12
Technical data	**EPP1518-0002**
Connection technology	M12, screw type
Specification	EN 61131-2, type 1/3
Input filter	adjustable 0…100 ms
Number of inputs	8, 2 of which can be used as 32 bit up/down counters
	 3-wire 2-wire  35 g
Nominal voltage	24 V DC (-15 %/+20 %)
Counting frequency	max. 1 kHz
Protocol	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type, EtherCAT-P-coded
Distributed clocks	yes
Sensor supply	from control voltage, max. 0.5 A per 4 sensors, short-circuit-proof
Current consumption from U_S	typ. 100 mA
Electrical isolation	500 V
Special features	adjustable filters
Operating temperature	-25…+60 °C
Approvals	CE, UL in preparation
Further information	EPP1518

We reserve the right to make technical changes.

Digital input | 24 V DC, positive switching, D-sub

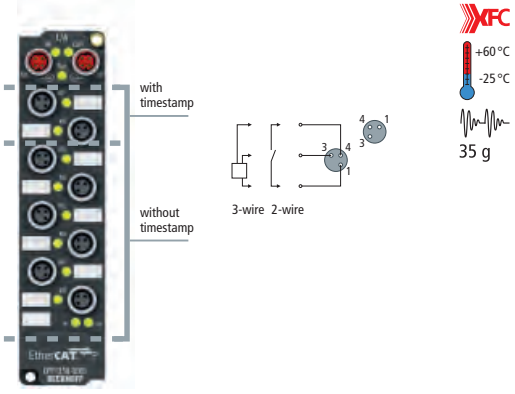
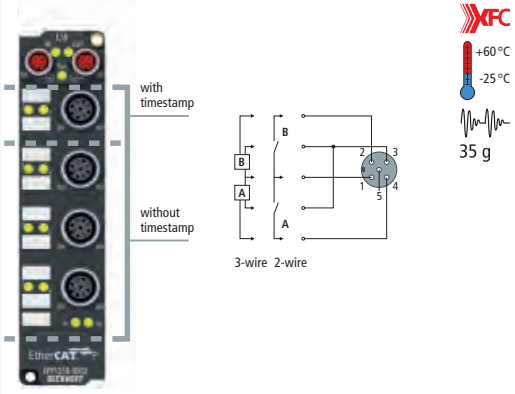
	16-channel digital input, 24 V DC, D-sub, type 1/3, positive switching	16-channel digital input, 24 V DC, D-sub, type 1/3, positive switching, 2 x 3-axis accelerometers
Technical data	**EPP1816-0008**	**EPP1816-3008**
Connection technology	D-sub socket, 25-pin	D-sub socket, 25-pin
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3
Input filter	10 µs	10 µs
Number of inputs	16	16
		 The EtherCAT P Box has 2 internal 3-axis accelerometers with 16 bit and a selectable resolution of ±2 g, ±4 g, ±8 g and ±16 g. Possible applications include the recording of vibrations and shocks/oscillations, and furthermore inclination measurements.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Bus interface	2 x M8 socket, shielded, screw type, EtherCAT-P-coded	2 x M8 socket, shielded, screw type, EtherCAT-P-coded
Distributed clocks	yes	yes
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Electrical isolation	500 V	500 V
Special features	compact design	integrated accelerometers
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP1816	EPP1816-3008

Digital input | 24 V DC, positive switching

	16-channel digital input, 24 V DC, M8, type 1/3		16-channel digital input, 24 V DC, M12, type 1/3	
Technical data	**EPP1809-0021**	**EPP1819-0021**	**EPP1809-0022**	**EPP1819-0022**
Connection technology	M8, screw type		M12, screw type	
Specification	EN 61131-2, type 1/3		EN 61131-2, type 1/3	
Input filter	3.0 ms	10 µs	3.0 ms	10 µs
Number of inputs	16		16	
				
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
Bus interface	2 x M8 socket, shielded, screw type, EtherCAT-P-coded		2 x M8 socket, shielded, screw type, EtherCAT-P-coded	
Distributed clocks	–		–	
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	
Current consumption from U_S	typ. 100 mA		typ. 100 mA	
Electrical isolation	500 V		500 V	
Operating temperature	-25…+60 °C		-25…+60 °C	
Approvals	CE, UL in preparation		CE, UL in preparation	
Further information	EPP1809		EPP1809	

We reserve the right to make technical changes.

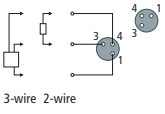
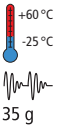
XFC digital input | **24 V DC, positive, fast inputs**

	8-channel digital input with 2-channel timestamp, 24 V DC, M8, type 1/3	8-channel digital input with 2-channel timestamp, 24 V DC, M12, type 1/3
Technical data	**EPP1258-0001**	**EPP1258-0002**
Connection technology	M8, screw type	M12, screw type
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3
Input filter	10 µs	10 µs
Number of inputs	8 (2 with timestamp)	8 (2 with timestamp)
		
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Bus interface	2 x M8 socket, shielded, screw type, EtherCAT-P-coded	2 x M8 socket, shielded, screw type, EtherCAT-P-coded
Resolution timestamp	1 ns (channel 0/1)	1 ns (channel 0/1)
Precision of timestamp	10 ns (+ input delay) (channel 0/1)	10 ns (+ input delay) (channel 0/1)
Distributed clocks	yes	yes
Distributed clock precision	< 100 ns (channel 0/1)	< 100 ns (channel 0/1)
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Electrical isolation	500 V	500 V
Special features	timestamp, latch last edge	timestamp, latch last edge
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP1258	EPP1258

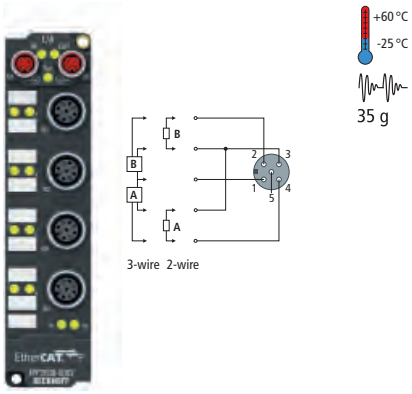
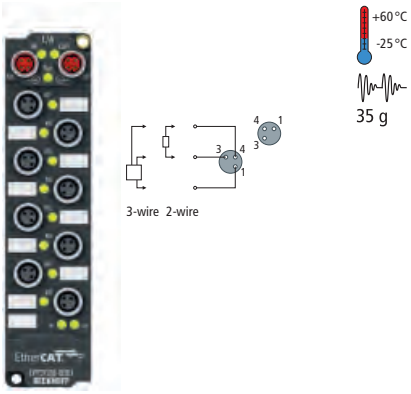
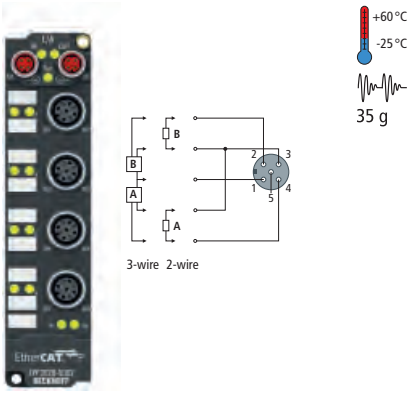
Digital output | 24 V DC

Many actuators are operated or actuated with 24 V DC. The EtherCAT P Box modules in the category "positive switching" switch all output channels to 24 V DC. Beyond that, the output circuit offers functions such as short circuit current limitation, short circuit power-off and the dissipation of inductive energy from the coil.

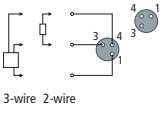
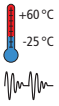
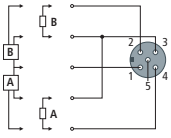
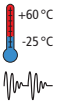
The most common output circuit supplies a max. continuous current of 0.5 A. Special EtherCAT P Box modules are available for higher currents. Any type of load (resistive, capacitive or inductive) can be connected to an output module.

	8-channel digital output, 24 V DC, M8, I_{MAX} = 0.5 A
Technical data	**EPP2008-0001**
Connection technology	M8, screw type
Load type	ohmic, inductive, lamp load
Max. output current	0.5 A (short-circuit-proof) per channel
Number of outputs	8
	 
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption from U_S	typ. 100 mA
Distributed clocks	–
Short circuit current	typ. 1.5 A
Auxiliary power current	typ. 20 mA + load
Electrical isolation	500 V
Special features	–
Operating temperature	-25…+60 °C
Approvals	CE, UL in preparation
Further information	EPP2008

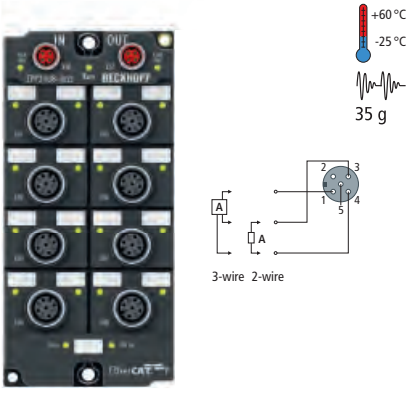
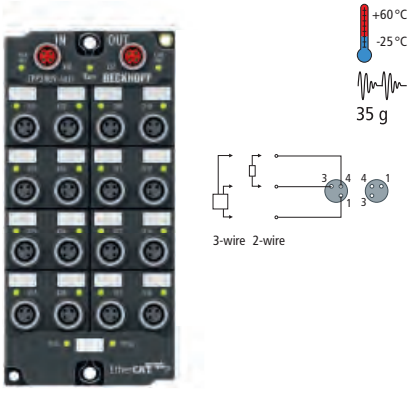
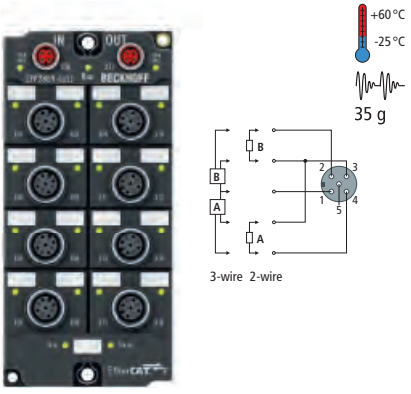
We reserve the right to make technical changes.

	8-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A	8-channel digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 3 A)	8-channel digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 3 A)
	EPP2008-0002	**EPP2028-0001**	**EPP2028-0002**
	M12, screw type	M8, screw type	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	0.5 A (short-circuit-proof) per channel	2 A per channel, individually short-circuit-proof, total current max. 3 A	2 A per channel, individually short-circuit-proof, total current max. 3 A
	8	8	8
			
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 100 mA	typ. 100 mA	typ. 100 mA
	–	–	–
	typ. 1.5 A	max. 7 A	max. 7 A
	typ. 20 mA + load	typ. 20 mA + load	typ. 20 mA + load
	500 V	500 V	500 V
	–	load current up to 2 A	load current up to 2 A
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL in preparation	CE, UL in preparation	CE, UL in preparation
	EPP2008	EPP2028	EPP2028

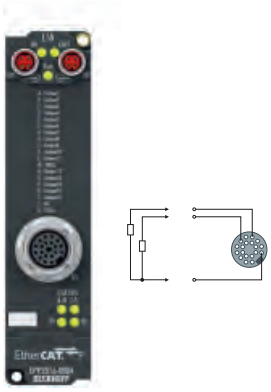
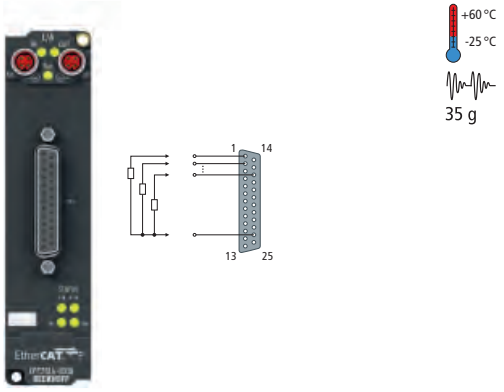
Digital output | 24 V DC

	8-channel digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 3 A), with diagnostics	8-channel digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 3 A), with diagnostics
Technical data	**EPP2038-0001**	**EPP2038-0002**
Connection technology	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	2 A per channel, individually short-circuit-proof, total current max. 3 A	2 A per channel, individually short-circuit-proof, total current max. 3 A
Number of outputs	8	8
	 3-wire 2-wire  35 g	 3-wire 2-wire  35 g
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Distributed clocks	–	–
Short circuit current	max. 7 A	max. 7 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Electrical isolation	500 V	500 V
Special features	load current up to 2 A	load current up to 2 A
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Protection class	IP 65/66/67 (according to EN 60529)	IP 65/66/67 (according to EN 60529)
Further information	EPP2038	EPP2038

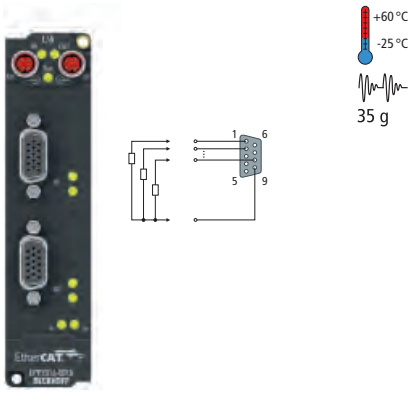
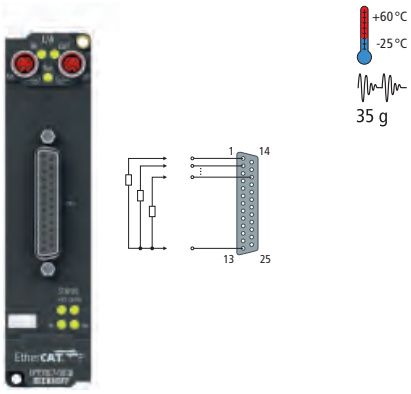
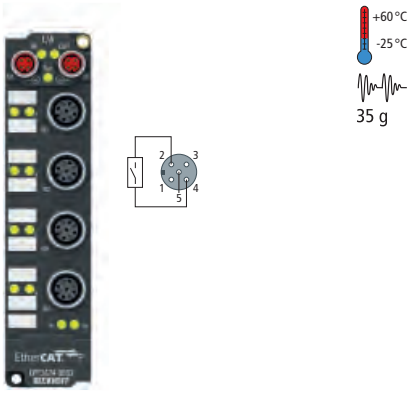
We reserve the right to make technical changes.

	8-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 3 A)	16-channel digital output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 3 A)	16-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 3 A)
	EPP2008-0022	**EPP2809-0021**	**EPP2809-0022**
	M12, screw type	M8, screw type	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	0.5 A per channel, individually short-circuit-proof, total current max. 3 A	0.5 A per channel, individually short-circuit-proof, total current max. 3 A	0.5 A per channel, individually short-circuit-proof, total current max. 3 A
	8	16	16
			
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 100 mA	typ. 100 mA	typ. 100 mA
	–	–	–
	max. 1.5 A	max. 1.5 A	max. 1.5 A
	typ. 20 mA + load	typ. 20 mA + load	typ. 20 mA + load
	500 V	500 V	500 V
	1 output per M12 plug	–	–
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL in preparation	CE, UL in preparation	CE, UL in preparation
	IP 65/66/67 (according to EN 60529)	IP 65/66/67 (according to EN 60529)	IP 65/66/67 (according to EN 60529)
	EPP2008-0022	EPP2809	EPP2809

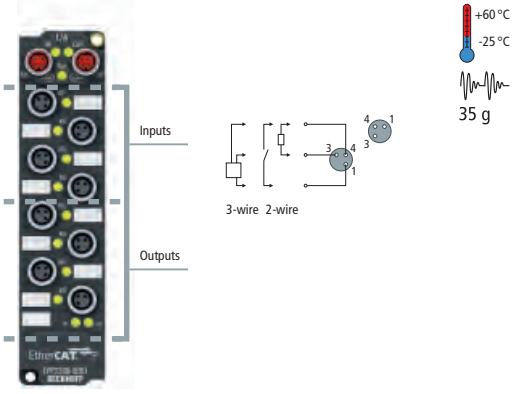
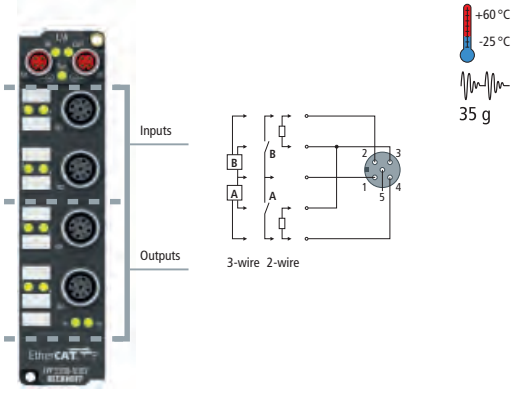
Digital output | 24 V DC

	16-channel digital output, 24 V DC, M16, I_{MAX} = 0.5 A (∑ 3 A)	16-channel digital output, 24 V DC, D-sub, I_{MAX} = 0.5 A (∑ 3 A)
Technical data	**EPP2816-0004**	**EPP2816-0008**
Connection technology	M16, 19-pin	D-sub socket, 25-pin
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	0.5 A per channel, individually short-circuit-proof, total current max. 3 A	0.5 A per channel, individually short-circuit-proof, total current max. 3 A
Number of outputs	16	16
		
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Distributed clocks	yes	yes
Short circuit current	max. 1.5 A	max. 1.5 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Ohmic switching current	–	–
Operating cycles mech. (min.)	–	–
Operating cycles electr. (min.)	–	–
Minimum permitted load	–	–
Electrical isolation	500 V	500 V
Special features	ideal for multi-pin connector valve terminals	ideal for multi-pin connector valve terminals
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP2816	EPP2816

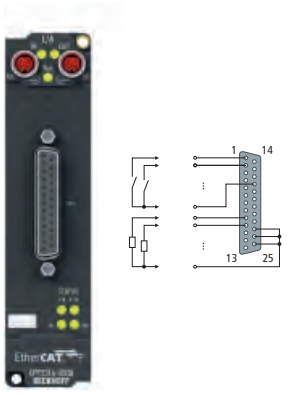
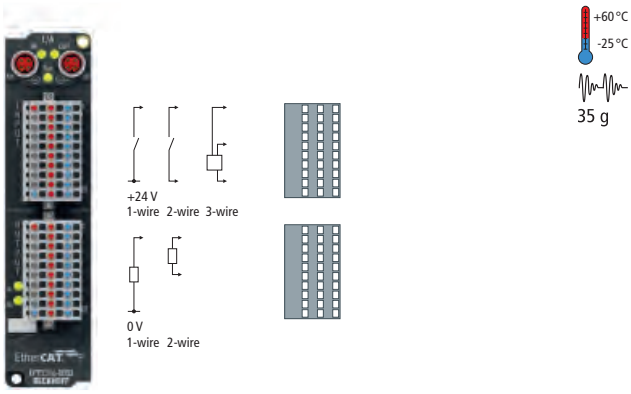
We reserve the right to make technical changes.

	16-channel digital output, 24 V DC, 2 x D-sub, I_{MAX} = 0.5 A (∑ 3 A)	24-channel digital output, 24 V DC, D-sub, I_{MAX} = 0.1 A	4-channel relay output, 25 V AC/30 V DC, M12
	EPP2816-0010	**EPP2817-0008**	**EPP2624-0002**
	2 x D-sub socket, 9-pin	D-sub socket, 25-pin	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	0.5 A per channel, individually short-circuit-proof, total current max. 3 A	0.1 A each channel, individually short-circuit-proof	potential-free switch
	16	24	4 x make contacts
			
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 100 mA	typ. 100 mA	typ. 100 mA
	yes	yes	–
	max. 1.5 A	max. 1.0 A	–
	typ. 20 mA + load	typ. 20 mA + load	typ. 20 mA + load
	–	–	0.5 A AC/2 A DC
	–	–	1 x 10^8
	–	–	2 x 10^5 (1 A/30 V DC)
	–	–	10 µA at 10 mV DC
	500 V	500 V	500 V
	ideal for multi-pin connector valve terminals	undervoltage detection for U_S and U_P < 18 V	potential-free switching
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL in preparation	CE, UL in preparation	CE, UL in preparation
	EPP2816	EPP2817	EPP2624

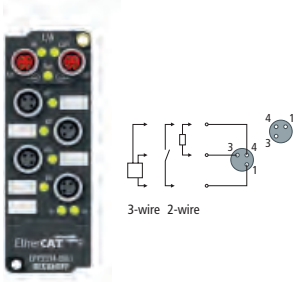
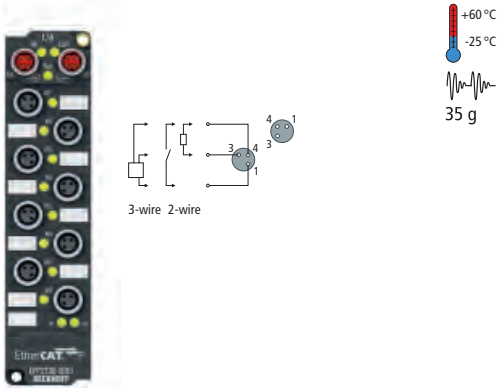
Digital combi | 24 V DC, positive switching

	4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 0.5 A		4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 0.5 A	
Technical data	**EPP2308-0001**	**EPP2318-0001**	**EPP2308-0002**	**EPP2318-0002**
Connection technology	M8, screw type		M12, screw type	
Specification	EN 61131-2, type 1/3		EN 61131-2, type 1/3	
Input filter	3.0 ms	10 µs	3.0 ms	10 µs
Number of channels	4 inputs + 4 outputs		4 inputs + 4 outputs	
				
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
Max. output current	0.5 A		0.5 A	
Load type	ohmic, inductive, lamp load		ohmic, inductive, lamp load	
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	
Short circuit current	typ. 1.5 A		typ. 1.5 A	
Auxiliary power current	typ. 20 mA per channel		typ. 20 mA per channel	
Current consumption from U_S	typ. 100 mA		typ. 100 mA	
Electrical isolation	500 V		500 V	
Special features	–		–	
Operating temperature	-25…+60 °C		-25…+60 °C	
Approvals	CE, UL in preparation		CE, UL in preparation	
Protection class	IP 65/66/67 (according to EN 60529)		IP 65/66/67 (according to EN 60529)	
Further information	EPP2308		EPP2308	

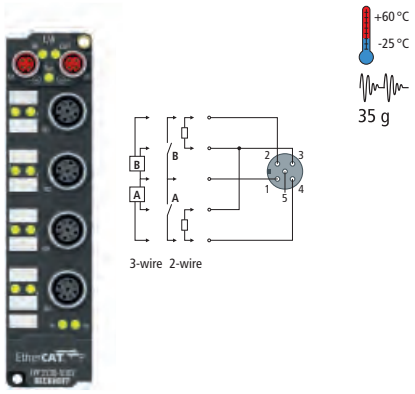
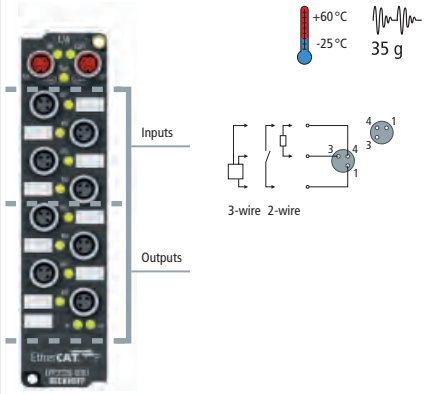
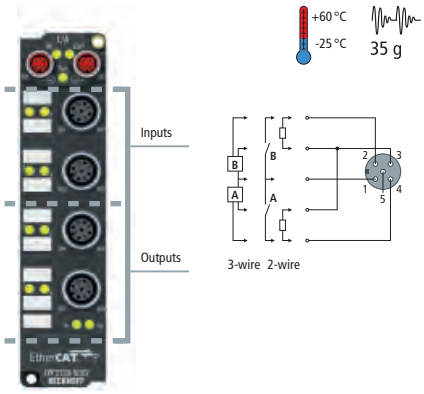
We reserve the right to make technical changes.

	8 x digital input + 8 x digital output, 24 V DC, D-sub, I_{MAX} = 0.5 A	8 x digital input + 8 x digital output, 24 V DC, I_{MAX} = 0.5 A, IP 20 connector
	EPP2316-0008	**EPP2316-0003**
	D-sub socket, 25-pin	connector with spring-loaded technique
	EN 61131-2, type 1/3	EN 61131-2, type 1/3
	10 µs	10 µs
	8 inputs + 8 outputs	8 inputs + 8 outputs
		 Accessories: – ZS2001-0001: connector, 1-pin, without LED – ZS2001-0002: connector, 1-pin, with LED – ZS2001-0004: connector, 3-pin, with LED
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	0.5 A per channel, individually short-circuit-proof	0.5 A per channel, individually short-circuit-proof
	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
	typ. 1.5 A	typ. 1.5 A
	typ. 20 mA	typ. 20 mA
	typ. 100 mA	typ. 100 mA
	500 V	500 V
	ideal for high number of channels	ideal for operating desks
	-25…+60 °C	-25…+60 °C
	CE, UL in preparation	CE, UL in preparation
	IP 65/66/67 (according to EN 60529)	IP 20
	EPP2316	EPP2316-0003

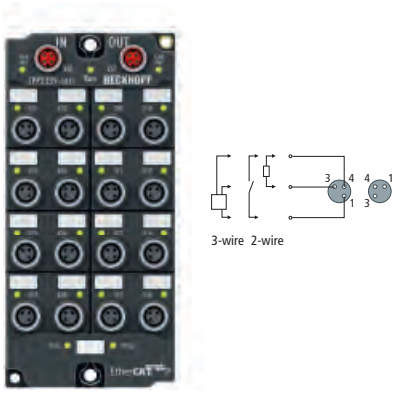
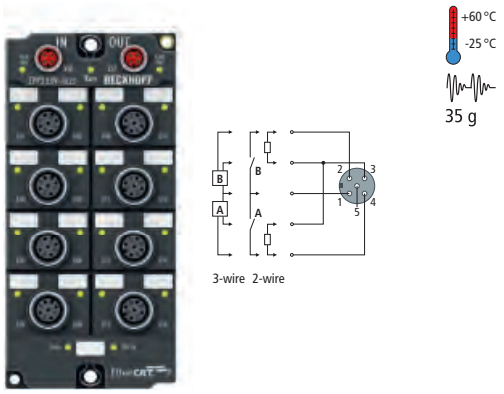
Digital combi | 24 V DC, positive switching

	4-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A	8-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A	
Technical data	**EPP2334-0061**	**EPP2338-0001**	**EPP2338-1001**
Connection technology	M8, screw type	M8, screw type	
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3	
Input filter	10 µs	10 µs	3.0 ms
Number of channels	4 digital inputs or outputs	8 digital inputs or outputs	
			
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	
Max. output current	0.5 A per channel, individually short-circuit-proof	0.5 A per channel, individually short-circuit-proof	
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load	
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof	
Short circuit current	typ. 1.5 A	typ. 1.5 A	
Auxiliary power current	typ. 20 mA	typ. 20 mA	
Current consumption from U_S	typ. 100 mA	typ. 100 mA	
Electrical isolation	–	500 V	
Operating temperature	-25…+60 °C	-25…+60 °C	
Approvals	CE, UL in preparation	CE, UL in preparation	
Further information	EPP2334-0061	EPP2338	

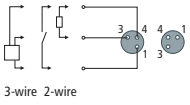
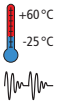
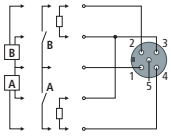
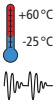
We reserve the right to make technical changes.

	8-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A		4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 3 A)	4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 3 A)
	EPP2338-0002	**EPP2338-1002**	**EPP2328-0001**	**EPP2328-0002**
	M12, screw type		M8, screw type	M12, screw type
	EN 61131-2, type 1/3		EN 61131-2, type 1/3	EN 61131-2, type 1/3
	10 µs	3.0 ms	3.0 ms	3.0 ms
	8 digital inputs or outputs		4 inputs + 4 outputs	4 inputs + 4 outputs
				
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	0.5 A per channel, individually short-circuit-proof		2 A per channel, individually short-circuit-proof, total current max. 3 A	2 A per channel, individually short-circuit-proof, total current max. 3 A
	ohmic, inductive, lamp load		ohmic, inductive, lamp load	ohmic, inductive, lamp load
	from load supply voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
	typ. 1.5 A		typ. 4 A	typ. 4 A
	typ. 20 mA		typ. 20 mA	typ. 20 mA
	typ. 100 mA		typ. 100 mA	typ. 100 mA
	500 V		500 V	500 V
	-25…+60 °C		-25…+60 °C	-25…+60 °C
	CE, UL in preparation		CE, UL in preparation	CE, UL in preparation
	EPP2338		EPP2328	EPP2328

Digital combi | 24 V DC, positive switching

	16-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 3 A)	16-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 3 A)
Technical data	**EPP2339-0021**	**EPP2339-0022**
Connection technology	M8, screw type	M12, screw type
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3
Input filter	3.0 ms	3.0 ms
Number of channels	16 digital inputs or outputs	16 digital inputs or outputs
		
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Max. output current	0.5 A per channel, individually short-circuit-proof, total current max. 3 A	0.5 A per channel, individually short-circuit-proof, total current max. 3 A
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
Short circuit current	typ. 1.5 A	typ. 1.5 A
Auxiliary power current	typ. 20 mA	typ. 20 mA
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Electrical isolation	500 V	500 V
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP2339	EPP2339

We reserve the right to make technical changes.

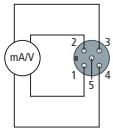
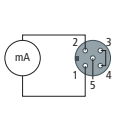
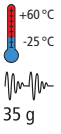
	16-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 3 A)	16-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 3 A)
	EPP2349-0021	**EPP2349-0022**
	M8, screw type	M12, screw type
	EN 61131-2, type 1/3	EN 61131-2, type 1/3
	10 µs	10 µs
	16 digital inputs or outputs	16 digital inputs or outputs
	 	 
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	0.5 A per channel, individually short-circuit-proof, total current max. 3 A	0.5 A per channel, individually short-circuit-proof, total current max. 3 A
	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
	typ. 1.5 A	typ. 1.5 A
	typ. 20 mA	typ. 20 mA
	typ. 100 mA	typ. 100 mA
	500 V	500 V
	-25…+60 °C	-25…+60 °C
	CE, UL in preparation	CE, UL in preparation
	EPP2349	EPP2349

Analog input | -10…+10 V, 0/4…20 mA, RTD

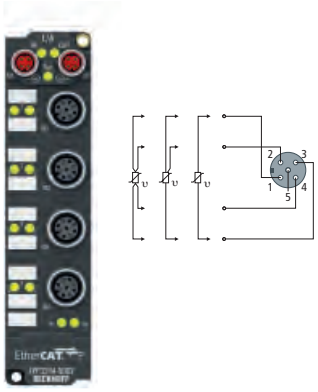
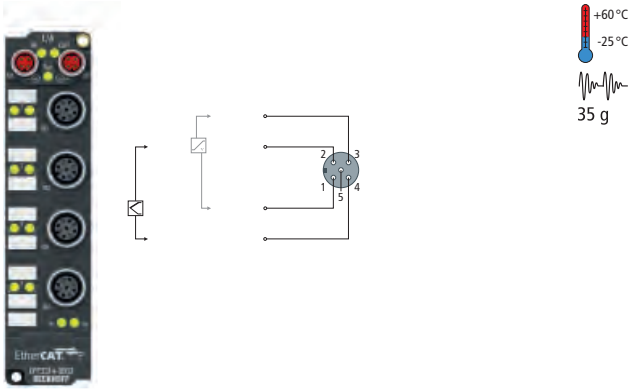
The EPP3174 and EPP3184 EtherCAT P Box modules evaluate analog standard signals within the range of -10/0 V to +10 V or 0/4 mA to 20 mA with 16-bit resolution. The signal form is separately configurable for each channel. The EPP3174 evaluates the difference between the two input signals Input+ and Input-. These must be referred to the ground potential of the load voltage U_P. The DC component does not affect the measurement, as long as it is in the common mode range. The measurement in the EPP3184 is single-ended and the negative reference potential is fixed to the ground potential of the supply voltage U_P.

The EPP3204 analog input module is intended for the direct connection of resistance thermometers. The resistance is measured with a low measuring current, linearised and represented in 0.1 °C. The EtherCAT P Box supports 2-, 3- and 4-wire measurement on all four channels. The measurements serve to eliminate or deduct the parasitic resistance of the sensor cable. All inputs are separately configurable for a wide range of sensors, for the three measurement procedures and for the direct measurement of resistance.

The EPP3314 EtherCAT P Box enables the measurement of temperature using thermocouples. The measured thermovoltage is linearised in accordance with the characteristic of the respective type and transferred to the controller as a temperature value in 1/10 °C or 1/100 °C. The inputs are separately configurable for a wide range of different sensor types. Parasitic thermovoltages arise at the interface of the measuring cable and the module, significantly falsifying the measurement. This error is eliminated by the ZS2000-3712 compensation connector.

	4-channel analog input, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit	
Technical data	**EPP3174-0002**	**EPP3184-0002**
Connection technology	M12, screw type	
Signal type	-10/0…+10 V | 0/4…20 mA	
Resolution	16 bit (incl. sign)	
Conversion time	~ 100 µs	
Number of inputs	4 (differential)	4 (single-ended)
	 EPP3174  EPP3184  35 g	
Measuring error	< ±0.3 % (relative to full scale value)	
Distributed clocks	yes	
Sensor types	–	
Measuring range	–	
Internal resistance	> 200 kΩ | 85 Ω typ. + diode voltage	
Sensor supply	from load supply voltage U_P, DC, any value up to 30 V	
Current consumption from U_S	typ. 100 mA	
Special features	current or voltage parameterisable	
Operating temperature	-25…+60 °C	
Approvals	CE, UL in preparation	
Further information	EPP3174	EPP3184

We reserve the right to make technical changes.

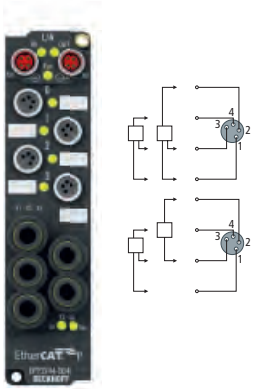
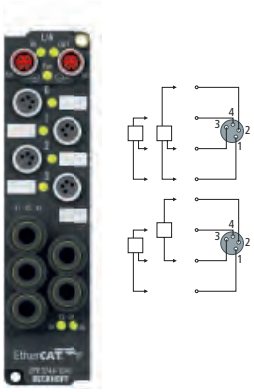
	4-channel analog input, PT100 (RTD), parameterisable, 16 bit	4-channel analog input, thermocouple/mV, parameterisable, 16 bit
	EPP3204-0002	**EPP3314-0002**
	M12, screw type	M12, screw type
	PT100	thermocouple
	0.1 °C per digit	0.1 °C per digit
	800 ms up to 2 ms, see documentation, default: approx. 85 ms	2.5 s up to 20 ms, see documentation, default: approx. 250 ms
	4	4
		
	< ±0.5 °C for PT sensors (further types see documentation)	< ±0.3 % for type K (relative to full scale value), further types see documentation
	–	–
	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ)	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	depending on sensor type; preset value is type K, -100…+1370 °C
	–	–
	–	–
	typ. 100 mA	typ. 100 mA
	open-circuit recognition	open-circuit recognition
	-25…+60 °C	-25…+60 °C
	CE, UL in preparation	CE, UL in preparation
	EPP3204	EPP3314

Analog input | **Pressure measuring**

The EPP3744 EtherCAT P Box, equipped with six digital inputs, two digital outputs and four pressure inputs, acquires these signals and transmits them – electrically isolated – to the controller. The signal status is indicated by LEDs; the digital signals are connected via 4-pin M8 plug connectors.

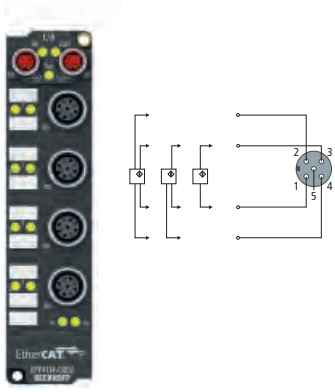
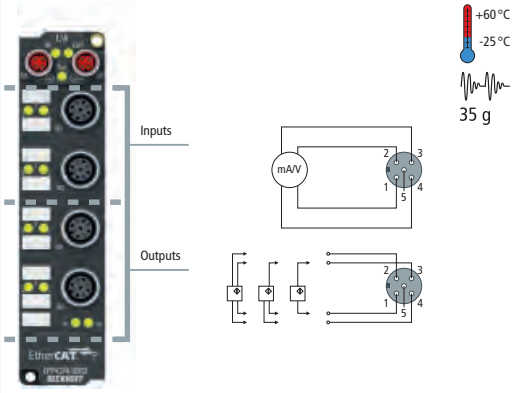
The pressure is measured as the differential pressure to the fifth connection by an integrated 6 mm fitting. The pressure values are available as 16-bit values. Measurement can be made between -1 to +1 bar (EPP3744-0041) or -7 to +7 bar (EPP3744-1041), with the value being output in relation to the fifth connection, e.g. for vacuum measurement in relation to the ambient pressure at suction grippers.

In absolute-pressure mode it is possible to measure pressures between 0 to 1 bar (EPP3744-0041) or 0 to 7 bar (EPP3744-1041).

	Pressure measuring box, 6 digital inputs 24 V DC, 2 digital outputs 24 V DC, 0.5 A, 4 pressure inputs 0…1 bar/-1…1 bar	Pressure measuring box, 6 digital inputs 24 V DC, 2 digital outputs 24 V DC, 0.5 A, 4 pressure inputs 0…7 bar/-7…7 bar
Technical data	**EPP3744-0041**	**EPP3744-1041**
Connection technology	digital signals: 4-pin M8; pressure measurement: 6 mm fitting	digital signals: 4-pin M8; pressure measurement: 6 mm fitting
Signal type	air pressure	air pressure
Conversion time	~ 3.5 ms	~ 3.5 ms
Number of inputs	6 dig. and 4 pressure inputs, 2 dig. outputs	6 dig. and 4 pressure inputs, 2 dig. outputs
		
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Measuring range	0…1 bar (0…15 psi)/ -1…1 bar (-15…15 psi)	0…7 bar (0…100 psi)/ -7…7 bar (-100…100 psi)
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Special features	direct pressure measuring at the machine	direct pressure measuring at the machine
Operating temperature	-20…+60 °C	-20…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP3744	EPP3744-1041

We reserve the right to make technical changes.

Analog output | -10…+10 V, 0/4…20 mA

	4-channel analog output, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit	2-channel analog input + 2-channel analog output, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit
Technical data	**EPP4174-0002**	**EPP4374-0002**
Connection technology	M12, screw type	M12, screw type
Signal type	-10/0…+10 V | 0/4…20 mA	-10/0…+10 V | 0/4…20 mA
Resolution	16 bit	16 bit
Conversion time	~ 40 µs	input: ~ 100 µs, output: ~ 40 µs
Number of outputs	4	2
Number of inputs	–	2
		
Measuring error	< 0.1 % (relative to full scale value)	input: < 0.3 %, output: < 0.1 % (each relative to full scale value)
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	yes	yes
Load	> 5 kΩ | < 500 Ω	output: > 5 kΩ | < 500 Ω
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Special features	current or voltage parameterisable per channel	combi module, current or voltage parameterisable per channel
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP4174	EPP4374

Position measurement | **Incremental encoder interfaces**

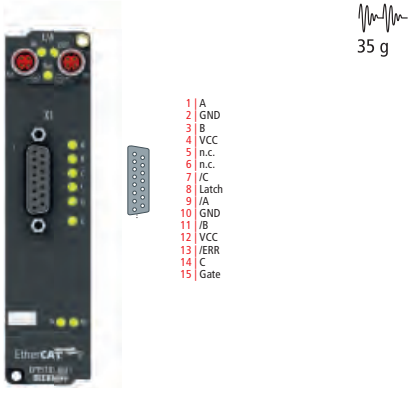
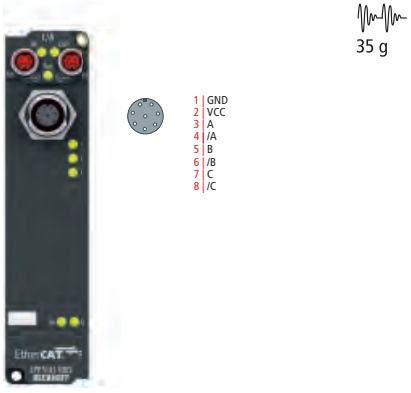
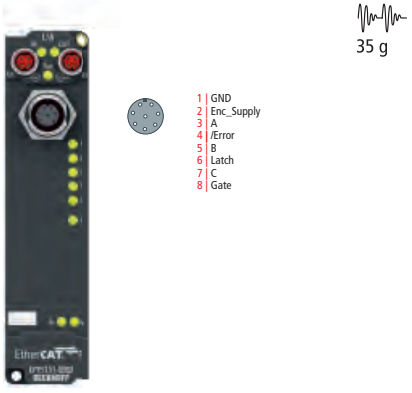
The EPP51x1 EtherCAT P Box is an interface for the direct connection of incremental encoders with differential inputs (RS485) (EPP5101) or 24 V DC inputs (EPP5151). A 32/16 bit counter with a quadrature decoder and a 32/16 bit latch for the zero pulse can be read, set or enabled. Incremental encoders with alarm outputs can be connected at the EPP5101's status input. Interval measurement with a resolution of up to 100 ns is possible for EPP5101 and EPP5151. The gate input allows the counter to be halted. The counter state is taken over with a rising edge at the latch input (EPP5101-0011). The EPP5101-1002 offers a 24 V DC sensor supply.

Due to the optional interpolating micro-increment function, the EPP5101 can supply even more precise axis positions for dynamic axes. In addition, it supports the synchronous reading of the encoder value together with other input data in the EtherCAT system via high-precision EtherCAT distributed clocks (DC).

The encoder is connected via an 8-pin M12 socket (EPP5101-0002, EPP5151-0002) or via a 15-pin D-sub socket (EPP5101-0011). In the M12 version not all signals are available.

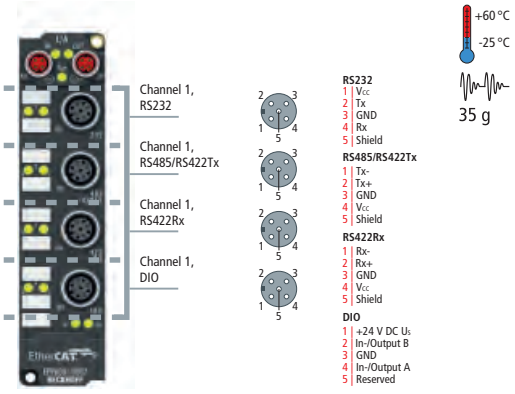
	Incremental encoder interface, M12, 8-pin
Technical data	**EPP5101-0002**
Connection technology	M12, 8-pin
Nominal voltage	24 V DC (-15 %/+20 %)
Number of channels	1
Encoder connection	differential input (RS485)
Counter	32 or 16 bit, binary
Limit frequency	4 million increments/s (with 4-fold evaluation)
Quadrature decoder	4-fold evaluation
Zero-pulse latch	16/32 bit
Commands	read, set, enable
Distributed clocks	yes
Sensor supply	+5 V DC, 150 mA (V_{CC})
Current consumption from U_S	typ. 100 mA
Electrical isolation	500 V
Operating temperature	0…+55 °C (-25…+60 °C in preparation)
Approvals	CE, UL in preparation
Further information	EPP5101

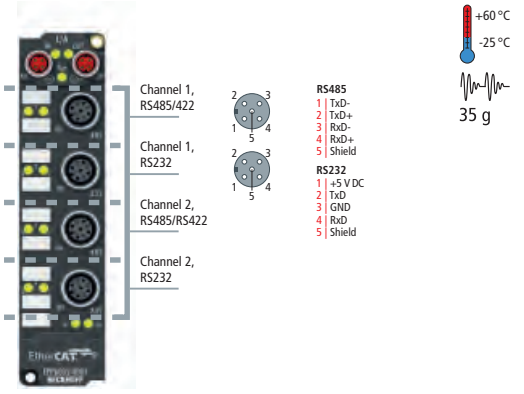
We reserve the right to make technical changes.

	Incremental encoder interface, D-sub socket, 15-pin	Incremental encoder interface, M12, 8-pin, 24 V DC sensor supply	Incremental encoder interface, M12, 8-pin
	EPP5101-0011	**EPP5101-1002**	**EPP5151-0002**
	D-sub socket, 15-pin	M12, 8-pin	M12, 8-pin
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	1	1	1
	 35 g 1 | A 2 | GND 3 | B 4 | VCC 5 | n.c. 6 | n.c. 7 | /C 8 | Latch 9 | /A 10 | GND 11 | /B 12 | VCC 13 | /ERR 14 | C 15 | Gate	 35 g 1 | GND 2 | VCC 3 | A 4 | /A 5 | B 6 | /B 7 | C 8 | /C	 35 g 1 | GND 2 | Enc_Supply 3 | A 4 | /Error 5 | B 6 | Latch 7 | C 8 | Gate
	differential input (RS485)	differential input (RS485)	24 V DC single ended
	32 or 16 bit, binary	32 or 16 bit, binary	32 or 16 bit, binary
	4 million increments/s (with 4-fold evaluation)	4 million increments/s (with 4-fold evaluation)	4 million increments/s (with 4-fold evaluation)
	4-fold evaluation	4-fold evaluation	4-fold evaluation
	16/32 bit	16/32 bit	16/32 bit
	read, set, enable	read, set, enable	read, set, enable
	yes	yes	yes
	+5 V DC, 150 mA (V_{CC})	24 V DC, 500 mA (V_{CC})	24 V DC/500 mA (Enc_Supply)
	typ. 100 mA	typ. 100 mA	typ. 100 mA
	500 V	500 V	500 V
	0…+55 °C (-25…+60 °C in preparation)	0…+55 °C (-25…+60 °C in preparation)	0…+55 °C (-25…+60 °C in preparation)
	CE, UL in preparation	CE, UL in preparation	CE, UL in preparation
	EPP5101	EPP5101	EPP5151

Communication | Serial interfaces RS232, RS422/RS485

	1-channel serial interface, RS232, RS422/RS485	2-channel serial interface, RS232, RS422/RS485
Technical data	**EPP6001-0002**	**EPP6002-0002**
Connection technology	M12, screw type	M12, screw type
Data transfer rates	300…115,200 baud; 9600 baud (8 bits, no parity, 1stop bit) is preset	300…115,200 baud; 9600 baud (8 bits, no parity, 1stop bit) is preset
Number of digital inputs/outputs	2, 24 V DC, 10 µs/0.5 A	–
Data transfer channels	1	2





The EPP6001 and EPP6002 serial interface modules allow the connection of devices with an RS232 or RS422/RS485 interface. The devices connected to the EPP600x communicate with the automation device via the coupler and the network. The modules transmit the data in a fully transparent manner to the higher-level automation device. The active serial communication channel functions independently of the higher-level bus system in full duplex mode at up to 115,200 baud, while a 864 byte receive buffer and a 128 byte send buffer are available. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

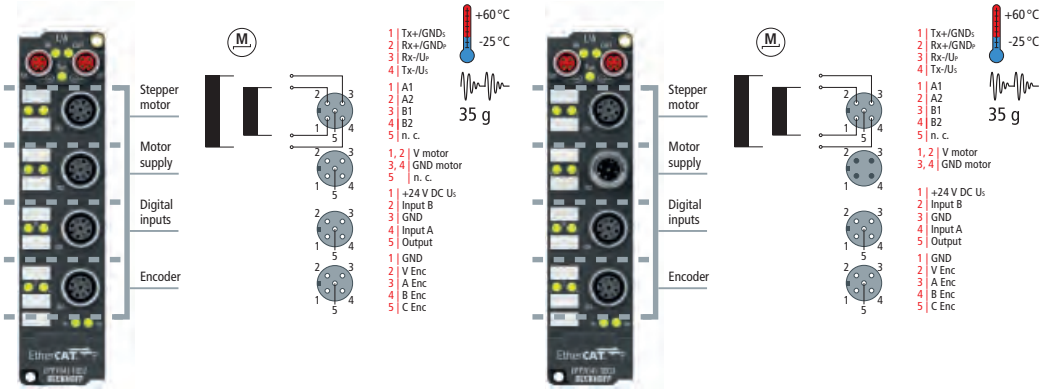
The 1-channel version EPP6001 has an increased end device power supply of up to 1 A, the connector assignment depends on the selected interface.The two integrated digital inputs/outputs allow the connection of additional sensors/actuators in order, for example, to trigger the reading process of the barcode reader or, depending on the result, to initiate an action. In the EPP6002 the connector assignment depends on the interface. For each channel, RS232 or RS422/RS485 can be selected. In conjunction with the TwinCAT Virtual Serial COM Driver (see page 1041), the EPP6001 and EPP6002 can be used as normal Windows COM interfaces.

Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	–
Bit distortion	< 3 %	< 3 %
Cable length	RS232: max. 15 m; RS422/RS485: approx. 1000 m	RS232: max. 15 m; RS422/RS485: approx. 1000 m
Data buffer	864 bytes receive buffer, 128 bytes transmit buffer	864 bytes receive buffer, 128 bytes transmit buffer
Sensor supply	+5 V DC, 1 A	+5 V DC, 20 mA each
Current consumption from Us	typ. 100 mA	typ. 100 mA
Special features	easy integration of serial end devices	easy integration of serial end devices
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP6001	EPP6002

We reserve the right to make technical changes.

Motion | Stepper motor modules

	Stepper motor module, 50 V DC, 1.5 A, with incremental encoder, 2 digital inputs, 1 digital output	Stepper motor module, 50 V DC, 5 A, with incremental encoder, 2 digital inputs, 1 digital output, motor connection via plug, for high-speed applications
Technical data	**EPP7041-1002**	**EPP7041-3002**
Connection method	M12, screw type	M12, screw type
Load type	uni- or bipolar stepper motors	uni- or bipolar stepper motors
Number of outputs	1 stepper motor, 1 digital 24 V DC output	1 stepper motor, 1 digital 24 V DC output
Number of inputs	2 digital inputs, encoder system (24 V DC encoder)	2 digital inputs, encoder system (24 V DC encoder)



The EPP7041-1002 and EPP7041-3002 EtherCAT P Box modules are intended for the direct connection of different stepper motors. The PWM output stages for two motor coils with compact design are located in the module together with two inputs for limit switches and cover a wide voltage and current range. The EPP7041 can be adjusted to the motor and the application by changing just a few parameters. 64-fold (EPP7041-1002) or 256-fold (EPP7041-3002) micro-stepping ensures particularly quiet and precise motor operation. Connection of an incremental encoder enables a simple servo axis to be realised. Two digital inputs and a digital 0.5 A output enable connection of end switches and a motor brake.

The hardware- and software-based configuration make the EPP7041-3002 stepper motor module particularly suitable for applications that are subject to unsteady motor operation due to natural resonance of the motor and the moved mass.

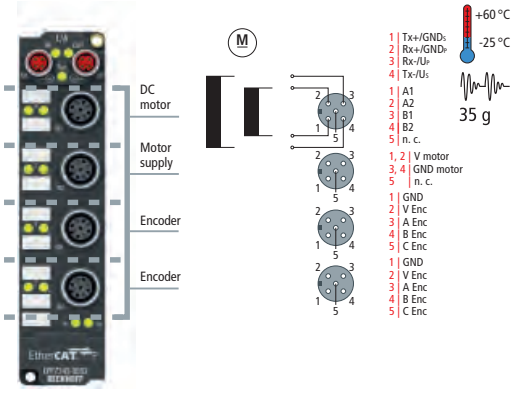
Nominal voltage	8…50 V DC	8…50 V DC
Distributed clocks	yes	yes
Protocol	EtherCAT	EtherCAT
Output current	2 x 1 A, 2 x 1.5 A peak current (overload- and short-circuit-proof)	2 x 3.5 A, 2 x 5 A peak current (overload- and short-circuit-proof)
Max. step frequency	1000, 2000, 4000 or 8000 full steps/s (configurable)	1000, 2000, 4000 or 8000 full steps/s (configurable)
Step pattern	64-fold micro stepping	256-fold micro stepping
Current controller frequency	approx. 30 kHz	dynamic
Resolution	approx. 5000 positions (per revolution)	approx. 5000 positions (per revolution, depending on motor and encoder type)
Encoder input signal	5…24 V DC, 5 mA, single-ended	5…24 V DC, 5 mA, single-ended
Pulse frequency	max. 400,000 increments/s (with 4-fold evaluation)	max. 400,000 increments/s (with 4-fold evaluation)
Current consumpt. from U_s	typ. 100 mA	typ. 100 mA
Special features	travel distance control, encoder input	for high-speed applications, travel distance control, encoder input, load indication, motor supply via plug
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP7041-1002	EPP7041-3002

Compact Drive Technology see page 926

Motion | DC motor output stage

DC motors can replace the considerably more expensive servomotors in many applications if they are operated with an intelligent controller. A DC motor can be integrated very simply into the control system using the EPP7342 EtherCAT P Box. All parameters are adjustable via the fieldbus. The small, compact design and the possibility to fit the modules directly to machines makes the EtherCAT DC motor output stage suitable for a wide range of applications. The output stage is protected against overload and short circuit and offers an integrated feedback system for incremental encoders.

The EPP7342 EtherCAT P Box enables direct operation of two DC motors. The speed or position is specified by the automation device via a 16 bit value. By connection of an incremental encoder, a simple servo axis can be realised. The output stage is protected against overload and short-circuit.

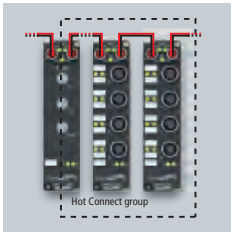
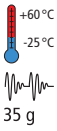
	2-channel DC motor output stage, 50 V DC, 3.5 A
Technical data	**EPP7342-0002**
Connection method	M12, screw type
Load type	DC brush motors, inductive
Number of outputs	2
	
Nominal voltage	8…50 V DC
Distributed clocks	yes
Protocol	EtherCAT
Output current	per channel max. 3.5 A (short-circuit-proof, common thermal overload warning for both output stages)
PWM clock frequency	32 kHz with 180° phase shift each
Duty factor	0…100 % (voltage-controlled)
Resolution	max. 10 bits current, 16 bits speed
Encoder input signal	5…24 V DC, 5 mA, single-ended
Pulse frequency	max. 400,000 increments/s (with 4-fold evaluation)
Current consumption from U_s	typ. 100 mA
Special features	travel distance control, encoder input
Operating temperature	-25…+60 °C
Approvals	CE, UL in preparation
Further information	EPP7342

We reserve the right to make technical changes.

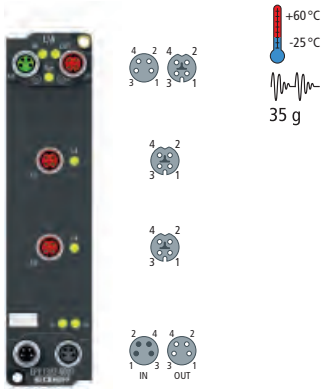
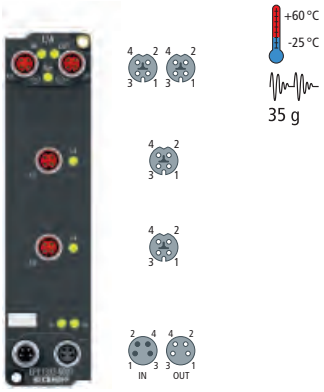
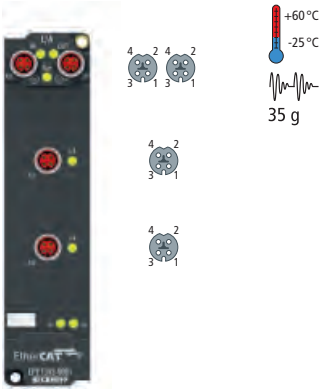
System | **EtherCAT P Box with ID switch**

The EPP1111 EtherCAT P Box has three decimal ID switches for assigning an ID to a group of EtherCAT components. This group can be present in any position in the EtherCAT P network, as a result of which variable topologies and Hot Connect groups can be realised in a simple manner.

The EtherCAT P connection is established via shielded EtherCAT-P-coded M8 screw type sockets with direct display of link and activity status. The Run LED indicates the status of the EPP1111.

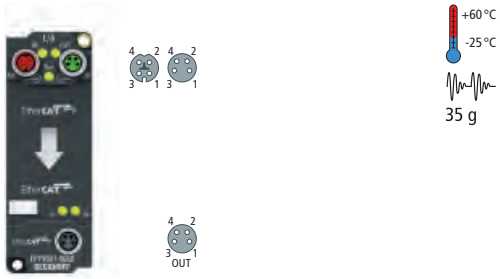
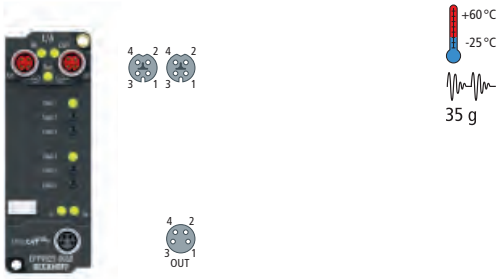
	EtherCAT P Box with ID switch
Technical data	**EPP1111-0000**
Task within EtherCAT system	identification of any EtherCAT group in the EtherCAT network
Number of channels	–
Data transfer rates	100 Mbaud
	 
Nominal voltage	24 V DC (-15 %/+20 %)
Distributed clocks	–
Bus interface	2 x M8 socket, shielded, screw type, EtherCAT-P-coded
Number of configurable IDs	999
Current consumption from U_S	typ. 100 mA
Special features	addressing of Hot Connect groups
Operating temperature	-25…+60 °C
Approvals	CE, UL in preparation
Further information	EPP1111

System | **Junctions**

	EtherCAT P junction with feed-in	EtherCAT P junction with refresh	EtherCAT P junction
Technical data	**EPP1322-0001**	**EPP1332-0001**	**EPP1342-0001**
Task within EtherCAT system	coupling to the EtherCAT network, EtherCAT P junction and feed-in of U_S and U_P	3-port EtherCAT P junction and refresh of U_S and U_P	3-port EtherCAT P junction
Data transfer rates	100 Mbaud	100 Mbaud	100 Mbaud
Protocol	EtherCAT/EtherCAT P	EtherCAT P	EtherCAT P
			
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	–	–
Number of channels	IN: 1 x EtherCAT, OUT: 3 x EtherCAT P	IN: 1 x EtherCAT P, OUT: 3 x EtherCAT P	IN: 1 x EtherCAT P, OUT: 3 x EtherCAT P
Bus interface	M8 socket, shielded, screw type, EtherCAT-P-coded	M8 socket, shielded, screw type, EtherCAT-P-coded	M8 socket, shielded, screw type, EtherCAT-P-coded
Distance between stations	100 m (100BASE-TX)	100 m (100BASE-TX)	100 m (100BASE-TX)
Current consumption from U_S	typ. 100 mA	typ. 100 mA	typ. 100 mA
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation	CE, UL in preparation
Further information	EPP1322	EPP1332	EPP1342

We reserve the right to make technical changes.

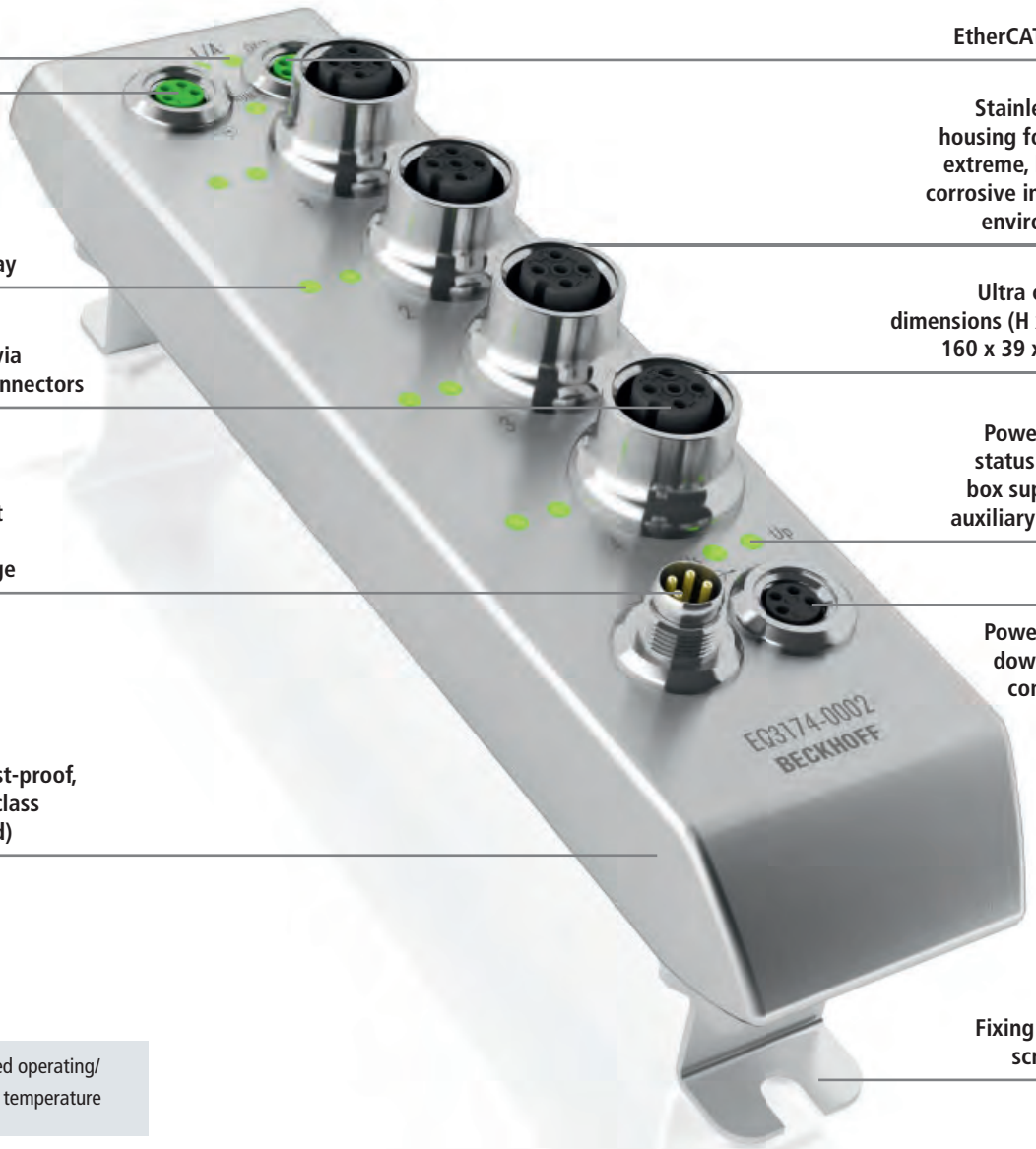
System | **System modules**

	EtherCAT P/EtherCAT connector with power transmission	EtherCAT P Box with diagnostics
Technical data	**EPP9001-0060**	**EPP9022-0060**
Task within EtherCAT system	converter from EtherCAT P to EtherCAT + power	diagnostics of the U_S and U_P voltages
Data transfer rates	100 Mbaud	100 Mbaud
Protocol	EtherCAT P/EtherCAT	EtherCAT P
		
	The EPP9001-0060 EtherCAT P Box converts the incoming EtherCAT P signal (red M8 socket, EtherCAT-P-coded) into an EtherCAT signal (green M8 socket). In addition, the voltage output from the U_S and U_P voltages can be found on the EtherCAT P Box (black M8 socket). The EPP9001-0060 is an active EtherCAT device, i.e. it appears in the EtherCAT process image of the EtherCAT master, e.g. TwinCAT.	The EPP9022-0060 EtherCAT P Box is used for diagnostics of the voltages U_S and U_P, for example temporarily during commissioning or permanently during operation. Even without an EtherCAT master, the voltage range is displayed on the box by LEDs (green, yellow and red). In a running EtherCAT network the voltage values of U_S and U_P can also be read out as process data in the master. The voltage levels for the LED displays can be adjusted by CoE. In addition, the EtherCAT P Box is equipped with an M8 power socket to which an external multimeter can be connected for measuring the voltages.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Distributed clocks	–	yes
Number of channels	IN: 1 x EtherCAT P, OUT: 1 x EtherCAT	IN: 1 x EtherCAT P, OUT: 1 x EtherCAT P
Bus interface	1 x M8 socket, shielded, screw type, EtherCAT-P-coded, 1 x M8 socket, shielded, screw type	M8 socket, shielded, screw type, EtherCAT-P-coded
Current consumption from U_S	typ. 100 mA	typ. 100 mA
Special features	–	diagnostic LED for U_S, diagnostic LED for U_P
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL in preparation	CE, UL in preparation
Further information	EPP9001-0060	EPP9022-0060

EQxxxx | EtherCAT Box (stainless steel housing)

▶ **EQxxxx**

EtherCAT



+60 °C
-25 °C
Extended operating/ storage temperature

We reserve the right to make technical changes.

4 x M12

8 x M12

The Beckhoff EtherCAT Box system is complemented by modules in stainless steel design. The modules of the EQxxxx series feature "Hygienic Design" throughout. They can be used in extreme, harsh and corrosive industrial environments and are therefore ideal for applications in the food, chemical or pharmaceutical industries, which require protection class IP 69K.

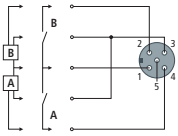
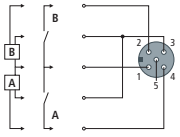
The stainless steel EtherCAT Box modules cover the typical range of requirements of I/O signals: digital inputs with a filter of 3.0 ms, digital outputs with 0.5 A output current, and combi modules with freely selectable digital inputs or outputs. In addition, analog input modules for current/voltage measurement are available. Temperature measurement modules for resistance sensors or thermocouples complement the product range. The signals are connected via M12 connectors.

The modules of the EQxxxx series have an EtherCAT interface. The power supply and transfer takes place via M8 connectors or sockets.

EQxxxx-00yz

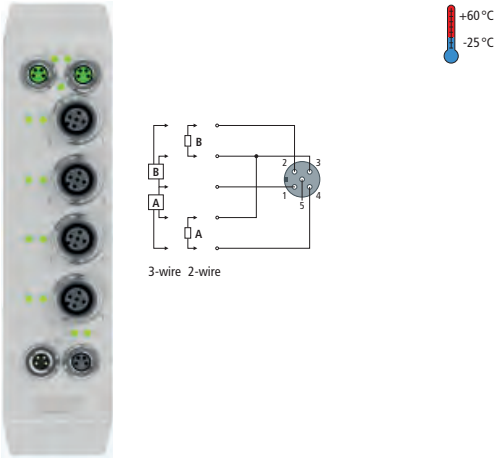
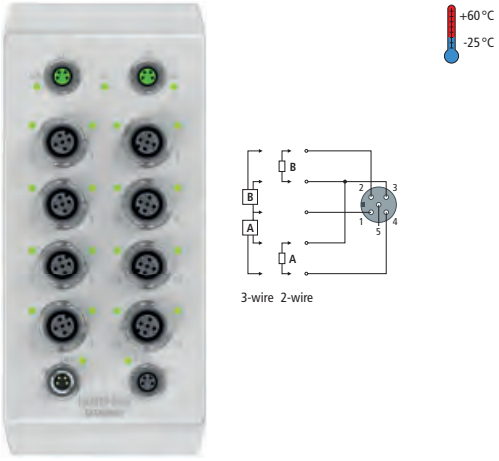
- 2 = connector M12, screw type, 5-pin
- 0 = width: 39 mm
- 2 = width: 72 mm
- Signals see page 544

Digital input | 24 V DC, positive switching

	8-channel digital input, 24 V DC, M12, type 1/3	16-channel digital input, 24 V DC, M12, type 1/3
Technical data	**EQ1008-0002**	**EQ1809-0022**
Connection technology	M12, screw type	M12, screw type
Specification	EN 61131-2, type 1/3	EN 61131-2, type 1/3
Input filter	3.0 ms	3.0 ms
Number of inputs	8	16
	 3-wire 2-wire	 3-wire 2-wire
	The EQ1008 EtherCAT Box with 8 digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are connected via M12 screw type connectors. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.	The EQ1809 EtherCAT Box with 16 digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The signals are connected via M12 screw type connectors. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Protocol	EtherCAT	EtherCAT
Bus interface	2 x M8 socket, shielded, screw type	2 x M8 socket, shielded, screw type
Distributed clocks	–	–
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S	130 mA	130 mA
Electrical isolation	500 V	500 V
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL
Further information	EQ1008	EQ1809

We reserve the right to make technical changes.

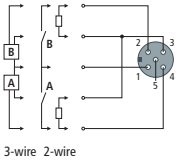
Digital output | **24 V DC, positive switching**

	8-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A	16-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A
Technical data	**EQ2008-0002**	**EQ2809-0022**
Connection technology	M12, screw type	M12, screw type
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
Number of outputs	8	16
		
	The EQ2008 EtherCAT Box with digital outputs connects binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A. The signals are connected via M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.	The EQ2809 EtherCAT Box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. The signal state is indicated by means of light emitting diodes. The signals are connected via M12 screw type connectors. The outputs are short-circuit-proof and protected against inverse connection.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption from U_S	130 mA	130 mA
Distributed clocks	–	–
Short circuit current	typ. 1.5 A	typ. 1.5 A
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Electrical isolation	500 V	500 V
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL	CE, UL
Further information	EQ2008	EQ2809

Digital combi | **24 V DC, positive switching**

16-channel digital input or output,
24 V DC, M12, I_{MAX} = 0.5 A

Technical data	EQ2339-0022
Connection technology	M12, screw type
Specification	EN 61131-2, type 1/3
Input filter	3.0 ms
Number of channels	16 digital inputs or outputs



The EQ2339 EtherCAT Box has 16 digital inputs or outputs in one device. A filter constant of 3.0 ms is available for the inputs. The outputs are short-circuit-proof and protected against inverse polarity. They handle load currents of up to 0.5 A each, although the total current is limited to 4 A. The signals are connected via M12 screw type connectors. The sensors are powered by the load voltage U_P.

Nominal voltage	24 V DC (-15 %/+20 %)
Max. output current	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
Load type	ohmic, inductive, lamp load
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof
Distributed clocks	–
Short circuit current	typ. 1.5 A
Auxiliary power current	typ. 20 mA + load
Current consumption from U_S	120 mA
Electrical isolation	500 V
Operating temperature	-25…+60 °C
Approvals	CE, UL
Further information	EQ2339

We reserve the right to make technical changes.

IN
OUT
Link / Act
Run
24V Us
Up 24V
EQ2339-0022
BECKHOFF
IN 24V OUT
EQ3174-0002
BECKHOFF

Analog input | -10…+10 V, 0/4…20 mA, temperature

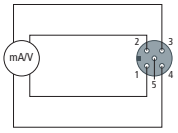
The EQ3174 EtherCAT Box evaluates analog standard signals within the range of -10/0 V to +10 V or 0/4 mA to 20 mA with 16-bit resolution. The signal form is separately configurable for each channel. The EQ3174 evaluates the difference between the two input signals Input+ and Input-. These must be referred to the ground potential of the load voltage U_P. The DC component does not affect the measurement, as long as it is in the common mode range.

The EQ3204 analog input module is intended for the direct connection of resistance thermometers. The resistance is measured with a low measuring current, linearised and represented in 0.1 °C. The EtherCAT Box supports 2-, 3- and 4-wire measurement on all four channels. The measurements serve to eliminate or deduct the parasitic resistance of the sensor cable. All inputs are separately configurable for a wide range of sensors, for the three measurement procedures and for the direct measurement of resistance.

The EQ3314 EtherCAT Box enables the measurement of temperature using thermocouples. The measured thermovoltage is linearised in accordance with the characteristic of the respective type and transferred to the controller as a temperature value in 1/10 °C or 1/100 °C. The inputs are separately configurable for a wide range of different sensor types. Parasitic thermovoltages arise at the interface of the measuring cable and the module, significantly falsifying the measurement. This error is eliminated by a compensation connector.

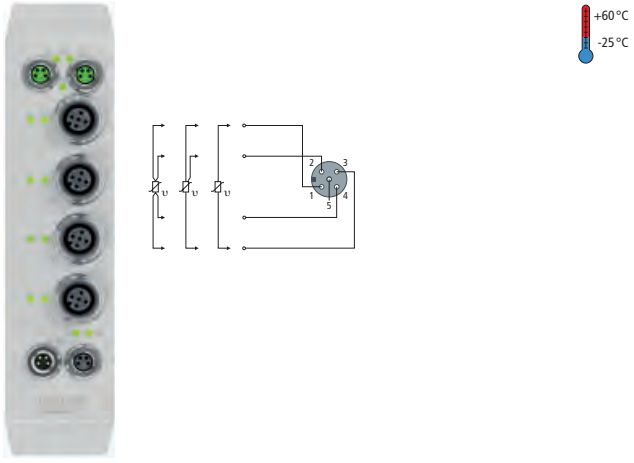
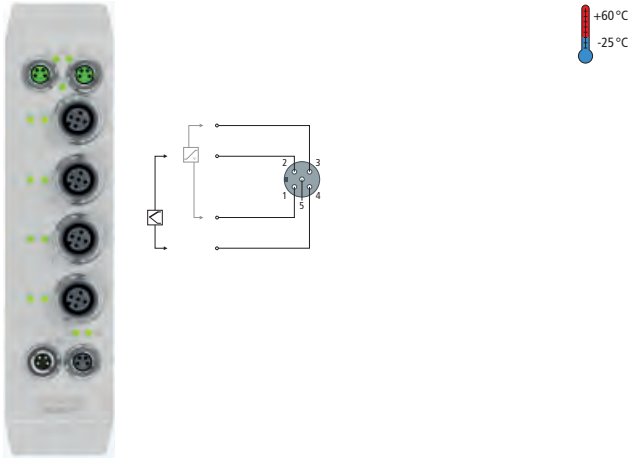
4-channel analog input,
-10/0…+10 V or 0/4…20 mA,
parameterisable, differential input,
16 bit

Technical data	EQ3174-0002
Connection technology	M12, screw type
Signal type	-10/0…+10 V | 0/4…20 mA
Resolution	16 bit (incl. sign)
Conversion time	~ 100 µs
Number of inputs	4
Measuring error	< ±0.3 % (relative to full scale value)
Distributed clocks	yes
Sensor types	–
Measuring range	–
Internal resistance	> 200 kΩ | 85 Ω typ. + diode voltage
Sensor supply	from load supply voltage U_P, DC, any value up to 30 V
Current consumption from U_S	120 mA
Operating temperature	-25…+60 °C
Approvals	CE, UL
Further information	EQ3174

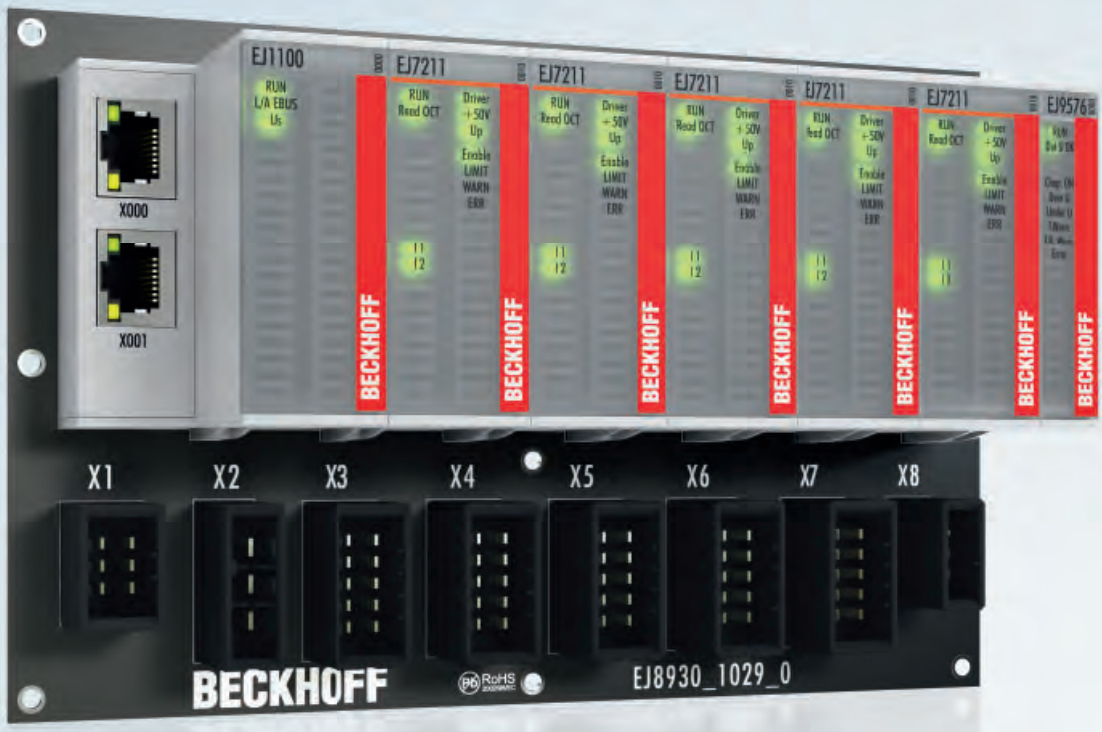


The EQ3174 EtherCAT Box has four analog inputs which can be individually parameterised, so that they process signals either in the -10/0 to +10 V or the 0/4 to 20 mA range. The voltage or input current is digitised with a resolution of 16 bit, and is transmitted (electrically isolated) to the higher-level automation device. The four input channels have differential inputs and have a common, internal ground potential. The input filter and therefore the conversion times are configurable in a wide range.

We reserve the right to make technical changes.

	4-channel analog input, PT100 (RTD), parameterisable, 16 bit	4-channel analog input, thermocouple/mV, parameterisable, 16 bit
	EQ3204-0002	**EQ3314-0002**
	M12, screw type	M12, screw type
	PT100	thermocouple
	0.1 °C per digit	0.1 °C per digit
	800 ms up to 2 ms, see documentation, default: approx. 85 ms	2.5 s up to 20 ms, see documentation, default: approx. 250 ms
	4	4
		
	The EQ3204 EtherCAT Box with analog inputs allows resistance sensors to be connected directly. The module's circuitry can operate the sensors using 2-, 3- or 4-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement. The module's standard settings are: resolution 0.1°C in the temperature range of PT100 sensors in 2-wire connection.	The EQ3314 EtherCAT Box with analog inputs permits four thermocouples to be connected directly. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The EQ3314 can also be used for mV measurement.
	< ±0.5 °C for PT sensors (further types see documentation)	< ±0.3 % for type K (relative to full scale value), further types see documentation
	–	–
	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ)	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	depending on sensor type; preset value is type K, -100…+1370 °C
	–	–
	–	–
	120 mA	120 mA
	-25…+60 °C	-25…+60 °C
	CE, UL	CE, UL
	EQ3204	EQ3314

EtherCAT®



Highlights

- Very compact EtherCAT I/O system in IP 20 for plug-in into a circuit board (signal distribution board)
- Optimised for high-volume production
- Application-specific connector interface

EtherCAT Plug-in Modules

Bus Terminals for circuit boards

▸ EtherCAT-Plug-in-Modules

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1044 TwinSAFE

Product overview EtherCAT plug-in modules

EtherCAT Couplers

EtherCAT Couplers E-bus	EJ1100 557	EJ1101-0022 557 external connectors, power supply module and optional ID switches

EtherCAT plug-in modules | Digital input: EJ1xxx

Signal	2-channel	4-channel	8-channel	16-channel
5 V DC			EJ1128 559	
24 V DC (filter 3.0 ms)			EJ1008 558 type 3	EJ1809 558 type 3
			EJ1859 558 type 3, 8 inputs, 8 outputs, I_{MAX} = 0.5 A	EJ1889 558 negative switching
24 V DC (safe inputs)		EJ1914 560 TwinSAFE, 4 safe inputs	EJ1918 560 TwinSAFE, 8 safe inputs	
			EJ1957 560 TwinSAFE, 8 safe inputs, 4 safe outputs	

EtherCAT plug-in modules | Digital output: EJ2xxx

Signal	2-channel	4-channel	8-channel	16-channel
24 V DC (I_{MAX} = 0.5 A)			EJ2008 561	EJ2809 561
			EJ1859 558 type 3, 8 inputs, 8 outputs, I_{MAX} = 0.5 A	EJ2889 561 negative switching
24 V DC (safe outputs)		EJ2914 562 TwinSAFE, 4 safe outputs	EJ2918 562 TwinSAFE, 8 safe outputs	
		EJ1957 562 TwinSAFE, 8 safe inputs, 4 safe outputs		
PWM	EJ2502 561 24 V DC, 0.5 A			

EtherCAT plug-in modules | Analog input: EJ3xxx

Signal	2-channel	4-channel	8-channel	16-channel
±10 V		EJ3004 563 single-ended, 12 bit	EJ3108 563 6 x differential inputs, 2 x single-ended, 16 bit	
Resistance thermometer (RTD)	EJ3202 563 16 bit	EJ3214 563 16 bit		

EN 61131-2 specifi cation ▶ **N61131-2**

We reserve the right to make technical changes.

EtherCAT plug-in modules | Analog output: EJ4xxx

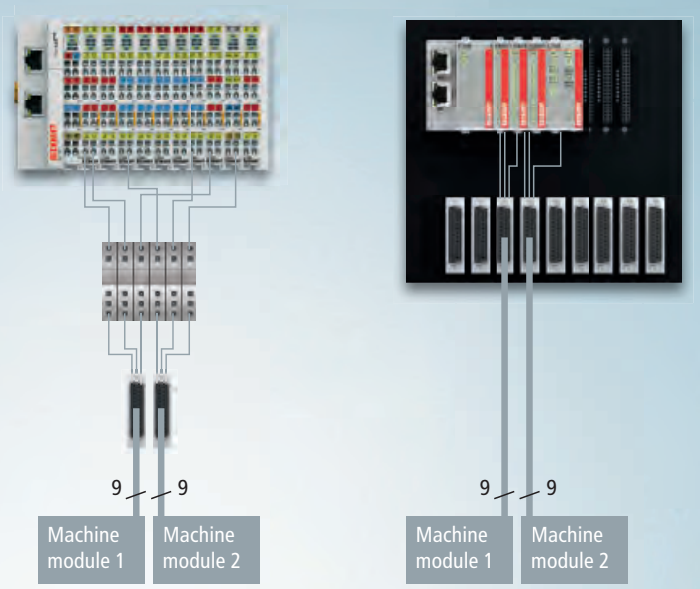
Signal	2-channel	4-channel
0…10 V	**EJ4002** 564 12 bit	
±10 V		**EJ4134** 564 16 bit

EtherCAT plug-in modules | Special functions: EJ5xxx, EJ6xxx, EJ7xxx

Signal	1-channel	2-channel
Position measurement		**EJ5002** 565 SSI encoder interface
Safety	**EJ6910** 566 TwinSAFE Logic	
Motion	**EJ7047** 567 stepper motor module, I_{MAX} = 5.0 A, 50 V DC, incremental encoder, vector control	**EJ7342** 567 DC motor output stage, I_{MAX} = 3.5 A, 50 V DC, incremental encoder
	EJ7211-0010 567 servomotor module, I_{MAX} = 4.5 A_{RMS}, 50 V DC, OCT	

EtherCAT plug-in modules | System: EJ9xxx

Signal	System	
System	**EJ9001** 568 placeholder module	
	Power supply and accessories	
24 V DC	**EJ9400** 569 input 24 V DC, E-bus power supply, 2.5 A	**EJ9404** 569 input 24 V DC, E-bus power supply, 12 A
	EJ9505 569 input 24 V DC, output 5 V DC, 0.5 A	
µF	**EJ9576** 568 brake chopper module, up to 72 V DC, 155 µF	



Signal distribution via single-core wiring

Signal distribution via signal distribution board

EJxxxx | EtherCAT plug-in modules

The EtherCAT I/O plug-in modules are based electronically on the well-known EtherCAT Terminals, and they provide the same broad variety of signals, including functional safety (TwinSAFE). Their electromechanical design enables them to be plugged directly into an application-specific signal distribution board. This routing board distributes signals and power supply to machine modules via prefabricated cables with application-specific plug connectors. The main advantage of the signal distribution board is the highly automated production process, from the manufacture of the circuit board and its assembly through to the inspection. All connector interfaces can be placed on the circuit board according to customer specifications. The connector level, which is matched to the application, considerably optimises the wiring procedure, for example with the use of prefabricated cables and coded plug connectors.

The manufacturing process can be accelerated as far as possible and the risk of wiring errors is minimised. This saves working time and thus costs. It allows production at different worldwide locations with a minimum of risk, since errors are avoided through automation and coding.

The EtherCAT plug-in modules offer an alternative to conventional point-to-point wiring in control cabinets, since they simplify wiring, and reduce the system installation time and testing costs where machines are manufactured in high numbers.

Compact design for an optimised machine footprint

Similar to the EtherCAT Terminal system, a module strand consists of a Bus Coupler and any desired I/O modules. In contrast to the EtherCAT Terminals, however, the EtherCAT plug-in modules have no spring-loaded contacts, since the wiring level is implemented differently: for communication, signal distribution and the supply of power to the modules plug connectors on the back side of the modules and the conductive tracks of the signal distribution board are used.

Measuring just 12 x 55 x 66 mm, the EJ modules are extremely compact; compared to the EtherCAT Terminals they are almost 50 % smaller in relation to volume. In conjunction with coding holes in the signal distribution board, coding pins on the underside of the EJ modules ensure protection against incorrect plug insertion. Thus, the risk of errors can be minimised during assembly and service.

The EtherCAT plug-in modules and the plug level for sensors and actuators can be placed flexibly on the signal distribution board. The signal distribution board is developed either by the user or as custom solution by Beckhoff.

I/O solution for standard applications

The EJ system supplements the modular Beckhoff I/O portfolio for controllers used in medium to high-volume production of standard machines. It is also suitable for applications where the reduction of error probability is critical for the exact replication of a machine. In general, the use of the EJ system is recommended for machine manufacturers who want to create a platform of common parts across their product range.

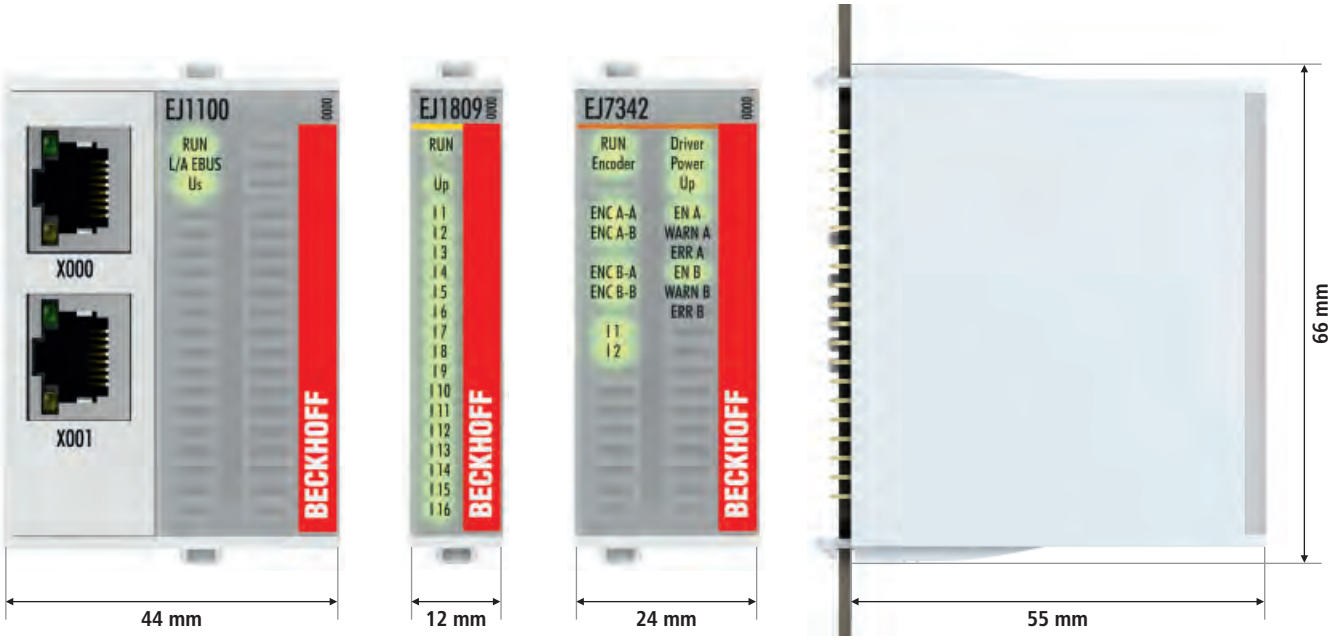
In addition, the EJ system directly addresses projects with a shortage of skilled workers. Especially when production facilities are distributed across various locations with different skill levels, the risk of errors increases along with the complexity of the machines. With the combination of I/O modules, signal distribution board and prefabricated cables, the EJ system offers efficient "Plug & Work" solutions for machine controllers.

Signal distribution board

The EtherCAT plug-in modules can be directly attached to a PCB. This application-specific PCB (signal distribution board) distributes signals and power supply to individual application-specific plug connectors, in order to connect the controller to further machine modules.

We reserve the right to make technical changes.

Technical data – EtherCAT plug-in modules

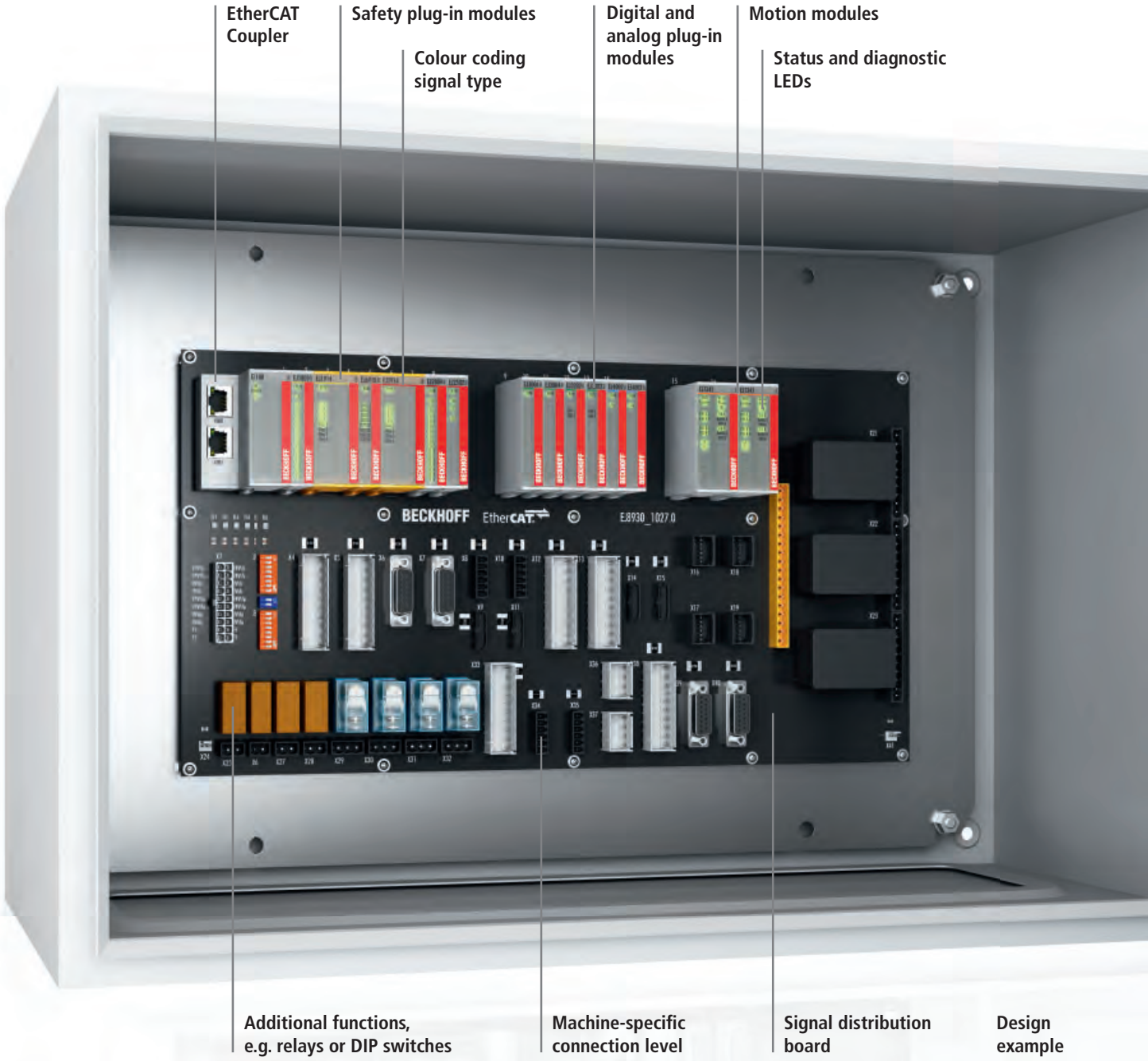


Technical data	EJ1100 coupler	12 mm EJ module	24 mm EJ module
Design form	EtherCAT I/O plug-in module		
Material	polycarbonate		
Installation	on signal distribution board		
Mechanical coding	EJ plug-in module: signal-specific coding pins on the housing, signal distribution board: holes in the printed circuit board		
Locking	latching lug in circuit board cut-out		
Connection method	field wiring: application-specific wiring level on the signal distribution board, EJ plug-in module: 2 x 20-pin socket strip		
EtherCAT connection	direct	via EJ1100 coupler	via EJ1100 coupler
Electrical isolation	500 V (E-bus/field potential)		
Current supply E-bus	2200 mA	–	–
Bus interface	2 x RJ45	–	–
Dimensions (W x H x D)	44 mm x 66 mm x 55 mm	12 mm x 66 mm x 55 mm	24 mm x 66 mm x 55 mm
Operating/storage temperature	0…+55 °C/-25…+85 °C		
Relative humidity	5…95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4 (with corresponding signal distribution board)		
Protection class/ installation position	EJ module: IP 20/horizontal, EJ system: dependent on signal distribution board and housing		

We reserve the right to make technical changes.

EtherCAT Plug-in Modules

▶ EtherCAT-Plug-in-Modules



We reserve the right to make technical changes.

EtherCAT Coupler

The EJ1100 and EJ1101-0022 couplers connect EtherCAT with the EtherCAT plug-in modules (EJxxxx). They convert the passing telegrams from Ethernet 100BASE-TX to E-bus signal representation.

The couplers are connected to the network via the upper Ethernet interface. The lower RJ45 socket may be used to connect further EtherCAT devices in the same strand.

The external RJ45 sockets of the EJ1101-0022 can be installed directly on the signal distribution board. In combination with the external power supply modules EJ9400 (2.5 A) and EJ9404 (12 A), many configurations can be implemented (cabinet feed-throughs, built-in solutions, etc.).

With the EJ1101-0022 a unique ID can be assigned to a group of EtherCAT components via external ID switches. This group can then be located at any position within the EtherCAT network. Variable topologies are therefore easily implementable.

EJ94xx | Power supply plug-in modules see page 569

	EtherCAT Coupler	EtherCAT Coupler with external connectors, power supply module and optional ID switches
Technical data	**EJ1100**	**EJ1101-0022**
Task within EtherCAT system	coupling of EtherCAT plug-in modules (EJxxxx) to 100BASE-TX EtherCAT networks	
Data transfer rates	100 Mbaud	
Bus interface	2 x RJ45	2 x RJ45 (external)
Type/number of peripheral signals	max. 4.2 GB addressable I/O points	max. 4.2 GB addressable I/O points
Data transfer medium	Industrial Ethernet cable (min. Cat.5), shielded	Industrial Ethernet/EtherCAT cable (min. Cat.5), shielded
Current consumption from U_S	70 mA + (∑ E-bus current/4)	–
Current consumption from U_P	load	–
Distance between stations	max. 100 m (100BASE-TX)	depends on signal distribution board
Delay	typ. 1 µs	typ. 1 µs
Power supply	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption E-bus	–	typ. 310 mA
Current supply E-bus	2200 mA	–
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE	CE
Further information	EJ1100	EJ1101-0022

Digital input | 24 V DC

	8-channel digital input, 24 V DC, type 1/3	16-channel digital input, 24 V DC, type 1/3	8-channel digital input + 8-channel digital output, 24 V DC, type 1/3	16-channel digital input, 24 V DC, negative switching
Technical data	**EJ1008**	**EJ1809**	**EJ1859**	**EJ1889**
Specification	EN 61131-2, type 1/3			negative switching "0": 18…30 V DC, "1": 0…7 V DC, typ. 3 mA input current
Input filter	typ. 3.0 ms			
Number of inputs	8	16	8 inputs + 8 outputs	16
	The EJ1008 digital input acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit.	The EJ1809 digital input acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation unit.	The EJ1859 EtherCAT plug-in module combines eight digital inputs and eight digital outputs in one device.	The EJ1889 digital input acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the higher-level automation device. The reference point for all inputs of the EJ1889 is the 24 V field voltage.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption E-bus	typ. 80 mA	typ. 80 mA	typ. 90 mA	typ. 80 mA
Distributed clocks	–	–	–	–
Special features	standard input module for bouncing signals (filter 3 ms)	standard input module with high number of channels for slow 24 V DC edges	combi module, 8 x output 24 V DC, max. output current 0.5 A, load type: ohmic, inductive, lamp load, reverse voltage protection	negative switching
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE	CE
Further information	EJ1008	EJ1809	EJ1859	EJ1889

We reserve the right to make technical changes.

Digital input | 5 V DC

The EJ1128 EtherCAT plug-in module acquires the binary 5 V DC control signals and transmits them, in an electrically isolated form, to the higher-level automation unit. The inputs feature HCT CMOS technology, i.e. the resulting switching thresholds allow the use of sensors with HC CMOS outputs as well as TTL outputs.

The power for the module (5 V DC) can be supplied via the EJ9505 power supply module.

	8-channel digital input, 5 V DC
Technical data	**EJ1128**
Specification	"0": < 0.8 V DC, "1": > 2.4 V DC, typ. 50 µA
Input filter	typ. 0.05 µs
Number of inputs	8
Nominal voltage	5 V DC
Current consumption E-bus	typ. 80 mA
Distributed clocks	–
Electrical isolation	500 V (E-bus/field potential)
Special features	fast CMOS input
Operating temperature	0…+55 °C
Approvals	CE
Further information	EJ1128

For availability status see Beckhoff website at: EJ1128

We reserve the right to make technical changes.

Digital input | 24 V DC, TwinSAFE

	4-channel digital input, TwinSAFE, 24 V DC	8-channel digital input, TwinSAFE, 24 V DC	8-channel digital input, 4-channel digital output, TwinSAFE, 24 V DC
Technical data	**EJ1914**	**EJ1918**	**EJ1957**
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
Max. output current	–		500 mA, ∑ 2 A
Number of inputs	4	8	8
Number of outputs	–	–	4
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT
Current consumption power contacts	–	–	–
Current consumption E-bus	approx. 200 mA	approx. 200 mA	approx. 200 mA
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Special features	4 safe inputs	8 safe inputs	8 safe inputs, 4 safe outputs
Operating/storage temperature	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C
Approvals	in preparation	in preparation	in preparation
Further information	EJ1914	EJ1918	EJ1957

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

Digital output | **24 V DC**

	8-channel digital output, 24 V DC, 0.5 A	16-channel digital output, 24 V DC, 0.5 A	16-channel digital output, 24 V DC, 0.5 A, negative switching	2-channel pulse width output, 24 V DC, 0.5 A
Technical data	**EJ2008**	**EJ2809**	**EJ2889**	**EJ2502**
Load type	ohmic, inductive, lamp load			
Max. output current	0.5 A (short-circuit-proof) per channel			
Switching times	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 60 µs, typ. T_{OFF}: 300 µs	typ. T_{ON}: 50 µs, typ. T_{OFF}: 200 µs	T_{ON}: > 750 ns, T_{OFF}: > 500 ns
Number of outputs	8	16	16	2
	The EJ2008 digital output connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation.	The EJ2809 digital output connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation.	The EJ2889 digital output connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation.	The EJ2502 output modulates the pulse width of a binary signal and outputs it electrically isolated from the E-bus.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption E-bus	typ. 110 mA	typ. 110 mA	typ. 130 mA	typ. 110 mA
Distributed clocks	–	–	–	–
Base frequency	–	–	–	1…20 kHz, 250 Hz default
Duty factor	–	–	–	0…100 %
Resolution	–	–	–	9…15 bit
Breaking energy	< 150 mJ/channel	< 150 mJ/channel	< 100 mJ/channel	–
Reverse voltage protection	yes	yes	yes	yes
Short circuit current	typ. < 2 A	typ. < 2 A	typ. < 7 A	typ. < 1.5 A
Special features	–	–	negative switching	separate frequency can be set for each channel
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE	CE
Further information	EJ2008	EJ2809	EJ2889	EJ2502

Digital output | 24 V DC, TwinSAFE

	8-channel digital input, 4-channel digital output, TwinSAFE, 24 V DC	4-channel digital output, TwinSAFE, 24 V DC	8-channel digital output, TwinSAFE, 24 V DC
Technical data	EJ1957	EJ2914	EJ2918
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
Max. output current	500 mA, ∑ 2 A	500 mA	
Number of inputs	8	–	–
Number of outputs	4	4	8
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT
Current consumption power contacts	–	–	–
Current consumption E-bus	approx. 200 mA	approx. 221 mA	approx. 221 mA
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Special features	8 safe inputs, 4 safe outputs	4 safe outputs	8 safe outputs
Operating/storage temperature	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C
Approvals	in preparation	in preparation	in preparation
Further information	EJ1957	EJ2914	EJ2918

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

Analog input | -10…+10 V, PT100

	4-channel analog input -10…+10 V, 12 bit, single-ended	8-channel analog input -10…+10 V, 16 bit, 6 differential and 2 single-ended inputs	2-channel analog input, PT100 (RTD), 16 bit	4-channel analog input, PT100 (RTD), 16 bit
Technical data	**EJ3004**	**EJ3108**	**EJ3202**	**i EJ3214**
Resolution	12 bits (16 bits presentation)	16 bit	0.1 °C per digit	
Conversion time	typ. 0.625 ms (default setting: 50 Hz filter)	min. cycle time 1 ms	approx. 85 ms default setting, 2…800 ms configurable	approx. 170 ms default setting
Number of inputs	4 (single-ended)	6 (differential) + 2 (single-ended)	2	4
	The EJ3004 analog input processes signals in the range between -10 and +10 V.	The EJ3108 analog input processes signals in the range between -10 and +10 V.	The EJ3202 analog input allows resistance sensors to be connected directly.	The EJ3214 analog input allows resistance sensors to be connected directly in 3-wire connection.
Signal type	-10…+10 V	-10…+10 V	RTD	RTD
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.5 °C for PT sensors	< ±0.5 °C for PT sensors, 4 x 3-wire connection
Current consumption E-bus	typ. 120 mA	typ. 300 mA	typ. 165 mA	typ. 190 mA
Distributed clocks	–	–	–	–
Sensor types	–	–	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ), KTY sensors (types see documentation)	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/4 kΩ), KTY sensors (types see documentation)
Measuring range	-10…+10 V	-10…+10 V	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)
Internal resistance	> 130 kΩ	differential: typ. 20 MΩ, single-ended: typ. 10 MΩ	–	–
Input filter limit frequency	1 kHz	typ. 200 Hz	typ. 1 kHz	typ. 1 kHz
Special features	standard and compact process image, switchable measuring data representation, activatable FIR/IIR filters, limit value monitoring, overload display in the process data	switchable measuring data representation, limit value monitoring, overload display in the process data	integrated digital filter, limit value monitoring, variable connection technology	integrated digital filter, limit value monitoring, variable connection technology
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE	CE
Further information	EJ3004	EJ3108	EJ3202	EJ3214

i For availability status see Beckhoff website at: EJ3214

Analog output | -10/0…10 V

	2-channel analog output, 0…10 V, 12 bit	4-channel analog output, -10…+10 V, 16 bit
Technical data	**EJ4002**	**EJ4134**
Signal voltage	0…10 V	-10…+10 V
Resolution	12 bit	16 bit
Conversion time	~ 150 µs	~ 200 µs (0…100 %)
Number of outputs	2	4
	The EJ4002 analog output generates signals in the range between 0 and 10 V.	The EJ4134 analog output generates signals in the range between -10 and +10 V.
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Current consumption E-bus	typ. 90 mA	typ. 90 mA
Distributed clocks	–	yes
Distributed clock precision	–	<< 1 µs
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Special features	Optional watchdog: user-specific output value with ramp; user synchronisation can be activated.	Watchdog parameterisable; user synchronisation can be activated.
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE	CE
Further information	EJ4002	EJ4134

We reserve the right to make technical changes.

Position measurement | **SSI encoder interface**

The EJ5002 plug-in module allows the direct connection of two SSI encoders. The data is transmitted to the controller synchronously with the clock cycle dictated by the EJ5002. Various parameters make it possible to flexibly adapt the EJ5002 to the respective application. Different parameters can be set and analysed like operation mode, SSI transfer rate, coding and data length. Furthermore, an additional bit can be displayed in the process image.

The 24 V power supply for the encoder can be provided directly via the feed-in on the signal distribution board. For optional 5 V power, the EJ9505 power supply module can be used.

The EJ5002 supports distributed clocks. Cyclic reading of the SSI encoder can thus be started with high precision, enabling detailed dynamic analysis of the axis in the control system.

	SSI encoder interface
Technical data	**EJ5002**
Technology	SSI encoder interface
Number of channels	2
Encoder connection	binary input: D+, D-, binary output: Cl+, Cl-
Input voltage	24 V DC (-15 %/+20 %)
Current consumption E-bus	typ. 120 mA
Data transfer rates	variable up to 1 MHz, 250 kHz default
Data direction	read
Distributed clocks	yes
Signal input	difference signal (RS422)
Signal output	difference signal (RS422)
Current consumption	typ. 20 mA (without sensor)
Special features	adjustable baud rate, coding and data length
Operating temperature	0…+55 °C
Approvals	CE
Further information	EJ5002

Communication | **TwinSAFE**

The EJ6910 TwinSAFE Logic can establish up to 212 connections to other TwinSAFE devices. Several EJ6910 can be cascaded in a TwinSAFE network with up to 65,535 TwinSAFE devices. The EJ6910 EtherCAT plug-in module features certified safety function blocks, which are configured according to the application. Safety functions such as emergency stop, safety door monitoring, two-hand control, etc. can thus easily be selected and linked. All blocks can be freely connected among each other and are complemented by operators such as AND, OR, etc. The required functions are programmed via the TwinCAT Safety Editor and loaded into the EJ6910 TwinSAFE Logic via the fieldbus. The EJ6910 is suitable for applications according to IEC 61508 SIL 3 and DIN EN ISO 13849-1:2008 PL e.

	TwinSAFE Logic
Technical data	**EJ6910**
Technology	TwinSAFE Logic
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
	The TwinSAFE Logic can establish 212 connections to other TwinSAFE devices.
Protocol	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	–
Current consumption E-bus	approx. 222 mA
Cycle time	500 µs…~10 ms
Fault response time	≤ watchdog time (parameterisable)
Permitted degree of contamination	2
Climate class EN 60721-3-3	3K3
Special features	backup restore
Operating/storage temperature	0…+55 °C/-25…+85 °C
Approvals	CE, TÜV SÜD
Further information	EJ6910

We reserve the right to make technical changes.

Motion | Stepper, servo and DC motor modules

	Stepper motor module 50 V DC, 5 A, with incremental encoder, vector control	Servomotor module for OCT, 50 V DC, 4.5 A_{RMS}	2-channel DC motor output stage 50 V DC, 3.5 A
Technical data	**EJ7047**	**EJ7211-0010**	**EJ7342**
Technology	direct motor connection		
Load type	uni- or bipolar stepper motors	permanent-magnet synchronous motors	DC brush motors, inductive
Output current	max. 5 A (overload- and short-circuit-proof)	output current I_N: 4.5 A (rms), peak current I_N: 9.0 A (rms) for 1 s	per channel max. 3.5 A (short-circuit-proof, common thermal overload warning for both output stages)
Number of channels	1 stepper motor, encoder input, 2 digital inputs, 1 output (0.5 A) configurable	1 servomotor, absolute feedback, motor brake, 2 digital inputs	2 DC motors, 2 digital inputs, encoder input
Nominal voltage	8…50 V DC	8…50 V DC	8…50 V DC
Current consumption E-bus	typ. 140 mA	typ. 130 mA	typ. 160 mA
Distributed clocks	yes	yes	yes
Maximum step frequency	1000, 2000, 4000 or 8000 full steps/s (configurable)	–	–
Step pattern	64-fold micro stepping	–	–
Current controller frequency	approx. 30 kHz	32 kHz	–
Frequency range	–	0…599 Hz	–
PWM clock frequency	–	16 kHz	30 kHz with 180° phase shift each
Duty factor	–	–	0…100 % (voltage-controlled)
Control resolution	approx. 5000 positions in typ. applications (per revolution)	–	max. 10 bits current, 16 bits speed
Encoder input signal	5…24 V DC, 5 mA, single-ended	–	5…24 V DC, 5 mA, single-ended
Pulse frequency	max. 400,000 increments/s (with 4-fold evaluation)	–	max. 400,000 increments/s (with 4-fold evaluation)
Special features	travel distance control, encoder input, vector control	compact and system-integrated, absolute feedback, One Cable Technology (OCT), plug-and-play	travel distance control, encoder input
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE
Further information	EJ7047	EJ7211-0010	EJ7342

System | **Placeholder, brake chopper**

	Placeholder module	Brake chopper module, 72 V, 155 µF
Technical data	**EJ9001**	**EJ9576**
Technology	placeholder module	brake chopper
Diagnostics	–	temperature on board, over-/undervoltage
	The placeholder modules can be plugged into unused slots on the signal distribution board. The slots reserved in such a way can be equipped with functional modules when the range of functions is extended.	The EJ9576 buffers the connected voltage via its integrated capacitors and connects the external brake resistor if the preset threshold of the internal voltage is exceeded.
Nominal voltage	–	arbitrary up to 72 V
Current consumption E-bus	typ. 60 mA	typ. 85 mA
Capacity	–	155 µF
Ripple current (max.)	–	10 A
Internal resistance	–	< 5 mΩ
Chopper voltage	–	adjustable
Recommended ballast resistor	–	10 Ω, typ. 100 W (dependent on application)
Overvoltage control range	–	typ. 1 V, parametrisable by CoE data
Ballast resistor clock rate	–	load-dependent, max. 100 µs, 2-point control
Electrical isolation	500 V (E-bus/field potential)	1500 V (E-bus/field potential)
Special features	placeholder module for subsequent functional extensions	adjustabel threshold
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE	CE
Further information	EJ9001	EJ9576

We reserve the right to make technical changes.

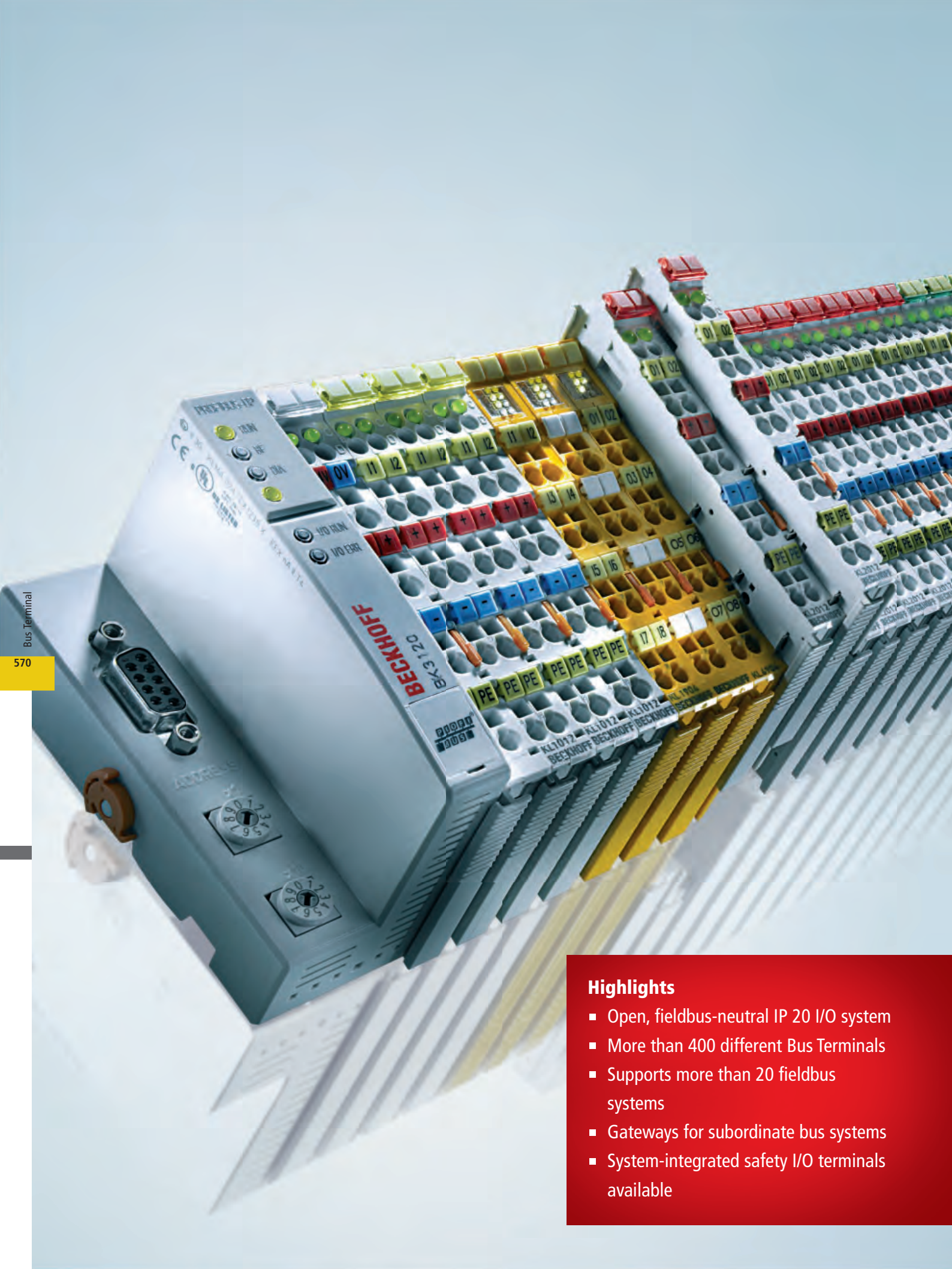
System | **Power supply modules**

The EJ94xx and EJ95xx module series are designed for the modified feeding of the operating voltage into the module strand. The EJ9400 and EJ9404 EtherCAT plug-in modules are used in combination with the EJ1101-0022 EtherCAT Coupler to supply the E-bus with power. Data is exchanged between the EtherCAT Coupler and the plug-in module over the E-bus. Each EtherCAT plug-in module draws a certain amount of current from the E-bus (see technical data: current consumption E-bus). This current is fed into the E-bus by the power supply plug-in module. To supply the E-bus with power, two performance classes are available: 2.5 A (EJ9400) and 12 A (EJ9404). The power supply is selected according to the number of EtherCAT plug-in modules that must be supplied.

The EJ9505 power supply module generates an output voltage of 5 V DC from the (24 V DC) input voltage. This output voltage can be used to supply power to EtherCAT plug-in modules or external sensors. The power LEDs indicate the module's operating state; the error LED indicates short circuit or overcurrent. The input voltage and the output voltage are not electrically isolated.

	Power supply plug-in module for E-bus, 2.5 A	Power supply plug-in module for E-bus, 12 A	Power supply plug-in module, 5 V DC, with diagnostics
Technical data	**EJ9400**	**EJ9404**	**EJ9505**
Technology	power supply module for E-bus		power supply module
Diagnostics in the process image	–		yes
Input voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Output voltage	–	–	5 V DC ±1 %
Input current	approx. 10 mA + (E-bus/6.25)	approx. 10 mA + (E-bus/6.25)	load-dependent
Max. output current	2.5 A	12 A	0.5 A
Short-circuit-proof	–	–	yes
Current consumption E-bus	–	–	typ. 70 mA
Electrical isolation	–	–	–
Special features	E-bus supply in combination with the EJ1101-0022 EtherCAT Coupler	E-bus supply in combination with the EJ1101-0022 EtherCAT Coupler	stabilised output voltage
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE
Further information	EJ9400	EJ9404	EJ9505

i For availability status see Beckhoff website at: EJ9505



Highlights

- Open, fieldbus-neutral IP 20 I/O system
- More than 400 different Bus Terminals
- Supports more than 20 fieldbus systems
- Gateways for subordinate bus systems
- System-integrated safety I/O terminals available

Bus Terminal

The modular fieldbus system for automation

▸ BusTerminal

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593 Lightbus BK2xx0
594 PROFIBUS BK3xx0, LC3100
596 Interbus BK40x0
596 CANopen BK51xx, LC5100
598 DeviceNet BK52x0, LC5200
600 ControlNet BK7000
600 CC-Link BK7150
601 Modbus BK73x0
602 SERCOS interface BK75x0
602 RS232/RS485 BK8x00
603 Ethernet TCP/IP BK9xx0
604 PROFINET BK9xx3
605 EtherNet/IP BK9xx5
605 USB BK9500

606 Bus Terminal Controllers

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System overview Bus Couplers

	Bus Coupler					PLC		
Features	Standard BKxx00	Economy BKxx10	Economy plus BKxx20	Compact BKxx5x	Low Cost LCxx00	Controller BCxx00	BCxx50	BC9191
Function	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave	fieldbus slave, with integrated IEC 61131-3 PLC	fieldbus slave, with integrated IEC 61131-3 PLC	Building Automation Room Controller
Program memory	–	–	–	–	–	32/96 kbyte	48 kbyte	BC9191: 48 kbyte, BC9191-0100: 128 kbyte
Main memory	–	–	–	–	–	–	–	–
Current supply K-bus	1750 mA	500 mA	1750 mA	1000 mA	500 mA	1750 mA	1000 mA	200 mA
Fieldbus connection	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	direct to the spring-loaded terminals	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	2 x RJ45 (switched)
Supported Bus Terminals	all	only digital I/Os (except KL15xx, KL25xx, KL2692, KL27x1)	all	all	only digital I/Os (except KL15xx, KL25xx, KL2692, KL27x1)	all	all	all
Maximum number of Bus Terminals	64	64	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64	64	64 (255 with terminal bus extension)	64
Electrical isolation	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	PROFIBUS: yes, CANopen and DeviceNet: no	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between mains supply and internal 24 V power supply

We reserve the right to make technical changes.

			Embedded PC			
	BCxx20	BXxx00	CX80xx	CX9xxx	CX9020	CX50xx
	fieldbus slave, with integrated IEC 61131-3 PLC	fieldbus slave, with integrated IEC 61131-3 PLC	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC, Motion Control, visualisation	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC, Motion Control, visualisation	Embedded PC, fieldbus slave, with integrated IEC 61131-3 PLC, Motion Control, visualisation
	128 kbyte	256 kbyte	–	–	–	–
	–	–	64 Mbyte DDR2	64…128 Mbyte SDRAM	1 Gbyte DDR3 RAM	512 Mbyte DDR2
	1750 mA	1450 mA	2000 mA	2000 mA	2000 mA	2000 mA
	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	plug (design depends on the fieldbus)	–	optional, plug (design depends on the fieldbus)	optional, plug (design depends on the fi eldbus)
	all	all	all	all	all	all
	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)	64 (255 with terminal bus extension)
	between fieldbus/ power contacts/ supply voltage	between fieldbus/ power contacts/ supply voltage	between supply voltage and fieldbus	between supply voltage and fieldbus	between supply voltage and fieldbus	between supply voltage and fieldbus

Further Embedded PCs see page 184

We reserve the right to make technical changes.

Product overview Bus Couplers

Fieldbus slave	Bus Coupler: Standard	Bus Coupler: Economy (only digital I/Os)	Bus Coupler: Economy plus	Bus Coupler: Compact	Bus Coupler: Low Cost (only digital I/Os)	PLC: Controller (IEC 61131-3) Program memory 32/96 kbyte	PLC: Program memory 48 kbyte	PLC: Program memory 128 kbyte
EtherCAT			BK1120 592	BK1150 592				
				BK1250 592				
LIGHTBUS	BK2000 593	BK2010 593	BK2020 593					
PROFIBUS		BK3010 594 1.5 Mbaud						
	BK3100 594 12 Mbaud	BK3110 594 12 Mbaud	BK3120 595 12 Mbaud	BK3150 595 12 Mbaud	LC3100 595 12 Mbaud	BC3100 608 12 Mbaud	BC3150 608 12 Mbaud	
			BK3520 595 12 Mbaud, fibre optic					
INTERBUS	BK4000 596		BK4020 596					
CANopen		BK5110 596	BK5120 597	BK5150 597	LC5100 597		BC5150 609	
				BK5151 597				
DeviceNet	BK5200 598	BK5210 598	BK5220 599	BK5250 599	LC5200 599		BC5250 610	
ControlNet	BK7000 600							
CC-Link				BK7150 600				
Modbus	BK7300 601			BK7350 601		BC7300 611	BC8050 611	
							BC8150 612	
sercos the automation bus	BK7500 602		BK7520 602					
RS485	BK8000 602						BC8050 611	
RS232	BK8100 603						BC8150 612	
Ethernet TCP/IP	BK9000 603			BK9050 603		BC9000 613	BC9050 613	BC9020 613
	BK9100 603 2-channel switch					BC9100 614 2-channel switch	BC9191 615 Room Controller	BC9191-0100 615 Room Controller
								BC9120 614 2-channel switch
PROFINET	BK9103 604 2-channel switch			BK9053 604				
EtherNet/IP	BK9105 605 2-channel switch			BK9055 605				
USB	BK9500 605							

We reserve the right to make technical changes.

	Embedded PC							
Program memory 256 kbyte	CX80xx	CX900x, CX9010	CX9020	CX1010	CX50xx	CX51xx	CX1020, CX1030	CX20xx
	CX8010 200		optional[2]		optional[2]	optional[2]		optional[2]
				optional[1]			optional[1]	
	CX8030 200 master		optional[2]	optional[1]	optional[2]	optional[2]	optional[1]	optional[2]
BX3100 609 12 Mbaud	**CX8031** 201 slave		optional[2]	optional[1]	optional[2]	optional[2]	optional[1]	optional[2]
BX5100 609	**CX8050** 201 master		optional[2]	optional[1]	optional[2]	optional[2]	optional[1]	optional[2]
	CX8051 201 slave		optional[2]	optional[1]	optional[2]	optional[2]	optional[1]	optional[2]
BX5200 610								
		optional[3]	optional[3]	optional[3]	optional[3]	optional[3]	optional[3]	optional[3]
BX8000 612	**CX8080** 202	optional[2]	optional[2]	optional[2]	optional[2]	optional[2]	optional[2]	optional[2]
BX8000 612	**CX8080** 202	optional[2]	optional[2]	optional[2]	optional[2]	optional[2]	optional[2]	optional[2]
BX9000 615	**CX8090** 202	**CX9000** 208	**CX9020** 214	**CX1010** 218	**CX5010** 224	**CX5120** 228	**CX1020** 232	**CX2020** 246
	CX8190 205	**CX9010** 210			**CX5020** 224	**CX5130** 228	**CX1030** 234	**CX2030** 246
						CX5140 228		**CX2040** 246
	CX8093 203	optional[3]	optional[2]	optional[3]	optional[2, 3]	optional[2, 3]	optional[3]	optional[2, 3]
	CX8095 203	optional[3]	optional[2]	optional[3]	optional[2, 3]	optional[2, 3]	optional[3]	optional[2, 3]

[1] via modular fieldbus interface, [2] via hardware, [3] via software library

We reserve the right to make technical changes.

Bus Terminal | Digital input: KL1xxxx/KS1xxx							KM1xxx
Signal	**2-channel**		**4-channel**		**8-channel**	**16-channel**	**4-/16-/32-/64-ch.**
5 V DC			**KL1124** 624 filter 0.2 ms				
24 V DC (filter 3.0 ms)	**KL1002** 621 type 3		**KL1104** 620 type 3	**KL1304** 620 type 2	**KL1408** 618 type 3	**KL1809** 619 type 3	
	KL1302 621 type 2	**KL1402** 621 type 3	**KL1154** 623 positive/negative switching	**KL1184** 622 negative switching	**KL1488** 622 negative switching	**KL1862** 621 flat-ribbon cable, type 3	**KM1002** 626 16-channel, type 1
	KL1052 623 positive/negative switching	**KL1352** 629 NAMUR	**KL1404** 619 4 x 2-wire connection, type 3	**KL1804** 620 8 x 24 V, 4 x 0 V, type 3	**KL1808** 619 8 x 24 V DC, type 3	**KL1889** 622 negative switching	**KM1004** 626 32-channel, type 1
	KL1212 620 short-circuit-protected sensor supply, type 1	**KL1362** 629 break-in alarm			**KL1859** 619 8 inputs, 8 outputs, type 3, I_{MAX} = 0.5 A	**KL1862-0010** 622 flat-ribbon cable, type 3, negative switching	**KM1008** 626 64-channel, type 1
24 V DC (filter 0.2 ms)	**KL1012** 621 type 3	**KL1312** 621 type 2	**KL1114** 620 type 3	**KL1314** 620 type 2	**KL1418** 618 type 3	**KL1819** 619 type 3	
		KL1412 621 type 3	**KL1164** 623 positive/negative switching	**KL1194** 622 negative switching	**KL1498** 622 negative switching	**KL1872** 621 flat-ribbon cable, type 3	**KM1012** 626 16-channel, type 1
			KL1414 619 4 x 2-wire connection, type 3	**KL1434** 619 4 x 2-wire connection, type 2			**KM1014** 626 32-channel, type 1
			KL1814 620 8 x 24 V, 4 x 0 V, type 3				**KM1018** 626 64-channel, type 1
24 V DC	**KL1232** 628 pulse expansion	**KL1382** 629 thermistor	**KL1904** 631 TwinSAFE, 4 safe inputs				**KM1644** 627 manual operation, 4-channel
≥ 48 V DC	**KL1032** 624 filter 3.0 ms	**KL1712-0060** 625					
120 V AC/DC	**KL1712** 625						
230 V AC	**KL1702** 625	**KL1722** 625 no power contacts	**KL1704** 625				
Counter (24 V DC)	**KL1501** 630 up/down, 100 kHz	**KL1512** 630 up/down, 1 kHz, 16 bit					

Bus Terminal | Digital output: KL2xxx/KS2xxx					KM2xxx
Signal	**2-channel**	**4-channel**	**8-channel**	**16-channel**	**2-/4-/16-/32-/64-channel**
5 V DC		**KL2124** 637			
24 V DC (I_{MAX} = 0.5 A)	**KL2012** 635	**KL2114** 634	**KL2408** 632	**KL2809** 632	
				KL2819 633 with diagnostics	**KM2002** 636 16-channel
	KL2032 634 reverse voltage protection	**KL2184** 638 negative switching	**KL2488** 638 negative switching	**KL2889** 638 negative switching	**KM2004** 636 32-channel
		KL2134 634 reverse voltage protection	**KL2808** 633 8 x 0 V	**KL2872** 635 flat-ribbon cable	**KM2008** 636 64-channel
	KL2212 635 diagnostic, protected sensor supply	**KL2404** 633 4 x 2-wire	**KL1859** 633 8 inputs, 8 outputs, filter 3.0 ms, type 3	**KL2872-0010** 638 flat-ribbon cable, negative switching	**KM2042** 635 16-channel, D-sub connection

The standard Bus Terminals (KLxxxx) can be optionally ordered as KSxxxx with pluggable wiring level.
EN 61131-2 specifi cation ▶ **N61131-2**

We reserve the right to make technical changes.

Bus Terminal | Digital output: KL2xxx/KS2xxx

Signal	1-channel	2-channel		4-channel	8-channel	KM2xxx 2-/4-/16-/32-/64-ch.
24 V DC (I_{MAX} = 2.0 A)		KL2022 635		KL2424 633 4 x 2-wire	KL2828 633 8 x 2-wire	
30 V AC/DC (I_{MAX} = 2.0 A), solid state relay				KL2784 639		
				KL2794 639 potential-free	KL2798 639 potential-free	
24 V DC		KL2442 634 2 x 4 A/1 x 8 A		KL2904 655 TwinSAFE, 4 safe outputs		
Relay 125/400 V AC	KL2631 641 400 V AC, make contact	KL2612 640 125 V AC, change-over				
230 V AC	KL2641 640 relay, make contact, manual operation, I_{MAX} = 16 A	KL2602 641 relay, make contact, I_{MAX} = 5 A	KL2622 641 relay, make contact, no power contacts, I_{MAX} = 5 A			KM2604 642 relay, I_{MAX} = 16 A, 4-channel
	KL2751 649 universal dimmer, 300 W	KL2652 641 relay, change-over, I_{MAX} = 5 A	KL2702 645 solid state relay, I_{MAX} = 0.3 A			KM2614 642 relay, I_{MAX} = 16 A, 4-channel, manual operation
	KL2761 649 universal dimmer, 600 W	KL2712 644 triac	KL2722 644 triac, mutually locked outputs			KM2774 645 triac outputs, I_{MAX} = 1.5 A
	KL2701 644 solid state relay, I_{MAX} = 3 A	KL2732 644 triac, mutually locked outputs, no power contacts	KL2692 646 cycle monitoring (watchdog)			KM2642 643 relay, I_{MAX} = 6 A, manual/automatic operation, relay state readable
						KM2652 643 relay, I_{MAX} = 6 A, manual/automatic operation, switch and relay state readable
PWM		KL2502 648 24 V DC, I_{MAX} = 0.1 A	KL2512 648 24 V DC, I_{MAX} = 1 A, negative switching			
		KL2535 648 I_{MAX} = ±1 A, 24 V DC, current-controlled	KL2545 648 I_{MAX} = ±3.5 A, 50 V DC, current-controlled			
Frequency output	KL2521 647					

Bus Terminal | Motion: KL2xxx/KS2xxx

Signal	< 3 A	5 A
Stepper motor	KL2531 651 I_{MAX} = 1.5 A, 24 V DC	KL2541 651 I_{MAX} = 5 A, 50 V DC, incremental encoder interface
DC motor output stage	KL2532 653 I_{MAX} = 1 A, 24 V DC	KL2552 653 I_{MAX} = 5 A, 50 V DC, incremental encoder interface
	KL2284 653 reverse switching, I_{MAX} = 2.0 A, 0…24 V DC	
AC motor speed controller	KL2791 654 230 V AC, 200 VA, 1-phase AC motor	

Bus Terminal | Analog input: KL3xxx/KS3xxx, KM3xxx

Signal	1-channel		2-channel		4-channel	8-channel
0…2 V, 0…500 mV			KL3172 659 0…2 V, 16 bit, 0.05 %	KL3172-0500 659 0…500 mV, 16 bit, 0.05 %		
±2 V				KL3182 659 16 bit, 0.05 %		
0…10 V	KL3061 658 single-ended, 12 bit		KL3062 658 single-ended, 12 bit	KL3162 659 16 bit, 0.05 %	KL3064 658 single-ended, 12 bit	
					KL3464 658 single-ended, 12 bit	KL3468 659 single-ended, 12 bit
±10 V	KL3001 656 differential input, 12 bit		KL3002 656 differential input, 12 bit	KL3102 657 differential input, 16 bit	KL3404 657 single-ended, 12 bit	KL3408 657 single-ended, 12 bit
				KL3132 657 16 bit, 0.05 %		
0…20 mA	KL3011 660 differential input, 12 bit	KL3041 661 with sensor supply, 12 bit	KL3012 660 differential input, 12 bit	KL3112 661 differential input, 16 bit	KL3044 660 single-ended, 12 bit	KL3448 661 single-ended, 12 bit
			KL3042 661 with sensor supply, 12 bit	KL3142 661 16 bit, 0.05 %	KL3444 660 single-ended, 12 bit	
4…20 mA	KL3021 662 differential input, 12 bit	KL3051 663 with sensor supply, 12 bit	KL3022 662 differential input, 12 bit	KL3122 663 differential input, 16 bit	KL3054 662 single-ended, 12 bit	KL3458 663 single-ended, 12 bit
			KL3052 663 with sensor supply, 12 bit	KL3152 663 16 bit, 0.05 %	KL3454 662 single-ended, 12 bit	
Resistance thermometer (RTD)	KL3201 665 PT100…1000, Ni100, 16 bit		KL3202 665 PT100…1000, Ni100, 16 bit	KL3222 665 PT100, 4-wire connection, high-precision	KL3204 664 PT100…1000, Ni100…1000, 2-wire connection	KL3208-0010 665 PT1000, Ni1000, NTC 1.8…100 k, potentiom. 1, 5, 10 kΩ
					KL3214 664 PT100…1000, Ni100…1000, KTY, 3-wire connection	KL3228 665 PT1000, Ni1000
Thermocouple/mV	KL3311 666 type J, K, L,…U, 16 bit		KL3312 667 type J, K, L,…U, 16 bit		KL3314 667 type J, K, L,…U, 16 bit	
Resistor bridge	KL3351 668 strain gauge, 16 bit	KL3356 668 strain gauge, 16 bit, self-calibration				
Oscilloscope	KL3361 669 ±16 mV		KL3362 669 ±10 V			
Measurement technology	KL3681 671 digital multimeter terminal, 18 bit		KL3403 670 3-phase power measurement terminal, 1 A	KL3403-0010 670 3-phase power measurement terminal, 5 A		
Pressure measuring	KM3701 672 differential pressure measuring, -100…+100 hPa	KM3701-0340 672 differential pressure measuring, up to 340 hPa	KM3702 673 relative pressure measuring, 7500 hPa	KM3712 673 relative pressure measuring, -1000…+1000 hPa		

Bus Terminal | Analog output: KL4xxx/KS4xxx

KM4xxx

Signal	1-channel	2-channel	4-channel	8-channel	2-channel
0…10 V	KL4001 676 12 bit, potential-free output	KL4002 676 12 bit	KL4004 676 12 bit, no power contacts		KM4602 677 12-bit manual/automatic operation
			KL4404 12 bit 677	KL4408 12 bit 677	
±10 V	KL4031 674 12 bit, potential-free output	KL4032 674 12 bit	KL4034 675 12 bit, no power contacts		
		KL4132 16 bit 675	KL4434 12 bit 675	KL4438 12 bit 675	
			KL4494 675 12 bit, 2 x input, 2 x output		
0…20 mA	KL4011 12 bit 678	KL4012 12 bit 678	KL4414 12 bit 679	KL4418 12 bit 679	
		KL4112 16 bit 679			
4…20 mA	KL4021 12 bit 680	KL4022 12 bit 680	KL4424 12 bit 681	KL4428 12 bit 681	

The standard Bus Terminals (KLxxxx) can be optionally ordered as KSxxxx with pluggable wiring level.

We reserve the right to make technical changes.

Bus Terminal | Special functions: KL5xxx/KS5xxx, KL6xxx/KS6xxx, KL8xxx

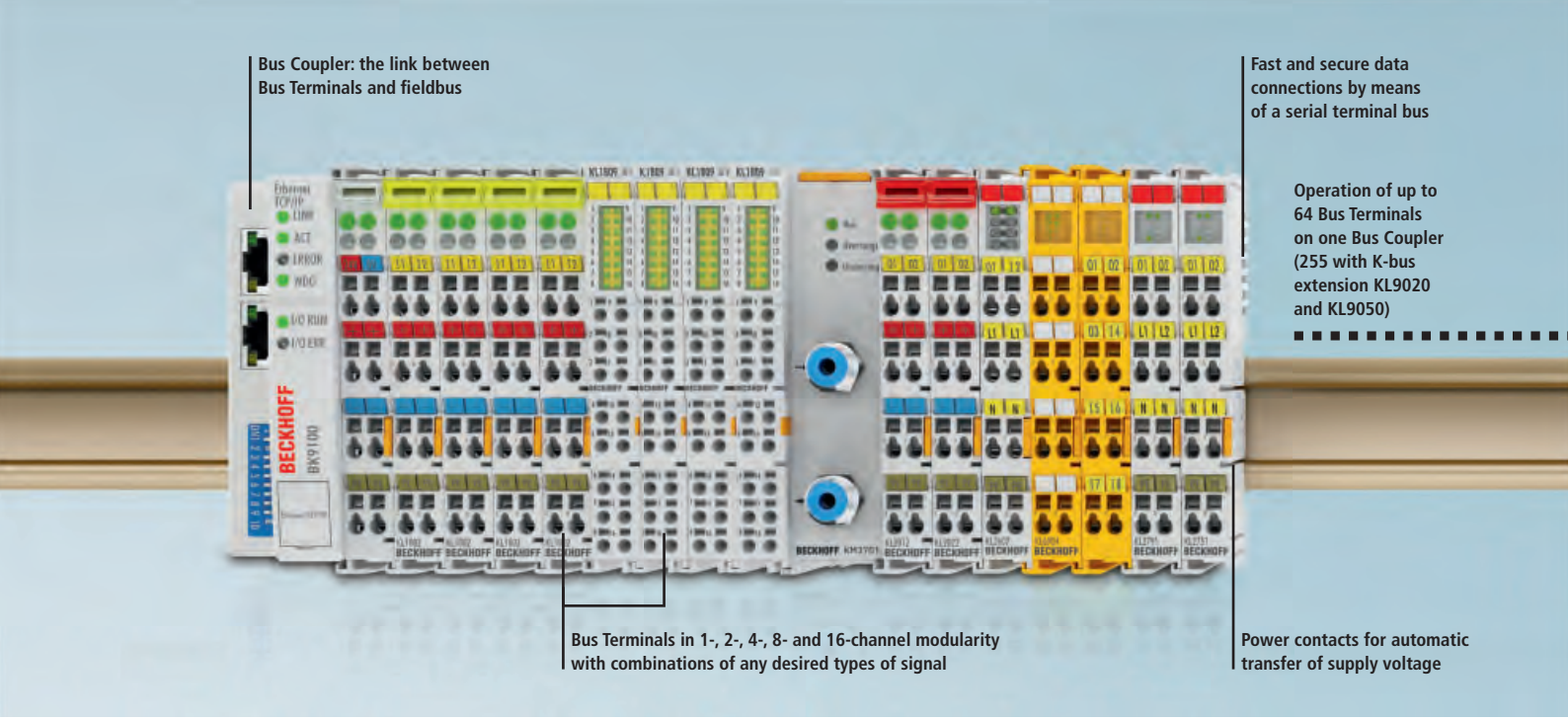
Signal			
Position measurement	**KL5001** 682 SSI encoder interface	**KL5051** 682 bidirectional SSI encoder interface	**KL5121** incremental encoder 683 interface with programmable outputs
	KL5101 differential input, 684 incremental encoder interface	**KL5152** 32 bit, 2-channel 685 incremental encoder interface	**KL5151** 685 32 bit, incremental encoder interface
	KL5111 685 incremental encoder interface		
Communication	**KL6001** 686 serial interface RS232, 19.2 kbaud	**KL6031** 686 serial interface RS232, 115.2 kbaud	**KL6011** 687 serial interface TTY, 20 mA current loop
	KL6051 687 data exchange terminal, 32 bit	**KL6021** 687 serial interface RS422/RS485, 19.2 kbaud	**KL6041** 687 serial interface RS422/RS485, 115.2 kbaud
	KL6023 wireless adapter 691 for EnOcean radio technology	**KL6021-0023** 691 RS485 interface for EnOcean signals	**KM6551** 689 wireless data exchange terminal
	KL6201 688 AS-Interface master terminal	**KL6211** AS-Interface master 688 terminal with power contacts	**KL6224** 692 IO-Link master
	KL6301 692 EIB/KNX Bus Terminal	**KL6401** 693 LON Bus Terminal	**KL6581** 690 EnOcean master
	KL6583 690 EnOcean transmitter/receiver	**KL6771** 693 MP-Bus master terminal	**KL6781** 693 M-Bus master terminal
	KL6811 DALI/DSI master 694 and power supply terminal	**KL6821** DALI 2 multi-master 694 and power supply terminal	**KL6831** 694 SMI terminal, LoVo
	KL6841 694 SMI terminal, 230 V AC		

Signal		
Safety	**KL6904** 695 TwinSAFE Logic Bus Terminal, 4 safe outputs	
Manual operation	**KL8519** 696 16-channel digital input signal module	
	KL8524 697 4 x 2-channel digital output, 24 V DC, 0.5 A	
	KL8528 697 8-channel digital output, 24 V DC, 0.5 A	
	KL8548 697 8-channel analog output, 0…10 V	
Power terminals	**KL8001** 698 switching capacity 5.5 kW, nominal current 0.9 to 9.9 A, connection mechanism for Siemens contactors (Sirius 3R series)	

Bus Terminal | System terminals: KL9xxx/KS9xxx

Signal	System		
System	**KL9010** bus end terminal 704	**KL9070** shield terminal 699	
	KL9020 704 terminal bus extension, end terminal	**KL9050** 704 terminal bus extension, coupler terminal	
	KL9060 adapter terminal 704 for power terminal KL8xxx	**KL9309** adapter terminal 704 for KL85xx manual operating modules	
	KL9080 isolation terminal 699	**KL9195** shield terminal 699	
Potential distribution terminal	**KL9180** 702 2 terminal points per power contact	**KL9181** 703 2 x 8 terminal points	
	KL9182 8 x 2 terminal points 703	**KL9183** 1 x 16 terminal points 703	
	KL9184 703 8 x 24 V DC, 8 x 0 V DC	**KL9185** 702 only 2 power contacts	
	KL9186 8 x 24 V DC 702	**KL9187** 8 x 0 V DC 703	
	KL9188 16 x 24 V DC 703	**KL9189** 16 x 0 V DC 703	
	KL9380 649 mains filter, approx. 1 µF		
Filter	**KL9540** 709 surge filter terminal for field supply		
	KL9540-0010 709 surge filter field supply for analog terminals	**KL9550** 709 surge filter terminal for system/field supply	
Diode array	**KL9300** 705 4 diodes, potential-free		
	KL9301 705 7 diodes, common cathode	**KL9302** 705 7 diodes, common anode	

Signal	Potential supply	Power supply and accessories
24 V DC	**KL9100** 700	**KL9400** 706 K-bus power supply, 2 A
	KL9110 700 diagnostic	**KL9505** 706 output 5 V DC, 0.5 A
	KL9200 701 with fuse	**KL9508** 707 output 8 V DC, 0.5 A
	KL9210 701 diagnostic, with fuse	**KL9510** 707 output 10 V DC, 0.5 A
		KL9512 707 output 12 V DC, 0.5 A
		KL9515 707 output 15 V DC, 0.5 A
	KL9520 708 AS-Interface potential supply	**KL9528** 708 AS-Interface power supply terminal
		KL9560 707 output 24 V DC, 0.1 A
50 V DC		**KL9570** 710 buffer capacitor terminal, 500 µF
120… 230 V AC	**KL9150** 700	
	KL9160 diagnostic 701	
	KL9250 with fuse 701	
	KL9260 diagnostic, with fuse 701	
Up to 400 V AC	**KL9190** 701	
	KL9290 with fuse 701	



The Bus Terminal system

The I/O signals are wired in a decentralised way to fieldbus devices or centrally to the controller. For both possibilities the available Bus Terminals enable an easy adaptation of different applications. With their compact design Beckhoff I/Os replace an entire group of devices with similar functions.

Flexible and stable

The Beckhoff Bus Terminal is an open and fieldbus-neutral I/O system consisting of electronic terminal blocks. The head of an electronic terminal block is the Bus Coupler with the interface to the fieldbus. Bus Couplers are available e.g. for EtherCAT, PROFIBUS and CANopen. Please see page 574 for a complete Bus Coupler overview.

With the master terminals, fieldbus functionalities are also available in form of a standard Bus Terminal. This is particularly advantageous for bus systems that are integrated as subsystems into a higher-level system. It means that only one system is required for the subsystem and for the higher-level bus interface. Master terminals are available for the following bus systems: AS-Interface, EIB/KNX, LON, DALI, MP-Bus and M-Bus.

Automation standard

The Beckhoff Bus Terminal ensures that control cabinets and terminal boxes are constructed more economically. Using the 4-wire terminating system, all of the usual sensors and actuators with different types of signals can be connected directly without other connection systems. It is no longer necessary to wire the field devices between the first terminal connection in the control cabinet or in the terminal box and the controller. This significantly reduces the costs involved in controller design and saves space, material, work, and money.

The Beckhoff Bus Terminals have been tried and tested in a wide range of sectors worldwide, from machine construction to building management. Beckhoff Bus Terminal technology makes design, construction, wiring, commissioning and maintenance of equipment and machines very cost-effective.

Design

The robust housing, secure contacts and the solidly built electronics are prominent features of our components. A station consists of one Bus Coupler and up to 64 electronic terminal blocks. With the K-bus extension it is possible to operate up to 255 Bus Terminals on one Bus Coupler.

The electronic terminal blocks are clipped onto the Bus Coupler. They connect by simply latching together. This means that each electronic terminal block can be exchanged separately and can be mounted on a standard mounting rail. In addition to horizontal type mounting, all other mounting types are permitted in the majority of the cases.

Free mix of signals

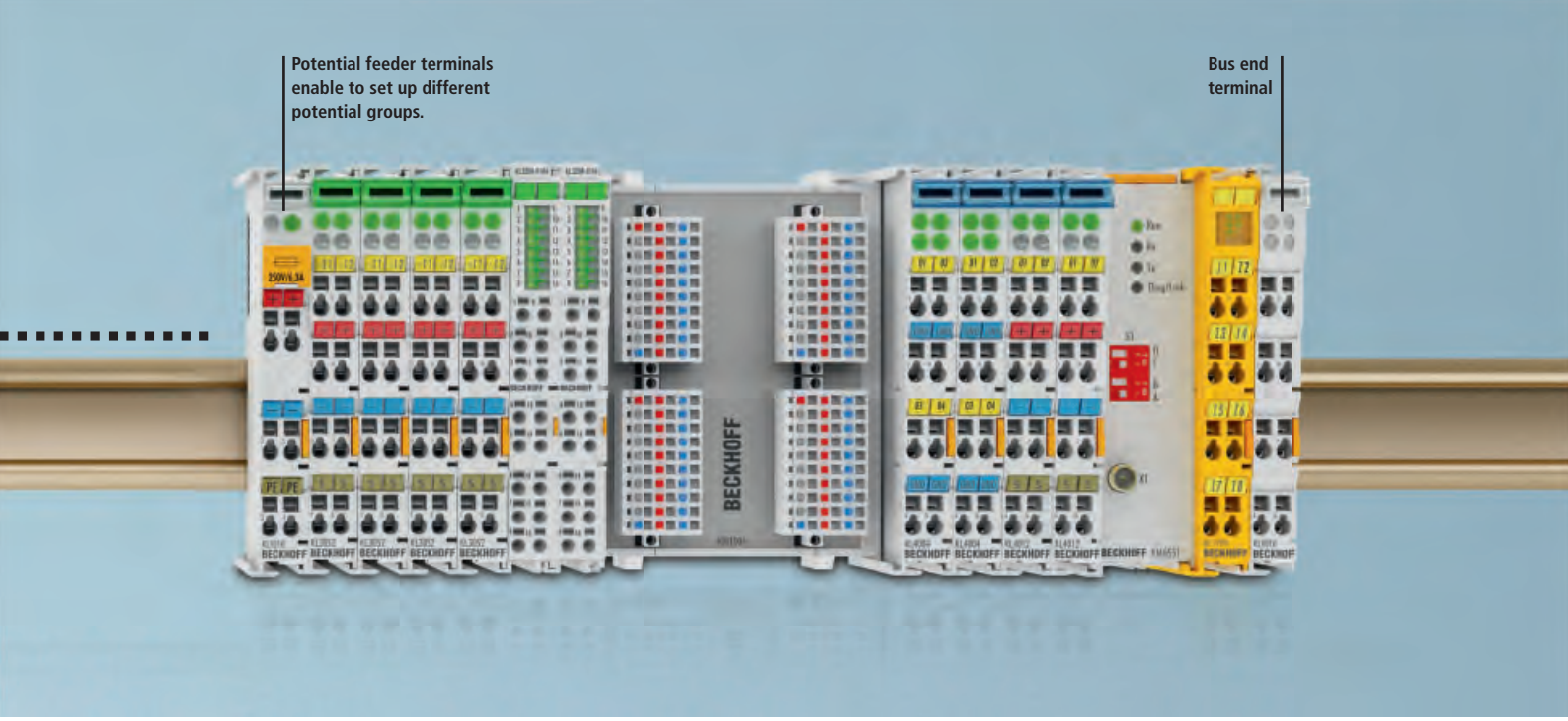
The Beckhoff I/O system supports about 400 Bus Terminals and is thus probably the most comprehensive system on the market. Appropriate Bus Terminals are available for any digital or analog automation signal type, for currents and voltages with standardised signal levels and for PT100 and thermocouple signals. Intelligent devices can be connected via Bus Terminals with serial interfaces in accordance with RS232, RS485 or 20 mA TTY.

The fine granularity of the Bus Terminals enables bit-precise composition of the required I/O channels. The digital Bus Terminals are available as 2-, 4-, 8- or 16-channel terminals. In the 16-channel variant, digital input and output signals are arranged in an ultra-compact way within a standard Bus Terminal housing across a width of only 12 mm. The standard analog signals of -10 to +10 V, 0 to +10 V, 0 to 20 mA and 4 to 20 mA are all available as 1-, 2-, 4- and 8-channel variants within a standard housing. The system is thus highly modular and can be projected cost-effectively with an accuracy down to a single channel.

Flexible connection system

The standard KLxxxx Bus Terminals include electronics and connection level in a single enclosure. They have been tried and tested for years. They feature integrated screwless spring loaded technique for fast and simple assembly.

We reserve the right to make technical changes.



The HD Bus Terminals (High Density) with 16 terminal points are distinguished by a particularly compact design, as the packaging density is twice as large as that of the standard 12 mm Bus Terminals. Single-wire conductors and conductors with a wire end sleeve can be inserted directly into the spring loaded terminal point without tools.

The KSxxxx type Bus Terminals feature a pluggable connection level. The assembly and wiring procedure for the KS series is the same as for the KL series. The KS series Bus Terminals enable the complete wiring to be removed as a plug connector from the top of the housing for servicing. The lower section can be removed from the Bus Terminal assembly by pulling the unlocking tab. Insert the new component and plug in the connector with the wiring. This reduces the installation time and eliminates the risk of wires being mixed up.

The familiar dimensions of the Bus Terminal only had to be changed slightly. The new connector adds about 3 mm. The maximum height of the Bus Terminal remains unchanged.

A tab for strain relief of the cable simplifies assembly in many applications and prevents tangling of individual connection wires when the connector is removed.

The Bus Terminal system is complemented by the compact version of the KMxxxx terminal modules with increased packing density. They are fully system-compatible. Like the Bus Terminals, they are bus-neutral and can therefore be operated with any Beckhoff Bus Coupler or Bus Terminal Controller. Like the standard Bus Terminals, the KM modules are integrated in the I/O system and connected with the internal terminal bus (K-bus). Bus Terminals and terminal modules can be combined without restriction.

Like for the Bus Terminals, no tools are required for the wiring. Spring-loaded terminals are used, however with connectors (cable cross section 0.5 to 1.5 mm²).

The terminal modules combine 16, 32 or 64 digital inputs or outputs on a very small area. This compact and slimline design enables very high packing densities, leading to smaller control cabinets and terminal boxes.

Bus Terminal with standard wiring

HD Bus Terminals (High Density) with 16 terminal points

Bus Terminal with pluggable wiring

Terminal module with pluggable wiring with high packing density

Bus Terminal features

Status LEDs for reliable and fast startup

Marking material for standard terminal blocks

Supply point for downstream inputs and outputs

Detachable labelling fields for clear text labels

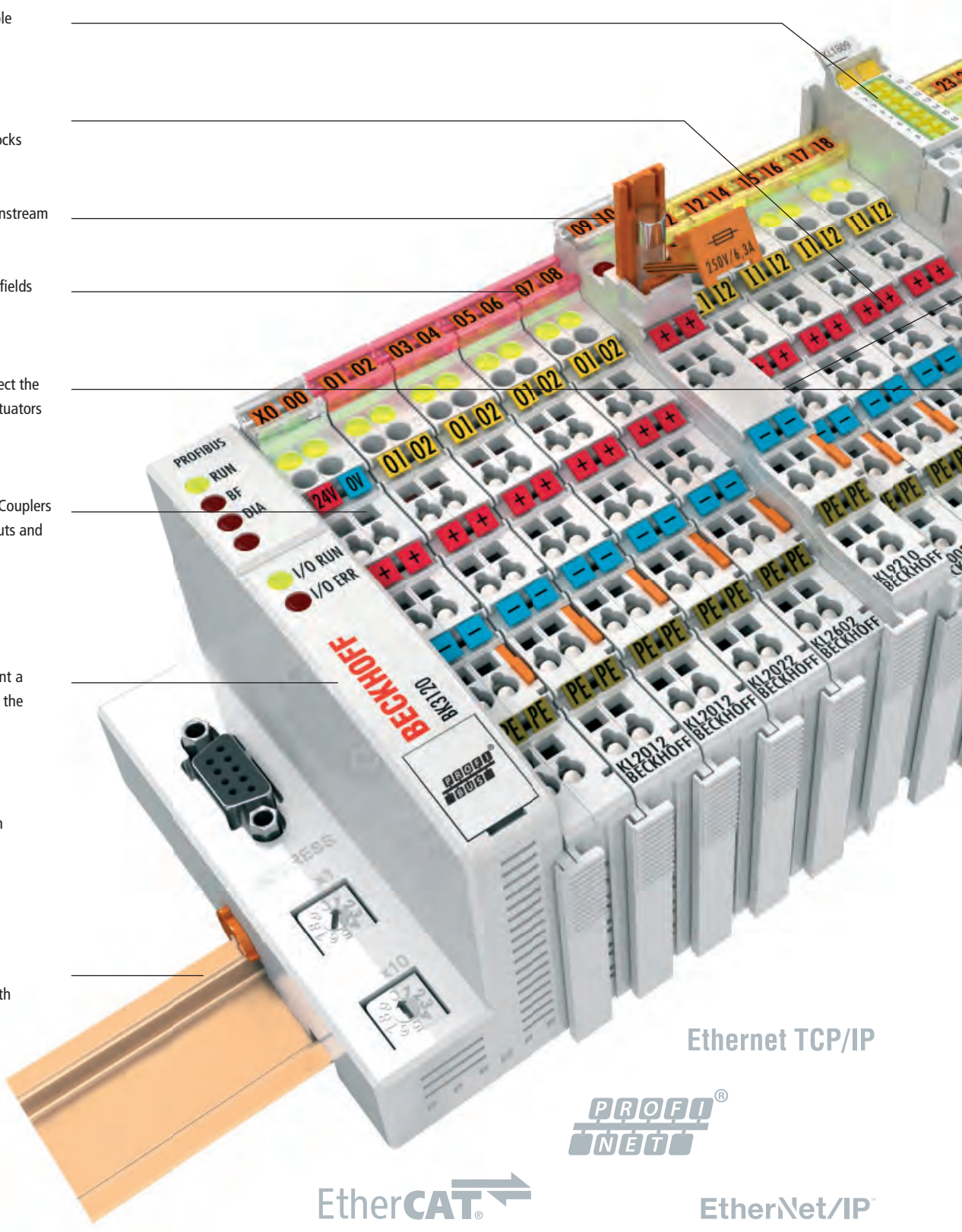
Power contacts connect the supply for sensors/actuators automatically.

Supply point for Bus Couplers and downstream inputs and outputs

Bus Couplers represent a universal interface to the fieldbuses.

Terminal block design
W x H x D (mm):
12 x 100 x 68

Assembly on 35 mm DIN mounting rail with no accessories



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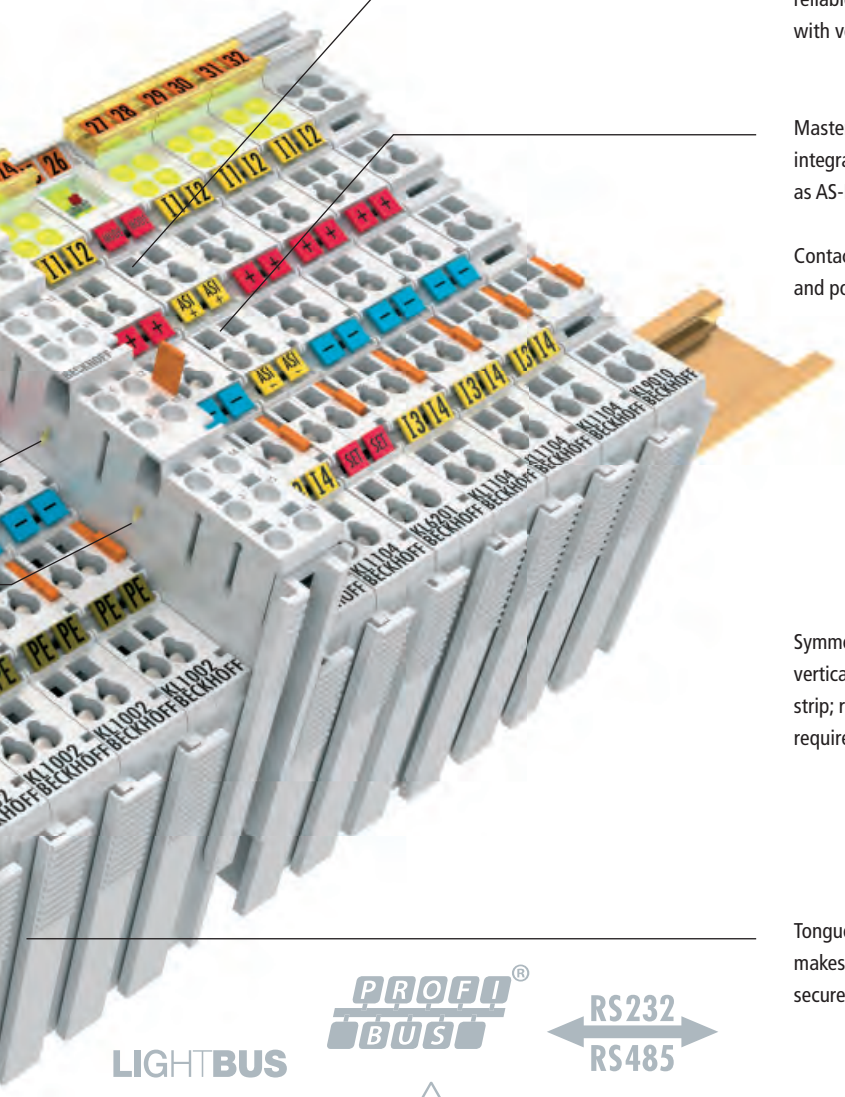
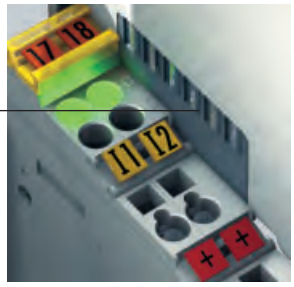


Screwless connection: using the reliable spring-loaded technique with vertical cable inlet

Master terminals enable the integration of subsystems such as AS-Interface.

Contacts for data transmission and power supply to the K-bus

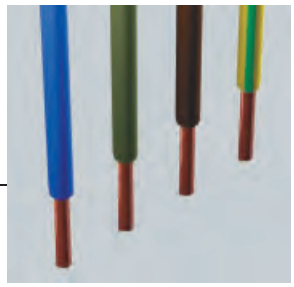


Symmetric release enables vertical removal from terminal strip; release slide does not require a tool.

Tongue and groove connection makes terminal strip structure secure and stable.

Leading PE power contact

The 4-wire terminating system (signal, 24 V DC, 0 V, PE) reduces assembly costs.



We reserve the right to make technical changes.

System overview fieldbus I/O

Bus Coupler series BK, the link between Bus Terminals and fieldbus

Bus Terminal Controller series BC with integrated IEC 61131-3 PLC

Bus Terminal Controller series BX with integrated IEC 61131-3 PLC and extended interfaces

Embedded PC series CX, further Embedded PCs see page 184

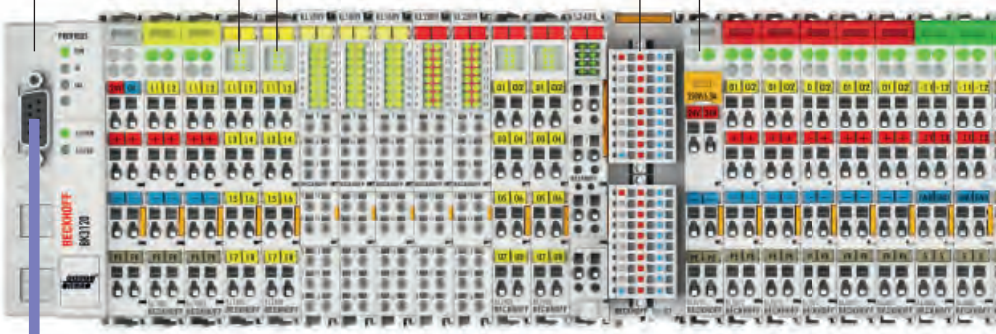
The head station of the Bus Terminals: from Bus Coupler with fieldbus interface to Embedded PC

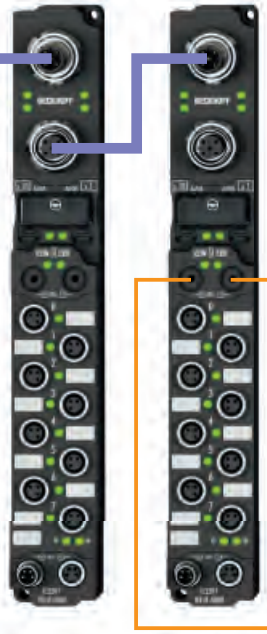
Free mix of signals: about 400 different Bus Terminals for connection to all common sensors and actuators

Potential feed terminals enable configuration of different potential groups.

Bus Terminals in 1-, 2-, 4-, 8- and 16-channel modularity

The terminal modules with plug-in wiring combine 16, 32 or 64 digital I/Os within a very small space and with high packing density.





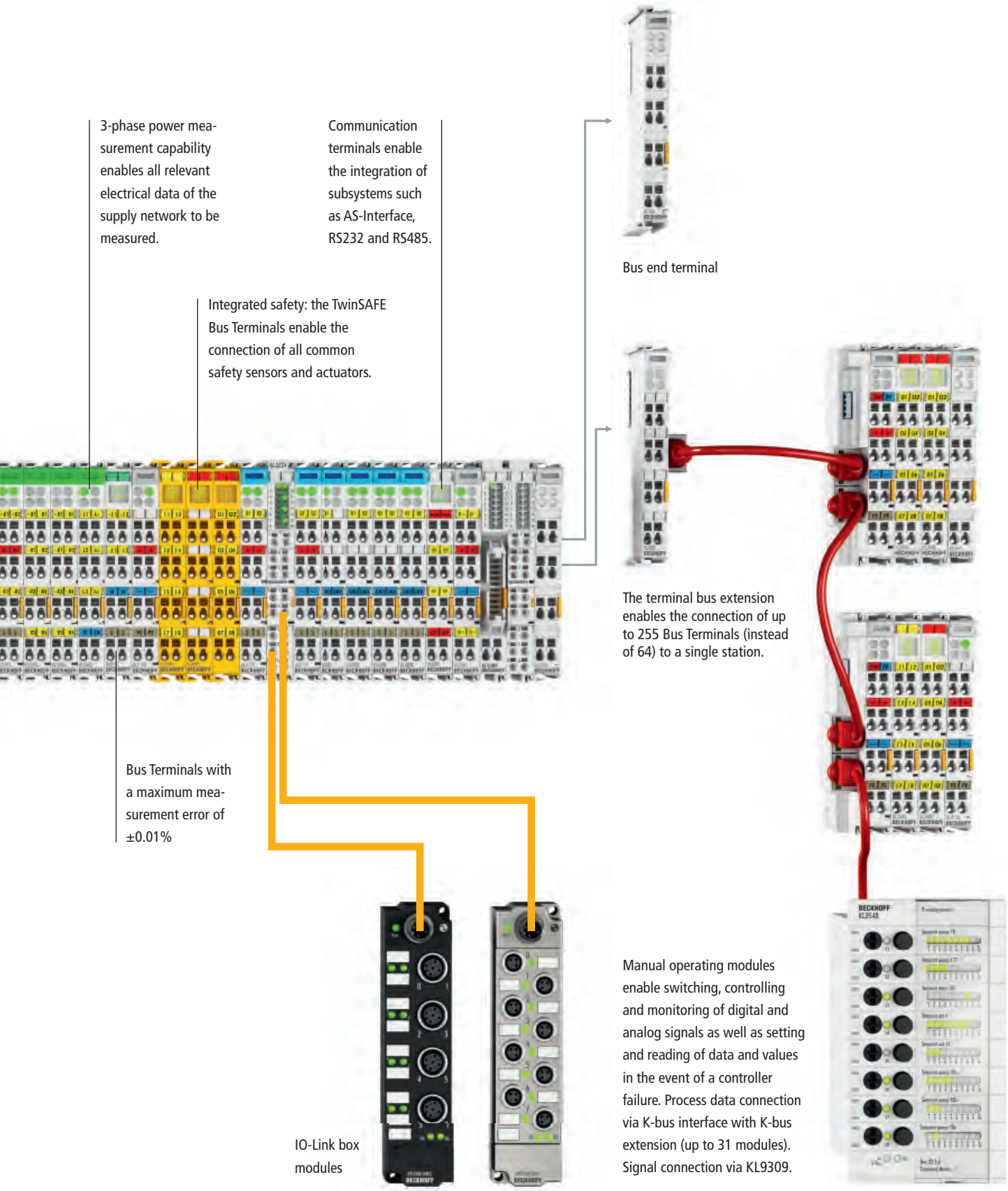
IP 67 Fieldbus Box, further Fieldbus Box modules see page 714

Compact Box

Coupler Box/ PLC Box

Extension Box modules

We reserve the right to make technical changes.



3-phase power measurement capability enables all relevant electrical data of the supply network to be measured.

Communication terminals enable the integration of subsystems such as AS-Interface, RS232 and RS485.

Integrated safety: the TwinSAFE Bus Terminals enable the connection of all common safety sensors and actuators.

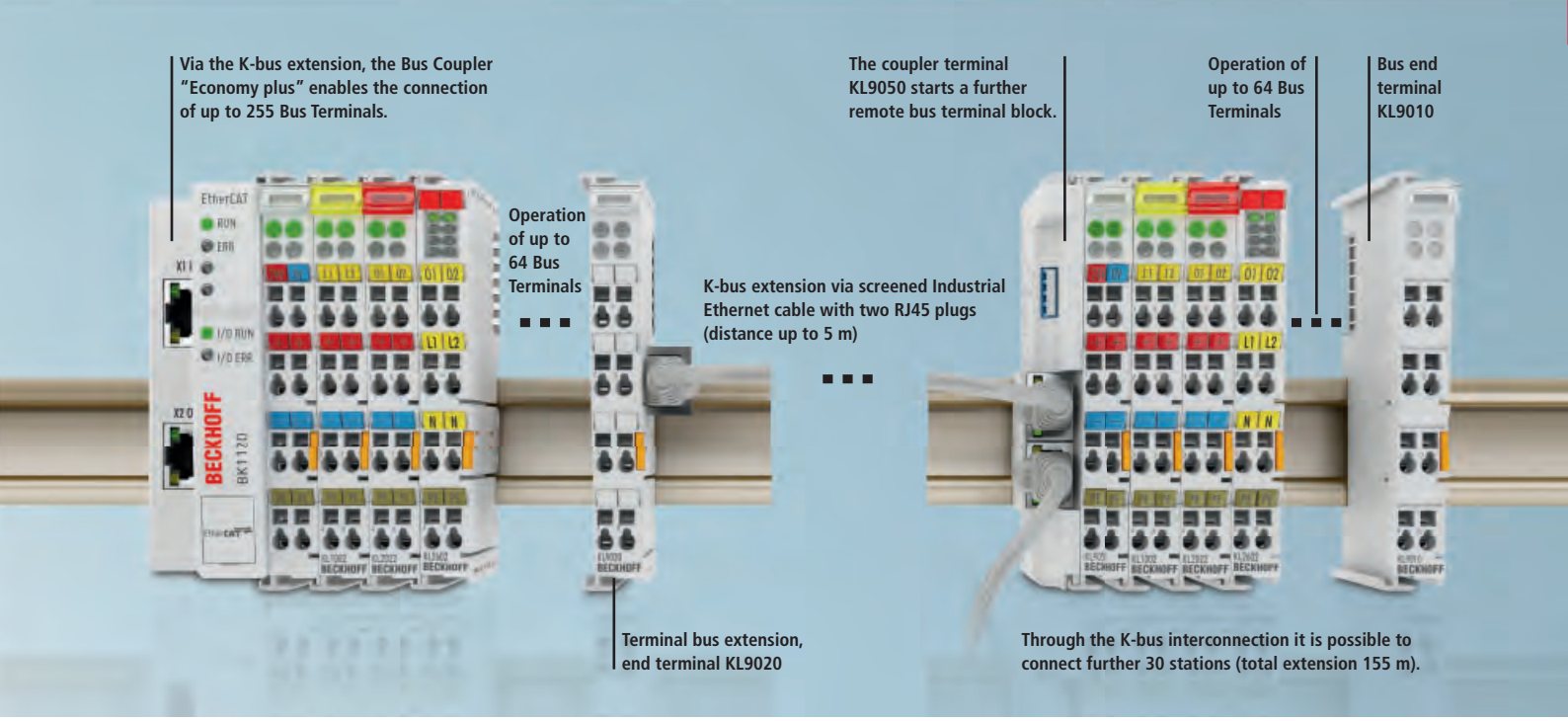
Bus end terminal

The terminal bus extension enables the connection of up to 255 Bus Terminals (instead of 64) to a single station.

Bus Terminals with a maximum measurement error of ±0.01%

IO-Link box modules

Manual operating modules enable switching, controlling and monitoring of digital and analog signals as well as setting and reading of data and values in the event of a controller failure. Process data connection via K-bus interface with K-bus extension (up to 31 modules). Signal connection via KL9309.



Terminal bus extension

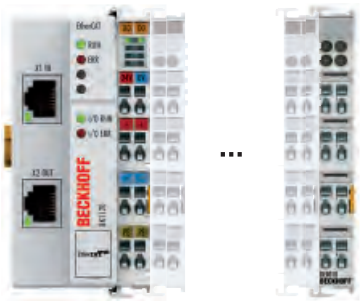
The Bus Couplers and Bus Terminal Controllers link the bus systems to the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number of terminals between 1 and 64, and a bus end terminal. The "Economy plus" and "Compact" series support all Bus Terminals of the Beckhoff system. It is also possible to operate up to 255 Bus Terminals on this Bus Coupler series with the K-bus extension.

The Bus Terminal extension allows Bus Terminals to be located in up to 31 blocks in the control cabinet or in the application. With a distance of up to 5 m between the Bus Terminal blocks, the Bus Terminal system can be used over a wider area and helps save costs.

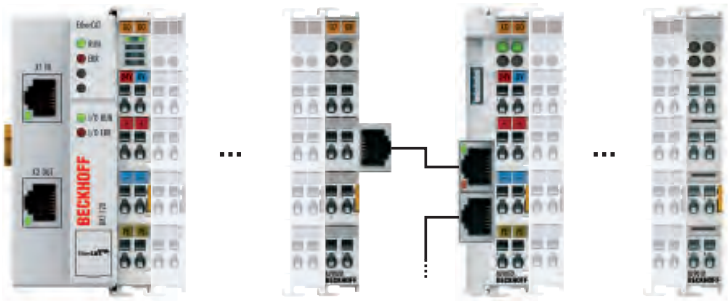
The Bus Coupler recognises the terminals to which it is connected, and performs the assignment of the inputs and outputs to the bytes of the process image automatically. The blocks with terminal bus extensions are treated as one unit by the Bus Coupler. The extension is transparent for the fieldbus and higher-level systems.

The system of Bus Coupler and Bus Terminal can be extended by replacing the KL9010 end terminal with the KL9020 extension. The KL9020 makes the K-bus signals available in an RJ45 socket for transmission onwards via a shielded Industrial Ethernet cable.

The KL9050 coupler terminal starts a further remote Bus Terminal block and provides the logical connection to the Bus Coupler via the Ethernet cable. 24 V DC, electrically isolated, for the field level can be input at this coupler terminal. The internal K-bus shares the same potential as the K-bus of the coupler. The KL9050 can be used via a second socket for the extension to the next Bus Terminal block. This Bus Terminal block starts in the same way as the one with a KL9050 coupler terminal. This coupling works at up to 31 stations. The maximum distance between two Bus Terminal blocks is 5 m and allows a total extension of 155 m. The system uses shielded Industrial Ethernet cables with two RJ45 plugs for the transmission. The cable is supplied ready-made in different lengths or can be made-to-measure for applications with conventional Ethernet tools. Data transfer is based on the interference-free and RS485 industry standard in a double-screened cable.



Operation with up to 64 Bus Terminals to one Bus Coupler with KL9010 bus end terminal

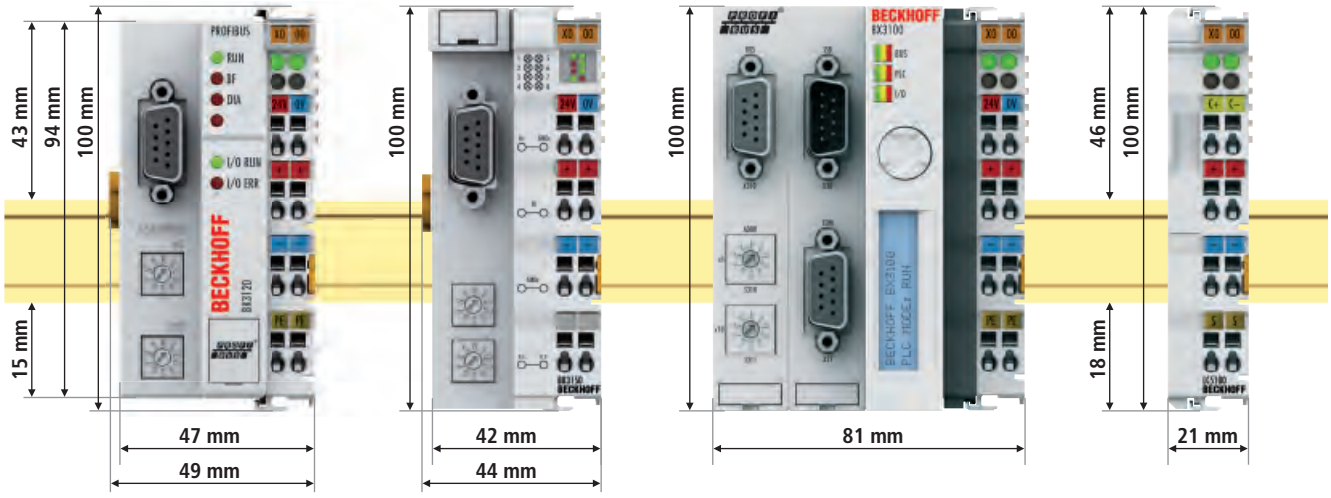


Operation with up to 255 Bus Terminals to one Bus Coupler with terminal bus extension end terminal KL9020 and coupler terminal KL9050

We reserve the right to make technical changes.

Technical data – Bus Coupler housing

The Beckhoff Bus Coupler electronics can be mounted in a variety of housings. A housing has three power contacts, which, if the application requires, automatically implement a continued connection, carrying the potential of the power circuit to the next Bus Terminal. The supply voltage that is connected to the Bus Coupler spring-loaded terminals is 24 V DC. If a different voltage is required for the power contacts, the appropriate power feed terminal must be inserted after the Bus Coupler.



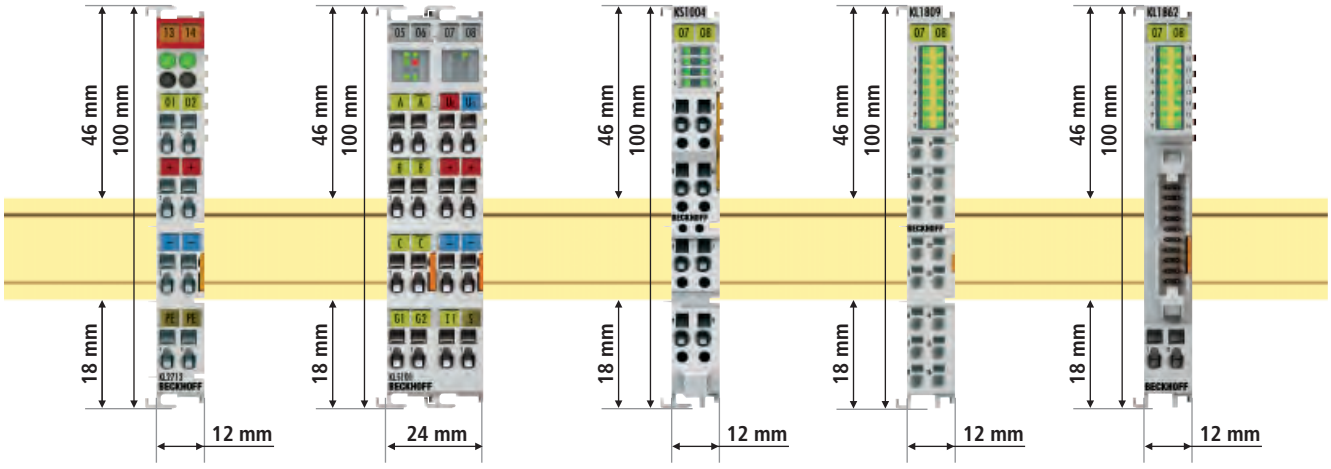
BKxxxx, BCxxxx | BKxx50, BCxx50 | BXxxxx | LCxxxx

Mechanical data	BKxxxx, BCxxxx	BKxx50, BCxx50	BXxxxx	LCxxxx	BC9191
Design form	compact terminal housing with signal LED	compact terminal housing with signal LED	compact terminal housing with signal LED	compact terminal housing with signal LED	compact controller
Material	polycarbonate	polycarbonate	polycarbonate	polycarbonate	PC/ABS
Dimensions (W x H x D)	49 mm x 100 mm x 68 mm	44 mm x 100 mm x 68 mm	81 mm x 100 mm x 89 mm (BX8000: 61 mm x 100 mm x 89 mm)	21 mm x 100 mm x 68 mm	118 mm (127 mm with end cap and DIN rail mounting) x 100 mm x 70 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock				
Side by side mounting by means of	double slot and key connection				
Marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	connection points on housing labelled and numbered
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)				
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				

Connection	BKxxxx, BCxxxx	BKxx50, BCxx50	BXxxxx	LCxxxx	BC9191
Wiring	spring-loaded technique	spring-loaded technique	spring-loaded technique	spring-loaded technique	spring-loaded technique with plug-gable wiring level
Connection cross-section	0.08…2.5 mm², AWG 28-14, stranded wire, solid wire	0.08…2.5 mm², AWG 28-14, stranded wire, solid wire	0.08…2.5 mm², AWG 28-14, stranded wire, solid wire	0.08…2.5 mm², AWG 28-14, stranded wire, solid wire	0.08…1.5/2.5 mm², AWG 28-14, stranded wire, solid wire
Stripping length	8…9 mm	8…9 mm	8…9 mm	8…9 mm	6…7 mm/8…9 mm
Fieldbus connection	depending on fieldbus	depending on fieldbus	depending on fieldbus	spring-loaded terminals	RJ45
Power contacts	3 spring contacts	3 spring contacts	3 spring contacts	3 spring contacts	none
Current load	I_{MAX}: 10 A (125 A short-circuit)	I_{MAX}: 10 A (125 A short-circuit)	I_{MAX}: 10 A (125 A short-circuit)	I_{MAX}: 10 A (125 A short-circuit)	–
Nominal voltage	24 V DC	24 V DC	24 V DC	24 V DC	110…240 V AC

Technical data – Bus Terminal housing

The Beckhoff Bus Terminal electronics can be mounted in a variety of housings. Bus Terminals are available with up to three power contacts, and can have a variety of voltages. Care should be taken to ensure that a change in voltage always starts with a power feed terminal.



Mechanical data	KLxxxx	KL5101	KSxxxx	HD housing	KL1862, KLx872
Design form	compact terminal housing with signal LED	compact terminal housing with signal LED	terminal housing with pluggable wiring level	HD (High Density) housing with signal LED	compact terminal housing with signal LED
Material	polycarbonate				
Dimensions (W x H x D)	12 mm x 100 mm x 68 mm	24 mm x 100 mm x 68 mm	12/24 mm x 100 mm x 71 mm	12 mm x 100 mm x 68 mm	12 mm x 100 mm x 68 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock				
Side by side mounting by means of	double slot and key connection				
Marking	standard terminal block marking	standard terminal block marking	standard terminal block marking	–	standard terminal block marking
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)				
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes				
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4				

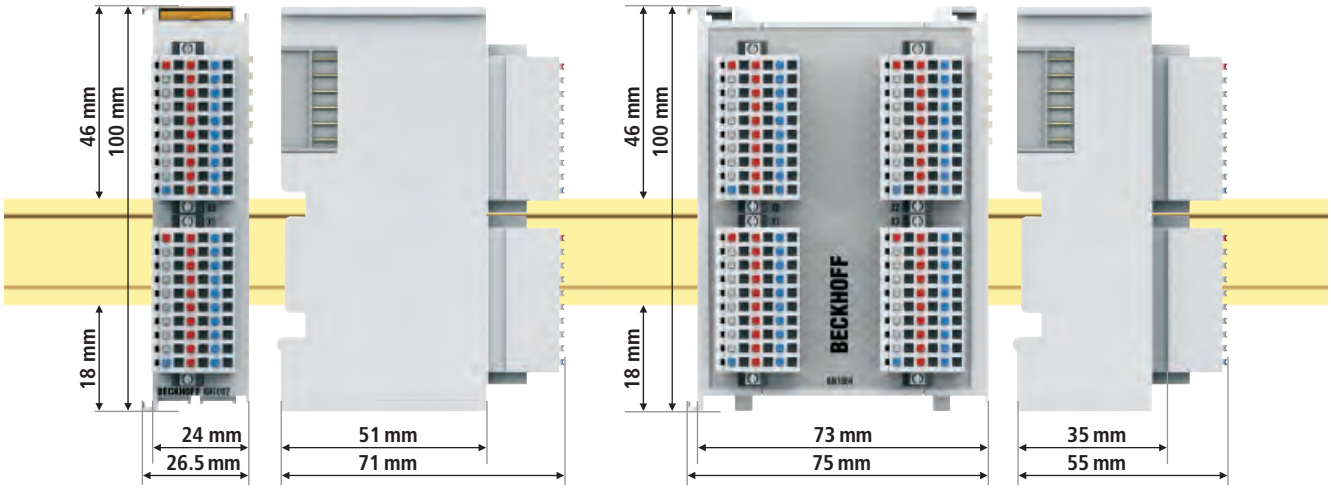
Connection	KLxxxx	KL5101	KSxxxx	HD housing	KL1862, KLx872
Wiring	spring-loaded technique	spring-loaded technique	spring-loaded technique	direct plug-in technique	flat-ribbon cable connection
Connection cross-section	s, st*: 0.08…2.5 mm², AWG 28-14	s, st*: 0.08…2.5 mm², AWG 28-14	s, st*: 0.08…1.5 mm², AWG 28-16	s*: 0.08…1.5 mm²; st: 0.25…1.5 mm²; f: 0.14…0.75 mm²	common flat-ribbon cables, AWG 28, spacing 1.27 mm
Stripping length	8…9 mm	8…9 mm	9…10 mm	8…9 mm	–
Power contacts	up to 3 blade/spring contacts	none	2 blade/spring contacts	2 blade/spring contacts	none
Current load	I_{MAX}: 10 A (125 A short-circuit)				
Nominal voltage	depends on Bus Terminal type				

*s: solid wire; st: stranded wire; f: ferrule

We reserve the right to make technical changes.

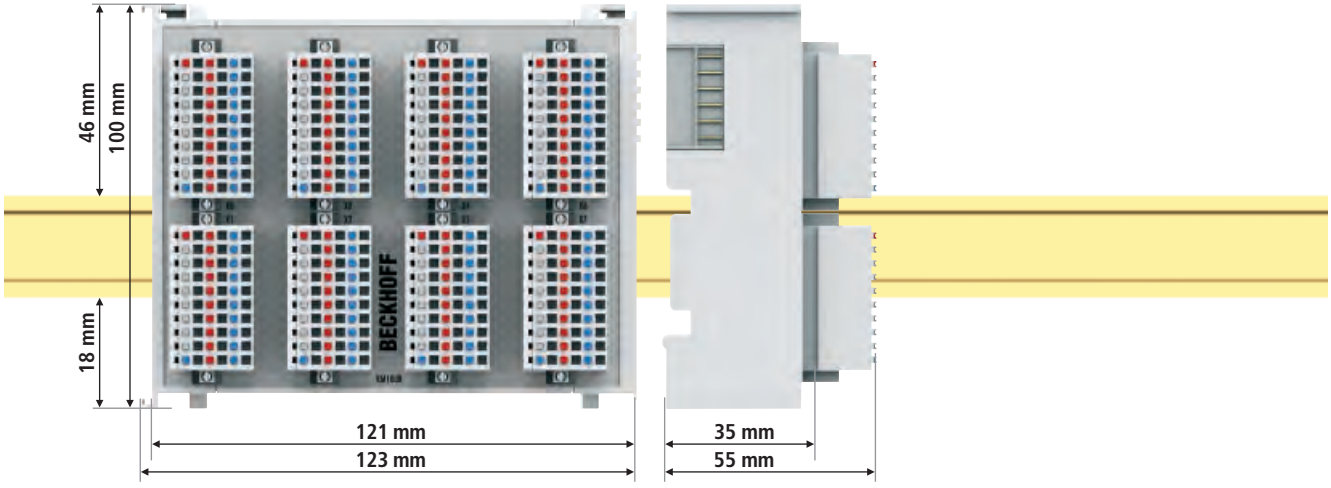
Technical data – Terminal module housing

The Beckhoff terminal modules with pluggable connection level are mounted in enclosures of different size.
Like for the HD Bus Terminals, spring-loaded terminals are used and no tools are required for the wiring.



KM10x2, KM20x2

KM10x4, KM20x4



KM10x8, KM20x8

Mechanical data	KMx0x2	KMx0x4	KMx0x8
Design form	compact terminal module with pluggable wiring level		
Dimensions (W x H x D)	26.5 mm x 100 mm x 71 mm	75 mm x 100 mm x 55 mm	123 mm x 100 mm x 55 mm
Installation	on 35 mm DIN rail, conforming to EN 60715 with lock		
Side by side mounting by means of	double slot and key connection		
Vibration resistance	conforms to EN 60068-2-6		
Shock resistance	conforms to EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		

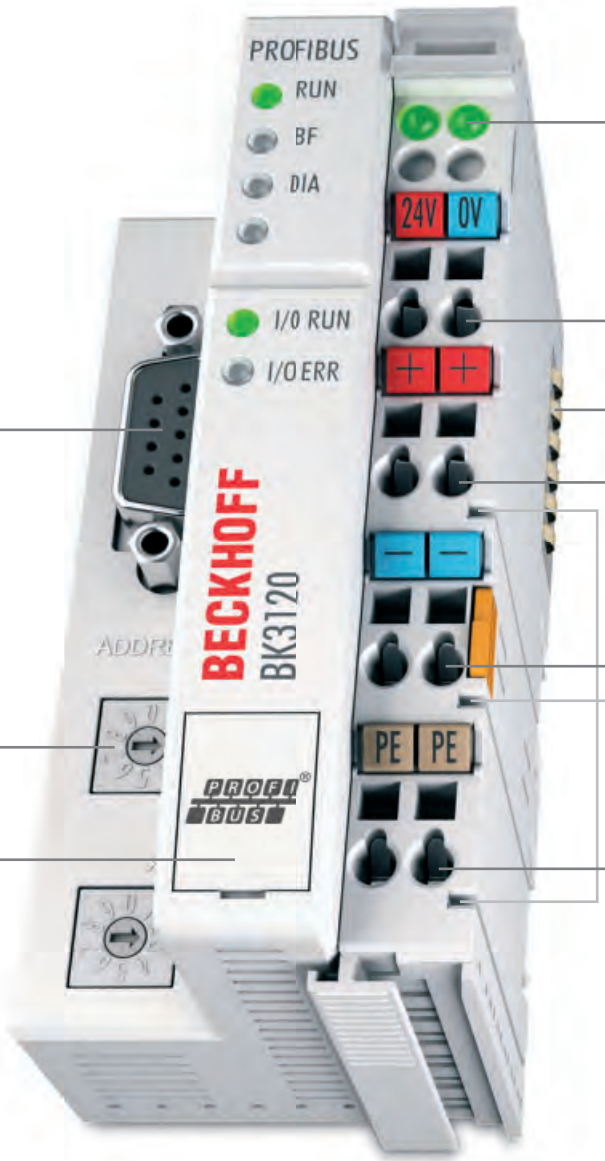
Connection	KMx0x2, KMx0x4, KMx0x8
Wiring	spring-loaded technique
Connection cross-section	0.08…1.5 mm², stranded wire, solid wire
Stripping length	8 mm
Power contacts	none
Nominal voltage	depends on Bus Terminal type, max. 60 V DC

We reserve the right to make technical changes.

BKxxxx | Bus Couplers

The interface between fieldbus and terminals

▶ Bus-Coupler



Power LEDs

Bus Coupler supply

K-bus

Fieldbus connection

Power contacts

Address selector

Configuration interface

Input for power contacts

+60 °C / -25 °C	Extended operating/ storage temperature
25 g	Extended mechanical load

For further information on the individual fieldbuses see page 262

We reserve the right to make technical changes.

Standard | BKxx00

Economy | BKxx10

Economy plus | BKxx20

Compact | BKxx50

Low Cost | LCxx00

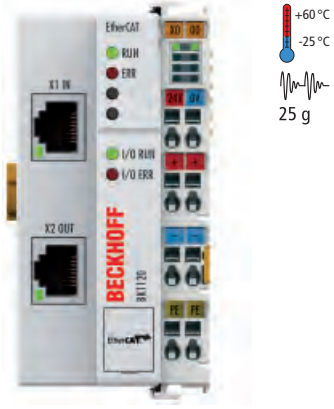
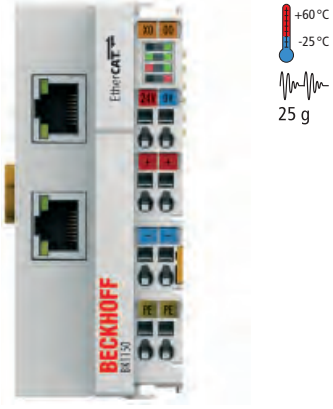
The Bus Couplers link the modularly expandable electronic terminal blocks with the respective fieldbus systems. The Bus Coupler performs all the monitoring and control tasks that are necessary for operation of the connected Bus Terminals. The specific settings of analog and multifunctional Bus Terminals are adapted to the application via the KS2000 configuration software.

In the standard Bus Couplers a unit consists of a Bus Coupler, any number of up to 64 terminals and a bus end terminal. The "Economy" versions enable particularly cost-effective configuration of peripheral interfacing connections with up to 64 digital input/output terminals. In addition to digital signal types, the "Economy plus" Bus Couplers also support all other types. Up to 255 Bus Terminals can be connected via the K-bus extension. The "Compact" Bus Couplers have a particularly compact housing and also enable connection of up to 255 Bus Terminals via the terminal bus extension. The "Low Cost" Bus Couplers are characterised by small dimensions and cost-effective connection technology and enable connection of up to 64 digital input/output terminals.

Technical data	BKxxxx, LCxxxx
Power supply	24 V DC (-15 %/+20 %)
Operating/storage temperature	0…+55 °C/-25…+85 °C (extended temperature range: -25…+60 °C/-40…+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable

EtherCAT | **Bus Couplers**

EtherCAT

	EtherCAT "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	EtherCAT "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	EtherCAT "Compact" coupler between E-bus and K-bus Terminals
Technical data	**BK1120**	**BK1150**	**BK1250**
Number of Bus Terminals	64 (255 with K-bus extension)		
Max. number of bytes fieldbus	1024 byte input and 1024 byte output		
Current supply K-bus	1750 mA	2000 mA	500 mA
	 +60 °C -25 °C 25 g	 +60 °C -25 °C 25 g	+60 °C -25 °C 25 g
	The BK1120 Bus Coupler connects EtherCAT, the real-time Ethernet system, with the modular, extendable electronic terminal blocks. A unit consists of a Bus Coupler, any number (between 1 and 64) of terminals (255 with K-bus extension) and one end terminal.	The BK1150 Bus Coupler connects EtherCAT to the modular extendable Bus Terminals (K-bus). A unit consists of a Bus Coupler, any number of terminals from 1 to 64 (with K-bus extension: 255) and a bus end terminal. The "Compact" Bus Coupler offers a cost-optimised alternative to the BK1120 EtherCAT Bus Coupler.	The BK1250 is a "Bus Coupler in terminal housing" for mixed application of EtherCAT Terminals (ELxxxx) and standard Bus Terminals (KLxxxx) in a bus station. Up to 64 Bus Terminals (with K-bus extension up to 255) can be connected to a BK1250.
Bus interface	2 x RJ45	2 x RJ45	via E-bus contacts
Data transfer rates	100 Mbaud	100 Mbaud	100 Mbaud
Weight	approx. 150 g	approx. 110 g	approx. 55 g
Operating temperature	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Further information	BK1120	BK1150	BK1250
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
PC Fieldbus Cards	FC90xx 788	FC90xx 788	FC90xx 788

We reserve the right to make technical changes.

Lightbus | **Bus Couplers**

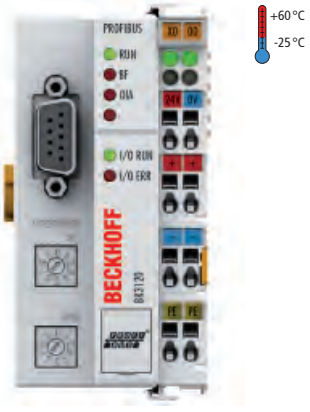
LIGHTBUS

	Standard Lightbus Bus Coupler for up to 64 Bus Terminals	Lightbus "Economy" Bus Coupler for up to 64 digital Bus Terminals	Lightbus "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
Technical data	**BK2000**	**BK2010**	**BK2020**
Number of Bus Terminals	64		64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output	32 byte input and 32 byte output	512 byte input and 512 byte output
Current supply K-bus	1750 mA	500 mA	1750 mA
	The BK2000 Bus Coupler connects the Lightbus system to the electronic terminal blocks, which can be expanded in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal. – distance between stations: 45 m for APF fibre, 300 m HCS fibre	The BK2010 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected. – distance between stations: 45 m for APF fibre, 300 m HCS fibre	With the K-bus extension technology, the "Economy plus" Bus Coupler BK2020 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The "Economy plus" series supports all Beckhoff system Bus Terminals. It can process in its full configuration 1020 digital signals and a maximum of 128 analog input and output channels per slave. – distance between stations: 45 m for APF fibre, 300 m HCS fibre
Bus interface	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)
Data transfer rates	2.5 Mbaud	2.5 Mbaud	2.5 Mbaud
Weight	approx. 150 g	approx. 130 g	approx. 150 g
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Further information	BK2000	BK2010	BK2020
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
PC Fieldbus Cards	FC200x 781	FC200x 781	FC200x 781

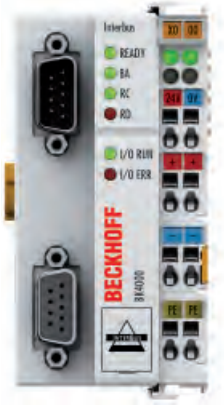
PROFIBUS | **Bus Couplers**

	PROFIBUS "Economy" Bus Coupler for up to 64 digital Bus Terminals, 1.5 Mbaud	Standard PROFIBUS DP/FMS Bus Coupler for up to 64 Bus Terminals, 12 Mbaud	PROFIBUS "Economy" Bus Coupler for up to 64 digital Bus Terminals, 12 Mbaud
Technical data	**BK3010**	**BK3100**	**BK3110**
Number of Bus Terminals	64		
Max. number of bytes fieldbus	64 byte input and 64 byte output	64 byte input and 64 byte output (DP and FMS mode), 128 byte input and 128 byte output (only DP mode)	64 byte input and 64 byte output
Current supply K-bus	500 mA	1750 mA	500 mA
	The BK3010 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.	The BK3100 Bus Coupler connects the PROFIBUS system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of the Bus Coupler, any number of up to 64 terminals and one end terminal.	The BK3110 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.
Bus interface	1 x D-sub 9-pin socket with shielding	1 x D-sub 9-pin socket with shielding	1 x D-sub 9-pin socket with shielding
Data transfer rates	automatic detection up to max. 1.5 Mbaud	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud
Weight	approx. 150 g	approx. 170 g	approx. 150 g
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
Further information	BK3010	BK3100	BK3110
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
PC Fieldbus Cards	FC310x 782	FC310x 782	FC310x 782

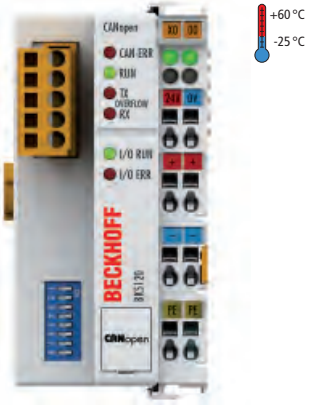
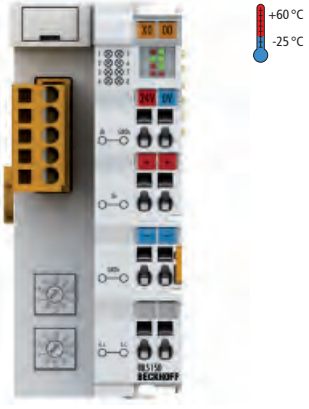
We reserve the right to make technical changes.

	PROFIBUS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	PROFIBUS "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	PROFIBUS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	PROFIBUS "Low Cost" Bus Coupler for up to 64 digital Bus Terminals, 12 Mbaud
	BK3120	**BK3150**	**BK3520**	**LC3100**
	64 (255 with K-bus extension)			64
	128 byte input and 128 byte output			64 byte input and 64 byte output
	1750 mA	1000 mA	1750 mA	500 mA
				
	The "Economy plus" version extends the existing PROFIBUS Bus Coupler series BK3xx0. The K-bus extension technology allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler.	The "Compact" Bus Coupler BK3150 for PROFIBUS extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing.	The particular feature for the BK3520 Bus Coupler is its fibre optic connection and its high transmission rate of up to 12 Mbaud. – distance between stations: up to 40 m	The LC3100 "Low Cost" Bus Coupler is marked by a smaller design and a more economical connection method.
	1 x D-sub 9-pin socket with shielding	1 x D-sub 9-pin socket with shielding	4 x HP-Simplex sockets (HP-Simplex plugs ZS1031-3500 included)	connection via Bus Terminal
	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud
	approx. 170 g	approx. 100 g	approx. 170 g	approx. 100 g
	-25…+60 °C	-25…+60 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	BK3120	BK3150	BK3520	LC3100
	see page 800	see page 800	see page 800	see page 800
	FC310x 782	FC310x 782	FC310x 782	FC310x 782

Interbus, CANopen | **Bus Couplers**

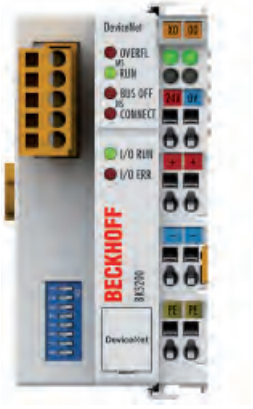
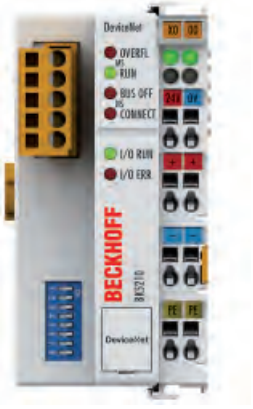
	Standard Interbus Bus Coupler for up to 64 Bus Terminals	Interbus "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Economy" Bus Coupler for up to 64 digital Bus Terminals
Technical data	**BK4000**	**BK4020**	**BK5110**
Number of Bus Terminals	64	64 (255 with K-bus extension)	64
Max. number of bytes fieldbus	64 byte input and 64 byte output		5 Tx/Rx PDOs
Current supply K-bus	1750 mA	1750 mA	500 mA
			
	The BK4000 Bus Coupler connects the Interbus bus system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal.	With the K-bus extension technology, the "Economy plus" Bus Coupler BK4020 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The "Economy plus" coupler supports all Beckhoff system Bus Terminals and can process 512 bit digital inputs and outputs per slave.	The BK5110 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.
Bus interface	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock	2 x D-sub plug, 9-pin, plug and socket with screening and vibration lock	1 x open style connector, 5-pin, included
Data transfer rates	500 kbaud	500 kbaud	up to 1 Mbaud
Weight	approx. 170 g	approx. 170 g	approx. 130 g
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL
Further information	BK4000	BK4020	BK5110
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
PC Fieldbus Cards	–	–	FC510x 784

We reserve the right to make technical changes.

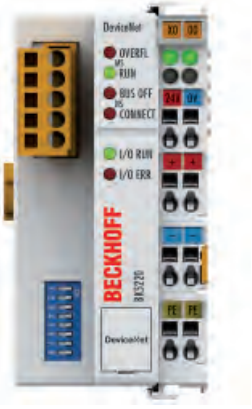
	CANopen "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	CANopen "Low Cost" Bus Coupler for up to 64 digital Bus Terminals (255 with K-bus extension)
	BK5120	**BK5150**	**BK5151**	**LC5100**
	64 (255 with K-bus extension)			64
	16 Tx/Rx PDOs			5 Tx/Rx PDOs
	1750 mA	1000 mA	1000 mA	500 mA
				
	With the K-bus extension technology, the "Economy plus" Bus Coupler BK5120 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The Bus Coupler works on the CAN protocol basis as defined in ISO 11898.	The "Compact" Bus Coupler BK5150 for CANopen extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing. Up to 64 Bus Terminals are supported; with the terminal bus extension, up to 255 Bus Terminals can be connected. The CANopen Bus Coupler offers automatic baud rate detection up to 1 Mbaud and two address selection switches for address assignment.	In contrast to the BK5150, the BK5151 has a 9-pin D-sub connector as a bus interface.	The LC5100 "Low Cost" Bus Coupler is marked by a smaller design and a more economical connection method. All the bit-oriented terminals can be connected to the LC5100. All the digital input and output terminals are supported with the exception of the KL15xx, KL25x2, KL2692 and KL27x1 terminals. All the system terminals, with and without diagnostics, can also be connected.
	1 x open style connector, 5-pin, included	open style connector, 5-pin	D-sub 9-pin socket	connection via Bus Terminal
	up to 1 Mbaud	automatic detection up to 1 Mbaud	automatic detection up to 1 Mbaud	up to 1 Mbaud
	approx. 150 g	approx. 100 g	approx. 100 g	approx. 100 g
	-25…+60 °C	-25…+60 °C	-25…+60 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	BK5120	BK5150	BK5151	LC5100
	see page 800	see page 800	see page 800	see page 800
	FC510x 784	FC510x 784	FC510x 784	FC510x 784

DeviceNet | **Bus Couplers**

DeviceNet™

	Standard DeviceNet Bus Coupler for up to 64 Bus Terminals	DeviceNet "Economy" Bus Coupler for up to 64 digital Bus Terminals
Technical data	**BK5200**	**BK5210**
Number of Bus Terminals	64	
Max. number of bytes fieldbus	512 byte input and 512 byte output	32 byte input and 32 byte output
Current supply K-bus	1750 mA	500 mA
		
	The BK5200 Bus Coupler connects the DeviceNet bus system to the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number of up to 64 terminals and one end terminal.	The BK5210 "Economy" variant permits particularly economical creation of peripheral interfacing connections. Up to 64 digital input/output terminals can be connected.
Bus interface	1 x open pluggable connector, 5-pin, included	1 x open pluggable connector, 5-pin, included
Data transfer rates	automatic detection up to 500 kbaud	automatic detection up to 500 kbaud
Weight	approx. 150 g	approx. 130 g
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Further information	BK5200	BK5210
Accessories		
Cordsets and connectors	see page 800	see page 800
PC Fieldbus Cards	FC520x 786	FC520x 786

We reserve the right to make technical changes.

	DeviceNet "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	DeviceNet "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	DeviceNet "Low Cost" Bus Coupler for up to 64 digital Bus Terminals (255 with K-bus extension)
	BK5220	**BK5250**	**LC5200**
	64 (255 with K-bus extension)		64
	512 byte input and 512 byte output		32 byte input and 32 byte output
	1750 mA	1000 mA	500 mA
			
	With the K-bus extension technology, the "Economy plus" Bus Coupler BK5220 allows the connection of up to 255 spatially distributed Bus Terminals to one Bus Coupler. The "Economy plus" series supports all Beckhoff system Bus Terminals and it can process in its full configuration 1020 digital signals and a maximum of 256 analog input and output channels per slave.	The "Compact" Bus Coupler BK5250 for DeviceNet extends the Beckhoff Bus Terminal system by a cost-optimised version in a compact housing. The DeviceNet Bus Coupler offers automatic baud rate detection up to 500 kbaud and two address selection switches for address assignment. A 5-pin connector for the fieldbus connection is included in the scope of supply.	The LC5200 "Low Cost" Bus Coupler is marked by a smaller design and a more economical connection method. All the bit-oriented terminals can be connected to the LC5200. All the digital input and output terminals are supported with the exception of the KL15xx, KL25x2, KL2692 and KL27x1 terminals. All the system terminals, with and without diagnostics, can also be connected.
	1 x open pluggable connector, 5-pin, included	open style connector, 5-pin	connection via Bus Terminal
	automatic detection up to 500 kbaud	automatic detection up to 500 kbaud	automatic detection up to 500 kbaud
	approx. 130 g	approx. 100 g	approx. 100 g
	-25…+60 °C	-25…+60 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
	BK5220	BK5250	LC5200
	see page 800	see page 800	see page 800
	FC520x 786	FC520x 786	FC520x 786

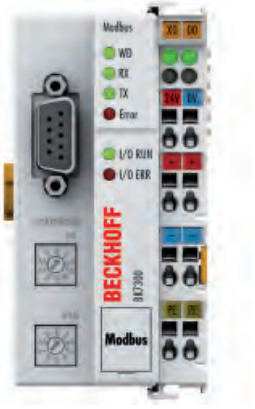
We reserve the right to make technical changes.

ControlNet, CC-Link, Modbus | **Bus Couplers**

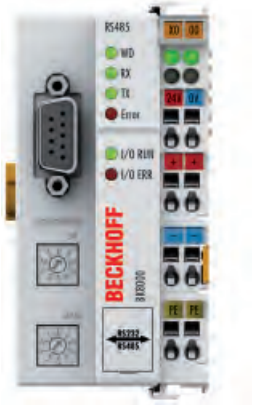
	ControlNet	CC-Link
	Standard ControlNet Bus Coupler for up to 64 Bus Terminals	CC-Link "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
Technical data	**BK7000**	**BK7150**
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	512 byte input and 512 byte output	32 byte input and 32 byte output
Current supply K-bus	1750 mA	1000 mA
	The Bus Coupler BK7000 connects the ControlNet bus system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. The BK7000 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.	The "Compact" Bus Coupler BK7150 connects the CC-Link system to the electronic terminal blocks, which can be extended in modular fashion. The BK7150 Bus Coupler supports the operation of all Bus Terminals. As far as the user is concerned, handling of the analog inputs/outputs is not different to other series. The information is available in the process image of the controller for processing in the form of a byte array.
Bus interface	2 x BNC female connector + NAP	1 x open style connector, 5-pin, included
Data transfer rates	5 Mbaud	156 kbaud…10 Mbaud
Weight	approx. 170 g	approx. 100 g
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Further information	BK7000	BK7150
Accessories		
Cordsets and connectors	see page 800	see page 800
PC Fieldbus Cards	–	–

We reserve the right to make technical changes.

Modbus

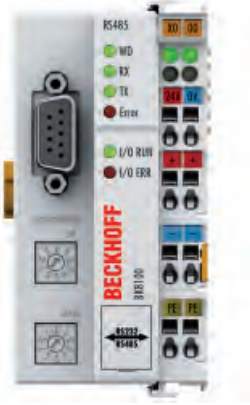
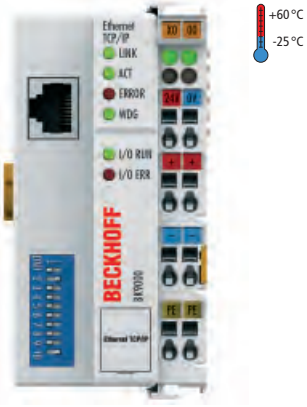
	Standard Modbus Bus Coupler for up to 64 Bus Terminals	Modbus "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)
	BK7300	**BK7350**
	64	64 (255 with K-bus extension)
	512 byte input and 512 byte output	
	1750 mA	1000 mA
		
	The BK7300 Bus Coupler connects the Modbus bus system to the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal.	The "Compact" BK7350 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected.
	D-sub 9-pin, RS485	D-sub 9-pin, RS485
	150 baud…38,400 baud	150 baud…38,400 baud
	approx. 170 g	approx. 100 g
	0…+55 °C	-25…+60 °C
	CE, UL, Ex, GL	CE, UL, Ex
	BK7300	BK7350
	see page 800	see page 800
	–	–

SERCOS, RS485/RS232, Ethernet | **Bus Couplers**

	Standard SERCOS Bus Coupler for up to 64 Bus Terminals	SERCOS "Economy plus" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard RS485 Bus Coupler for up to 64 Bus Terminals
Technical data	**BK7500**	**BK7520**	**BK8000**
Number of Bus Terminals	64	64 (255 with K-bus extension)	64
Max. number of bytes fieldbus	32 byte input/32 byte output for the cyclic interface (depending on the master)	254 word I/O for the cyclic interface (depending on the master)	512 byte input and 512 byte output
Current supply K-bus	1750 mA	1750 mA	1750 mA
			
	The Bus Coupler BK7500 connects the SERCOS bus system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. – distance between stations: 40 m plastic fibre optic	Compared with the Bus Coupler BK7500, the BK7520 allows, with the K-bus extension technology, the connection of up to 255 Bus Terminals to one Bus Coupler. The Bus Coupler recognises the connected terminals and automatically generates the affiliations of the inputs/outputs to the bytes of the process image. – distance between stations: 40 m plastic fibre optic	The Bus Coupler BK8000 uses the physics of the RS485 specification for data transmission. Application of the Bus Coupler with a serial interface is suited to those cases in which the use of a fieldbus system can be omitted. The RS485 interface can be used by any automation device to gain access to the Bus Coupler. Data exchange is made via an open, documented protocol.
Bus interface	F-SMA standard, IEC 872-2	F-SMA standard, IEC 872-2	RS485 D-sub
Data transfer rates	2/4 Mbaud, adjustable by means of configuration switch	2/4/8/16 Mbaud, adjustable by means of configuration switch	9.6 kbaud, 19.2 kbaud, 38.4 kbaud
Weight	approx. 170 g	approx. 170 g	approx. 170 g
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL
Further information	BK7500	BK7520	BK8000
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
PC Fieldbus Cards	FC750x 787	FC750x 787	–

We reserve the right to make technical changes.

Ethernet

	Standard RS232 Bus Coupler for up to 64 Bus Terminals	Standard Ethernet TCP/IP Bus Coupler for up to 64 Bus Terminals	Ethernet TCP/IP "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard Ethernet TCP/IP Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), with integrated 2-channel switch
	BK8100	**BK9000**	**BK9050**	**BK9100**
		64	64 (255 with K-bus extension)	
		512 byte input and 512 byte output		
	1750 mA	1750 mA	1000 mA	1750 mA
				
	The Bus Coupler BK8100 uses the physics of the RS232C (V.24) specification for data transmission. Application of the Bus Coupler with a serial interface is suited to those cases in which the use of a fieldbus system can be omitted. The RS232 interface can be used by any automation device (e.g. a PC with RS232 interface) to gain access to the Bus Coupler.	The BK9000 Bus Coupler connects Ethernet with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. – distance between stations: 100 m between hub/switch and Bus Coupler	The "Compact" BK9050 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected. – distance between stations: 100 m between hub/switch and Bus Coupler	The BK9100 Bus Coupler connects Ethernet with the modular, extendable electronic terminal blocks. With the K-bus extension, up to 255 Bus Terminals can be connected. – distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler
	RS232 D-sub	1 x RJ45	1 x RJ45	2 x RJ45 (2-channel switch)
	9.6 kbaud, 19.2 kbaud, 38.4 kbaud	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
	approx. 170 g	approx. 170 g	approx. 100 g	approx. 170 g
	0…+55 °C	-25…+60 °C	0…+55 °C	-25…+60 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
	BK8100	BK9000	BK9050	BK9100
	see page 800	see page 800	see page 800	see page 800
	–	FC90xx 788	FC90xx 788	FC90xx 788

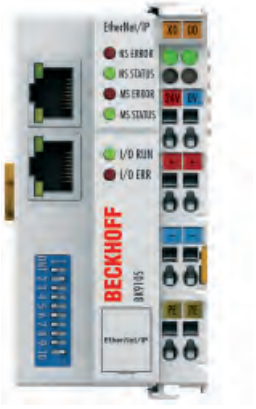
PROFINET, EtherNet/IP, USB | **Bus Couplers**

	PROFINET "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard PROFINET Bus Coupler for up to 64 Bus Terminals (with integrated 2-channel switch)
Technical data	**BK9053**	**BK9103**
Number of Bus Terminals	64 (255 with K-bus extension)	
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1750 mA	1750 mA
	The BK9053 Bus Coupler connects PROFINET with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals (255 with K-bus extension) and one end terminal. – distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler	The BK9103 Bus Coupler connects PROFINET RT with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. In addition to the standard Bus Coupler functionalities, the BK9103 supports up to 255 terminals with the K-bus extension. – distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler
Bus interface	1 x RJ45	2 x RJ45 (2-channel switch)
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
Weight	approx. 100 g	approx. 170 g
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Further information	BK9053	BK9103
Accessories		
Cordsets and connectors	see page 800	see page 800
PC Fieldbus Cards	FC90xx 788	FC90xx 788
TwinCAT Supplement	PROFINET RT Controller 1013	PROFINET RT Controller 1013

We reserve the right to make technical changes.

EtherNet/IP™

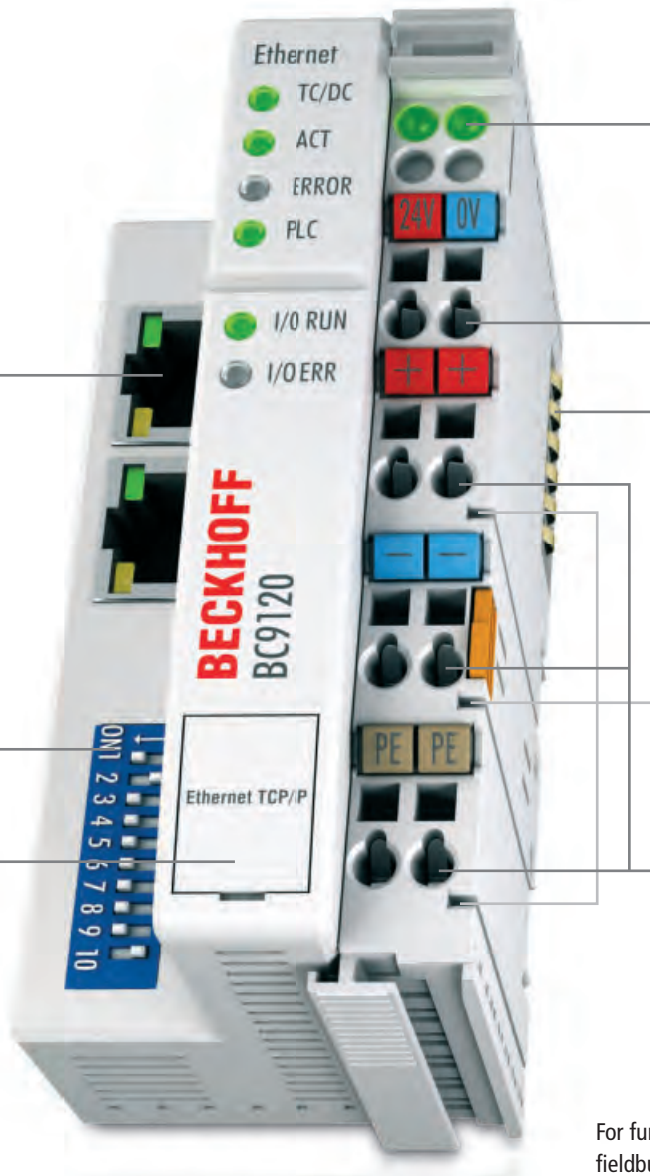
USB

	EtherNet/IP "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard EtherNet/IP Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension)	Standard USB Bus Coupler for up to 64 Bus Terminals
	BK9055	**BK9105**	**BK9500**
	64 (255 with K-bus extension)		64
	512 byte input and 512 byte output		512 byte input and 512 byte output
	1000 mA	1750 mA	1750 mA (less downstream current)
			
	The "Compact" BK9055 Bus Coupler is a cost-optimised version with compact housing. With the K-bus extension, up to 255 Bus Terminals can be connected. – distance between stations: 100 m between hub/switch and Bus Coupler	The BK9105 Bus Coupler connects EtherNet/IP with the modular, extendable electronic terminal blocks. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. In addition to the standard Bus Coupler functionalities, the BK9105 supports up to 255 terminals with the K-bus extension. – distance between stations: 100 m between hub/switch and Bus Coupler or between Bus Coupler and Bus Coupler	The Bus Coupler BK9500 connects the Universal Serial Bus (USB) system with the electronic terminal blocks, which can be extended in modular fashion. One unit consists of one Bus Coupler, any number from 1 to 64 terminals and one end terminal. – distance between stations: 30 m, 5 m from BK9500 to BK9500
	1 x RJ45	2 x RJ45 (2-channel switch)	1 x B type (upstream), 3 x A type (downstream)
	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate	12 Mbaud
	approx. 100 g	approx. 170 g	approx. 170 g
	0…+55 °C	-25…+60 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex
	BK9055	BK9105	BK9500
	see page 800	see page 800	see page 800
	FC90xx 788	FC90xx 788	–
	–	–	driver included in TwinCAT

BCxxxx, BXxxxx | Bus Terminal Controllers

Controllers with fieldbus interface

▶ Bus-Terminal-Controller



Fieldbus connection

Address selector

Configuration interface

Power LEDs

Bus Coupler supply

K-bus

Power contacts

Input for power contacts

+60 °C
-25 °C
Extended operating/ storage temperature

For further information on the individual fieldbuses see page 262

Embedded PCs are alternatively available, see page 184

We reserve the right to make technical changes.

BCxxxx | Bus Terminal Controllers

BXxxxx | Bus Terminal Controllers

The Bus Terminal Controllers of the BC and BX series are small controllers with a high degree of flexibility. The I/O system consisting of modularly expandable electronic terminal blocks, interfaces for all market-relevant fieldbus systems and the integrated IEC 61131-3 PLC enables the Bus Terminal Controllers to be used as stand-alone control systems or as intelligent fieldbus slaves. The Bus Terminal Controller is programmed using the TwinCAT programming system according to IEC 61131-3. The configuration or fieldbus interface of the controller is used for loading the PLC program.

The main distinguishing features between the BX series and the BC series are the larger memory capacity and a larger number of expandable interfaces.

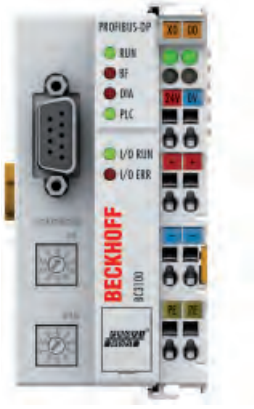
The BCxx00 Bus Terminal Controllers form a unit consisting of the controller, any number (up to 64) of terminals and a bus end terminal. In contrast to the BCxx50, BCxx20 and BXxx00 series, a terminal bus extension cannot be used.

The "Compact" BCxx50 and BCxx20 Bus Terminal Controllers are fitted in cost-optimised, compact housings and support the K-bus extension (up to 255 Bus Terminals).

The devices of the BX family have two serial interfaces. The device itself comprises an illuminated LC display with 2 lines of 16 characters each, a joystick switch and a real-time clock. Further peripheral devices, e.g. displays, can be connected via the integrated Beckhoff Smart System Bus (SSB).

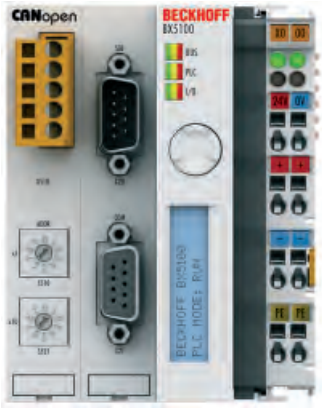
Technical data	BCxxxx, BXxxxx
Power supply	24 V DC (-15 %/+20 %)
Programming	TwinCAT 2 (via programming interface or fieldbus)
Programming languages	IEC 61131-3 (IL, LD, FBD, SFC, ST)
Operating/storage temperature	0…+55 °C/-25…+85 °C (extended temperature range: -25…+60 °C/-40…+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6
Shock resistance	conforms to EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable

PROFIBUS, CANopen | **Bus Terminal Controllers**

	PROFIBUS Bus Terminal Controller for up to 64 Bus Terminals, 12 Mbaud	PROFIBUS "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud
Technical data	**BC3100**	**BC3150**
Number of Bus Terminals	64	64 (255 with K-bus extension)
Max. number of bytes fieldbus	128 byte input and 128 byte output	
Current supply K-bus	1750 mA	1000 mA
		
	The Bus Terminal Controller BC3100 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for PROFIBUS. It is an intelligent slave and can be used as distributed intelligence in the PROFIBUS system.	The "Compact" BC3150 Bus Terminal Controller is housed in a cost-optimised and compact housing. Unlike the BC3100, the BC3150 supports up to 255 Bus Terminals via the K-bus extension.
Bus interface	1 x D-sub socket, 9-pin	1 x D-sub socket, 9-pin
Data transfer rates	automatic detection up to 12 Mbaud	automatic detection up to 12 Mbaud
Program memory	32/96 kbytes	48 kbytes
Data memory	32/64 kbytes	32 kbytes
Remanent data	512 bytes	2 kbytes
Online change	–	yes
Weight	approx. 170 g	approx. 100 g
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex
Further information	BC3100	BC3150
Accessories		
Cordsets and connectors	see page 800	see page 800
PC Fieldbus Cards	FC310x 782	FC310x 782
TwinCAT 2 PLC	see page 1022	see page 1022

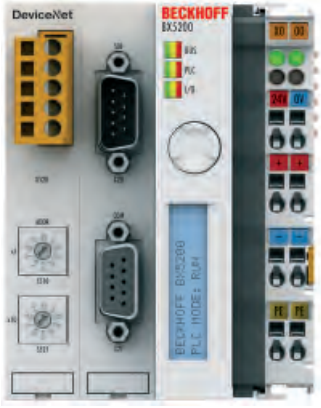
We reserve the right to make technical changes.

CANopen

	PROFIBUS Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension), 12 Mbaud	CANopen "Compact" Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	CANopen Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
	BX3100	**BC5150**	**BX5100**
		64 (255 with K-bus extension)	
	244 byte input and 244 byte output	16 Tx/Rx PDOs	32 Tx/Rx PDOs
	1450 mA	1000 mA	1450 mA
	+60 °C -25 °C	+60 °C -25 °C	 +60 °C -25 °C
	The BX3100 Bus Terminal Controller has a PROFIBUS slave interface with automatic baud rate detection up to 12 Mbaud and an address selection switch for address assignment.	The "Compact" BC5150 Bus Terminal Controller for CANopen extends the Beckhoff small controller series by a cost-optimised version in a compact housing.	The BX5100 Bus Terminal Controller has a CANopen slave interface. It has automatic baud rate detection up to 1 Mbaud and an address selection switch for address assignment.
	1 x D-sub socket, 9-pin	open style connector, 5-pin	open style connector, 5-pin
	automatic detection up to 12 Mbaud	automatic detection up to 1 Mbaud	automatic detection up to 1 Mbaud
	256 kbytes	48 kbytes	256 kbytes
	256 kbytes	32 kbytes	256 kbytes
	2 kbytes	2 kbytes	2 kbytes
	yes	yes	yes
	approx. 250 g	approx. 100 g	approx. 250 g
	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL	CE, UL, Ex	CE, UL
	BX3100	BC5150	BX5100
	see page 800	see page 800	see page 800
	FC310x 782	FC510x 784	FC510x 784
	see page 1022	see page 1022	see page 1022

DeviceNet, Modbus, RS232/RS485 | **Bus Terminal Controllers**

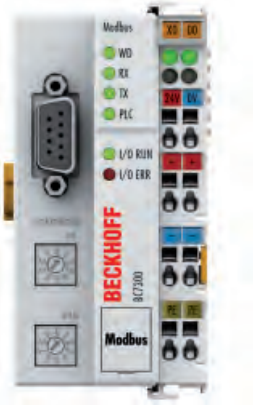
DeviceNet

	DeviceNet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	DeviceNet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
Technical data	**BC5250**	**BX5200**
Number of Bus Terminals	64 (255 with K-bus extension)	
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1000 mA	1450 mA
	+60 °C -25 °C	 +60 °C -25 °C
	The BC5250 Bus Terminal Controller with DeviceNet interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing. The DeviceNet Controller offers automatic baud rate detection up to 500 kbaud and two address selection switches for address assignment.	The BX5200 Bus Terminal Controller has a DeviceNet slave interface. It has automatic baud rate detection up to 500 kbaud and an address selection switch for address assignment. Up to 512 byte of input and 512 byte of output can be exchanged with the controller.
Bus interface	open style connector, 5-pin	open style connector, 5-pin
Data transfer rates	automatic detection up to 500 kbaud	automatic detection up to 500 kbaud
Program memory	48 kbytes	256 kbytes
Data memory	32 kbytes	256 kbytes
Remanent data	2 kbytes	2 kbytes
Online change	yes	yes
Weight	approx. 100 g	approx. 250 g
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL
Further information	BC5250	BX5200
Accessories		
Cordsets and connectors	see page 800	see page 800
PC Fieldbus Cards	FC520x 786	FC520x 786
TwinCAT 2 PLC	see page 1022	see page 1022

We reserve the right to make technical changes.

Modbus

RS232
RS485

	Modbus RS485 Bus Terminal Controller for up to 64 Bus Terminals	RS485 Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
	BC7300	**BC8050**
	64	64 (255 with K-bus extension)
	512 byte input and 512 byte output	512 byte input and 512 byte output
	1750 mA	1000 mA
		+60 °C -25 °C
	The Bus Terminal Controller BC7300 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Modbus. The BC7300 is an intelligent slave and can be used as a non-central intelligence in the Modbus system.	The Bus Terminal Controller BC8050 with serial RS485 interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing. An open serial protocol – like in the BK8x00 Bus Couplers – and the Modbus RTU/ASCII protocol are implemented. The address and the protocol are selected via the two rotary selection switches.
	D-sub 9-pin, RS485	RS485 D-sub
	150, 300, 600, 1200, 2400, 4800, 9600, 19,200, 38,400 baud (default: 9600 baud)	1.2 kbaud…38.4 kbaud
	32/96 kbytes	48 kbytes
	32/64 kbytes	32 kbytes
	512 bytes	2 kbytes
	–	yes
	approx. 170 g	approx. 100 g
	0…+55 °C	-25…+60 °C
	CE, UL, Ex, GL	CE, UL, Ex
	BC7300	BC8050
	see page 800	see page 800
	–	–
	see page 1022	see page 1022

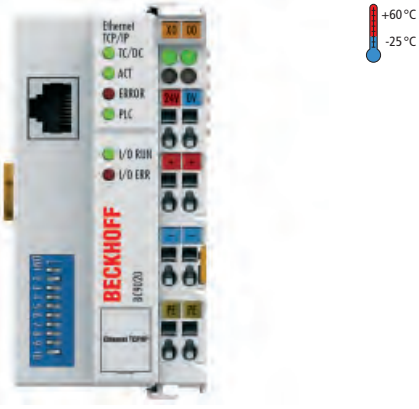
RS232/RS485, Ethernet | **Bus Terminal Controllers**

RS232
RS485

	RS232 Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	RS232/RS485 Bus Terminal Controller for up to 64 Bus Terminals 255 with K-bus extension)
Technical data	**BC8150**	**BX8000**
Number of Bus Terminals	64 (255 with K-bus extension)	
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1000 mA	1450 mA
	+60 °C -25 °C	+60 °C -25 °C
	The Bus Terminal Controller BC8150 with serial RS232 interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing. An open serial protocol – like in the BK8x00 Bus Couplers – and the Modbus RTU/ASCII protocol are implemented.	The BX8000 Bus Terminal Controller is a stand-alone PLC. One unit consists of the BX8000 Bus Terminal Controller with up to 64 Bus Terminals and a bus end terminal. With the terminal bus extension system, the connection of up to 255 Bus Terminals is possible. The controller is programmed via the COM1 interface. In addition, the BX8000 has a second COM port, optionally RS232 or RS485. This can be used for connecting serial devices, such as displays.
Bus interface	RS232 D-sub	open style connector, 5-pin
Data transfer rates	1.2 kbaud…38.4 kbaud	300 baud…115 kbaud
Program memory	48 kbytes	256 kbytes
Data memory	32 kbytes	256 kbytes
Remanent data	2 kbytes	2 kbytes
Online change	yes	yes
Weight	approx. 100 g	approx. 250 g
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL
Further information	BC8150	BX8000
Accessories		
Cordsets and connectors	see page 800	see page 800
PC Fieldbus Cards	–	–
TwinCAT 2 PLC	see page 1022	see page 1022

We reserve the right to make technical changes.

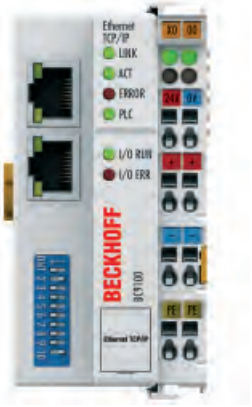
Ethernet

	Ethernet Bus Terminal Controller for up to 64 Bus Terminals	Ethernet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	Ethernet TCP/IP Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)
	BC9000	**BC9050**	**BC9020**
	64	64 (255 with K-bus extension)	
	512 byte input and 512 byte output		
	1750 mA	1000 mA	1750 mA
			
	The Bus Terminal Controller BC9000 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Ethernet. It is an intelligent slave that can be used as a non-central intelligence in the Ethernet system. One unit consists of the Bus Terminal Controller, any number of terminals between 1 and 64, and a bus end terminal.	The BC9050 Bus Terminal Controller with Ethernet interface extends the Beckhoff small controller series by a cost-optimised version in a compact housing.	The BC9020 Bus Terminal Controller is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Ethernet. It is an intelligent slave and can be used as decentralised intelligence in the Ethernet system.
	1 x RJ45	1 x RJ45	1 x RJ45
	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
	64/96 kbytes	48 kbytes	128 kbytes
	64/128 kbytes	32 kbytes	128 kbytes
	4080 bytes	2 kbytes	2 kbytes
	–	yes	yes
	approx. 170 g	approx. 100 g	approx. 170 g
	-25…+60 °C	0…+55 °C	-25…+60 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex, GL
	BC9000	BC9050	BC9020
	see page 800	see page 800	see page 800
	FC90xx 788	FC90xx 788	FC90xx 788
	see page 1022	see page 1022	see page 1022

We reserve the right to make technical changes.

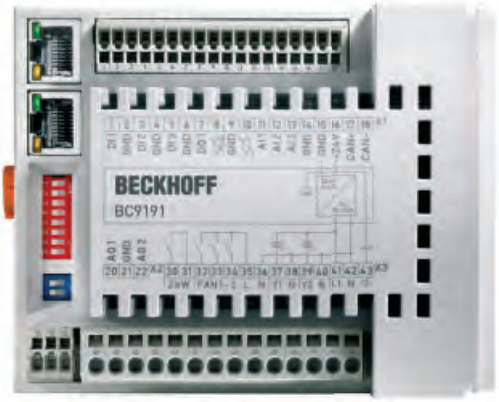
Ethernet | **Bus Terminal Controllers**

Ethernet

	Ethernet TCP/IP Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension, with integrated 2-channel switch)	Ethernet TCP/IP Bus Terminal Controller for up to 64 Bus Terminals (with integrated 2-channel switch)
Technical data	**BC9120**	**BC9100**
Number of Bus Terminals	64 (255 with K-bus extension)	64
Max. number of bytes fieldbus	512 byte input and 512 byte output	
Current supply K-bus	1750 mA	1750 mA
	+60 °C -25 °C	 +60 °C -25 °C
	In contrast to the BC9020, the BC9120 has an additional RJ45 port. Both Ethernet ports operate as 2-channel switches.	The Bus Terminal Controller BC9100 is a Bus Coupler with integrated PLC functionality and has a fieldbus interface for Ethernet. The BC9100 is an intelligent slave and can be used as a non-central intelligence in the Ethernet system.
Bus interface	2 x RJ45 (2-channel switch)	2 x RJ45 (2-channel switch)
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
Program memory	128 kbytes	64/96 kbytes
Data memory	128 kbytes	64/128 kbytes
Remanent data	2 kbytes	4080 bytes
Online change	yes	–
Weight	approx. 170 g	approx. 170 g
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Further information	BC9120	BC9100
Accessories		
Cordsets and connectors	see page 800	see page 800
PC Fieldbus Cards	FC90xx 788	FC90xx 788
TwinCAT 2 PLC	see page 1022	see page 1022

We reserve the right to make technical changes.

Ethernet Room Controller

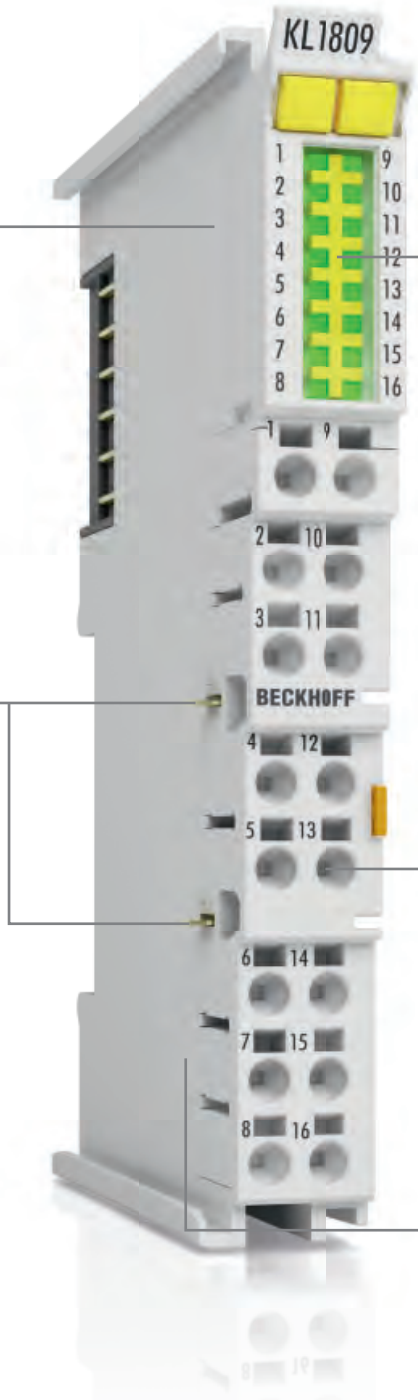
	Ethernet Bus Terminal Controller for up to 64 Bus Terminals (255 with K-bus extension)	Building Automation Room Controller, 48 kbyte, sub bus for KL6583 (EnOcean)	Building Automation Room Controller, 128 kbyte, RS485 interface
	BX9000	**BC9191**	**BC9191-0100**
	64 (255 with K-bus extension)	64	
		512 byte input and 512 byte output	
	1450 mA	200 mA	
			**Digital inputs:** 3 contacts (e.g. window contact, dew point, occupancy sensor) **Analog inputs:** 1 x PT/Ni1000; 1 x resistance measurement for set point; 3 x 0…10 V **Digital outputs:** 1 x LED, 10 mA; 1 x 230 V AC, 10 A, relay; 3 x 230 V AC, 1 A, relay; 2 x 230 V AC, 1 A, triac **Analog outputs:** 2 x 0…10 V
	The BX9000 Bus Terminal Controller has an Ethernet slave/master interface. The controller has automatic baud rate detection up to 100 Mbaud. The address can optionally be entered via DHCP, BootP, ARP or with the joystick switch.	The BC9191 and BC9191-0100 Ethernet Room Controllers cover the standard functionalities for room control in a compact design. The two versions differ in terms of the memory capacity of the integrated PLC and the sub bus. The BC9191 has an integrated interface to the KL6583 (EnOcean), the BC9191-0100 has an RS485 interface. Both versions have the necessary I/O signals and two switched Ethernet interfaces. They can be extended with Bus Terminals. A parameterisable PLC program for room temperature control is included in the delivery.	
	RJ45	2 x RJ45 (switched)	
	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate	
	256 kbytes	48 kbytes	128 kbytes
	256 kbytes	32 kbytes	128 kbytes
	2 kbytes	2 kbytes	
	yes	yes	
	approx. 250 g	approx. 345 g	
	0…+55 °C	0…+55 °C	
	CE, UL	CE	
	BX9000	BC9191	BC9191-0100
	see page 800	see page 800	
	FC90xx 788	FC90xx 788	
	see page 1022	see page 1022	

KLxxxx | Bus Terminals

▶BusTerminal

The Bus Terminals have a galvanic isolation between the field level and the communication level (K-bus). A terminal is equipped with 1…n input or output channels. The channels within a terminal are usually not electrically isolated from each other.

The power contacts on the left hand side (if available) supply the terminals with field voltage. Depending on the terminals 24 V DC, 230 V AC or other voltages are transferred. The supply power required is listed in the technical data. The maximum load of the power contacts is 10 A.



Beckhoff Bus Terminals feature function-dependant coloured labels: yellow for digital inputs, red for digital outputs, green for analog inputs, blue for analog outputs. The LED frames for HD Bus Terminals are also colour-coded accordingly.

Different field level connection techniques can be used for Bus Terminals:

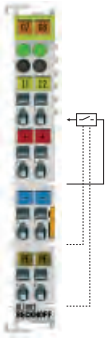
- standard terminal point: 0.08…2.5 mm² spring-loaded technique
- HD Bus Terminal: 0.08… 0.75 mm² (with ferrule); 0.08…1.5 mm² (single-wire); spring-loaded technique; direct plug-in technique
- ribbon: especially used in Asia for digital input/output channels
- plug-in wiring level: KS terminals

Some 2-channel Bus Terminals have a PE power contact, which can be used for PE distribution by connecting it together with similar terminals. The EMC spring contact on the underside of the terminal only serves to remove interference and may not be used as a protective earth.

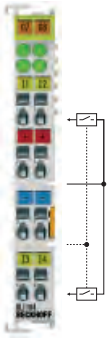
+60 °C -25 °C	Extended operating/ storage temperature
25 g	Extended mechanical load

Technical data see page 587

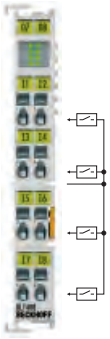
We reserve the right to make technical changes.



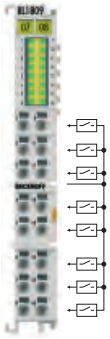
2-channel terminals
The 2-channel terminals provide additional power (+24 V DC), ground (0 V DC) and in many cases also PE for each channel. Connection is carried out with 3- or 4-wire connection.



4-channel terminals
Along with four channels the 4-channel terminals have another four connection points available. These can provide 24 V DC or ground. Connection is carried out with 2-wire connection.



8-channel terminals
The 8-channel terminals have one channel per connection point due to a high packing density. The power contact of the terminal will be used as the common reference potential. Connection is carried out with 1-wire connection.



16-channel terminals
The HD (High Density) housing allows 16 channels to be accommodated on a unit that is only 12 mm wide. The power contact of the terminal will be used as the common reference potential. Connection is carried out with 1-wire connection.

The Bus Terminals offer the possibility to directly connect many different signals. No signal converter or additional evaluation device is needed. The direct connection reduces the costs and simplifies the control technology. Each Bus Terminal separates the internal electronics from the connection level and thus simplifies the creation of voltage groups with different voltages. In addition, interfering voltages on the signal connector lose their adverse effects.

The KL1xxx, KL2xxx Bus Terminal product family is designed for the processing of digital or binary signals. There are "High" and "Low" states. In the positive switching logic the High state corresponds to the level of the supply voltage, the Low state corresponds to ground level. For negative switching logic it is the other way around. The Bus Terminal product family supports both types of logic for various supply voltages. 1-, 2-, 3- and 4-wire connections allow the use of Bus Terminals in almost all applications without further wiring work.

The KL3xxx and KL4xxx Bus Terminal product family processes analog signals. The most commonly used are 0 to 10 V, ±10 V, 0 to 20 mA and 4 to 20 mA. Also many other industry-standard voltage and current signals are supported and pre-processed.

In the KL5xxx and KL6xxx Bus Terminal product families other complex signals, such as position values and digital interfaces, are supported. Some Bus Terminals act as fieldbus masters for subordinate bus systems. The Bus Terminal station thus becomes a universal gateway between different systems.

The KL9xxx system terminals round off the application of Bus Terminals with power feed and power supply units.

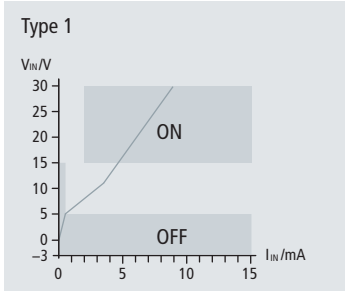
Technical data	**KLxxxx** | KSxxxx
Electrical isolation	500 V (K-bus/field potential); if not indicated otherwise
Operating/storage temperature	0…+55 °C/-25…+85 °C (extended temperature range: -25…+60 °C/-40…+85 °C)
Relative humidity	95 %, no condensation
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 25 g, 6 ms); 1000 shocks per direction, 3 axes
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable (see documentation)
Pluggable wiring	for all KSxxxx Bus Terminals

Digital input | 24 V DC, positive switching

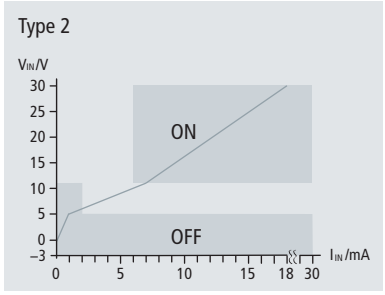
The digital inputs of a 24 V supply are among the most used signals. The EN 61131-2 standard describes the input characteristic and distinguishes three types. Type 1 has a small input current with low power dissipation. This input is optimised for mechanical switches and actively-switched electronic outputs. Type 2 has a significantly larger input current and is optimised for 2-wire sensors with a high quiescent current consumption. In switched-on state the current consumption of this input is high. The related power dissipation is generally not acceptable. Type 3 is a combination between type 1, with low current in switched-on state, and a satisfactorily high quiescent current for the majority of modern 2-wire sensors. The type 3 input can be used in almost all applications as a replacement for type 1.

The diagram shows the typical current/voltage curves of the Bus Terminal inputs and the allowable range of conformity in accordance with the standard.

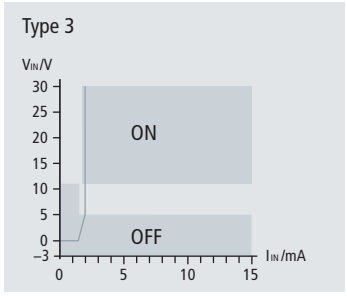
The input circuits differ in their filtering functions. The filtering has the task of suppressing electromagnetic interference. However, this does have the drawback of signal deceleration. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and delivers a stable signal for simple PLC applications. Filter times of 0.2 ms are suitable for applications with shortest possible reaction times and should be used for mechanical switches only in a restricted manner.



Signal voltage "0": -3…5 V DC
Signal voltage "1": 15…30 V DC



Signal voltage "0" -3…5 V DC
Signal voltage "1": 11…30 V DC

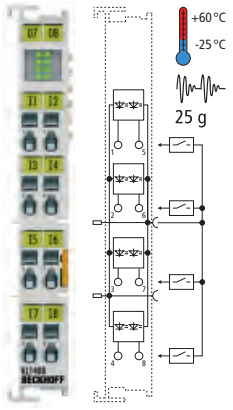


Signal voltage "0": -3…5 V DC
Signal voltage "1": 11…30 V DC

Characteristics of the 3 input types according to EN 61131-2 (24 V DC)

8-channel digital input terminal, 24 V DC, 1-wire, type 1/3

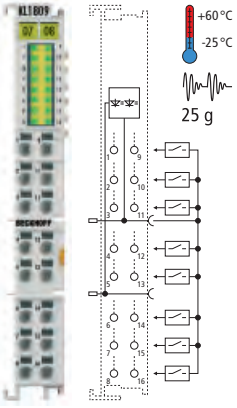
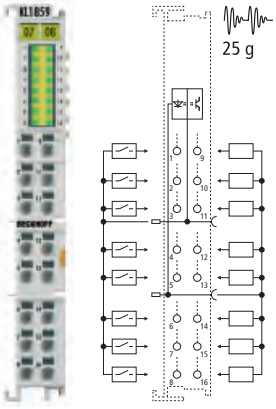
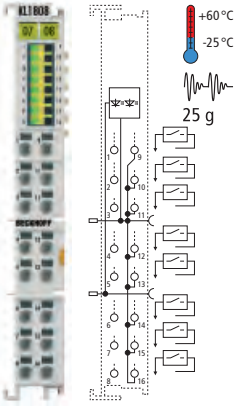
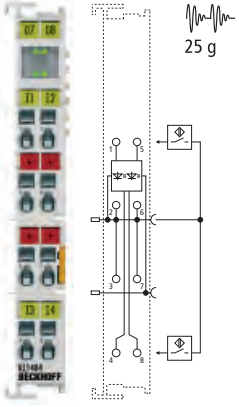
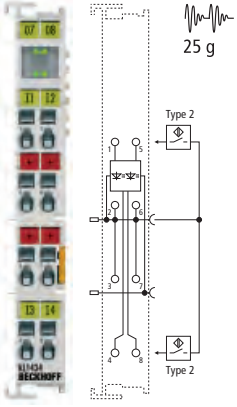
Technical data	KL1408 | KS1408	KL1418 | KS1418
Connection technology	1-wire	
Specification	EN 61131-2, type 1/3	
Input filter	typ. 3.0 ms	typ. 0.2 ms
Number of inputs	8	



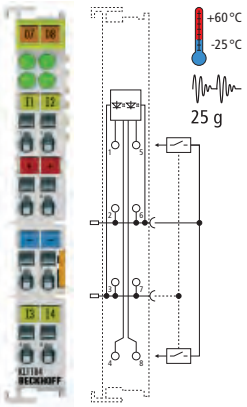
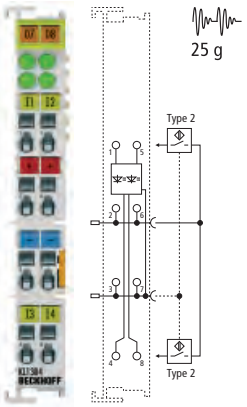
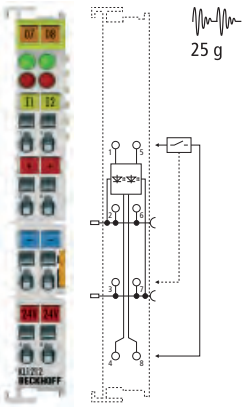
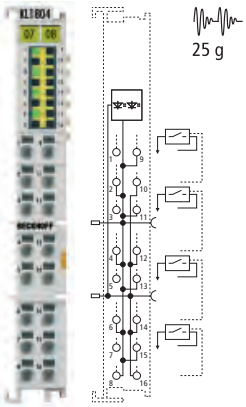
The KL1408 and KL1418 digital input terminals have eight inputs, which are each assigned to a connection point. This way, a high packing density can be achieved for signal sources with common grounds.

Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 2 mA + load
Current consumption K-bus	typ. 5 mA
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex, GL
Weight	approx. 55 g
Further information	KL1408

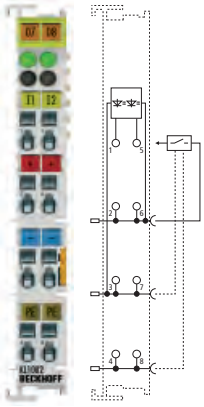
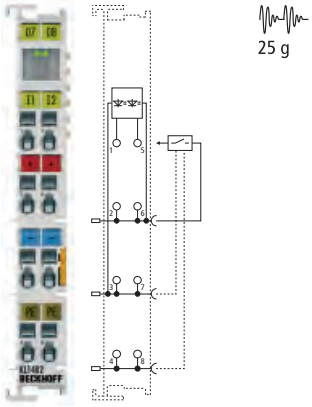
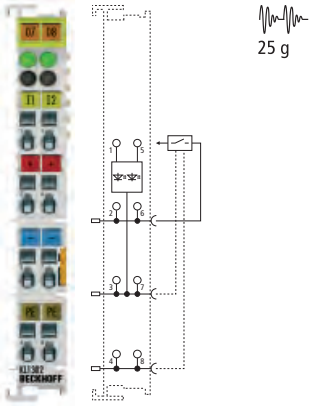
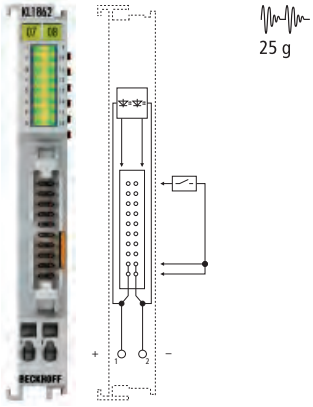
We reserve the right to make technical changes.

	16-channel digital input terminal, 24 V DC, 1-wire, type 1/3		8-channel digital input + 8-channel digital output, 24 V DC, 1-wire, type 1/3	8-channel digital input terminal, 24 V DC, 2-wire, type 1/3		4-channel digital input terminal, 24 V DC, 2-wire, type 1/3		4-channel digital input terminal, 24 V DC, 2-wire, type 2
	KL1809	**KL1819**	**KL1859**	**KL1808**		**KL1404** | KS1404	**KL1414** | KS1414	**KL1434** | KS1434
				2-wire				
								EN 61131-2, type 2
	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 3.0 ms		typ. 3.0 ms	typ. 0.2 ms	typ. 0.2 ms
	16		8 inputs + 8 outputs	8		4		4
								
	The HD (High Density) Bus Terminals with higher packing density contain 16 terminal points housed in a 12 mm terminal block.		The KL1859 digital Bus Terminal combines eight digital inputs and eight digital outputs in one device. – number of outputs: 8 – max. output current: 0.5 A (per channel) – load type: ohmic, inductive, lamp load – reverse voltage protection: yes	The KL1808 HD (High Density) Bus Terminal has eight inputs and eight 24 V connections, which are suitable for the connection of 2-wire sensors.		The KL1404 and KL1414 digital input terminals are suitable for the connection of four 2-wire sensors.		The KL1434 digital input terminal is suitable for the connection of four 2-wire sensors of type 2 (EN 61131-2).
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
	typ. 4 mA + load		typ. 15 mA + load	typ. 2 mA + load		typ. 1 mA + load		only load
	typ. 20 mA		typ. 25 mA	typ. 15 mA		typ. 3 mA		typ. 3 mA
	-25…+60 °C		0…+55 °C	-25…+60 °C		0…+55 °C		0…+55 °C
	CE, UL, Ex, GL		CE, UL, Ex, GL	CE, UL, Ex, GL		CE, UL, Ex, GL		CE, UL, Ex
	approx. 60 g		approx. 60 g	approx. 60 g		approx. 50 g		approx. 50 g
	KL1809		KL1859	KL1808		KL1404		KL1434

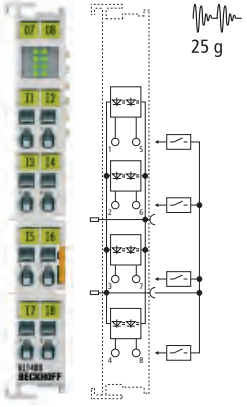
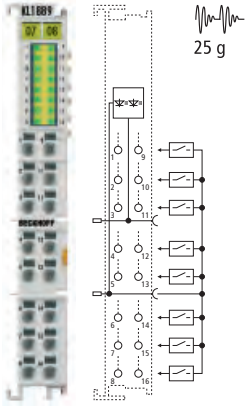
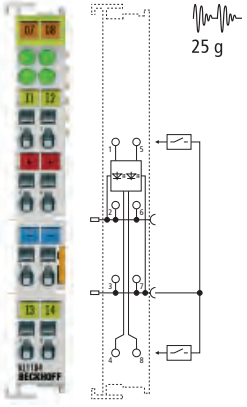
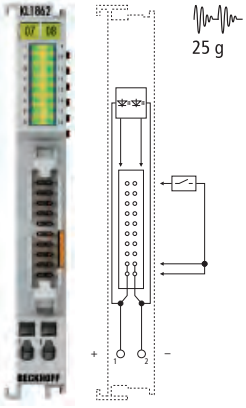
Digital input | 24 V DC, positive switching

	4-channel digital input terminal, 24 V DC, 2-/3-wire, type 1/3		4-channel digital input terminal, 24 V DC, 2-/3-wire, type 2		2-channel digital input terminal, 24 V DC, with short-circuit protected sensor supply and diagnostics, 3-wire, type 1	4-channel digital input terminal, 24 V DC, 3-wire, type 1/3	
Technical data	**KL1104** | KS1104	**KL1114** | KS1114	**KL1304** | KS1304	**KL1314** | KS1314	**KL1212** | KS1212	**KL1804**	**KL1814**
Connection technology	2-/3-wire				3-wire		
Specification	EN 61131-2, type 1/3		EN 61131-2, type 2		EN 61131-2, type 1	EN 61131-2, type 1/3	
Input filter	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 3.0 ms	typ. 0.2 ms
Number of inputs	4		4		2	4	
							
	The KL1104 and KL1114 digital input terminals have four inputs and also provide 24 V DC and ground per channel.		The KL1304 and KL1314 digital input terminals have four inputs and also provide 24 V DC and ground per channel. The terminals are especially suitable for sensors which require a high quiescent current.		The KL1212 digital input terminal contains two inputs, which are suitable for the connection of 3-wire sensors. The terminal offers a short-circuit-proof sensor supply voltage with integrated diagnostic. A short-circuit or an open lead in the sensor supply is detected and the terminal status is relayed to the controller via the K-bus.	The KL1804 and KL1814 HD Bus Terminals contain four inputs, 24 V and ground connections, which are suitable for the application of 3-wire sensors.	
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	
Current consumption power contacts	only load		only load		only load	typ. 1 mA + load	
Current consumption K-bus	typ. 5 mA		typ. 3 mA		typ. 8 mA	typ. 10 mA	
Operating temperature	-25…+60 °C		0…+55 °C		0…+55 °C	0…+55 °C	
Approvals	CE, UL, Ex, GL		CE, UL, Ex		CE, UL, Ex, GL	CE, UL, Ex, GL	
Weight	approx. 55 g		approx. 50 g		approx. 55 g	approx. 60 g	
Further information	KL1104		KL1304		KL1212	KL1804	
Special terminals							
Distinguishing features							

We reserve the right to make technical changes.

	2-channel digital input terminal, 24 V DC, 4-wire, type 1/3		2-channel digital input terminal, 24 V DC, 4-wire, type 1/3		2-channel digital input terminal, 24 V DC, 4-wire, type 2		16-channel digital input terminal, 24 V DC, 1-wire, flat-ribbon cable connection, type 1/3	
	KL1002 | KS1002	**KL1012** | KS1012	**KL1402** | KS1402	**KL1412** | KS1412	**KL1302** | KS1302	**KL1312** | KS1312	**KL1862**	**KL1872**
	4-wire						flat-ribbon cable	
					EN 61131-2, type 2		EN 61131-2, type 1/3	
	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms
	2		2		2		16	
								
	The KL1002 and KL1012 digital input terminals have two inputs, which are suitable for the connection of 4-wire sensors.		The current/voltage characteristics have been optimised for 4-wire sensors. The input current in low state is increased to a minimum value of 1.5 mA and therefore supports the majority of commercially available 4-wire sensors. A typical value for the energy-saving high current is 2.2 mA.		The KL1302 and KL1312 digital input terminals have two inputs, which are suitable for the connection of 4-wire sensors. The terminals are especially suitable for sensors which require a high quiescent current.		A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points.	
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
	only load		typ. 1 mA + load		only load		typ. 4 mA from the 24 V supply (no power contacts)	
	typ. 3 mA		typ. 3 mA		typ. 3 mA		typ. 3 mA	
	-25…+60 °C		0…+55 °C		0…+55 °C		0…+55 °C	
	CE, UL, Ex, GL		CE, UL, Ex, GL		CE, UL, Ex		CE, UL, Ex	
	approx. 50 g		approx. 50 g		approx. 50 g		approx. 50 g	
	KL1002		KL1402		KL1302		KL1862	
							KL1862-0010	
							negative switching	622

Digital input | 24 V DC, negative switching

	8-channel digital input terminal, 24 V DC, 1-wire		16-channel digital input terminal, 24 V DC, 1-wire	4-channel digital input terminal, 24 V DC, 2-/3-wire		16-channel digital input terminal, 24 V DC, 1-wire, flat-ribbon cable
Technical data	**KL1488** | KS1488	**KL1498** | KS1498	**KL1889**	**KL1184** | KS1184	**KL1194** | KS1194	**KL1862-0010**
Connection technology	1-wire			2-/3-wire		flat-ribbon cable
Specification	negative switching					
Input filter	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms
Number of inputs	8		16	4		16
						
	The negative switching KL1488 and KL1498 digital input terminals are suitable for the connection of eight sensors by 1-wire technology.		The HD (High Density) Bus Terminals with higher packing density contain 16 terminal points housed in a 12 mm terminal block.	Negative switching sensors can be connected to the KL1184 and KL1194 digital input terminals.		A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points.
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 2 mA + load		typ. 4 mA + load	only load		typ. 4 mA from the 24 V supply (no power contacts)
Current consumption K-bus	typ. 5 mA		typ. 20 mA	typ. 8 mA		typ. 3 mA
Operating temperature	0…+55 °C		0…+55 °C	0…+55 °C		0…+55 °C
Approvals	CE, UL, Ex		CE, UL, Ex, GL	CE, UL, Ex		CE, UL, Ex
Weight	approx. 55 g		approx. 55 g	approx. 55 g		approx. 50 g
Further information	KL1488		KL1889	KL1184		KL1862
Special terminals						**KL1862**
Distinguishing features						positive switching

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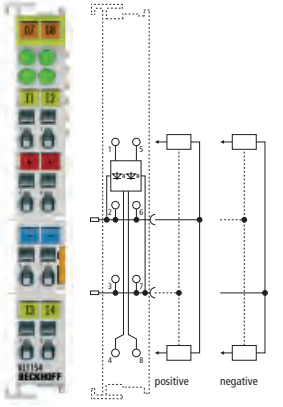
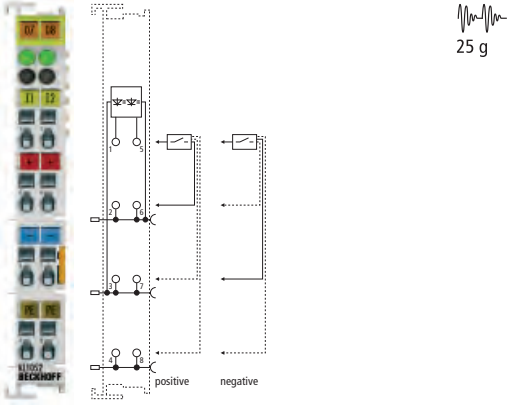
We reserve the right to make technical changes.

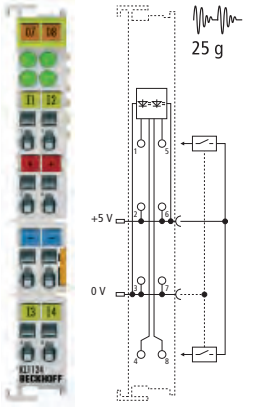
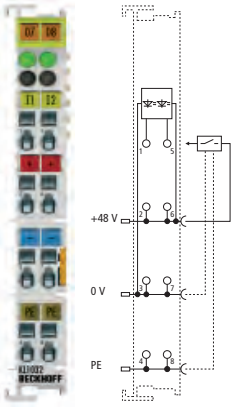
Digital input | 24 V DC, positive/negative switching

	4-channel digital input terminal, 24 V DC, 2-/3-wire		2-channel digital input terminal, 24 V DC, 4-wire
Technical data	**KL1154** | KS1154	**KL1164** | KS1164	**KL1052** | KS1052
Connection technology	2-/3-wire		4-wire
Specification	positive and negative switching		
Input filter	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms
Number of inputs	4		2
			
	Positive or negative switching sensors can be connected to the KL1154 and KL1164 digital input terminals. – signal voltage "0": 7.6…17.4 V DC – signal voltage "1": 0…7 V DC and 18…30 V DC		Positive or negative switching sensors can be connected to the KL1052 digital input terminal. – signal voltage "0": 7.6…17.4 V DC – signal voltage "1": 0…7 V DC and 18…30 V DC
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
Current consumption power contacts	–		–
Current consumption K-bus	typ. 8 mA		typ. 8 mA
Operating temperature	0…+55 °C		0…+55 °C
Approvals	CE, UL, Ex		CE, UL, Ex
Weight	approx. 55 g		approx. 50 g
Further information	KL1154		KL1052
Special terminals			**KL1052-0010**
Distinguishing features			96 V DC (not in accordance with the EN 61131-2 specifications)

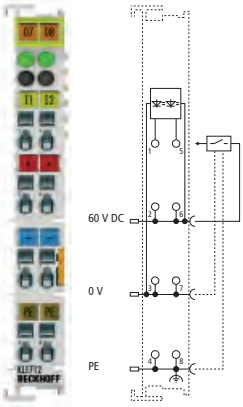
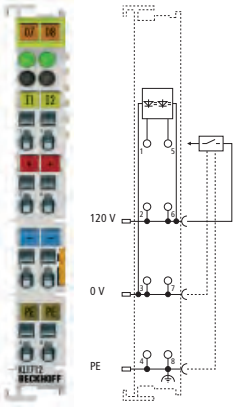
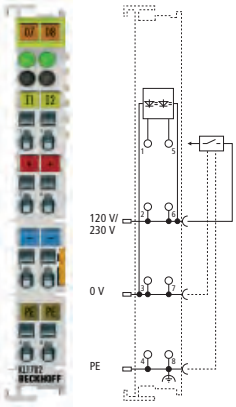
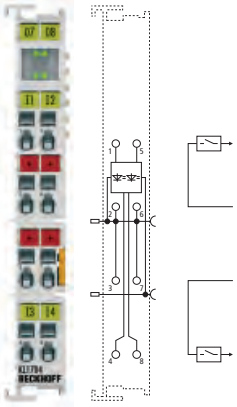
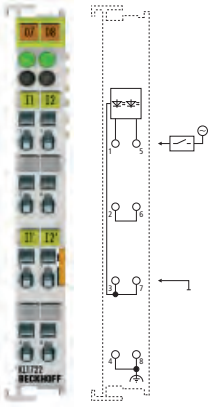
Digital input | 5…230 V

Rather than the usual 24 V DC control voltage, additional voltage range/potentials are implemented for sensors and actuators. The digital input terminals from the signal range 5 to 230 V allow direct input of these special sensor/actuator supplies without a further level conversion. The Bus Terminals are separately supplied with the corresponding control voltage by a power feed terminal, so that a Bus Terminal station can be operated with various different potential groups.

KL9xxx power feed terminals
see page 700

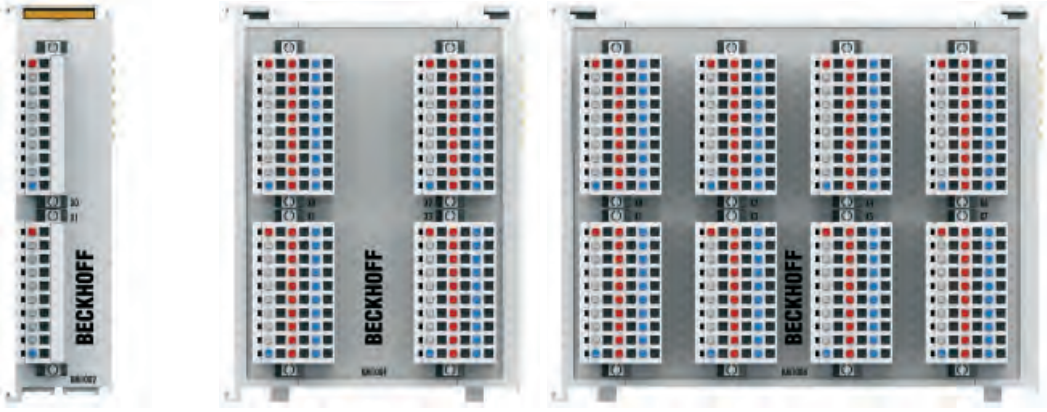
	4-channel digital input terminal, 5 V DC, 2-/3-wire	2-channel digital input terminal, 48 V DC, 4-wire, type 1
Technical data	**KL1124** | KS1124	**KL1032** | KS1032
Connection technology	2-/3-wire	4-wire
Input filter	typ. 0.2 ms	typ. 3.0 ms
Number of inputs	4	2
"0" signal voltage	< 0.8 V	-6…+34 V
"1" signal voltage	> 2.4 V	34…60 V
		
	The KL1124 digital input terminal is suitable for the reading of 5 V DC logic signals. The 5 V DC supply voltage can be generated with the KL9505 power supply unit terminal and fed in via the power contacts.	The KL1032 digital input terminal is suitable for the reading of 48 V DC logic signals.
Nominal voltage	5 V DC	48 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 1 mA + load	–
Current consumption K-bus	typ. 5 mA	typ. 3 mA
Electrical isolation	500 V (K-bus/field potential)	500 V (K-bus/field potential)
Special features	supply 5 V DC via power contacts	further voltage values on request
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Weight	approx. 50 g	approx. 50 g
Further information	KL1124	KL1032
Special terminals		
Distinguishing features		

We reserve the right to make technical changes.

	2-channel digital input terminal, 60 V DC, 4-wire, type 1	2-channel digital input terminal, 120 V AC/DC, 4-wire, type 1	2-channel digital input terminal, 120/230 V AC, 4-wire, type 1	4-channel digital input terminal, 120/230 V AC, 2-wire, type 1	2-channel digital input terminal, 120/230 V AC, 2-wire, type 1
	KL1712-0060 | KS1712-0060	**KL1712** | KS1712	**KL1702** | KS1702	**KL1704**	**KL1722** | KS1722
				2-wire	
	typ. 10 ms				
	2	2	2	4	2
	0…20 V	0…40 V	0…40 V	0…40 V	0…40 V
	40…70 V	80…140 V	79…260 V	79…260 V	79…260 V
					
	The KL1712-0060 digital input terminal is suitable for the reading of 60 V DC logic signals.	The KL1712 digital input terminal is suitable for the acquisition of direct and alternating voltage logic signals.	The KL1702 digital input terminal is suitable for the acquisition of logic signals in the alternating voltage range from 120 to 230 V AC.	The KL1704 digital input terminal is suitable for the acquisition of logic signals in the alternating voltage range from 120 to 230 V AC.	The KL1722 digital input terminal does not have a power contact, so that individual potential groups can be built up. The voltage between input 1 and input 2 must not exceed 230 V AC.
	60 V DC	120 V AC/DC	120/230 V AC	120/230 V AC	120/230 V AC
	–	–	–	–	–
	typ. 3 mA	typ. 3 mA	typ. 3 mA	typ. 3 mA	typ. 3 mA
	500 V (K-bus/mains voltage); 3750 V AC, 1 min.	500 V (K-bus/mains voltage); 3750 V AC, 1 min.	500 V (K-bus/mains voltage); 3750 V AC, 1 min.	500 V (K-bus/mains voltage); 3750 V AC, 1 min.	500 V (K-bus/mains voltage); 3750 V AC, 1 min.
	60 V DC rail applications	120 V AC power grids	ohmic/capacitive input behaviour	ohmic/capacitive input behaviour	ohmic/capacitive input behaviour
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL	CE, UL, Ex	CE, UL, Ex, GL	CE, UL	CE, UL, Ex, GL
	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
	KL1712-0060	KL1712	KL1702	KL1704	KL1722
		KL1712-0010	**KL1702-0010**		
		24 V AC/DC input circuit	230 V AC input circuit with type 2 characteristics		

Digital input | 24 V DC, terminal modules

	16-channel digital input module, 24 V DC, plug connector, type 1		32-channel digital input module, 24 V DC, plug connector, type 1		64-channel digital input module, 24 V DC, plug connector, type 1	
Technical data	**KM1002**	**KM1012**	**KM1004**	**KM1014**	**KM1008**	**KM1018**
Connection technology	plug					
Specification	EN 61131-2, type 1					
Input filter	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms	typ. 3.0 ms	typ. 0.2 ms
Number of inputs	16 (2 x 8)		32 (4 x 8)		64 (8 x 8)	



Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are optionally available with 1 or 3 pins. LEDs integrated in the plug indicate the signal state for each channel directly at the wire.

Ordering information:
KM10xx-0000 without plugs
-0001 1-pin plug (without status LED)
-0002 1-pin plug (with status LED)
-0004 3-pin plug (with status LED)

Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	– (no power contacts)	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 3 mA	typ. 3 mA	typ. 3 mA
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	approx. 310 g with 1-pin connector, approx. 390 g with 3-pin connector
Further information	KM1002	KM1004	KM1008

We reserve the right to make technical changes.

Digital input | **Manual operation**

Manual input of process data directly to the terminal is suitable for example for:
- training and test installations
- emergency operating levels in buildings
- operating levels in the control cabinet
- program development/simulation

It is possible to have a response directly on the module by the LEDs controlled by the process image.

Together with the following terminals, further manual operational functions can be implemented:
- KL2641 | 1-channel relay output terminal, 230 V AC, 16 A, bistable, manual operation, see page 640
- KM2642, KM2652 | 2-channel relay module, 230 V AC, 6 A, manual/automatic operation, see page 643
- KM2614 | 4-channel relay module, 230 V AC, 16 A, automatic operation/manual operation on the relay, see page 642
- KM4602 | 2-channel analog output terminal, 0…10 V, manual/automatic operation, see page 677

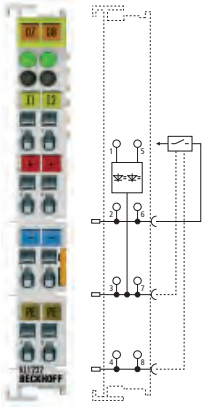
The manual operating modules of the KL85xx series (see page 696) are installed in the control cabinet door. This way, the modules can be operated without having to open the control cabinet.

	4-channel manual operation, 4 x switch, 4 x LED
Technical data	**KM1644**
Specification	manual operation level
Number of channels	4 inputs + 4 outputs
	 The digital KM1644 input terminal is used for manual input directly in the process data. The four switches supply their status to the control system as digital bit information. The four LEDs indicate the four output bits from the process data and cannot be activated directly via the switches.
Nominal voltage	–
Current consumption power contacts	– (no power contacts)
Current consumption K-bus	typ. 5 mA
Switch settings	ON, OFF, PUSH
Special features	manual/emergency operation
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 65 g
Further information	KM1644

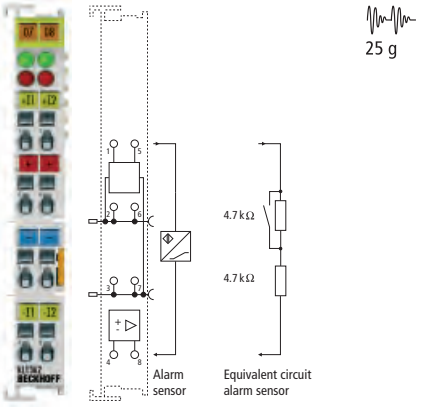
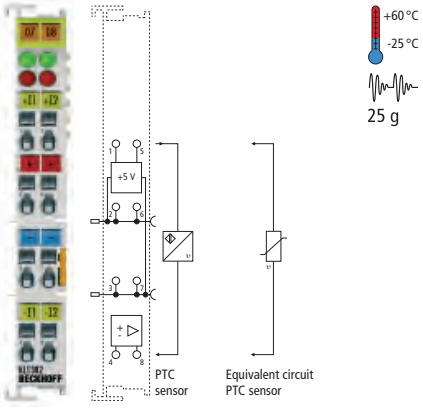
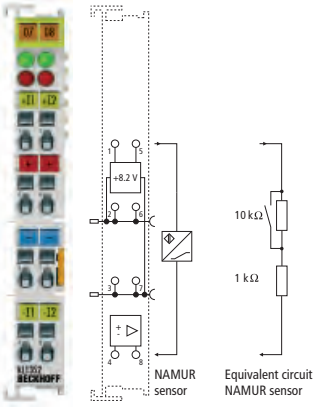
Digital input | **Special functions**

A specific alignment of the logic signals to the application is possible with the special terminals. The signal is either pre-processed inside the terminal or prepared as far as possible by a specialised input circuit, so that no additional module needs to be switched between sensor and Bus Terminal.

The KL1362, KL1382 and KL1352 Bus Terminals generate a voltage internally for sensor supply. Depending on the logical state of the sensor this changes the current or the voltage. The Bus Terminal evaluates this state and transmits it to the process image of the controller. If required, a diagnostic for wiring breaks and short-circuits is available in the event of a fault.

	2-channel digital input terminal, 24 V DC, with edge triggered pulse expansion
Technical data	**KL1232** | KS1232
Connection technology	4-wire
Specification	pulse expansion
Input filter	0.2 ms
Number of inputs	2
	 25 g
	The KL1232 has an input circuit that extends plus-switched signals, triggered on the rising edge, to 100 ms. The KL1232 is particularly suitable for recording very short signals in control systems with a longer processing time than the signal length.
Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3…+5 V
"1" signal voltage	15…30 V
Current consumption power contacts	–
Current consumption K-bus	typ. 5 mA
Special features	edge triggered pulse expansion
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 55 g
Further information	KL1232
Special terminals	**KL1232-xxxx**
Distinguishing features	special terminals see page 711

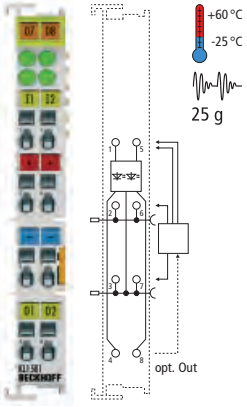
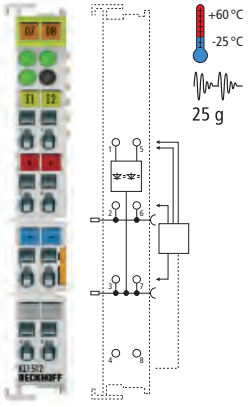
We reserve the right to make technical changes.

	2-channel digital input terminal, 24 V DC, for break-in alarm	2-channel digital input terminal, 24 V DC, thermistor	2-channel digital input terminal, 24 V DC, for NAMUR sensors
	KL1362 | KS1362	**KL1382** | KS1382	**KL1352** | KS1352
	2-wire		
	break-in alarm	thermistor PTC	NAMUR
	3.0 ms	30 ms	3.0 ms
	2	2	2
			
	The digital KL1362 input terminal analyses the input signals of break-in sensors with the aid of a current loop. It enables safe monitoring of alarm contacts with fixed resistance ratio. In the process image, the state of the sensor is indicated by one bit each. A further bit reports short circuits or line interruptions. – line interruption: < 0.1 mA – short circuit: > 3 mA – cable resistance: ≤ 200 Ω	The digital KL1382 input terminal analyses the input signal of thermistor sensors with the aid of a current loop and a voltage of less than 5 V. It is a monitoring device for the thermal machine protection of PTC sensors, suitable for the direct monitoring of motors, bearings and equipment. In the process image, the state of the sensor is indicated by one bit each. A further bit reports short circuits or line interruptions. – sensor voltage: ≤ 5 V – diagnostics: open-circuit: > 8 kΩ short-circuit: < 25 Ω	The digital input terminal KL1352 analyses the input signal from NAMUR sensors in accordance with EN 50277 (previously DIN 19234). One bit indicates the sensor's signal state in the process image. A further bit reports short circuits or line interruptions. – switching hysteresis: 0.2 mA – short circuit current: < 8.2 mA – short circuit detection: > 6.5 mA
	24 V (-15 %/+20 %)	24 V (-15 %/+20 %)	24 V (-15 %/+20 %)
	"0" signal current: < 1 mA	≤ 1.5 kΩ	≤ 1.2 mA
	"1" signal current: > 1 mA	≥ 3 kΩ	≥ 2.1 mA
	–	–	–
	typ. 35 mA	typ. 60 mA	typ. 70 mA
	monitoring of alarm contacts	monitoring device for thermal machine protection	NAMUR
	0…+55 °C	-25…+60 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
	approx. 55 g	approx. 55 g	approx. 55 g
	KL1362	KL1382	KL1352

Digital input | **Counters**

Pulses often need to be captured in technical control applications. If the pulse length is the order of magnitude of the control cycle time or less, the controller cannot record these signals correctly any more. Pre-processing is then required. The "counter terminals" can count the number of pulses and deliver reliable values to the controller, even though the controller cannot capture the pulse at that speed. The counter is adapted to the individual requirements, such as forwards/backwards counter or Gate/Latch-controlled, by parameterisation. With a counter depth of 16- or 32-bit an overflow, even at high frequencies, can easily be managed by the controller.

The KL1501 is optimised for particularly fast signals. On this basis, other input voltages and special pre-processing are available with special varieties of terminals. The KL1512 is developed for price-sensitive areas of application and has certain limitations in relation to speed, bit width and functionality.

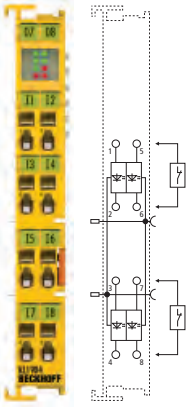
	Up/down counter, 24 V DC, 100 kHz, 32 bit	Up/down counter, 24 V DC, 1 kHz, 16 bit
Technical data	**KL1501** | KS1501	**KL1512** | KS1512
Input filter	–	0.2 ms
Number of inputs	2	
		
	The up/down counter counts binary pulses, and transmits the counter state, in an electrically isolated form, to the higher-level automation device. In the KL1501 Bus Terminal it is possible to choose the (32-bit) counting direction (forwards/backwards) using the forwards/backwards input, and the gate connection can be used to trigger the counter.	In the KL1512 digital input terminal it is possible to choose forwards or backwards counter (16-bit) direction. It is particularly suitable for simple counting tasks.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
"0" signal voltage	-3…+5 V	-3…+5 V
"1" signal voltage	15…30 V	15…30 V
Current consum. pow. cont.	–	–
Current consumption K-bus	typ. 50 mA	typ. 50 mA
Counting frequency	max. 100 kHz (2 kHz for switching up and down)	max. 1 kHz
Max. output current	0.5 A typ. (short-circuit-proof) per channel	–
Counter depth	32 bit	16 bit
Special features	2 additional outputs	–
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 50 g	approx. 55 g
Further information	KL1501	KL1512
Special terminals	**KL1501-001x**	
Distinguishing features	special terminals see 711	

We reserve the right to make technical changes.

Digital input | **TwinSAFE**

The KL1904 safety Bus Terminal is a digital input terminal for sensors with potential-free 24 V DC contacts and comprises four fail-safe inputs. The KL1904 meets the requirements of DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3).

For further information on TwinSAFE and the TwinSAFE products see page 1044

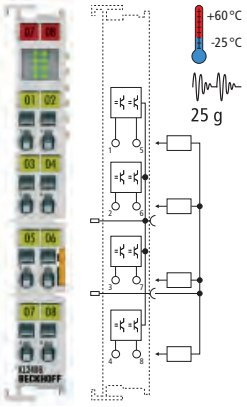
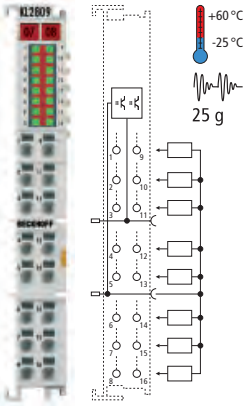
	4-channel digital input terminal, TwinSAFE, 24 V DC
Technical data	**KL1904**
Connection technology	2-wire
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Number of inputs	4
	 The KL1904 Safety Bus Terminal has four fail-safe inputs.
Protocol	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	–
Current consumption K-bus	48 mA
Response time	typ. 4 ms (read input/write to K-bus)
Fault response time	≤ watchdog time (parameterisable)
Permitted degree of contamination	2
Climate class EN 60721-3-3	3K3
Installation position	horizontal
Special features	4 safe inputs
Operating temperature	0…+55 °C
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 50 g
Protection class	IP 20
Further information	KL1904

Digital output | 24 V DC, positive switching

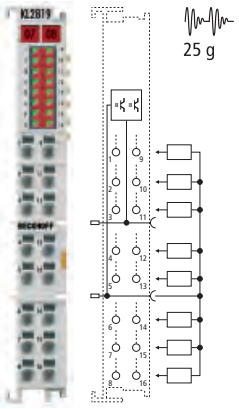
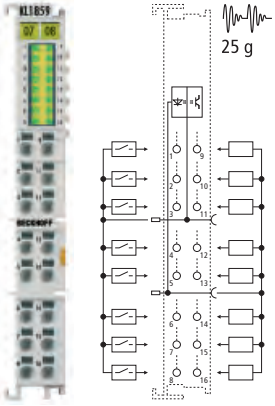
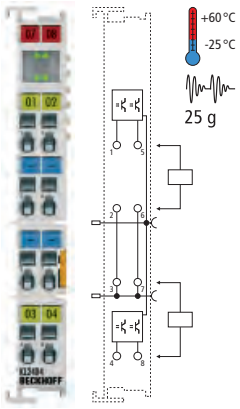
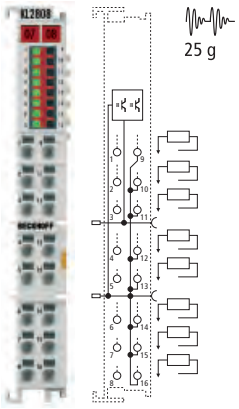
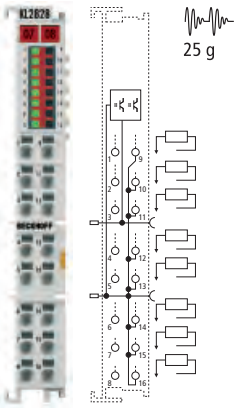
Many actuators are driven or controlled with 24 V DC. The Bus Terminals of the "positive switching" category switch all output channels to 24 V DC, so all connected actuators are hard-wired to ground (0 V). The output of a Bus Terminal can be considered as a functional 24 V DC relay contact. The output circuit offers further functions such as short-circuit-current limitation, short-circuit switch-off and the rapid depletion of inductive energy from the coil.

The most common output circuit delivers a maximum continuous current of 0.5 A. Special output terminals are available for higher currents. Any type of load (ohmic, capacitive, inductive) can be connected to an output terminal. As lamp and capacitive loads are critical due to their high starting currents, they are limited by the output circuits of the Bus Terminals. This ensures that the upstream circuit-breaker is not triggered. Inductive loads are problematic at switch-off, as high induction voltages develop if the current is interrupted too fast. An integrated freewheeling diode prevents this voltage peak. However, the current is reduced so slowly that it leads to faults in many technical control applications. For example, a valve remains open for many milliseconds. The Bus Terminals represent a compromise between prevention of overvoltage and rapid switch-off. They suppress the induction voltage to about 24 V DC and realise switch-off times which approximately correspond to the switch-on time of the coil.

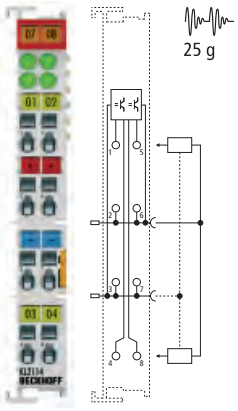
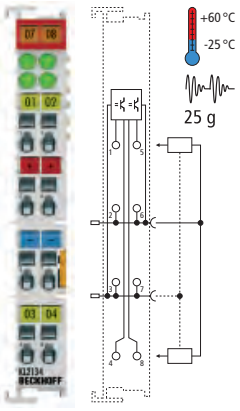
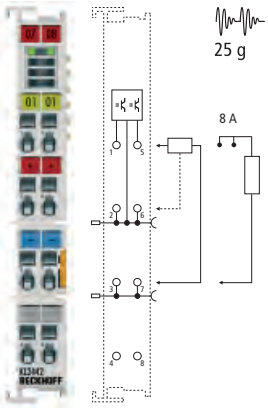
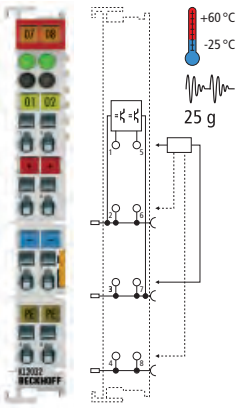
In the case of short-circuit, the output circuit limits the current and prevents the activation of the upstream circuit-breaker. The Bus Terminal maintains this current until important self-heating and finally switches off. After the circuit has cooled, it switches back on. The output signal is driven in time until the output of the controller is switched off or the short-circuit is rectified. The clock frequency depends on the ambient temperature and the load of the other terminal channels. The overload protection of the output is also realised by thermal switch-off. The total current specified should be observed. If a total current is not given, it is not limited.

	8-channel digital output terminal, 24 V DC, 1-wire	16-channel digital output terminal, 24 V DC, 1-wire
Technical data	**KL2408 | KS2408**	**KL2809**
Connection technology	1-wire	
Load type	ohmic, inductive, lamp load	
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Number of outputs	8	16
		
	The KL2408 digital output terminal has 8 outputs, each one is assigned a terminal point. This way, a high packing density can be achieved for actuators with common ground potential.	The KL2809 HD (High Density) Bus Terminal has 16 digital outputs and is suitable for applications in which a very high packing density is required.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 60 mA + load	typ. 35 mA + load
Current consumption K-bus	typ. 18 mA	typ. 35 mA
Breaking energy	< 150 mJ/channel	< 150 mJ/channel
Reverse voltage protection	yes	yes
Short circuit current	< 2 A	< 2 A
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 70 g	approx. 70 g
Further information	KL2408	KL2809

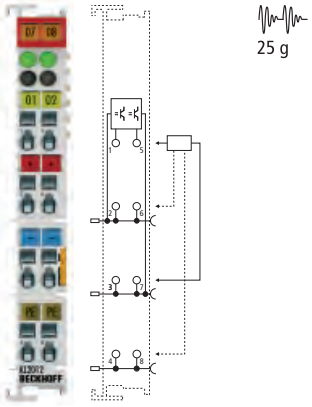
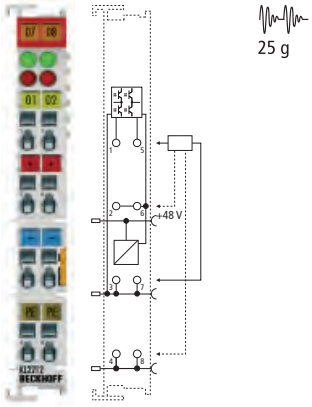
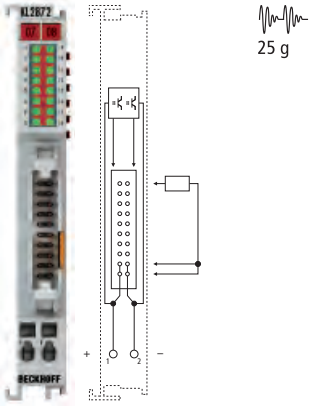
We reserve the right to make technical changes.

	16-channel digital output terminal, 24 V DC, 1-wire, with diagnostics	8-channel digital input + 8-channel digital output, 24 V DC, 1-wire	4-channel digital output terminal, 24 V DC, 2-wire		8-channel digital output terminal, 24 V DC, 2-wire	8-channel digital output terminal, 24 V DC, 2-wire
	KL2819	KL1859	KL2404 | KS2404	KL2424 | KS2424	KL2808	KL2828
			2-wire			
						ohmic, inductive, capacitive
	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	2.0 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	2 A per channel (∑ 10 A)
	16	8 outputs + 8 inputs	4		8	8
						
	The KL2819 HD (High Density) Bus Terminal has 16 digital outputs and is suitable for applications in which a very high packing density is required. Diagnostic information on overtemperature and lack of voltage supply are evaluated by the controller.	The KL1859 digital Bus Terminal combines eight digital inputs and eight digital outputs in one device. – number of inputs: 8 – input filter: 3.0 ms – type 1/3	The KL2404 and KL2424 digital input terminals are suitable for the connection of four 2-wire actuators.		The KL2808 High Density Bus Terminal contains eight outputs and eight ground connection points for the connection of 2-wire actuators and thus allows a very high packing density.	The KL2828 High Density Bus Terminal contains eight outputs and eight ground connection points for the connection of 2-wire actuators and thus allows a very high packing density.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 50 mA + load	typ. 15 mA + load	typ. 30 mA + load		typ. 15 mA + load	typ. 15 mA + load
	typ. 80 mA	typ. 25 mA	typ. 9 mA		typ. 20 mA	typ. 18 mA
	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel	< 1.7 J/channel	< 150 mJ/channel	< 1.2 J/channel
	yes	yes	yes		yes	yes
	< typ. 1 A	< 2 A	< 2 A	< 70 A	< 2 A	< 40 A typ.
	0…+55 °C	0…+55 °C	-25…+60 °C		0…+55 °C	0…+55 °C
	CE	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL
	approx. 70 g	approx. 60 g	approx. 70 g		approx. 65 g	approx. 70 g
	KL2819	KL1859	KL2404		KL2808	KL2828

Digital output | 24 V DC, positive switching

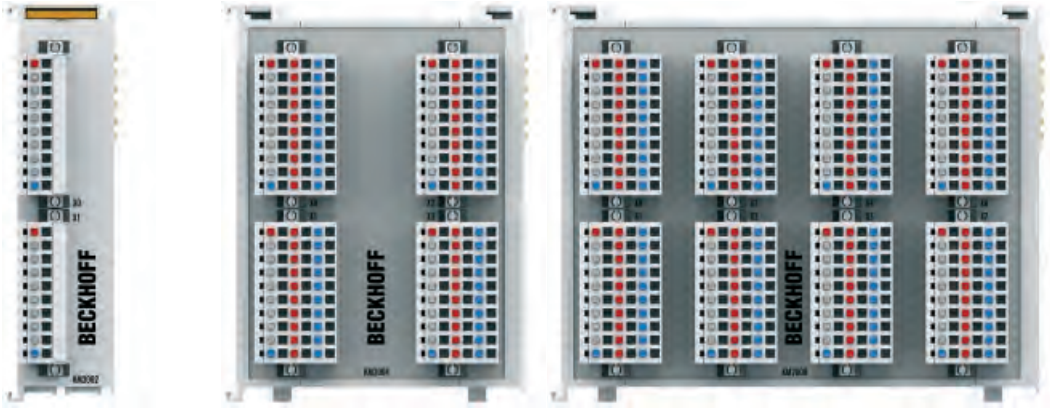
	4-channel digital output terminal, 24 V DC, 2-/3-wire	4-channel digital output terminal, 24 V DC, 2-/3-wire	2-channel digital output terminal, 24 V DC, 3-wire	2-channel digital output terminal, 24 V DC, 4-wire
Technical data	**KL2114** | KS2114	**KL2134** | KS2134	**KL2442**	**KL2032** | KS2032
Connection technology	2-/3-wire		3-wire	4-wire
Load type	ohmic, inductive, lamp load			
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	4.0 A (short-circuit-proof) per channel, 8 A for parallel connection	0.5 A (short-circuit-proof) per channel
Number of outputs	4	4	2	2
				
	The KL2114 digital output terminal connects the control signals to the actuators in an electrically isolated manner.	The KL2134 digital output terminal connects the control signals to the actuators in an electrically isolated manner. It is protected against reverse polarity connection.	The KL2442 is suitable for the connection of actuators with high current requirement of 4 A. For parallel switched outputs, even 8 A is possible.	The KL2032 digital output terminal connects the control signals to the actuators in an electrically isolated manner.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 30 mA + load	typ. 30 mA + load	typ. 30 mA + load	typ. 20 mA + load
Current consumption K-bus	typ. 9 mA	typ. 9 mA	typ. 9 mA	typ. 5 mA
Breaking energy	< 150 mJ/channel	< 150 mJ/channel	no data	< 150 mJ/channel
Reverse voltage protection	–	yes	yes	yes
Short circuit current	< 2 A	< 2 A	< 70 A	< 2 A
Operating temperature	0…+55 °C	-25…+60 °C	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL	CE	CE, UL, Ex, GL
Weight	approx. 70 g	approx. 70 g	approx. 70 g	approx. 55 g
Further information	KL2114	KL2134	KL2442	KL2032
Special terminals				
Distinguishing features				

We reserve the right to make technical changes.

	2-channel digital output terminal, 24 V DC, 4-wire		2-channel digital output terminal, 24 V DC, 4-wire, with diagnostics	16-channel digital output terminal, 24 V DC, flat-ribbon cable connection	16-channel digital output terminal, 24 V DC, D-sub connection
	KL2012 | KS2012	**KL2022** | KS2022	**KL2212** | KS2212	**KL2872**	**KM2042**
				flat-ribbon cable	D-sub
	0.5 A (short-circuit-proof) per channel	2.0 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A per channel, individually short-circuit-proof, ∑ 4 A
	2		2	16	16
	 25 g		 25 g	 25 g	
	The digital output terminals KL2012 and KL2022 connect the control signals to the actuators in an electrically isolated manner.		Diagnostic possibilities: – short-circuit to 24 V – short-circuit to 0 V – undervoltage	The KL2872 allows the connection of 16 actuators by direct ribbon cable via a 20-pin contact strip with a 2.54 mm contact spacing. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points.	The digital output terminal KM2042 allows direct connection of actuators by D-sub connection, which is common in e.g. valve terminals. Plug X2 included in the scope of supply.
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	typ. 15 mA + load	typ. 20 mA + load	typ. 15 mA + load	typ. 60 mA from the supply (no power contacts)	– (no power contacts)
	typ. 5 mA		typ. 15 mA	typ. 5 mA	typ. 5 mA
	< 150 mJ/channel	< 1.7 J/channel	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel
	–		–	yes	yes
	< 2 A	< 70 A	< 2 A	< 2 A	< 2 A
	0…+55 °C		0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE
	approx. 55 g		approx. 60 g	approx. 55 g	approx. 90 g
	KL2012		KL2212	KL2872	KM2042
				KL2872-0010	
				negative switching 638	

Digital output | 24 V DC, terminal modules

	16-channel digital output, 24 V DC, plug connector	32-channel digital output, 24 V DC, plug connector	64-channel digital output, 24 V DC, plug connector
Technical data	**KM2002**	**KM2004**	**KM2008**
Connection technology	plug		
Load type	ohmic, inductive, lamp load		
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Number of outputs	16 (2 x 8)	32 (4 x 8)	64 (8 x 8)



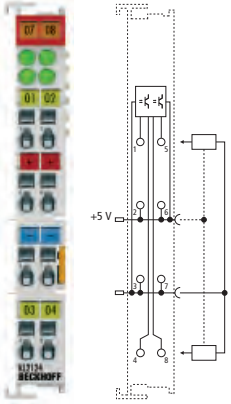
Like the standard Bus Terminals, the terminal modules are integrated in the I/O system. Plug connectors with spring connections enable plug-in wiring and are optionally available with 1 or 3 pins. LEDs integrated in the plug indicate the signal state for each channel directly at the wire.
Ordering information:
KM200x-0000 without plugs
-0001 1-pin plug (without status LED)
-0002 1-pin plug (with status LED)
-0004 3-pin plug (with status LED)

Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	– (no power contacts)	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 5 mA	typ. 5 mA	typ. 5 mA
Breaking energy	< 150 mJ/channel	< 150 mJ/channel	< 150 mJ/channel
Reverse voltage protection	yes	yes	yes
Short circuit current	< 2 A	< 2 A	< 2 A
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE	CE
Weight	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	approx. 90 g with 1-pin connector, approx. 110 g with 3-pin connector	approx. 310 g with 1-pin connector, approx. 390 g with 3-pin connector
Further information	KM2002	KM2004	KM2008

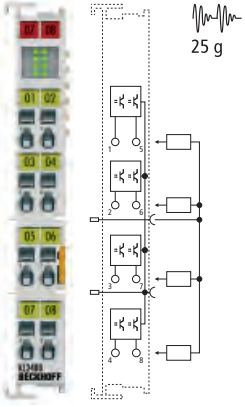
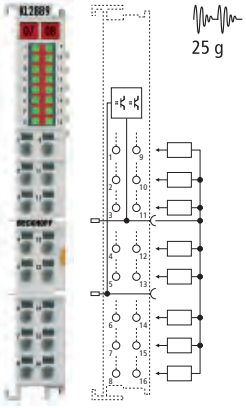
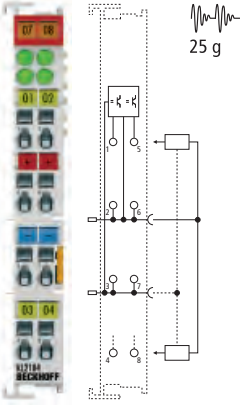
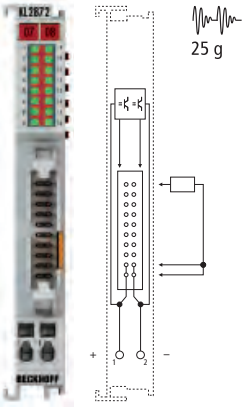
We reserve the right to make technical changes.

Digital output | 5 V DC, positive switching

The KL2124 digital output terminal connects the binary control signals from the automation unit on to the actuators at the process level with electrical isolation. The load current outputs of the KL2124 version are protected against overload and short-circuit. The Bus Terminal contains four channels that indicate their signal state by means of light emitting diodes.

	4-channel digital output terminal, 5 V DC, 2-/3-wire
Technical data	**KL2124 | KS2124**
Connection technology	2-/3-wire
Load type	ohmic, inductive, lamp load
Max. output current	±20 mA (short-circuit-proof) per channel, 8 mA signal current
Number of outputs	4
	 25 g The positive-switching KL2124 output terminal offers four outputs and additionally provides 5 V DC and ground (0 V) for each channel.
Nominal voltage	5 V DC
Current consumption power contacts	typ. 16 mA + load
Current consumption K-bus	typ. 14 mA
Breaking energy	–
Reverse voltage protection	yes
Short circuit current	–
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 70 g
Further information	KL2124

Digital output | 24 V DC, negative switching

	8-channel digital output terminal, 24 V DC, 1-wire	16-channel digital output terminal, 24 V DC, 1-wire	4-channel digital output terminal, 24 V DC, 2-/3-wire	16-channel digital output terminal, 24 V DC, flat-ribbon cable connection
Technical data	**KL2488** | KS2488	**KL2889**	**KL2184** | KS2184	**KL2872-0010**
Connection technology	1-wire		2-/3-wire	flat-ribbon cable
Load type	ohmic, inductive, lamp load			
Max. output current	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel	0.5 A (short-circuit-proof) per channel
Number of outputs	8	16	4	16
				
	The KL2488 digital output terminal is suitable for the connection of eight negative switching actuators using 1-wire connection technology.	The KL2889 HD (High Density) Bus Terminal offers terminal points for 16 negative switching actuators using 1-wire connection technology and thus a very high packing density.	The KL2184 digital output terminal offers four outputs and additionally provides 24 V DC and ground (0 V) for each channel.	A 20-pin plug connector with 2.54 mm contact spacing enables the secure connection of plug connectors using insulation displacement contact, as is usual for ribbon cables and special round cables. The required 24 V DC voltage supply must be input by the ribbon cable or the terminal points 1 and 2.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 60 mA + load	typ. 35 mA + load	typ. 30 mA + load	typ. 60 mA from the supply (no power contacts)
Current consumption K-bus	typ. 18 mA	typ. 45 mA	typ. 9 mA	typ. 5 mA
Breaking energy	< 100 mJ/channel	< 100 mJ/channel	< 100 mJ/channel	< 100 mJ/channel
Reverse voltage protection	yes	yes	yes	yes
Short circuit current	< 7 A	< 7 A	< 7 A	< 7 A
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
Weight	approx. 70 g	approx. 70 g	approx. 70 g	approx. 55 g
Further information	KL2488	KL2889	KL2184	KL2872

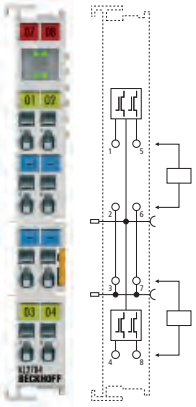
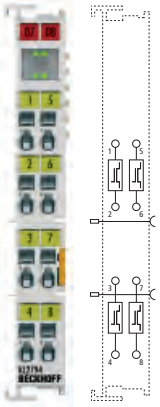
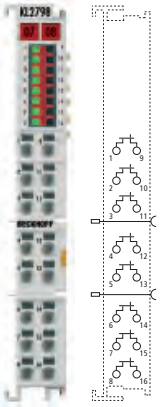
We reserve the right to make technical changes.

Digital output | 30 V AC/DC, solid state relays

The KL2784, KL2794 and KL2798 digital output terminals each provide four (KL27x4) or eight (KL2798) switches, which can be used like a relay contact for AC/DC voltages. The KL2784 uses a power contact as a common potential. In the KL2794 and KL2798, the power contacts are passed directly to the circuit without connection.

The electronic switch in the Bus Terminal is implemented by efficient MOSFET transistors with a low switch-on resistance. The electronics are virtually wear-free. The switch itself is not short-circuit-proof, but can conduct a high current with its high pulse current capability long enough, until the circuit-breaker switches off. It behaves like a robust relay contact.

Inductive loads can be switched directly, without further safety measures. The circuit switches relatively slowly and prevents high peak voltages. No break sparks are created in the terminal and thus no electromagnetic interference pulse.

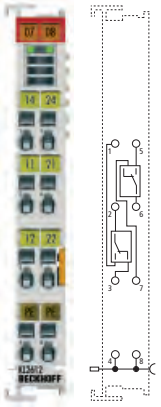
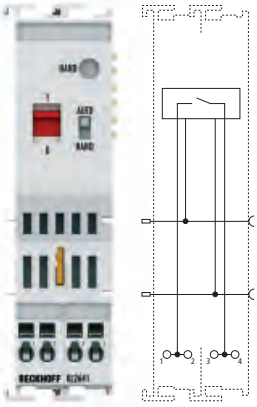
	4-channel digital output terminal, 30 V AC/DC, solid state relay	4-channel digital output terminal, 30 V AC/DC, solid state relay, potential-free	8-channel digital output terminal, 30 V AC/DC, solid-state relay
Technical data	**KL2784** | KS2784	**KL2794** | KS2794	**KL2798**
Connection technology	2-wire		
Load type	AC/DC loads		
Max. output current	2 A per channel	2 A per channel	2 A per channel (∑ 10 A)
Number of outputs	4 x make contacts	4 x make contacts	8 x make contacts
	 4 electronic switches on the power contact	 4 potential-free electronic switches	 8 potential-free electronic switches
Nominal voltage	0…30 V AC/DC (only ohmic load: 0…48 V DC)	0…30 V AC/DC (only ohmic load: 0…48 V DC)	0…30 V AC/DC (only ohmic load: 0…48 V DC)
Current consum. pow. cont.	only load	–	–
Current consumption K-bus	80 mA	80 mA	80 mA
Breaking energy	no data	no data	no data
Short circuit current	90 A	90 A	5 A (100 ms), < 50 A (10 ms), observe the cut-off characteristic of the fuse
Surge voltage protection	> 39 V	> 39 V	> 39 V
Peak current	5 A (100 ms), < 50 A (10 ms)	5 A (100 ms), < 50 A (10 ms)	5 A (100 ms), < 50 A (10 ms)
On-resistance	typ. 0.03 Ω	typ. 0.03 Ω	typ. 0.03 Ω
Switching on speed	typ. 1.8 ms, max. 5 ms	typ. 1.8 ms, max. 5 ms	typ. 1.8 ms, max. 5 ms
Switching off speed	typ. 30 ms, max. 50 ms	typ. 30 ms, max. 50 ms	typ. 30 ms, max. 50 ms
Special features	alternative for relay contacts	alternative for relay contacts, potential-free	substitute for relay contacts, potential-free
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL
Weight	approx. 70 g	approx. 70 g	approx. 70 g
Further information	KL2784	KL2794	KL2798

Digital output | **Relay outputs up to 400 V AC**

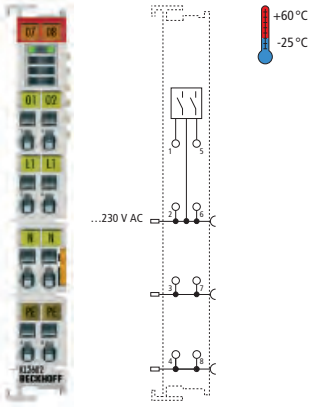
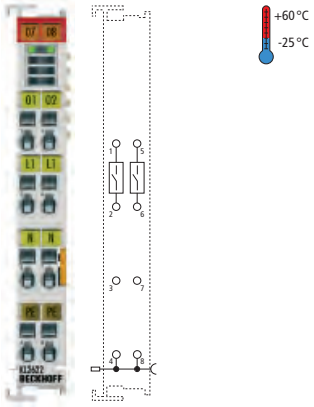
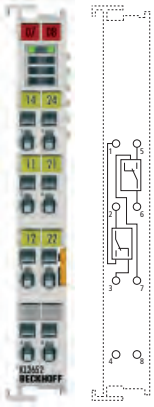
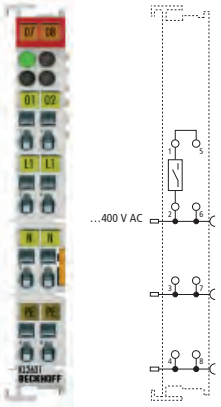
The Bus Terminals switch a relay as a function of the bits in the process image. The relays completely isolate the current flow by a mechanical contact; there is no residual current through the open contact. The Bus Terminals are not equipped with a protective circuit, so as not to allow for residual current by parallel switched components. The relay contacts differ in their contact material. Signal contacts also switch small voltages and currents; large current here lead to a change in the contact characteristics. Power contacts can switch large loads. A oxide layer on the power contacts prevents safe contact for small voltages below 1 V DC.

Switching on is accompanied by a bouncing. The electrical connection is initially switched on and off briefly, until the contact is securely in its closed location. With an inductive load (coil) this behaviour leads to a spark and to corresponding electromagnetic radiation. Capacitive loads create a short-circuit for a brief period of time. This can – particularly with alternating voltages – lead to such high switch-on currents at switch-on under peak value that the bouncing contact is burned shut. A capacitive load can also be electronic devices, which are typically equipped with a rectifier in the input and a relatively large smoothing capacitor. Electronic ballast is especially critical for fluorescent lamps. The maximum switch-on currents of the devices, which should be observed, are shown in the technical data numerous times.

The switch-off of a relay takes place by mechanical opening the contact. An arc burns for a short moment and warms the contact. For an inductive load (coil) a large part of the magnetic energy stored in the coil is additionally released as heat at the contact. This load on the contact determines the service life of the relay and is called the electrical service life. The mechanical service life is defined as the number of switching operations without current flow through the contact.

	2-channel relay output terminal, 125 V AC	1-channel relay output terminal, 230 V AC, bistable, manual operation
Technical data	**KL2612** | KS2612	**KL2641**
Load type	ohmic	ohmic, inductive, lamp load
Max. output current	2 A per channel	16 A
Number of outputs	2 x change-over	1 x make contact
	 The KL2612 Bus Terminal is equipped with potential-free contacts.	 The KL2641 output terminal has a relay with a single contact, which can be used universally for the switching of mains voltage consumers. The relay can optionally be switched in manual or automatic mode.
Nominal voltage	125 V AC/30 V DC	230 V AC (max. switching voltage 440 V AC)
Current consum. pow. cont.	– (no power contacts)	typ 65 mA + load
Current consumption K-bus	typ. 60 mA	typ. 5 mA
Switching current	0.5 A AC/2 A DC (ohmic)	16 A AC
Operat. cycles mech. (min.)	1 x 10^8	1 x 10^6
Operat. cycles electr. (min.)	2 x 10^5 (1 A/30 V DC)	no data
Lamp test, electronic ballast	max. 2 A starting current	max. 16 A starting current
Minimum permitted load	10 µA at 10 mV	–
Special features	signal relay	manual operation; bistable relay contact
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE
Weight	approx. 80 g	approx. 110 g
Further information	KL2612	KL2641

We reserve the right to make technical changes.

	2-channel relay output terminal, 230 V AC	2-channel relay output terminal, 230 V AC	2-channel relay output terminal, 230 V AC, 300 V DC	1-channel relay output terminal, 400 V AC, 300 V DC
	KL2602 | KS2602	**KL2622** | KS2622	**KL2652** | KS2652	**KL2631** | KS2631
	5 A per channel			2 A
	2 x make contacts for power contact	2 x make contacts	2 x change-over	1 x make contacts for power contact
				
	The KL2602 output terminal has two relays each of which has a single contact. The relay contact is connected to the power contacts, which are suitable for use at up to 230 V AC, and can be generally used for switching devices requiring mains power.	The KL2622 Bus Terminal has potential-free contacts; the power contacts are not looped through.	The KL2652 output terminal has two relays each with a changeover contact, which can be used universally for the switching of mains voltage consumers of 230 V AC or 300 V DC. The KL2652 Bus Terminal is equipped with potential-free contacts.	The KL2631 output terminal has a relay with a single contact, which is connected with the power contacts (usable up to 400 V AC) and can be used universally for the switching of mains voltage consumers. In order to use high voltages of up to 400 V AC, the KL2631 must be supplied via the KL9190 power feed terminal.
	230 V AC/30 V DC	230 V AC/30 V DC	230 V AC (max. switching voltage 250 V AC/300 V DC)	400 V AC/300 V DC
	only load	–	– (no power contacts)	only load
	typ. 80 mA	typ. 85 mA	typ. 90 mA	typ. 80 mA
	5 A AC/DC (ohmic)/ 2 A AC/DC (inductive)	5 A AC/DC (ohmic)/ 2 A AC/DC (inductive)	max. 1 A AC/1 A DC at 40 V DC; max. 0.15 A at 300 V DC (UL: max. 230 V AC, 1 A)	switching capacity DC: 300 V = 0.15 A; 24 V = 5 A; non-linear; switching capacity AC: 1500 VA
	2×10^7	2×10^7	5×10^6	1×10^7
	1×10^5 (5 A/30 V DC)	1×10^5 (5 A/30 V DC)	1×10^6 (1 A/250 V AC)	1.3×10^5 (2 A/250 V AC)
	max. 5 A starting current (4 x 58 W)	max. 5 A starting current (4 x 58 W)	max. 6 A starting current	no data
	10 mA at 5 V DC	10 mA at 5 V DC	100 mA (12 V DC)	no data
	power relay	potential-free contacts	reverse switching realisable	400 V contact
	-25…+60 °C	-25…+60 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL	CE, GL
	approx. 85 g	approx. 80 g	approx. 55 g	approx. 85 g
	KL2602	KL2622	KL2652	KL2631

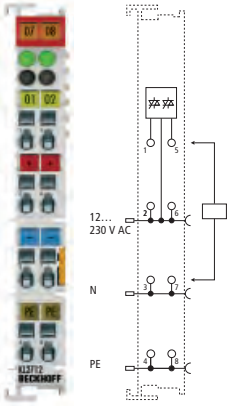
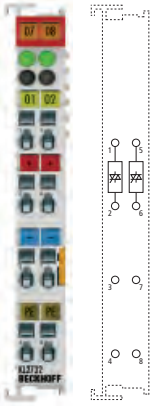
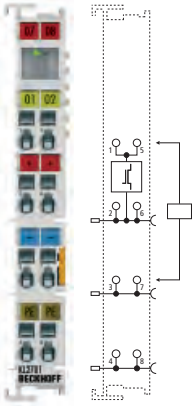
Digital output | **Relay outputs up to 400 V AC**

	4-channel relay module, 230 V AC	4-channel relay module, 230 V AC, automatic/manual operation
Technical data	**KM2604**	**KM2614**
Load type	ohmic, inductive, lamp load	
Max. output current	16 A	
Number of outputs	4 x change-over	4 x change-over
	The KM2604 terminal module combines four pluggable power relays in one fieldbus module. The high switching capacity of 16 A at 230 V AC enables direct mains connection of consumers with high current consumption. The relays are positioned at the top and can therefore be exchanged easily.	The KM2614 terminal module combines four pluggable power relays in one fieldbus module. The high switching capacity of 16 A at 230 V AC enables direct mains connection of consumers with high current consumption. The relays are positioned at the top and can therefore be exchanged easily. Each relay can be manually switched to the ON status. A seal indicates the initial manual operation.
Nominal voltage	230 V AC (max. switching voltage 250 V AC/30 V DC)	230 V AC (max. switching voltage 250 V AC/30 V DC)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 15 mA	typ. 15 mA
Switching current	16 A AC/12 A DC at 30 V DC	16 A AC/12 A DC at 30 V DC
Operat. cycles mech. (min.)	5 x 10^6	5 x 10^6
Operat. cycles electr. (min.)	1 x 10^6 (1 A/250 V AC)	1 x 10^6 (1 A/250 V AC)
Lamp test, electronic ballast	max. 25 A starting current	max. 25 A starting current
Minimum permitted load	5 mA (10 V DC)	5 mA (10 V DC)
Special features	–	automatic/manual operation at the relay
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE	CE
Weight	approx. 250 g	approx. 250 g
Further information	KM2604	KM2614

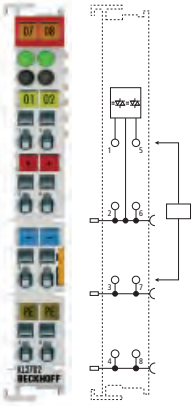
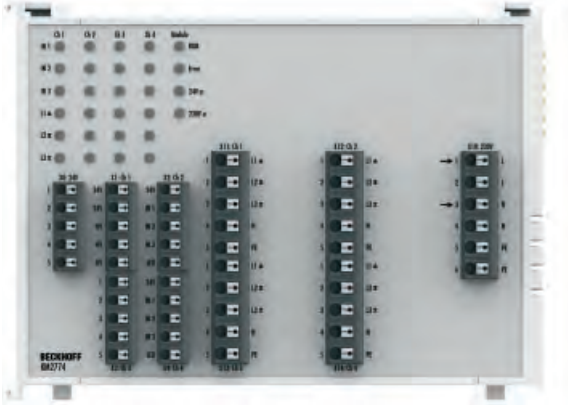
We reserve the right to make technical changes.

	2-channel relay module, 230 V AC, manual/automatic operation	2-channel relay module, 230 V AC, manual/automatic operation
	KM2642	**KM2652**
	6 A per channel	
	2 x change-over	2 x change-over
	The digital KM2642 output terminal has two independent relay change-over contacts, which can be used for switching mains current consumers. For each channel a switch enables selection between automatic, manual on, manual off. In automatic mode the logical state of an output bit switches the relay. For manual mode a 24 V supply is required for the Bus Coupler. The output state can be read by the controller.	The digital KM2652 output terminal has two independent relay change-over contacts, which can be used for switching mains current consumers. For each channel a switch enables selection between automatic, manual on, manual off. In automatic mode the logical state of an output bit switches the relay. For manual mode a 24 V supply is required for the Bus Coupler. The state of the output and the switch can be read by the controller.
	230 V AC (max. switching voltage 250 V AC)	230 V AC (max. switching voltage 250 V AC)
	– (no power contacts)	– (no power contacts)
	typ. 130 mA	typ. 130 mA
	6 A AC/4 A DC at 30 V DC	6 A AC/4 A DC at 30 V DC
	1 x 10^6	1 x 10^6
	1 x 10^5 (3 A/250 V AC)	1 x 10^5 (3 A/250 V AC)
	max. 10 A starting current	max. 10 A starting current
	100 mA (12 V DC)	100 mA (12 V DC)
	manual/automatic operation	manual/automatic operation, switch setting readable
	0…+55 °C	0…+55 °C
	CE	CE
	approx. 110 g	approx. 110 g
	KM2642	KM2652

Digital output | **Triac outputs up to 230 V AC**

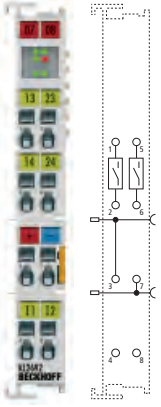
	2-channel triac output terminal, 12…230 V AC		2-channel triac output terminal, 12…230 V AC	1-channel solid state load relay up to 230 V AC/DC
Technical data	**KL2712** | KS2712	**KL2722** | KS2722	**KL2732** | KS2732	**KL2701** | KS2701
Connection technology	4-wire		2-wire	2-/3-/4-wire
Load type	ohmic, inductive			
Max. output current	2 x 0.025…0.5 A	1 x 1 A	1 x 1 A	3 A steady load
Number of outputs	2 x make contacts, mutually locked	2 x make contacts	2 x make contacts	1 x make contact
				
	The KL2712 and KL2722 output terminals use a power switch to control mains voltage from 12 V to 230 V AC. The switching element is a Triac which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear.		The KL2732 output terminal uses a power switch to control mains voltage from 12 V to 230 V AC. The switching element is a Triac. As a semiconductor switch, it is not subject to wear.	The KL2701 output terminal uses an electronic load relay to switch a mains voltage of up to 230 V AC/DC. The switching element is a high-power MOSFET which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear.
Nominal voltage	12…230 V AC		12…230 V AC	0…230 V AC/DC
Current consum. pow. cont.	only leakage and load current		– (no power contacts)	only leakage and load current
Current consumption K-bus	typ. 10 mA		typ. 10 mA	typ. 65 mA
Switching times	0.1…10 ms, zero crossing		0.1…10 ms, zero crossing	1.5…5 ms
Frequency range	47…63 Hz		47…63 Hz	DC…100 Hz
Surge voltage protection	> 275 V AC		> 275 V AC	from 400 V AC
Peak current	40 A (16 ms), 1.5 A (30 s)		40 A (16 ms), 3 A (30 s)	5 A (20 s), 50 A (100 ms)
Leakage current (OFF state)	typ. 0.8 mA, max. 1.5 mA		typ. 0.8 mA, max. 1.5 mA	<< 1 mA
Switch-off time	T/2		T/2	2…4 ms
Maximum residual voltage	1.5 V		1.5 V	(100 mΩ)
Special features	reverse motors (blinds)		reverse motors (blinds)	–
Operating temperature	0…+55 °C		0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE, Ex, GL	CE, GL	CE
Weight	approx. 55 g		approx. 55 g	approx. 55 g
Further information	KL2712		KL2732	KL2701
Special terminals	KL27x2-0010		KL2732-0010	
Distinguishing features	special terminals see page 711		special terminals see page 711	

We reserve the right to make technical changes.

	2-channel solid state load relay up to 230 V AC/DC			4-channel triac output module for 4 blind motors
	KL2702 | KS2702	KL2702-0020	KL2702-0002	KM2774
				mixed
	0.3 A steady load on each channel	1.5 A steady load on each channel	2 A steady load on each channel	1.5 A per channel
	2 x make contacts	2 x make contacts	2 x make contacts, mutually locked	4 x 3 make contacts
				
	The KL2702 output terminal uses an electronic load relay to switch a mains voltage of up to 230 V AC/DC. The switching element is a high-power MOSFET which is connected to the power contact potential. As a semiconductor switch, it is not subject to wear.			Mixed module 24 V DC/230 V AC for the direct control of blinds applications
	0…230 V AC/DC (DC…100 Hz)			80…230 V AC
	only leakage and load current			– (no power contacts)
	typ. 10 mA	typ. 50 mA	typ. 50 mA	typ. 30 mA
	1.5…5 ms			0.1…10 ms, zero crossing
	DC…100 Hz			50 Hz
	from 400 V AC			> 275 V AC
	0.5 A (20 s), 1.5 A (100 ms)	2.5 A (20 s), 7.5 A (100 ms)	2.5 A (20 s), 7.5 A (100 ms)	40 A (16 ms), 3 A (30 s)
	<< 1 mA			typ. 0.8 mA, max. 1.5 mA
	0.05…0.1 ms	5…8 ms	5…8 ms	T/2
	(2.1 Ω)	(200 mΩ)	(300 mΩ)	1.5 V
	–			–
	0…+55 °C			0…+55 °C
	CE, UL, Ex, GL	CE	CE	CE
	approx. 55 g			approx. 270 g
	KL2702			KM2774

Digital output | **Cycle monitoring**

The KL2692 Bus Terminal monitors a bit that is toggled by the controller during each cycle. If the toggle signal fails, the terminal switches off two potential-free relays in order to prevent damage to the machine. Failure of the toggle signal may be caused by the PLC cycle stopping, by a fault in the bus cable or connector, or by a fault in a bus device. The cycle monitoring time can be parameterised. The Bus Terminal has an enable input that enables the relay to be switched on if a correct toggle signal is detected.

	Cycle monitoring terminal (watchdog)
Technical data	KL2692 | KS2692
Connection technology	2-wire
Max. output current	3 A per channel
Number of outputs	2 potential-free relay outputs (normally-open contacts)
Number of inputs	2 digital 24 V inputs
	
Nominal voltage	30 V DC
Current consumption power contacts	–
Current consumption K-bus	approx. 165 mA
Switching times	parameterisable
Ohmic switching current	5 A AC/DC per channel
Inductive switching current	2 A AC/DC per channel
Operat. cycles mech. (min.)	2 x 10^7
Operat. cycles electr. (min.)	1 x 10^5 (5 A/30 V DC)
Minimum permitted load	10 mA at 5 V DC
Operating temperature	0…+55 °C
Approvals	CE, UL
Weight	approx. 60 g
Further information	KL2692
Special terminals	KL2692-1001
Distinguishing features	2 digital inputs, 2 potential-free relays, end terminal variant

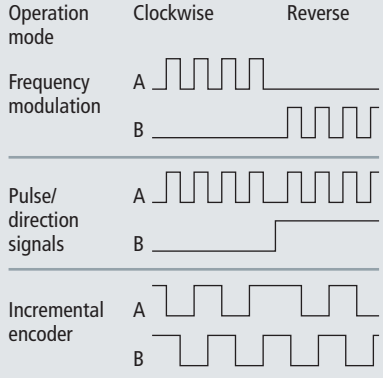
We reserve the right to make technical changes.

Digital output | **Frequency output (pulse train)**

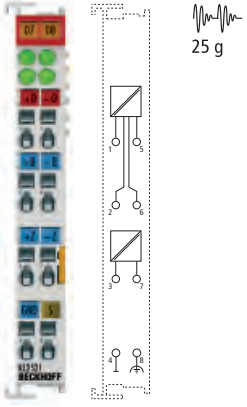
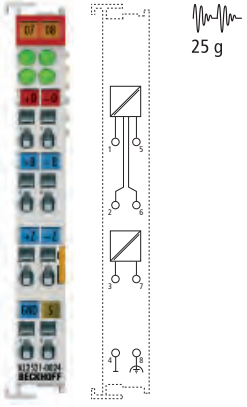
The output terminals provide a parameterisable pulse sequence through both their outputs. The relation between channel A and B is adjustable, e.g. as encoder characteristic. The pulse rate and the frequency are specified by the controller via a 16-bit value. The LEDs are driven in time with the outputs and each displays an active output. The galvanic isolation of the K-bus is realised.

The KL2521 has two RS422-compatible differential outputs, which are fed electrically isolated from the K-bus. For the KL2521-0024 both output channels are implemented as potential-free FET switches and must be fed externally. The 100 mA switch output is short-circuit-proof.

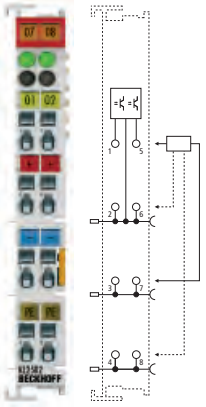
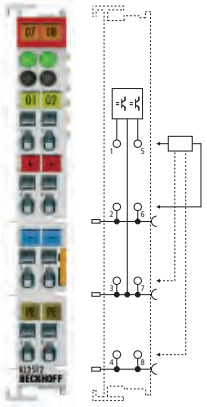
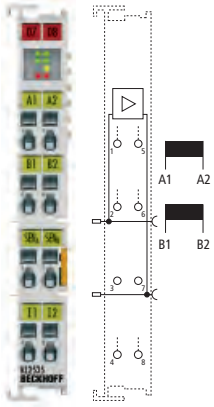
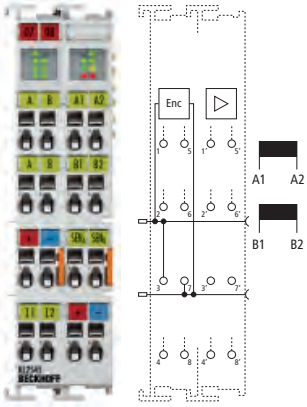
The KL2521 series offers different modes of operation: frequency modulation on the individual channels, incremental encoder or pulse/direction signals. A travel distance control can also be parameterised.



Frequency pulse patterns

	1-channel pulse train output terminal, RS422	1-channel pulse train output terminal, 24 V DC
Technical data	**KL2521** | KS2521	**KL2521-0024** | KS2521-0024
Output pattern	pulse direction, encoder simulation	
Max. output current	RS422 specification	0.5 A
Number of outputs	1 channel (2 differential outputs A, B)	1 channel (2 single-ended low side switches A, B)
Number of inputs	2 (+T, +Z)	2 (+T, +Z)
	 25 g	 25 g
Nominal voltage	RS422 level	24 V DC (externally supplied)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 50 mA, max. 120 mA (load-dependent)	typ. 50 mA, max. 120 mA (load-dependent)
PWM clock frequency	1…500 kHz, 50 kHz default	1…500 kHz, 50 kHz default
Duty factor	50 % (±20 %)	50 % (±20 %)
Resolution	max. 15 bit	max. 15 bit
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL
Weight	approx. 50 g	approx. 50 g
Further information	KL2521	KL2521
Special terminals	KL2521-0010	
Distinguishing features	with additional outputs (230 V AC/DC, 100 mA) instead of the additional inputs of the default variant	

Digital output | 24/50 V DC, PWM outputs

	2-channel pulse width output terminal, 24 V DC	2-channel pulse width output terminal, 24 V DC	2-channel pulse width current terminal, 24 V DC	2-channel pulse width current terminal, 50 V DC
Technical data	**KL2502** | KS2502	**KL2512** | KS2512	**KL2535** | KS2535	**KL2545** | KS2545
Load type	ohmic		inductive > 1 mH, valves, coils	
Max. output current	0.1 A (1 A driver component) per channel	1 A per channel	2 x ±1 A (short-circuit-proof, thermal overload-proof for both channels together)	2 x ±3.5 A (short-circuit-proof, thermal overload-proof for both channels together)
Number of outputs	2	2	2	2
				
	The KL2502 digital output terminal modulates the pulse width of a binary signal, and outputs it electrically isolated from the K-bus. The mark/space ratio is prescribed by a 16-bit value from the automation unit.	The negative switching KL2512 output terminal enables direct connection of different ohmic loads. The output signal is a pulse-width modulated voltage. The typical load of an LED group or an incandescent lamp is connected between the positive side of the supply voltage and the output of the KL2512.	The KL2535 digital output terminal controls an output current via pulse width control of the supply voltage. It is electrically isolated from the K-bus. The current value (0 to ±1 A) is specified by the automation device via a 16-bit value.	The KL2545 digital output terminal controls an output current via pulse width control of the supply voltage. It is electrically isolated from the K-bus. The current value (0 to ±3.5 A) is specified by the automation device via a 16-bit value.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	8…50 V DC
Current consum. pow. cont.	typ. 10 mA + load	typ. 10 mA + load	only load	typ. 30 mA + load
Current consumption K-bus	typ. 18 mA	typ. 18 mA	typ. 60 mA	typ. 100 mA
PWM clock frequency	1…20 kHz, 250 Hz default	1…20 kHz, 250 Hz default	36 kHz	36 kHz
Duty factor	0…100 % (T_{ON} > 750 ns, T_{OFF} > 500 ns)	0…100 %	0…100 % (current-controlled)	0…100 % (current-controlled)
Resolution	max. 10 bit	max. 10 bit	max. 12 bit	max. 12 bit
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, Ex	CE	CE
Weight	approx. 50 g	approx. 50 g	approx. 55 g	approx. 100 g
Further information	KL2502	KL2512	KL2535	KL2545
Special terminals	KL2502-xxxx			
Distinguishing features	special terminals see page 711			

We reserve the right to make technical changes.

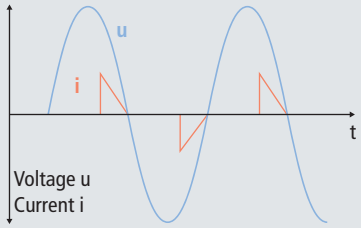
Digital output | **Universal dimmers up to 230 V AC**

To dim light efficiently means electronically regulating the current flow through the lighting medium using the phase control principle. The ratio of the switch-on time to the switch-off time determines the output light quantity via the flow of current. Depending on the load connected (ohmic, capacitive, inductive) either the switch-on time (leading edge phase control | load type: L) or the switch-off time (trailing edge phase control | load type: C, R) must be regulated. The load type of an electronic ballast depends on the transformer used and must be taken into account.

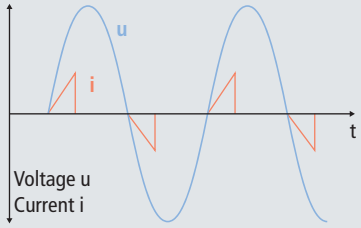
The KL2751 and KL2761 universal dimmer terminals automatically recognise the connected load and select the corresponding control principle. The short-circuit resistance prevents damage to the fuse, so that no additional maintenance work is necessary when exchanging the lamp.

If high-energy, high-frequency interference pulses are likely to occur in the 230 V AC mains power supply, they can be eliminated by an upstream KL9380 feed and filter terminal.

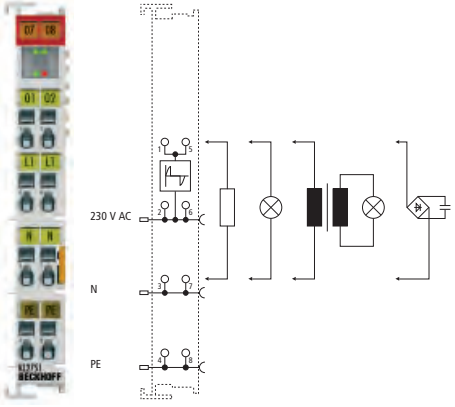
Leading edge phase control



Trailing edge phase control



1-channel universal dimmer terminal, 230 V AC

Technical data	KL2751 | KS2751	KL2761 | KS2761
Connection technology	4-wire	
Load type	ohmic, inductive or capacitive (not mixed), lamp load, automatic load detection	
Max. output current	1.35 A	2.7 A
Number of outputs	1	
		
Nominal voltage	230 V AC	
Current consumption power contacts	only load	
Current consumption K-bus	typ. 95 mA	
Short circuit current	10…20 A	20…40 A
Mains voltage	230 V AC (50 Hz)	
Rated output	300 VA (W)	600 VA (W)
Rated current	max. 1.35 A	max. 2.7 A
Control type	phase control	
Resolution	1 %	
Leakage current	< 1 mA (OFF state)	
Special features	dimmers with fieldbus functionality	
Operating temperature	0…+55 °C	
Approvals	CE	
Weight	approx. 60 g	
Further information	KL2751	KL2761
Special terminals	**KL2751-0011**	**KL2761-0011**
Distinguishing features	without power contacts	600 W, 50 Hz (without power contacts)
Accessories		
KL9380	mains fi lter terminal for dimmers see KL9380	

Digital output | 24/50 V DC, stepper motor terminals

Stepper motors are often used in positioning drives. They allow, by the combination of single steps, a positioning process without feedback of the rotor positions. This "open control chain" mode of operation and the longevity of a stepper motor are particularly interesting for price-sensitive fields of application. However, safe positioning is only guaranteed within the performance limits.

In contrast with a DC motor the control of a stepper motor is carried out by the different energisation of the individual motor windings following a defined pattern of pulses. The electromagnetic field of the stator is switched intermittently so that the shaft turns through the step angle α. The motor follows the impulse pattern of the control unit, until the coupled momentum exceeds its holding momentum or the impulse demand is too dynamic, which leads to standstill of the motor. With the KL2531 and KL2541 stepper motor terminals, which are suitable for highly dynamic movement, this problem in areas of higher speeds of rotation can be solved.

The KL2531 and KL2541 stepper motor terminals are designed for direct connection of medium capacity stepper motors. A high frequency clocked PWM output stage regulates the currents through the motor coils. The stepper motor terminals are synchronised with the motor by parameterising. Unipolar as well as bipolar stepper motors can be driven.

Additional inputs support functions like homing and final position monitoring. 64-fold micro stepping ensures particularly quiet and precise motor operation. Together with a stepper motor, the stepper motor terminals represent an inexpensive small servo axis. The KL2541 also includes an incremental encoder interface to read position data.

Both KL2531 and KL2541 stepper motor terminals can be controlled like a servo drive by a speed interface from a Motion Control software such as TwinCAT for example. In applications with a less complex and less powerful CPU the control is also possible via a position interface (travel distance control). The stepper motor terminals move the motor themselves to a desired position. Ramp steepness and maximum speed can be entered as parameters.

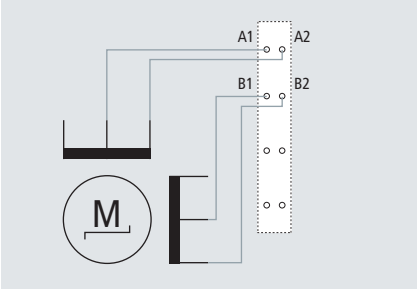
Irregular operation at certain speed ranges, particularly without coupled load, indicates that the stepper motor is being runat its resonance frequency. Under certain circumstances the motor may even stop. Resonances in the lower frequency range essentially result from the mechanical motor parameters. Apart from their impact on smooth running, such resonances can lead to significant loss of torque, or even loss of step of the motor, and are therefore particularly undesirable. Due to their sine/cosine current profile, KL2531 and KL2541 stepper motor terminals are able to prevent this effect in almost all standard motors. The rotor is not moved from step to step, so it no longer jumps to the next position, but moves through 64 intermediate steps. So the rotor is carefully moved from one step to the next. The usual loss of torque at certain speeds is avoided and operation can be optimised for the particular application. This means that the lower speed range, where particularly high torque is available, can be fully utilised.

The KL2531 stepper motor terminal is designed exclusively for 24 V supply voltage. The motor current can reach up to 1.5 A. The KL2541 covers a supply voltage range from 8 V DC to 50 V DC and also needs a 24 V supply from the power contacts. The motor current can be set from 1 to 5 A.

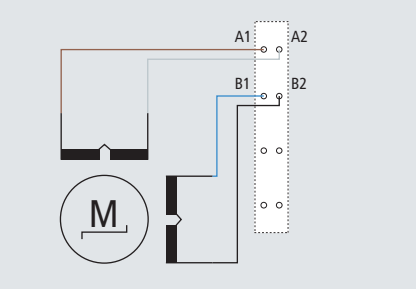
The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative acceleration causes the feedback of energy, which leads to voltage peaks at the power supply unit. A KL9570 buffer capacitor terminal protects from the effects of overvoltage, in that it absorbs some of the energy. If the voltage exceeds the capacity of the terminal, it gets rid of the excess energy via an external resistance.

AS10xx | Stepper motors see page 937

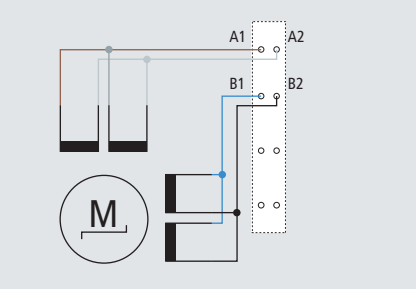
AS20xx | Stepper motors see page 934



Connection of a unipolar stepper motor

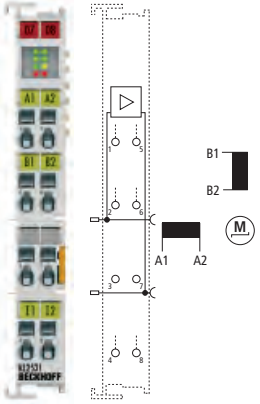
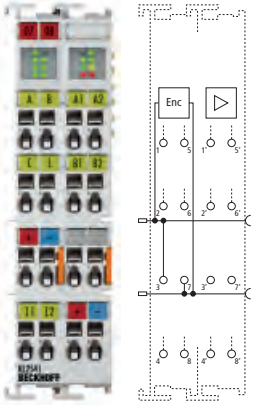


Connection of a bipolar AS10xx stepper motor, serial



Connection of a bipolar AS10xx stepper motor, parallel

We reserve the right to make technical changes.

	Stepper motor terminal 24 V DC, 1.5 A	Stepper motor terminal 50 V DC, 5 A, with incremental encoder
Technical data	**KL2531** | KS2531	**KL2541** | KS2541
Connection technology	direct motor connection	
Load type	uni- or bipolar stepper motors	
Max. output current	1.5 A (overload- and short-circuit-proof)	5 A (overload- and short-circuit-proof)
Number of outputs	1 stepper motor	1 stepper motor, encoder input
	 25 g	 25 g
Nominal voltage	24 V (-15 %/+20 %)	8…50 V DC
Current consumption power contacts	only load	typ. 35 mA
Current consumption K-bus	typ. 60 mA	typ. 100 mA
Number of inputs	2	2 for limit position, 4 for an encoder system
Maximum step frequency	125,000 steps/s	125,000 steps/s
Step pattern	full step, half step, up to 64-fold micro stepping	full step, half step, up to 64-fold micro stepping
Current controller frequency	approx. 25 kHz	approx. 25 kHz
Resolution	approx. 5000 positions in typ. applications (per revolution)	approx. 5000 positions in typ. applications (per revolution)
Encoder input signal	–	5…24 V, 5 mA, single-ended
Pulse frequency	–	max. 400,000 increments/s (with 4-fold evaluation)
Special features	travel distance control	travel distance control, encoder input
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE	CE
Weight	approx. 50 g	approx. 100 g
Further information	KL2531	KL2541
Special terminals		**KL2541-0006**
Distinguishing features		stepper motor terminal 50 V DC, 5 A, 5 V encoder supply

Digital output | 24/50 V DC, DC motor output stages

DC motors can replace the servomotors in many applications if they are operated with an intelligent controller. A DC motor can be integrated very simply into the control system using the KL2532 and KL2552 Bus Terminals. All parameters are adjustable via the fieldbus. The small, compact design and DIN rail mounting make the DC motor output stages suitable for a wide range of applications. The output stages are protected against overload and short circuit and offer an integrated feedback system for incremental encoders on a case-by-case basis.

Through integration into TwinCAT NC, the DC motor can be used in combination with the DC motor output stage – like a servo-axis – for the application without any modifications.

Compared to other motors a DC motor is easier to adjust. The speed of rotation is proportional to the voltage. With the KL2532 Bus Terminal the rotation speed can easily be set through the process data. The integrated compensation of the internal resistance keeps the motor at the desired speed for load changes. A simple drive task can be performed by a simple controller.

For demanding positioning tasks a closed speed control loop with a feedback system is needed. The KL2552 allows connection of an incremental encoder. The control loop can be closed by the higher-level controller.

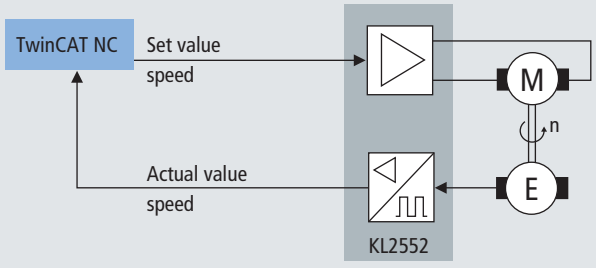
The peak current may briefly significantly exceed the rated current and in this way makes the whole drive system very dynamic. In such dynamic applications, negative acceleration causes the feedback of energy, which leads to voltage peaks at the power supply unit. A KL9570 buffer capacitor terminal protects from the effects of overvoltage, in that it absorbs some of the energy. If the voltage exceeds a threshold, the terminal dissipates the excess energy via an external resistance.

The KL2284 output terminal is sufficient for applications with start/stop or right/left running functions without controllers.

It switches loads in selectable polarity. This means that DC motors can be used in both directions of rotation. A polarity is switched with two output bits per channel. An interlock prevents simultaneous switching of both directions. Advanced power semiconductors enable safe and wear-free switching with minimum dimensions. The high starting and short-circuit currents of the KL2284 are comparable with a robust relay. The number of switching cycles is almost unlimited.

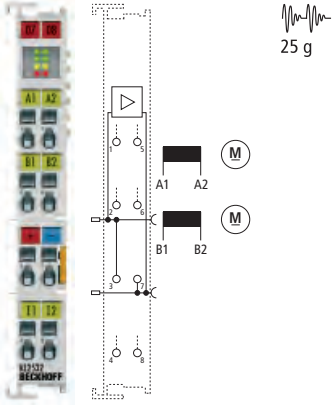
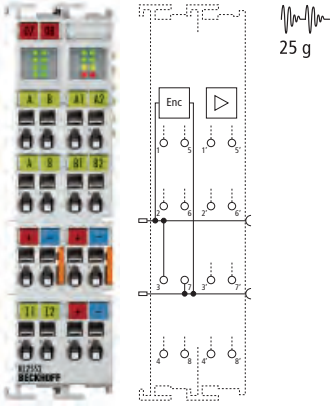
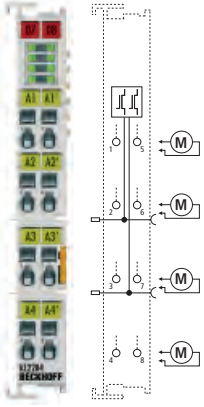
KL9570 | Buffer capacitor terminal
see page 710

Control of a DC motor with encoder feedback



Realising demanding positioning tasks by closed speed control loop

We reserve the right to make technical changes.

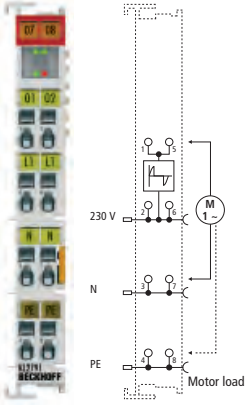
	2-channel DC motor output stage, 24 V DC, 1 A	2-channel DC motor output stage, 50 V DC, 5 A	4-channel digital output terminal, 24 V DC, 2-wire
Technical data	**KL2532** | KS2532	**KL2552** | KS2552	**KL2284** | KS2284
Connection technology	direct motor connection		2-wire
Load type	DC brush motors, inductive		AC/DC loads
Max. output current	2 x 1 A (short-circuit-proof, thermal overload-proof for both channels together)	2 x 5 A (short-circuit-proof, thermal overload-proof for both channels together)	2 A per channel
Number of outputs	2 DC motors	2 DC motors, encoder input	4 x H-bridge circuit
			
Nominal voltage	24 V DC (-15 %/+20 %)	8…50 V DC	0…24 V AC/DC
Current consumption power contacts	typ. 30 mA + load	typ. 50 mA	only load
Current consumption K-bus	typ. 50 mA	typ. 100 mA	100 mA
Current limitation/ short circuit current	controlled, adjustable	controlled, adjustable	90 A
Peak current	–	–	5 A (100 ms), < 50 A (10 ms)
On-resistance	–	–	typ. 0.03 Ω
PWM clock frequency	30 kHz with 180° phase shift each	30 kHz with 180° phase shift each	–
Duty factor	0…100 % (voltage-controlled)	0…100 % (voltage-controlled)	–
Resolution	max. 10 bits current, 16 bits speed	max. 10 bits current, 16 bits speed	–
Encoder input signal	–	5…24 V, 5 mA, single-ended	–
Pulse frequency	–	max. 400,000 increments/s (with 4-fold evaluation)	–
Switching on speed	–	–	typ. 235 ms, max. 300 ms
Switching off speed	–	–	typ. 30 ms, max. 50 ms
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE	CE, UL	CE
Weight	approx. 55 g	approx. 100 g	approx. 70 g
Further information	KL2532	KL2552	KL2284

We reserve the right to make technical changes.

Digital output | 230 V AC, AC motor speed controller

When driving working machines whose production or conveying performance can be influenced via the drive speed of the motor, energy can be saved by means of variable speed. This particularly applies if the change in the motor speed is also linked with large changes in the emitted mechanical output. Increase the speed – higher load, decrease – lower load. This procedure is particularly suitable for uncontrolled units with a square load characteristic, because regulating the speed just a little brings about a large change in energy consumption due to its square influence.

Using the KL2791 single-phase AC motor terminal, a single-phase AC motor with a maximum power consumption of 0.2 KW can be operated with speed control depending on the process data. L1 and N of the motor are wired directly to the terminal; this is in turn integrated in the control environment via a Bus Coupler or connected directly to an embedded device. The controller specifies the set value for the motor speed in the form of a 16-bit word; the speed is regulated internally in the terminal. The motor is switched on and off with a practice-proven mains-synchronous pattern, so that the motor consumes less power and the speed falls significantly. This method is well suited to motors with fixed loads, such as pumps and fans, in order to achieve a control range for the flow rate from 10 to 100 %.

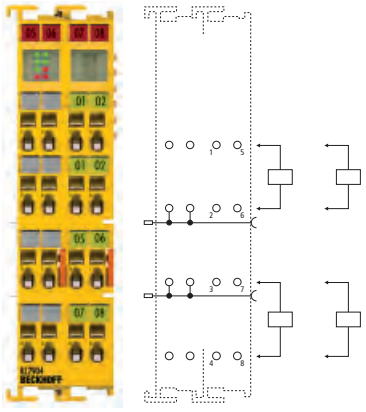
	1-channel AC motor speed controller, 230 V AC, 200 VA	
Technical data	KL2791 | KS2791	
Connection technology	direct motor connection	
Load type	1-phase AC motors	
Max. output current	0.9 A	
Number of outputs	1 motor	
		
Nominal voltage	230 V AC	
Current consumption power contacts	only load	
Current consumption K-bus	typ. 95 mA	
Reverse voltage protection	no	
Rated output	≤ 200 VA	
Control type	phase/full wave control	
Resolution	1 %	
Leakage current	< 1 mA (OFF state)	
Operating temperature	0…+55 °C	
Approvals	CE	
Weight	approx. 60 g	
Further information	KL2791	
Special terminals	KL2791-0011	KL2791-1200
Distinguishing features	230 V AC, 200 VA, max. 0.9 A, without power contacts	120 V AC, 100 VA

We reserve the right to make technical changes.

Digital output | **TwinSAFE**

The KL2904 safety Bus Terminal is a digital output terminal. It switches 24 V DC actuators with up to 0.5 A current per channel. The KL2904 meets the requirements of DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3). If the Bus Terminal detects a fault, it switches off automatically (fail stop).

For further information on TwinSAFE and the TwinSAFE products see page 1044

	4-channel digital output terminal, TwinSAFE, 24 V DC
Technical data	**KL2904**
Connection technology	2-wire
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Max. output current	0.5 A/20 mA min. (per channel)
Number of outputs	4
	 The KL2904 Safety Bus Terminal has four outputs.
Protocol	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	load-dependent
Current consumption K-bus	250 mA
Fault response time	≤ watchdog time (parameterisable)
Permitted degree of contamination	2
Climate class EN 60721-3-3	3K3
Installation position	horizontal
Special features	4 safe outputs
Operating/storage temperature	0…+55 °C/-25…+70 °C
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 100 g
Further information	KL2904

We reserve the right to make technical changes.

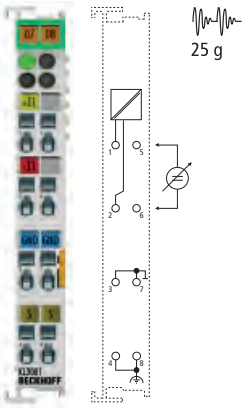
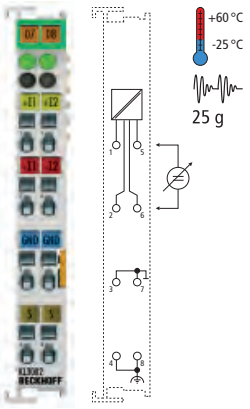
Analog input | -10…+10 V

The KL3xxx Bus Terminals read analog signal voltages in the common standard signal range of -10 to +10 V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA. Inside the terminal the field side of the K-bus is electrically isolated and enables the interconnection to desired potential groups. The 1-channel terminals are available for applications in which each signal must be completely isolated. An additional electrically isolated 24 V DC supply can be created by the application of the KL9560 power supply terminal (24 V DC/24 V DC).

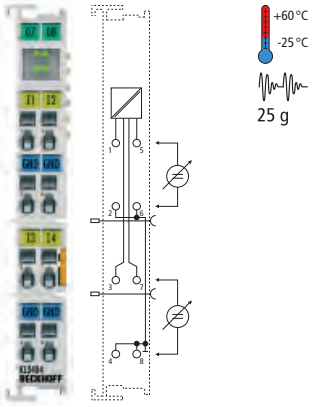
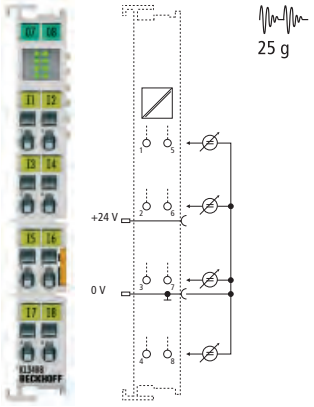
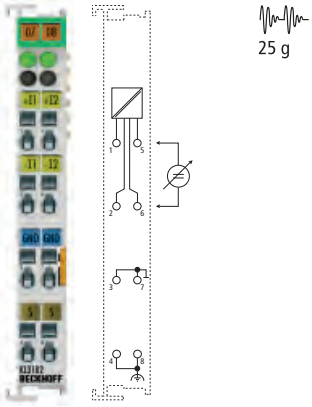
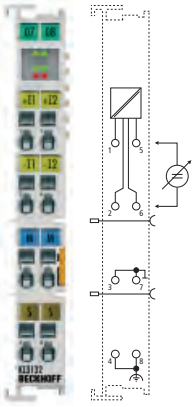
The analog input Bus Terminals differ in their different resolutions of the analog/digital conversion, conversion speed and accuracy. For 1- and 2-channel terminals 1-, 2-, 3- and 4-wire connections are available for the sensors. 4-channel Bus Terminals can only be used with 1- and 2-wire connections. The KL3454 is optimised for the use of 2-wire sensors with 24 V DC supply. The signal current is measured between ground and the input. The second connection point for the sensor is the 24 V supply from the terminal's power contact.

The input circuit of the terminals differs between single-ended and differential inputs. A single-ended input expects a signal with a fixed reference to ground. In practice, single-ended is easily to be wired using single-wire connection. The differential input only measures the difference between both inputs +I and -I. An overlap within the common-mode area (common-mode voltage) has no effect on the result. For measurement two conductors should always be connected; in the case of single-wire connection input -I can be connected to ground.

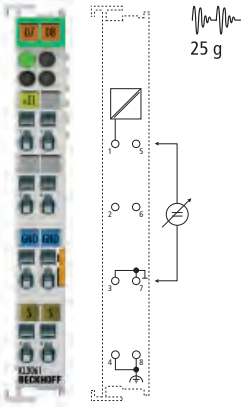
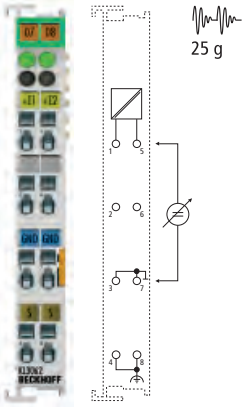
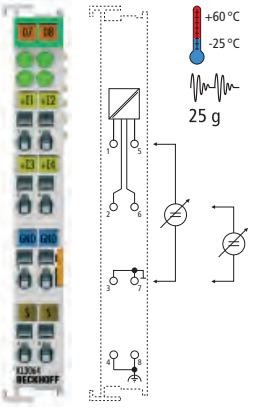
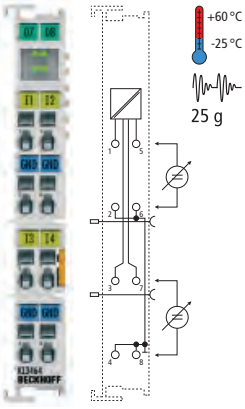
The product range is rounded off by further special input voltages and covers a wide field of applications for the processing of analog signals. By the expansion of power supply terminals well-stabilised auxiliary voltages from 5 to 15 V can be generated.

	1-channel analog input terminal, -10…+10 V, 12 bit, differential input	2-channel analog input terminal, -10…+10 V, 12 bit, differential input
Technical data	**KL3001** | KS3001	**KL3002** | KS3002
Signal voltage	-10…+10 V	
Resolution	12 bit (for 0…10 V range: resolution 11 bit)	
Technology	differential input	differential input
Conversion time	~ 1 ms	~ 2 ms
Number of inputs	1	2
	 The KL3001 analog input terminal is characterised by its electrical isolation.	 The KL3002 analog input terminal combines two differential inputs with a common internal ground potential in one housing.
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 65 mA	typ. 65 mA
Internal resistance	> 200 kΩ	> 200 kΩ
Common-mode voltage U_{CM}	35 V max.	35 V max.
Special features	–	–
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 70 g	approx. 70 g
Further information	KL3001	KL3002
Special terminals		**KL3002-00xx**
Distinguishing features		special terminals see 711

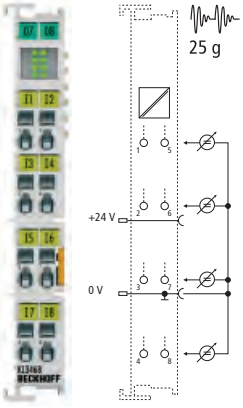
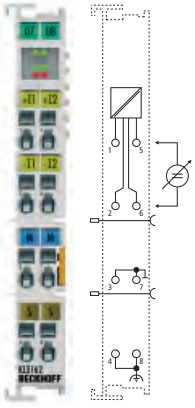
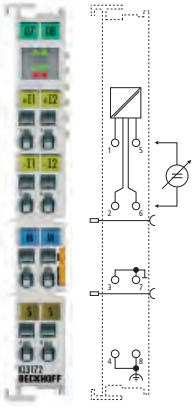
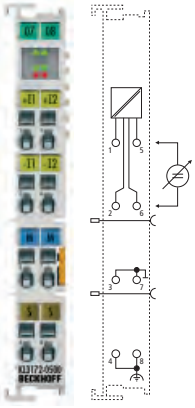
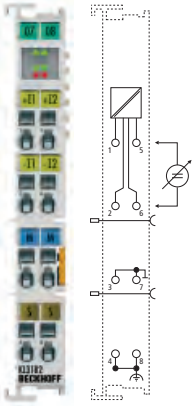
We reserve the right to make technical changes.

	4-channel analog input terminal, -10…+10 V, 12 bit, single-ended	8-channel analog input terminal, -10…+10 V, 12 bit, single-ended	2-channel analog input terminal, -10…+10 V, 16 bit, differential input	2-channel analog input terminal, -10…+10 V, 16 bit, differential input
	KL3404 | KS3404	**KL3408** | KS3408	**KL3102** | KS3102	**KL3132** | KS3132
			16 bit (for 0…10 V range: resolution 15 bit)	
	single-ended	single-ended	differential input	differential input
	~ 2 ms	~ 4 ms	~ 140 ms, configurable to 2 ms	~ 140 ms, configurable
	4	8	2	2
				
	The KL3404 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.	The KL3408 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.	The KL3102 analog input terminal combines two differential inputs with a common internal ground potential in one housing.	The KL3132 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.
	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.05 % (relative to full scale value)
	–	–	– (no power contacts)	–
	typ. 100 mA	typ. 140 mA	typ. 65 mA	typ. 85 mA
	> 130 kΩ	> 130 kΩ	> 200 kΩ	> 200 kΩ
	–	–	35 V max.	35 V max.
	–	high packing density	–	increased measuring accuracy
	-25…+60 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
	approx. 75 g	approx. 75 g	approx. 70 g	approx. 70 g
	KL3404	KL3408	KL3102	KL3132
			KL3102-0050	
			Siemens S7 format	

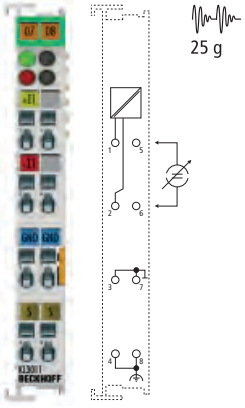
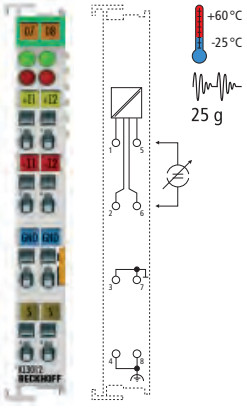
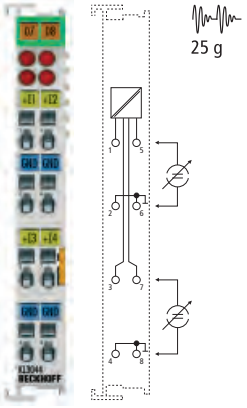
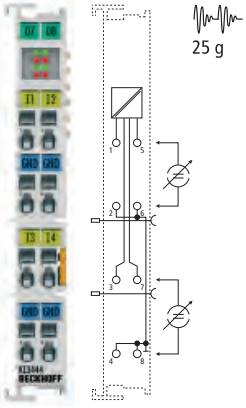
Analog input | 0…10 V, 0…2 V, 0…500 mV, ±2 V

	1-channel analog input terminal, 0…10 V, 12 bit, single-ended	2-channel analog input terminal, 0…10 V, 12 bit, single-ended	4-channel analog input terminal, 0…10 V, 12 bit, single-ended	4-channel analog input terminal, 0…10 V, 12 bit, single-ended
Technical data	**KL3061** | KS3061	**KL3062** | KS3062	**KL3064** | KS3064	**KL3464** | KS3464
Signal voltage	0…10 V			
Resolution	12 bit			
Technology	single-ended	single-ended	single-ended	single-ended
Conversion time	~ 1 ms	~ 2 ms	~ 4 ms	~ 2 ms
Number of inputs	1	2	4	4
				
	The KL3061 analog input terminal is characterised by its fine granularity and electrical isolation.	The KL3062 analog input terminal combines two single-ended inputs with a common internal ground potential in one housing.	The KL3064 analog input terminal contains four single-ended inputs with a common internal ground potential.	The KL3464 analog input terminal combines four single-ended inputs with a common internal ground potential in one housing.
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)	– (no power contacts)	–
Current consumption K-bus	typ. 60 mA	typ. 60 mA	typ. 85 mA	typ. 100 mA
Internal resistance	> 130 kΩ	> 130 kΩ	> 130 kΩ	> 130 kΩ
Common-mode voltage U_{CM}	–	–	–	–
Special features	–	–	–	–
Operating temperature	0…+55 °C	0…+55 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 60 g	approx. 60 g	approx. 80 g	approx. 75 g
Further information	KL3061	KL3062	KL3064	KL3464
Special terminals		**KL3062-00xx**	**KL3064-00xx**	
Distinguishing features		special terminals see 711	special terminals see 711	

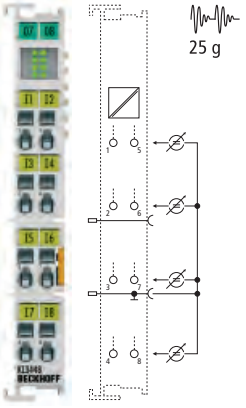
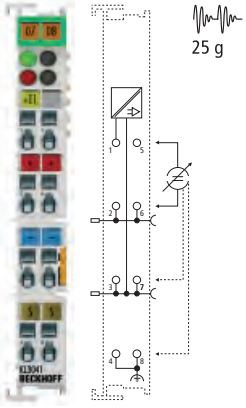
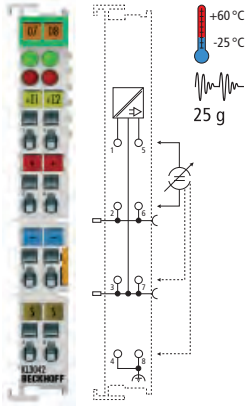
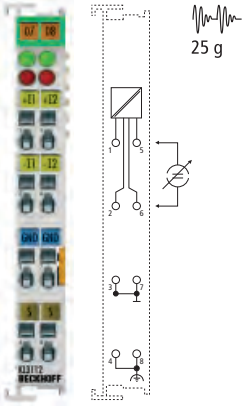
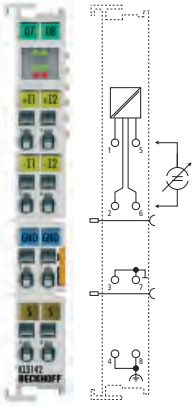
We reserve the right to make technical changes.

	8-channel analog input terminal, 0…10 V, 12 bit, single-ended	2-channel analog input terminal, 0…10 V, 16 bit, differential input	2-channel analog input terminal, 0…2 V, 16 bit, differential input	2-channel analog input terminal, 0…500 mV, 16 bit, differential input	2-channel analog input terminal, -2…+2 V, 16 bit, differential input
	KL3468 | KS3468	**KL3162** | KS3162	**KL3172** | KS3172	**KL3172-0500**	**KL3182** | KS3182
			0…2 V	0…500 mV	-2…+2 V
		16 bit			
	single-ended	differential input	differential input	differential input	differential input
	~ 4 ms	140 ms, configurable	140 ms, configurable	140 ms, configurable	140 ms, configurable
	8	2	2	2	2
					
	The KL3468 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.	The KL3162 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.	The KL3172 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.	The KL3172-0500 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.	The KL3182 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.
	< ±0.3 % (relative to full scale value)	< ±0.05 % (relative to full scale value)	< ±0.05 % (relative to full scale value)	< ±0.05 % (relative to full scale value)	< ±0.05 % (relative to full scale value)
	–	–	–	–	–
	typ. 140 mA	typ. 85 mA	typ. 85 mA	typ. 85 mA	typ. 85 mA
	> 130 kΩ	> 200 kΩ	> 200 kΩ	> 200 kΩ	> 200 kΩ
	–	35 V max.	35 V max.	35 V max.	35 V max.
	high packing density	increased measuring accuracy	increased measuring accuracy	increased measuring accuracy	increased measuring accuracy
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 75 g	approx. 70 g	approx. 70 g	approx. 70 g	approx. 70 g
	KL3468	KL3162	KL3172	KL3172	KL3182

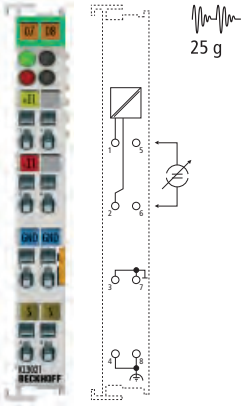
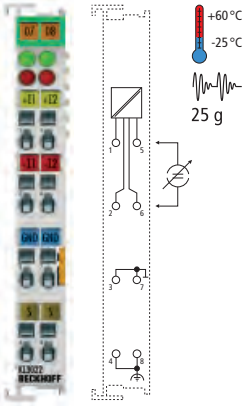
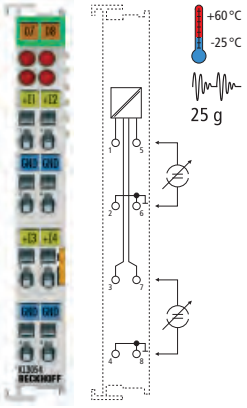
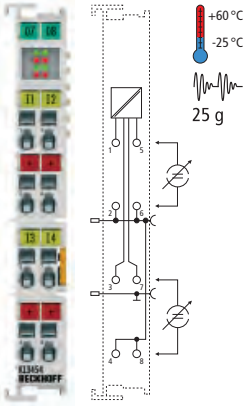
Analog input | 0…20 mA

	1-channel analog input terminal, 0…20 mA, 12 bit, differential input	2-channel analog input terminal, 0…20 mA, 12 bit, differential input	4-channel analog input terminal, 0…20 mA, 12 bit, single-ended	4-channel analog input terminal, 0…20 mA, 12 bit, single-ended
Technical data	**KL3011** | KS3011	**KL3012** | KS3012	**KL3044** | KS3044	**KL3444** | KS3444
Signal current	0…20 mA			
Resolution	12 bit			
Technology	differential input	differential input	single-ended	single-ended
Conversion time	~ 1 ms	~ 2 ms	~ 4 ms	~ 2 ms
Number of inputs	1	2	4	4
				
	The KL3011 analog input terminal is characterised by its electrical isolation. The input channels of the Bus Terminal have differential inputs and possess a common, internal ground potential.	The KL3012 analog input terminal combines two differential inputs with a common internal ground potential in one housing.	The KL3044 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.	The KL3444 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Current consum. pow. cont.	– (no power contacts)	– (no power contacts)	– (no power contacts)	–
Current consumption K-bus	typ. 60 mA	typ. 60 mA	typ. 65 mA	typ. 85 mA
Internal resistance	80 Ω + 0.7 V	80 Ω + 0.7 V	80 Ω + 0.7 V	< 85 Ω
Common-mode voltage U_{CM}	35 V max.	35 V max.	–	–
Surge voltage resistance	35 V DC	35 V DC	35 V max.	30 V DC
Special features	–	–	–	–
Operating temperature	0…+55 °C	-25…+60 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 70 g	approx. 70 g	approx. 70 g	approx. 75 g
Further information	KL3011	KL3012	KL3044	KL3444
Special terminals		**KL3012-00xx**		
Distinguishing features		special terminals see 711		

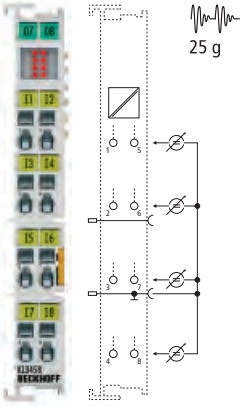
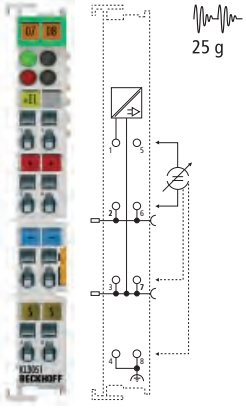
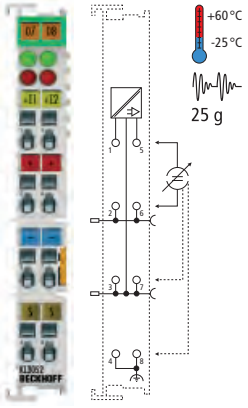
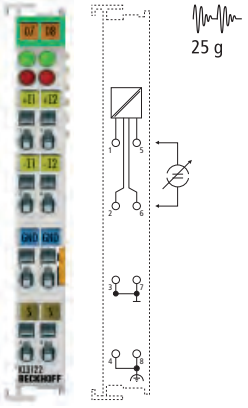
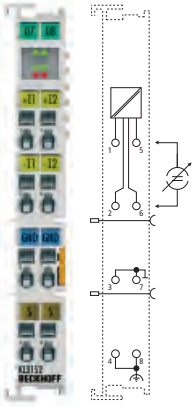
We reserve the right to make technical changes.

	8-channel analog input terminal, 0…20 mA, 12 bit, single-ended	1-channel analog input terminal, 0…20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 0…20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 0…20 mA, 15/16 bit, differential input	2-channel analog input terminal, 0…20 mA, 16 bit, differential input
	KL3448 | KS3448	**KL3041** | KS3041	**KL3042** | KS3042	**KL3112** | KS3112	**KL3142** | KS3142
				15 bit, configurable to 16 bit	16 bit
	single-ended	single-ended	single-ended	differential input	differential input
	~ 4 ms	~ 1 ms	~ 2 ms	140 ms, configurable to 2 ms	140 ms, configurable
	8	1	2	2	2
					
	The KL3448 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.	The job of the KL3041 and KL3042 analog input terminals is to supply power to measuring transducers located in the field and to transmit analog measurement signals with electrical isolation to the automation device. The voltage for the sensors is supplied to the terminals via the power contacts. The power contacts can optionally be supplied with operating voltage in the standard way or via a supply terminal (KL9560) with electrical isolation. The 0 V power contact is the reference potential for the inputs.		The KL3112 analog input terminal combines two differential inputs with a common internal ground potential in one housing.	The KL3142 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05% (in relation to the full scale value). The differential inputs have a common, internal ground potential.
	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.05 % (relative to full scale value)
	–	only load	only load	– (no power contacts)	–
	typ. 105 mA	typ. 65 mA	typ. 65 mA	typ. 60 mA	typ. 85 mA
	< 85 Ω	80 Ω + 0.7 V	80 Ω + 0.7 V	50 Ω typ. shunt, load: 60 Ω + diode voltage	100 Ω typ. shunt
	–	–	–	35 V max.	±10 V max.
	30 V DC	35 V max.	35 V max.	35 V DC	35 V DC
	high packing density	with sensor supply	with sensor supply	–	increased measuring accuracy
	0…+55 °C	0…+55 °C	-25…+60 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
	approx. 75 g	approx. 70 g	approx. 70 g	approx. 70 g	approx. 70 g
	KL3448	KL3041	KL3042	KL3112	KL3142
			KL3042-00xx	**KL3112-0050**	
			special terminals see 711	Siemens S7 format	

Analog input | 4…20 mA

	1-channel analog input terminal, 4…20 mA, 12 bit, differential input	2-channel analog input terminal, 4…20 mA, 12 bit, differential input	4-channel analog input terminal, 4…20 mA, 12 bit, single-ended	4-channel analog input terminal, 4…20 mA, 12 bit, single-ended
Technical data	**KL3021** | KS3021	**KL3022** | KS3022	**KL3054** | KS3054	**KL3454** | KS3454
Signal current	4…20 mA			
Resolution	12 bit			
Technology	differential input	differential input	single-ended	single-ended
Conversion time	~ 1 ms	~ 2 ms	~ 4 ms	~ 2 ms
Number of inputs	1	2	4	4
				
	The KL3021 analog input terminal is characterised by its fine granularity and electrical isolation. The input channels of the Bus Terminal have differential inputs and possess a common, internal ground potential.	The KL3022 analog input terminal combines two differential inputs with a common internal ground potential in one housing.	The KL3054 analog input terminal has four inputs, which are implemented in 2-wire technique. The common reference ground of the inputs is the internal ground.	In the KL3454 Bus Terminal, the four inputs are 2-wire versions and have a common ground potential. The 24 V power contact is connected to the terminal in order to enable the connection of 2-wire sensors.
Measuring error	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)
Current consum. pow. cont.	– (no power contacts)	– (no power contacts)	– (no power contacts)	only load
Current consumption K-bus	typ. 60 mA	typ. 60 mA	typ. 75 mA	typ. 85 mA
Internal resistance	80 Ω + 0.7 V	80 Ω + 0.7 V	80 Ω + 0.7 V	< 85 Ω
Common-mode voltage U_{CM}	35 V max.	35 V max.	–	–
Surge voltage resistance	35 V DC	35 V DC	35 V max.	30 V DC
Special features	–	–	for 2-wire sensors	–
Operating temperature	0…+55 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 70 g	approx. 70 g	approx. 70 g	approx. 75 g
Further information	KL3021	KL3022	KL3054	KL3454
Special terminals		**KL3022-00xx**	**KL3054-0050**	
Distinguishing features		special terminals see 711	Siemens S7 format	

We reserve the right to make technical changes.

	8-channel analog input terminal, 4…20 mA, 12 bit, single-ended	1-channel analog input terminal, 4…20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 4…20 mA, 12 bit, with sensor supply	2-channel analog input terminal, 4…20 mA, 15/16 bit, differential input	2-channel analog input terminal, 4…20 mA, 16 bit, differential input
	KL3458 | KS3458	**KL3051** | KS3051	**KL3052** | KS3052	**KL3122** | KS3122	**KL3152** | KS3152
				15 bit, configurable to 16 bit	16 bit
	single-ended	single-ended	single-ended	differential input	differential input
	~ 4 ms	~ 1 ms	~ 2 ms	140 ms, configurable to 2 ms	140 ms, configurable
	8	1	2	2	2
					
	The KL3458 analog input terminal combines eight inputs in one housing. The use of single conductor connection technology enables the connection of multi-channel sensor technology with minimum space requirements. The reference ground for all inputs is the 0 V power contact.	The job of the KL3051 and KL3052 analog input terminals is to supply power to measuring transducers located in the field and to transmit analog measurement signals with electrical isolation to the automation device. The voltage for the sensors is supplied to the terminals via the power contacts. The power contacts can optionally be supplied with operating voltage in the standard way or via a power feed terminal (KL9xxx) with electrical isolation. The 0 V power contact is the reference potential for the inputs.		The KL3122 analog input terminal combines two differential inputs with a common internal ground potential in one housing.	The KL3152 analog input terminal is optimised for highly accurate control processes due to its low measuring error of ±0.05 % (in relation to the full scale value). The differential inputs have a common, internal ground potential.
	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.3 % (relative to full scale value)	< ±0.05 % (relative to full scale value)
	–	only load	only load	– (no power contacts)	–
	typ. 105 mA	typ. 65 mA	typ. 65 mA	typ. 60 mA	typ. 85 mA
	< 85 Ω	80 Ω + 0.7 V	80 Ω + 0.7 V	50 Ω typ. shunt, load: 60 Ω + diode voltage	100 Ω typ. shunt
	–	–	–	35 V max.	±10 V max.
	30 V DC	35 V max.	35 V max.	35 V DC	35 V DC
	high packing density	with sensor supply	with sensor supply	–	increased measuring accuracy
	0…+55 °C	0…+55 °C	-25…+60 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
	approx. 75 g	approx. 70 g	approx. 70 g	approx. 70 g	approx. 70 g
	KL3458	KL3051	KL3052	KL3122	KL3152
			KL3052-00xx	**KL3122-0050**	
			special terminals see 711	Siemens S7 format	

Analog input | **Resistance thermometers (RTD, PT100, PT1000)**

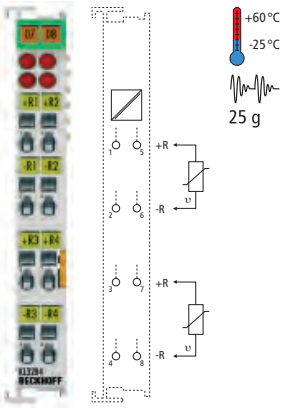
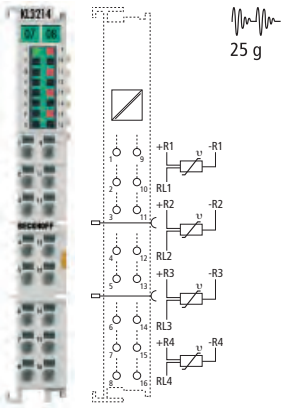
The KL32xx Bus Terminals are intended for direct connection of resistance thermometers. The resistance is measured with a small measurement current and the temperature value is calculated by a linearisation corresponding to the sensor type which has been implemented.

In practice, platinum and nickel sensors with different resistance values are used. The resistance value of the sensor is always defined at 0 °C:

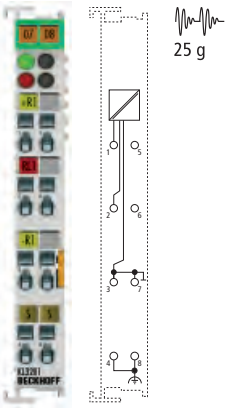
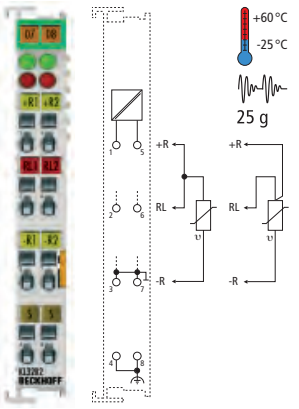
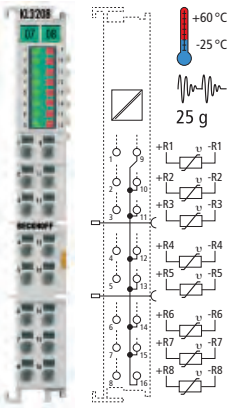
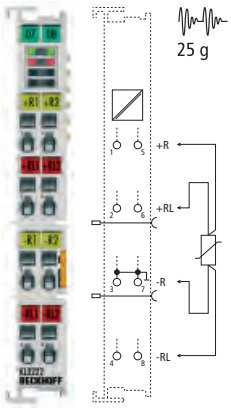
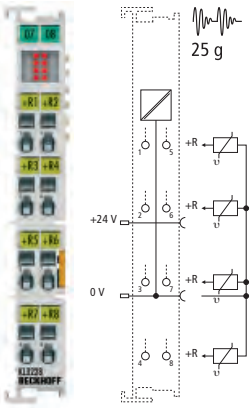
– PT100 = 100 Ω at 0 °C
– PT1000 = 1000 Ω at 0 °C
– Ni100 = 100 Ω at 0 °C
– …

The Bus Terminals support 2-, 3- or 4-wire measurement. The measurement and the sensor can be used in any combination, depending on the type of application. For 2-wire measurement 1000 Ω sensors are recommended to reduce the influence of the conductor resistance.

The KL32xx series indicates sensor faults, e.g. a broken wire, via error LEDs. In addition, the KL3208-0010 offers a cable resistance calibration and is particularly suitable for building automation.

	4-channel analog input terminal, PT100 (RTD)	4-channel analog input terminal, PT100 (RTD), 16 bit
Technical data	**KL3204** | KS3204	**KL3214**
Sensor types	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/5 kΩ)	PT100/200/500/1000, Ni100/120/1000, potentiometer: 10 Ω…1.2/4 kΩ, KTY sensors (types see documentation)
Resolution	0.1 °C per digit	
Technology	2-wire	3-wire
Conversion time	~ 250 ms	approx. 170 ms default setting
Number of inputs	4	4
	 Standard setting: resolution 0.1 °C in the temperature range of PT100 sensors	 Standard setting: resolution 0.1 °C
Measuring error	< ±1 °C	< ±0.5 °C for PT sensors
Measuring range	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)
Current consum. pow. cont.	– (no power contacts)	–
Current consumption K-bus	typ. 60 mA	typ. 120 mA
Measuring current	typ. 0.5 mA	< 0.5 mA (load-dependent)
Operating temperature	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE, UL
Weight	approx. 70 g	approx. 60 g
Further information	KL3204	KL3214
Special terminals	**KL3204-0030**	
Distinguishing features	NTC (10 kΩ)	

We reserve the right to make technical changes.

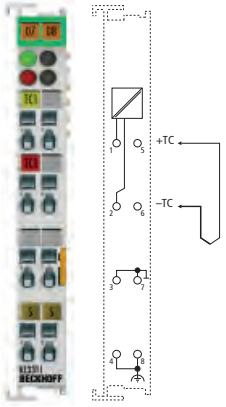
	1-channel analog input terminal, PT100 (RTD)	2-channel analog input terminal, PT100 (RTD)	8-channel analog input terminal, PT1000, Ni1000 (RTD), NTC 1.8…100 k, potentiometer 1, 5, 10 kΩ	2-channel analog input terminal, PT100 (RTD), KTY, high-precision	8-channel analog input terminal, PT1000, Ni1000 (RTD)
	KL3201 | KS3201	**KL3202** | KS3202	**KL3208-0010**	**KL3222** | KS3222	**KL3228** | KS3228
	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/5 kΩ)		PT1000 (default), Ni1000, potentiometer 1/5/10 kΩ, NTC 1.8 k/2.2 k/3 k/5 k/ 10 k/20 k/100 k	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer, 10 Ω…1.2/5 kΩ), KTY	PT1000, Ni1000
			0.01 °C per digit		0.1 °C per digit
	2-/3-wire	2-/3-wire	2-wire	4-wire	1-wire
	~ 200 ms	~ 250 ms	~ 1 s	typ. 50 ms	~ 1 s
	1	2	8	2	8
					
	Standard setting: resolution 0.1 °C in the temperature range of PT100 sensors in 3-wire connection	Standard setting: resolution 0.1 °C in the temperature range of PT100 sensors in 3-wire connection	Standard setting: resolution 0.01 °C in the temperature range of PT/Ni1000 sensors; particularly suitable for building automation	Standard setting: resolution 0.01 °C in the temperature range of PT100 sensors in 4-wire connection	Standard setting: resolution 0.1 °C in the temperature range of Ni1000 sensors, inputs with common, internal ground potential
	< ±1 °C	< ±1 °C	-20…+60 °C: ±0.25 °C at 25 °C ambient temperature; -50…+150 °C: ±1.5 °C (for PT/Ni sensors)	0.1 °C at 40 °C ambient temperature, 4-wire connection, PT100 sensors and 50 Hz filter	~ ±1 °C, depending on wiring
	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	-50…+150 °C (depending on sensor type)	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors); -200…+320 °C (high-precision)	-50…+150 °C (PT sensors); -50…+150 °C (Ni sensors)
	– (no power contacts)	– (no power contacts)	–	–	–
	typ. 60 mA	typ. 60 mA	typ. 85 mA	typ. 60 mA	typ. 85 mA
	typ. 0.5 mA	typ. 0.5 mA	< 0.5 mA typ.	typ. 0.5 mA	~ 0.5 mA typ.
	0…+55 °C	-25…+60 °C	-25…+60 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 70 g	approx. 70 g	approx. 75 g	approx. 70 g	approx. 75 g
	KL3201	KL3202	KL3208	KL3222	KL3228
		KL3202-00xx			
		special terminals see page 711			

Analog input | **Thermocouples**

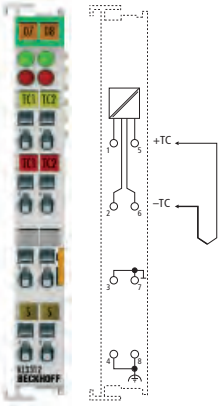
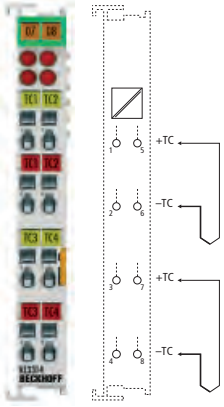
Thermocouples can be classified as active transducers. They exploit the thermo-electric effect (Seebeck, Peltier, Thomson). Where two electrical conductors of different materials (e.g. iron and constantan) make contact, a contact voltage occurs at the contact points, which is clearly a function of temperature and so is called thermovoltage. Due to changes in the material during the implementation of a thermocouple, at least two of such material pairings occur. One is placed at the measurement location, the other is the so-called comparison point, which is normally located in the measurement device. In order to compensate for the reference point effect, the temperature at the reference point must be known. For the KL331x this is the connection point of the thermocouple to the terminal contacts, which is why the terminal contact temperature is specially measured here.

Thermocouples represent economical and easy to install sensors for temperature measurement with reduced need for accuracy. Depending on the type of thermocouple, temperatures from -200 to +2300 °C can be measured. The linearisation and cold junction compensation is carried out by a characteristic curve on a microprocessor. The directions in the documentation, concerning earthing and thermocouples which are not potential-free, must be observed. An error LED indicates a broken wire.

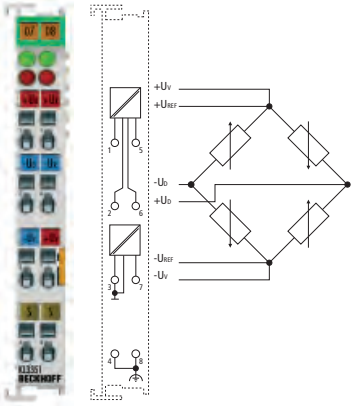
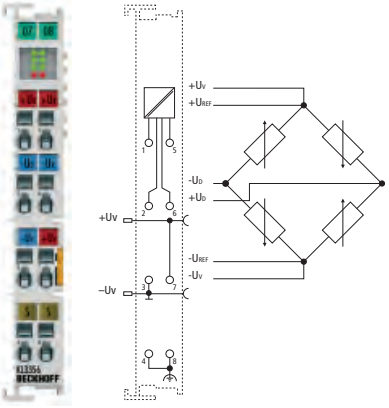
1-channel analog input terminal,
thermocouple with open-circuit recognition

Technical data	KL3311
Thermocouple sensor types	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
Resolution	0.1 °C per digit
Technology	2-wire
Conversion time	~ 200 ms
Number of inputs	1
	 25 g
	The analog input terminal KL3311 enables direct connection of a thermocouple. The circuit of the Bus Terminal can operate thermocouples using 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. Compensation for the cold junction is made through an internal temperature measurement at the terminal. The KL3311 can also be used for mV measurement.
Measuring error	< ±0.5 % (relative to full scale value)
Measuring range	in the range defined in each case for the sensor (default setting: type K; -100…+1370 °C); mV measurement: ±30 mV…±120 mV
Current consumption power contacts	– (no power contacts)
Current consumption K-bus	typ. 65 mA
Special features	electrically isolated
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 70 g
Further information	KL3311
Special terminals	
Distinguishing features	

We reserve the right to make technical changes.

	2-channel analog input terminal, thermocouple with open-circuit recognition	4-channel analog input terminal, thermocouple with open-circuit recognition
	KL3312	**KL3314**
	2-wire	2-wire
	~ 250 ms	~ 250 ms
	2	4
	 25 g	 25 g
	The KL3312 analog input terminal allows two thermocouples to be connected directly. The circuit of the Bus Terminal can operate thermocouples using 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. Compensation for the cold junction is made through an internal temperature measurement at the terminals. The KL3312 can also be used for mV measurement.	The KL3314 analog input terminal allows four thermocouples to be connected directly. The circuit of the Bus Terminals can operate thermocouples using 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. Compensation for the cold junction is made through an internal temperature measurement at the terminals. The KL3314 can also be used for mV measurement.
	< ±0.5 % (relative to full scale value)	< ±0.5 % (relative to full scale value)
	in the range defined in each case for the sensor (default setting: type K; -100…+1370 °C); mV measurement: ±30 mV…±120 mV	in the range defined in each case for the sensor (default setting: type K; -100…+1370 °C); mV measurement: ±30 mV…±120 mV
	– (no power contacts)	– (no power contacts)
	typ. 65 mA	typ. 75 mA
	–	–
	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex, GL
	approx. 70 g	approx. 75 g
	KL3312	KL3314
	KL3312-xxxx	
	special terminals see page 711	

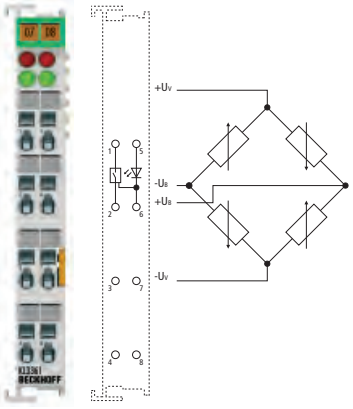
Analog input | **Resistor bridges**

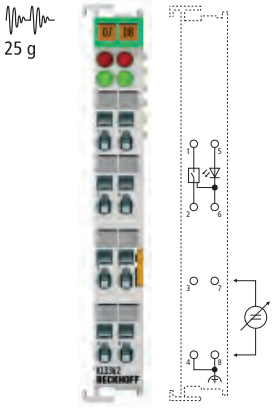
	1-channel analog input terminal, resistor bridge (strain gauge)	1-channel analog input terminal, accurate resistor bridge evaluation
Technical data	**KL3351** | KS3351	**KL3356** | KS3356
Signal voltage	U_D: -16…+16 mV U_{REF}: -10…+10 V	U_D: -20…+20 mV U_{REF}: -12…+12 V
Resolution	16 bit	
Technology	DMS connection	DMS connection
Conversion time	< 250 ms, configurable	< 250 ms, configurable
Number of inputs	2, for one resistor bridge	2, for one resistor bridge
		
	The KL3351 analog input terminal permits direct connection of a resistor bridge. The bridge voltage, U_D, and the supply voltage, U_{REF}, to the bridge are digitised with 16 bit resolution, and are transmitted along an electrically isolated channel to the supervising automation system. The input channels are available in the form of two 16 bit values for further processing. The resulting measurement can be calculated from the formula: measurement = U_D/U_{REF}. Precise acquisition of the supply voltage along with the bridge voltage compensates for long-term and temperature drift.	The KL3356 analog input terminal permits direct connection of a resistor bridge. Its improved input circuit makes the KL3356 significantly more accurate than the KL3351. The ratio between the bridge voltage U_D and the supply voltage U_{REF} is determined in the input circuit. In order to achieve good long-term stability, the complete circuit is re-calibrated at least every three minutes. This procedure can be synchronised by the control in order to prevent the calibration leading to a delay in the production process.
Measuring error	< ±0.1 % (relative to full scale value)	< ±0.01 % (relative to full scale value)
Current consumption power contacts	– (no power contacts)	only load
Current consumption K-bus	typ. 65 mA	typ. 85 mA
Internal resistance	> 200 kΩ (U_{REF}), > 1 MΩ (U_D)	> 200 kΩ (U_{REF}), > 1 MΩ (U_D)
Power supply U_V	5 V DC, max. 20 mA	via power contacts
Filter	50 Hz, configurable	50 Hz, configurable
Special features	with internal bridge supply	increased measuring accuracy, self-calibration
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 70 g	approx. 75 g
Further information	KL3351	KL3356
Special terminals	KL3351-0001	
Distinguishing features	with faster measurement time approx. 10 ms	

We reserve the right to make technical changes.

Analog input | **Oscilloscopes**

	1-channel analog input terminal, oscilloscope, -16…+16 mV	2-channel analog input terminal, oscilloscope, -10…+10 mV
Technical data	**KL3361** | KS3361	**KL3362** | KS3362
Signal voltage	U_{IN}: -16…+16 mV	-10…+10 V
Resolution	14 bit + sign	
Technology	high-speed data logger	high-speed data logger
Conversion time	< 100 µs, configurable (10 µs with fast sampling mode)	< 100 µs, configurable (10 µs with fast sampling mode)
Number of inputs	1 analog, 1 trigger	2 analog, 1 trigger



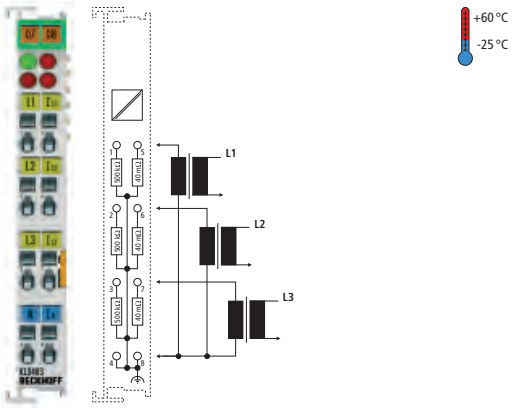


The KL3361 and KL3362 analog input terminals make it possible to perform non-central preliminary processing of analog values. The input values are digitised with a 14-bit resolution and written into an internal memory. An efficient processor can pre-process the values. Limit values, maximum and minimum values will be determined or monitored. The Bus Terminals can also carry out envelope curve monitoring. A trigger starts cyclical processes. The result or all the measured values are transported to the higher-level automation unit.

Measuring error	< ±1 % (relative to full scale value)	< ±0.5 % (relative to full scale value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 120 mA with external DMS power supply, typ. 140 mA with internal DMS power supply from terminal (4 x 350 Ω)	typ. 120 mA
Internal resistance	> 1 MΩ (U_B)	> 500 kΩ
Supply voltage	5 V DC, max. 20 mA	–
Power supply	via the K-bus	via the K-bus
Internal memory	32 kbytes	32 kbytes
Special features	high-speed strain gauge analysis (for all fieldbuses)	high-speed analog analysis
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 55 g	approx. 55 g
Further information	KL3361	KL3362

Analog input | **Power measurement**

The KL3403 Bus Terminal enables the measurement of all relevant electrical data of the supply network. The voltage is measured via the direct connection of L1, L2, L3 and N. The current of the three phases L1, L2 and L3 is fed via simple current transformers. All measured currents and voltages are available as root-mean-square values. In the KL3403 version, the effective power and the energy consumption for each phase are calculated. Through the relationship of the root-mean-square values of voltage and current all other information, such as effective power P, apparent power S or phase shift angle cos φ can be derived. For each fieldbus, KL3403 provides a comprehensive network analysis and an energy management option.

	3-phase power measurement terminal	
Technical data	**KL3403** | KS3403	**KL3403-0010**
Measuring voltage	max. 500 V AC 3~ (ULx-N: max. 288 V AC)	
Resolution	16 bit (21 bit, internal)	
Technology	3-phase connection technique	
Update time	50 ms per measured value preset, free configurable	
Number of inputs	3 phases + N	
		
Measuring error	0.5 % relative to full scale value (U, I), 1 % calculated value	
Current consumption power contacts	– (no power contacts)	
Current consumption K-bus	typ. 115 mA	
Measuring procedure	true RMS with 64,000 samples/s	
Measured values	current, voltage, effective power, energy, cos φ, peak values U, I and P, frequency	
Measuring current	max. 1 A, via measuring transformers x A/1 A	max. 5 A (AC/DC), via measuring transformers x A/5 A
Electrical isolation	1500 V (K-bus/field potential)	
Special features	energy meter, power measurement, True RMS	
Operating temperature	-25…+60 °C	
Approvals	CE, UL	
Weight	approx. 75 g	
Further information	KL3403	
Special terminals	**KL3403-0020**	**KL3403-0022**
Distinguishing features	current path designed for 20 mA, optimised for electronic current transformer, operating temperature 0…+55 °C	current path and voltage input designed for 20 mA, operating temperature 0…+55 °C

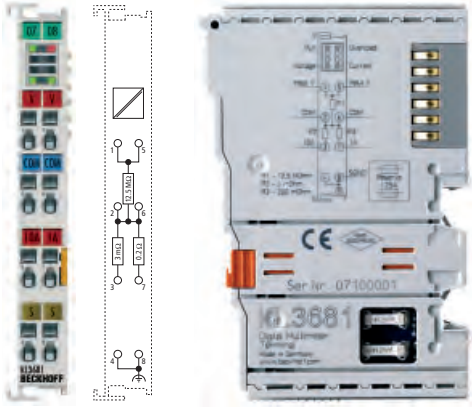
We reserve the right to make technical changes.

Analog input | **Digital multimeter**

The KL3681 Bus Terminal enables measurement of currents and voltages in a wide input range. The measuring ranges are switched automatically, as usual in advanced digital multimeters. There are two current paths available for current measurement. One of them is a high current path for up to 10 A. The current and the voltage measurement facility can be used for DC and AC. The alternating parameters are output as true RMS values. The measurement readings can be read and processed with commercially available fieldbuses. At the same time the KL3681 enables the measuring type and range to be set via the bus.

Excellent interference immunity is achieved through the fully electrically isolated design of the electronic measuring system and the dual slope conversion system. High precision and simple, high impedance measurement from 300 mV to 300 V allow the Bus Terminal to be used like a modern digital multimeter.

In measuring applications in particular, the voltage to be expected is often not yet known during the planning phase. Automatic adjustment of the measurement range simplifies use and reduces stock levels. The selected measuring type and overload are indicated by LEDs.

	Digital multimeter terminal
Technical data	**KL3681** | KS3681
Measuring voltage	300 mV, 3 V, 30 V, 300 V
Resolution	18 bit + sign in each measurement range
Technology	digital multimeter with automatic range selection
Update time	0.5 s, 1 s for measuring range selection
Number of inputs	1 voltage or 1 current (10 A/1 A)
	
Measuring error	0.01 % DC voltage measurement at 25 °C
Current consumption power contacts	– (no power contacts)
Current consumption K-bus	typ. 100 mA
Measuring procedure	DC with arithmetic averaging, AC with true RMS value calculation
Measured values	current, voltage
Measuring current	100 mA, 1 A and 10 A via high-current path
Electrical isolation	1500 V (K-bus/field potential)
Special features	automatic or manual range selection, 1.25 A fuse installed + spare fuse, filter deactivatable
Operating temperature	0…+55 °C
Approvals	CE
Weight	approx. 70 g
Further information	KL3681
Accessories	**ZB8000-0001**
Spare fuse	10 pieces, 1.25 A 844

Analog input | **Pressure measuring**

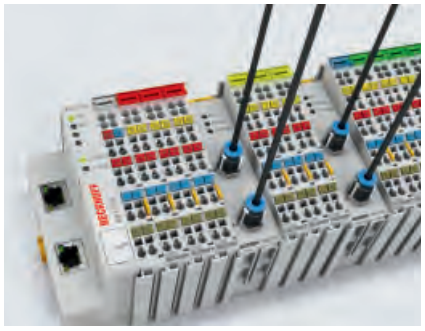
The pressure measuring terminals are divided into two groups: differential pressure measurement with the measurement between two connections and relative pressure measurement with duplicate measurement against ambient.

The Bus Terminal can be used for measurement of the pressure or also as a replacement for a pressure switch. Through the pressure value in the control unit the switching threshold for a logical linking can be stored as a parameter. Manual setting of the pressure switch in the practice is no longer necessary.

The measuring hoses can simply be connected by plugging them into a quick coupling. Normal 4 mm compressed air hoses are used.

With the direct integration of the pressure measurement into the Bus Terminal system the installation of a pressure measurement unit including its wiring can be omitted.

The pressure measurement terminals are suitable for the measurement of non-aggressive gases. Water or gases which encourage oxidation should not be allowed to get into the Bus Terminal.



1-channel differential pressure measuring terminal -100…+100 hPa

Technical data	KM3701	KM3701-0340
Technology	differential pressure measurement	
Resolution	0.1 hPa (0.1 mbar) per digit	
Number of inputs	1 (differential pressure)	
	The KM3701 pressure measuring terminal enables direct measurement of pressure differences between two hose connections. The pressure difference is available in the fieldbus as a 16 bit value and can be measured between any points up to an ambient pressure of 10 bar. The status LEDs indicate proper function or errors such as over-range.	
Measuring error	3 % (relative to full scale value)	
Measuring range	-100…+100 hPa (-100…+100 mbar)	up to 340 hPa (340 mbar)
Current consumption power contacts	– (no power contacts)	
Current consumption K-bus	typ. 15 mA	
Max. overload	500 hPa (500 mbar) differential, 5000 hPa (5 bar) to ambient	
Medium	non-aggressive gases	
Special features	–	
Operating temperature	0…+55 °C	
Approvals	CE, UL	
Weight	approx. 95 g	
Further information	KM3701	

We reserve the right to make technical changes.

	2-channel relative pressure measuring terminal 7500 hPa	2-channel relative pressure measuring terminal -1000…+1000 hPa
	KM3702	**KM3712**
	relative pressure measurement	
	2	2
	The KM3702 pressure measuring terminal enables direct measurement of two pressure values at the hose connections. The pressure is determined as a pressure difference to the ambiance of the KM3702 and is available in the fieldbus as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.	The KM3712 pressure measuring terminal enables direct measurement of two negative pressure values at the hose connections. The pressure is determined as a pressure difference to the ambiance of the KM3712 and is available in the fieldbus as a 16 bit value. The status LEDs indicate proper function or errors such as over-range.
	3 % (relative to full scale value)	3 % (relative to full scale value)
	0…7500 hPa (7.5 bar)	-1000…+1000 hPa (-1…+1 bar)
	– (no power contacts)	– (no power contacts)
	typ. 15 mA	typ. 15 mA
	10,000 hPa (10 bar)	5000 hPa (5 bar)
	non-aggressive gases	non-aggressive gases
	–	–
	0…+55 °C	0…+55 °C
	CE, UL	CE, UL
	approx. 95 g	approx. 95 g
	KM3702	KM3712

Analog output | -10…+10 V

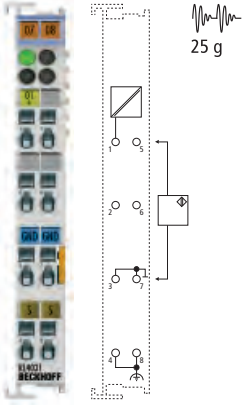
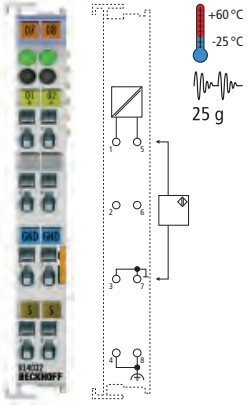
The KL4xxx Bus Terminals provide analog signal voltages in the common standard signal range of -10 to +10 V, 0 to 10 V, 0 to 20 mA and 4 to 20 mA. Inside the terminal the field side is electrically isolated from the K-bus and enables the interconnection to the desired potential groups. The 1-channel Bus Terminals are available for application instances, in which each signal must be completely electrically isolated. An additional electrically isolated 24 V DC supply can be created by the introduction of the KL9560 power supply terminal.

The Bus Terminals of this group differ in their different resolutions of the analog/digital conversion, conversion speed and accuracy. For 1- and 2-channel Bus Terminals 1-, 2-, 3- and 4-wire sensor connections are available. 4-channel Bus Terminals can only be used with 1- and 2-wire connections.

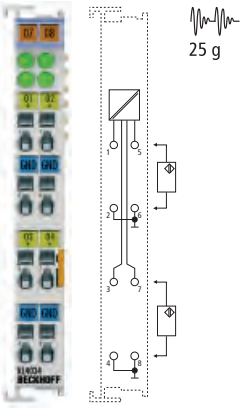
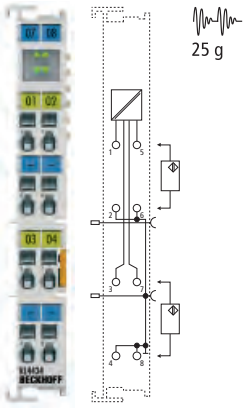
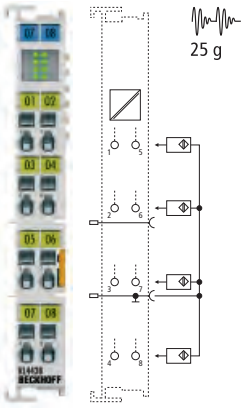
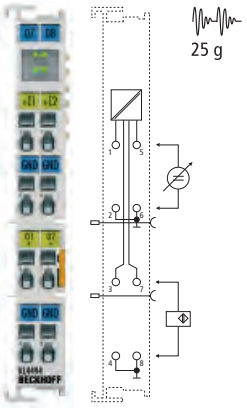
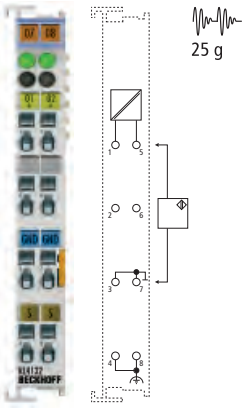
The current output terminals 0 to 20 mA and 4 to 20 mA are fed from the 24 V DC supply and are electrically connected with it. The signal current flows from the output to ground.

Most Bus Terminals with voltage outputs are supplied from the internal K-bus. These Bus Terminals are potential-free and must be connected with the actuator through an additional ground wire. In contrast, the KL4404/08 and KL4434/38 Bus Terminals are supplied by the 24 V from the power contacts and use a power contact as a reference ground.

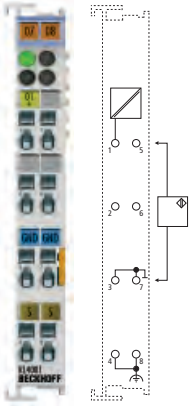
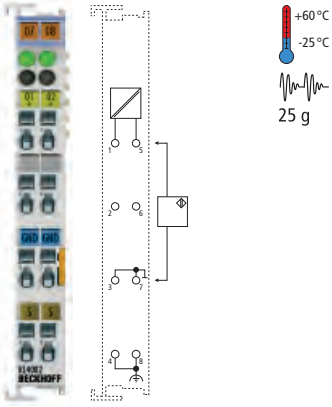
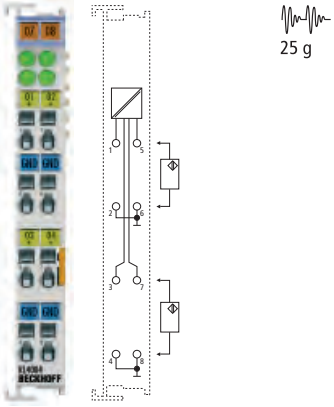
KL9560 | Power supply terminal
see page 707

	1-channel analog output terminal, -10…+10 V, 12 bit	2-channel analog output terminal, -10…+10 V, 12 bit
Technical data	**KL4031** | KS4031	**KL4032** | KS4032
Signal voltage	-10…+10 V	
Resolution	12 bit	
Technology	–	single-ended
Conversion time	~ 1.5 ms	~ 1.5 ms
Number of outputs	1	2
		
	The KL4031 analog output terminal generates signals in the range from -10 to +10 V. It combines two output channels, which have a common ground potential in one housing.	The KL4032 analog output terminal generates signals in the range from -10 to +10 V. It combines two output channels, which have a common ground potential in one housing.
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 75 mA	typ. 75 mA
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Special features	potential-free output	–
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 85 g	approx. 85 g
Further information	KL4031	KL4032
Special terminals		**KL4032-00xx**
Distinguishing features		special terminals see page 711

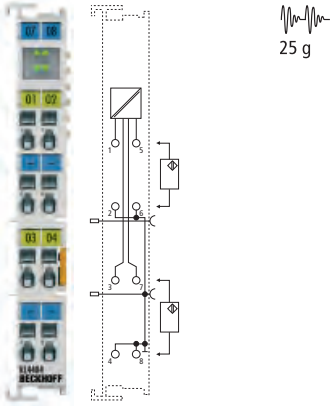
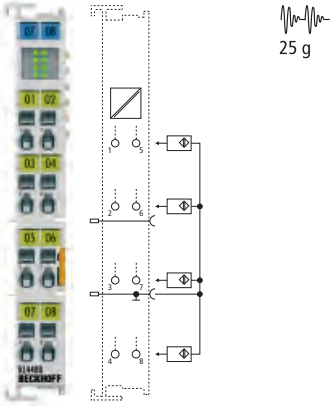
We reserve the right to make technical changes.

	4-channel analog output terminal, -10…+10 V, 12 bit	4-channel analog output terminal, -10…+10 V, 12 bit	8-channel analog output terminal, -10…+10 V, 12 bit	2-channel analog input, 2-channel analog output terminal, -10…+10 V, 12 bit	2-channel analog output terminal, -10…+10 V, 16 bit
	KL4034 | KS4034	**KL4434** | KS4434	**KL4438** | KS4438	**KL4494** | KS4494	**KL4132** | KS4132
					16 bit
	single-ended	single-ended	single-ended	single-ended	single-ended
	~ 2 ms	~ 4 ms	~ 8 ms	< 2 ms	~ 1.5 ms
	4	4	8	2 outputs + 2 inputs	2
					
	The KL4034 analog output terminal generates signals in the range from -10 to +10 V. It combines four output channels, which have a common ground potential in one housing.	The KL4434 analog output terminal generates signals in the range from -10 to +10 V. It combines four output channels, which have a common ground potential in one housing.	The KL4438 analog output terminal generates signals in the range from -10 to +10 V. It combines eight output channels in one housing and is thus particularly suited for space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.	The KL4494 analog output terminal combines two analog inputs and two analog outputs. The input and output channels of the Bus Terminal have a common ground potential. – input internal resistance: > 130 kΩ	The KL4132 analog output terminal generates signals in the range from -10 to +10 V. It combines two output channels, which have a common ground potential in one housing.
	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)	< ±0.2 % (relative to end value)	< ±0.3 % (relative to end value)	< ±0.1 % (relative to end value)
	– (no power contacts)	only load	only load	only load	– (no power contacts)
	typ. 85 mA	typ. 20 mA	typ. 20 mA	typ. 70 mA	typ. 75 mA
	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
	–	–	high packing density	input/output terminal	increased resolution
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
	approx. 85 g	approx. 75 g	approx. 75 g	approx. 55 g	approx. 85 g
	KL4034	KL4434	KL4438	KL4494	KL4132
	KL4034-0010				**KL4132-00xx**
	Siemens S5 format				special terminals see page 711

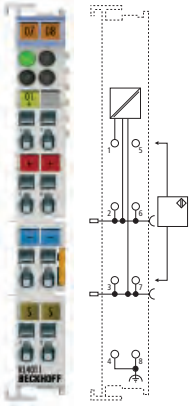
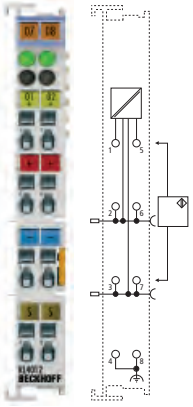
Analog output | 0…10 V

	1-channel analog output terminal, 0…10 V, 12 bit	2-channel analog output terminal, 0…10 V, 12 bit	4-channel analog output terminal, 0…10 V, 12 bit
Technical data	**KL4001** | KS4001	**KL4002** | KS4002	**KL4004** | KS4004
Signal voltage	0…10 V		
Resolution	12 bit		
Technology	–	single-ended	single-ended
Conversion time	~ 1.5 ms	~ 1.5 ms	~ 2 ms
Number of outputs	1	2	4
			
	The KL4001 analog output terminal generates signals in the range from 0 to +10 V. It combines two output channels, which have a common ground potential in one housing.	The KL4002 analog output terminal generates signals in the range from 0 to +10 V. It combines two output channels, which have a common ground potential in one housing.	The KL4004 analog output terminal generates signals in the range from 0 to +10 V. It combines four output channels, which have a common ground potential in one housing.
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Current consumption power contacts	– (no power contacts)	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 75 mA	typ. 75 mA	typ. 85 mA
Load	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
Special features	potential-free output	–	–
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 85 g	approx. 85 g	approx. 85 g
Further information	KL4001	KL4002	KL4004
Special terminals		**KL4002-00xx**	**KL4004-0050**
Distinguishing features		special terminals see page 711	Siemens S7 format

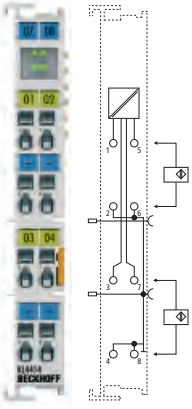
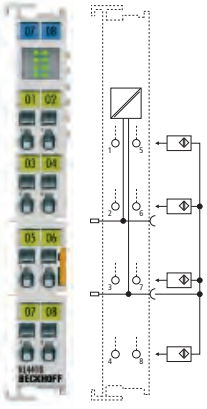
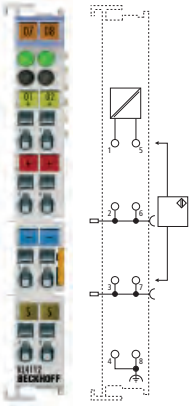
We reserve the right to make technical changes.

	4-channel analog output terminal, 0…10 V, 12 bit	8-channel analog output terminal, 0…10 V, 12 bit	2-channel analog output terminal, 0…10 V, 12 bit, manual/automatic operation
	KL4404 | KS4404	**KL4408** | KS4408	**KM4602**
	single-ended	single-ended	single-ended
	~ 4 ms	~ 8 ms	~ 1.5 ms
	4	8	2
	 25 g	 25 g	
	The KL4404 analog output terminal generates signals in the range from 0 to +10 V. It combines four output channels, which have a common ground potential in one housing.	The KL4408 analog output terminal generates signals in the range from 0 to +10 V. It combines eight output channels in one housing and is thus particularly suited to space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.	The analog KM4602 output terminal has two potential-free analog 0 to +10 V outputs. Both are connected internally to common ground. For each channel a switch enables selection of automatic or manual mode. In automatic mode, an analog value is issued depending on the process data. With the manual switch settings, the value set via the potentiometer is applied to the output. For manual mode a 24 V supply is required for the Bus Coupler. The switch state can be read by the controller.
	< ±0.1 % (relative to end value)	< ±0.2 % (relative to end value)	< ±0.1 % (relative to end value)
	only load	only load	– (no power contacts)
	typ. 20 mA	typ. 20 mA	typ. 175 mA
	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)	> 5 kΩ (short-circuit-proof)
	–	high packing density	manual/automatic operation
	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE
	approx. 75 g	approx. 75 g	approx. 85 g
	KL4404	KL4408	KM4602

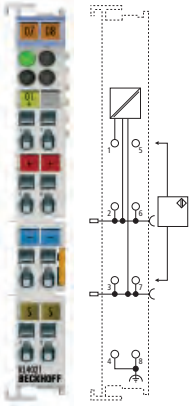
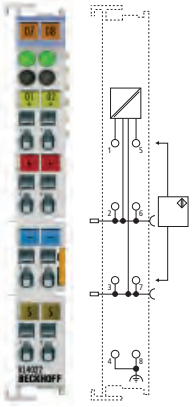
Analog output | 0…20 mA

	1-channel analog output terminal, 0…20 mA, 12 bit	2-channel analog output terminal, 0…20 mA, 12 bit
Technical data	**KL4011** | KS4011	**KL4012** | KS4012
Signal current	0…20 mA	
Resolution	12 bit	
Technology	single-ended	single-ended
Conversion time	~ 1.5 ms	~ 1.5 ms
Number of outputs	1	2
	 25 g	 +60 °C -25 °C 25 g
	The KL4011 analog output terminal generates analog output signals in the range from 0 to 20 mA.	The KL4012 analog output terminal generates signals in the range from 0 to 20 mA. It combines two output channels, which have a common ground potential with the 24 V DC supply, in one housing. The output stages are powered by the 24 V DC supply.
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Current consumption power contacts	typ. 30 mA + load	typ. 50 mA + load
Current consumption K-bus	typ. 60 mA	typ. 60 mA
Load	< 500 Ω	< 500 Ω
Power supply	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)
Special features	–	–
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 80 g	approx. 80 g
Further information	KL4011	KL4012
Special terminals		**KL4012-00xx**
Distinguishing features		special terminals see page 711

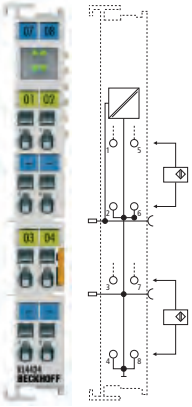
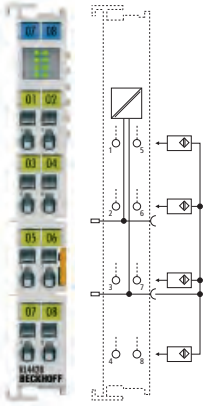
We reserve the right to make technical changes.

	4-channel analog output terminal, 0…20 mA, 12 bit	8-channel analog output terminal, 0…20 mA, 12 bit	2-channel analog output terminal, 0…20 mA, 15/16 bit
	KL4414 | KS4414	**KL4418** | KS4418	**KL4112** | KS4112
			15 bit, configurable to 16 bit
	single-ended	single-ended	single-ended
	~ 4 ms	~ 8 ms	~ 3.5 ms
	4	8	2
	 25 g	 25 g	 25 g
	The KL4414 analog output terminal generates signals in the range from 0 to 20 mA. It combines four channels, which have a common ground potential in one housing. The output stages are powered by the 24 V DC supply.	The KL4418 analog output terminal generates signals in the range from 0 to 20 mA. It combines eight output channels in one housing and is thus particularly suited to space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.	The KL4112 analog output terminal generates signals in the range from 0 to 20 mA. It combines two output channels, which have a common ground potential with the 24 V DC supply, in one housing. The output stages are powered by the 24 V DC supply.
	< ±0.1 % (relative to end value)	< ±0.2 % (relative to end value)	< ±0.1 % (relative to end value)
	typ. 60 mA + load	typ. 60 mA + load	typ. 50 mA + load
	typ. 20 mA	typ. 20 mA	typ. 60 mA
	< 350 Ω (short-circuit-proof)	< 150 Ω (short-circuit-proof)	< 500 Ω
	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)
	–	high packing density	increased resolution
	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex
	approx. 75 g	approx. 75 g	approx. 80 g
	KL4414	KL4418	KL4112
			KL4112-00xx
			special terminals see page 711

Analog output | 4…20 mA

	1-channel analog output terminal, 4…20 mA, 12 bit	2-channel analog output terminal, 4…20 mA, 12 bit
Technical data	**KL4021** | KS4021	**KL4022** | KS4022
Signal current	4…20 mA	
Resolution	12 bit	
Technology	single-ended	single-ended
Conversion time	~ 1.5 ms	~ 1.5 ms
Number of outputs	1	2
	 25 g	 +60 °C -25 °C 25 g
	The KL4021 analog output terminal generates analog output signals in the range from 4 to 20 mA.	The KL4022 analog output terminal generates signals in the range from 4 to 20 mA. It combines two output channels, which have a common ground potential with the 24 V DC supply, in one housing. The output stages are powered by the 24 V DC supply.
Output error	< ±0.1 % (relative to end value)	< ±0.1 % (relative to end value)
Current consumption power contacts	typ. 30 mA + load	typ. 50 mA + load
Current consumption K-bus	typ. 60 mA	typ. 60 mA
Load	< 500 Ω	< 500 Ω
Power supply	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)
Special features	–	–
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 80 g	approx. 80 g
Further information	KL4021	KL4022
Special terminals		**KL4022-00xx**
Distinguishing features		special terminals see page 711

We reserve the right to make technical changes.

	4-channel analog output terminal, 4…20 mA, 12 bit	8-channel analog output terminal, 4…20 mA, 12 bit
	KL4424 | KS4424	**KL4428** | KS4428
	single-ended	single-ended
	~ 4 ms	~ 8 ms
	4	8
	 25 g	 25 g
	The KL4424 analog output terminal generates signals in the range from 4 to 20 mA. It combines four channels, which have a common ground potential in one housing. The output stages are powered by the 24 V DC supply.	The KL4428 analog output terminal generates signals in the range from 4 to 20 mA. It combines eight output channels in one housing and is thus particularly suited to space-saving use in the control cabinet. The 0 V power contact serves as the common ground potential.
	< ±0.1 % (relative to end value)	< ±0.2 % (relative to end value)
	typ. 60 mA + load	typ. 60 mA + load
	typ. 20 mA	typ. 20 mA
	< 350 Ω (short-circuit-proof)	< 150 Ω (short-circuit-proof)
	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)	24 V DC via power contacts (alternative 15 V DC with power supply terminal KL9515)
	–	increased packing density
	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL
	approx. 75 g	approx. 75 g
	KL4424	KL4428

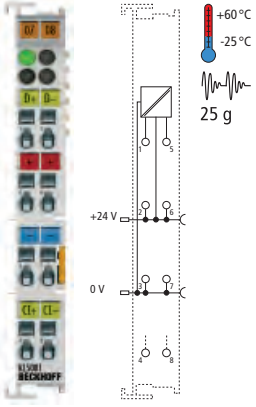
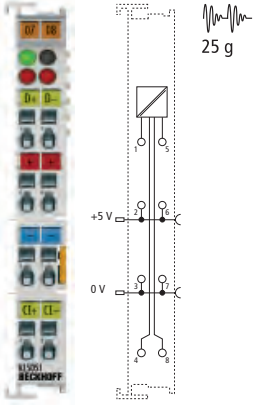
Position measurement | **SSI encoder interfaces**

The KL5001 SSI interface terminal enables the direct connection of an SSI encoder that is powered via the SSI interface. The interface circuit generates a pulse for reading the encoder and makes the incoming data stream available to the controller as a data word in the process image. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register. A screen can be connected via the KL9195 shield terminal.

The KL5051 bidirectional SSI interface terminal enables the connection of digital servo drives. The encoder is powered via the SSI interface, which consists of two logic channels. The first channel us used for the positioning of the drive, while the second channel is used to set releases, to transmit parameter data and to read status information and parameter values. The 5 V DC supply voltage can be generated with the KL9505 power supply terminal and fed into the power contacts.

KL9195 | Shield terminal
see page 699

KL9505 | Power supply terminal
see page 706

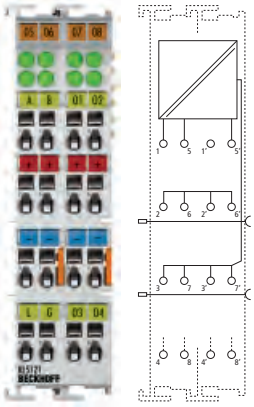
	SSI encoder interface	Bidirectional SSI encoder interface
Technical data	**KL5001** | KS5001	**KL5051** | KS5051
Technology	SSI encoder interface	
Data direction	read	bidirectional
Number of channels	1 encoder interface	1 encoder interface
Encoder connection	binary input: D+, D-, binary output: Cl+, Cl-	binary input: D+, D-, binary output: Cl+, Cl-
		
Power supply	24 V DC via power contacts	5 V DC via power contacts (KL9505)
Current consumption power contacts	typ. 20 mA + load	no data
Current consumption K-bus	typ. 25 mA	typ. 75 mA
Signal input	difference signal (RS422)	difference signal (RS422)
Signal output	difference signal (RS422)	difference signal (RS422)
Encoder supply	24 V DC via power contacts	5 V DC
Data transfer rates	variable up to 1 MHz, 250 kHz default	1 MHz
Special features	–	bidirectional
Operating temperature	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex
Weight	approx. 60 g	approx. 80 g
Further information	KL5001	KL5051

We reserve the right to make technical changes.

Position measurement | **Incremental encoder interface**

The KL5121 Bus Terminal can be used to implement a linear path control. The terminal reads an incremental signal supplied by an incremental encoder or a pulse generator and switches the outputs at predefined counter states. The counter states can be transmitted to the terminal by the higher-level automation device in the form of a table. The position is registered with the latch input, which is activated/deactivated by the gate input. Up to four 24 V outputs can be switched. The LEDs indicate the states of the signals at the various inputs and outputs.

The KL5121 is particularly suitable for applications that are dependent on a short response time. The K-Bus cycle time, the fieldbus runtime and the processing speed of the controller are of no importance for the fast and accurate processing of positional data, since the Bus Terminal always switches the outputs with a constant time delay, irrespective of the control environment.

	Incremental encoder interface with programmable outputs
Technical data	**KL5121** | KS5121
Technology	incremental encoder interface with programmable outputs
Number of channels	1 incremental encoder + 4 outputs
Encoder connection	A, B, latch, gate
	 25 g
Power supply	24 V DC (-15 %/+20 %)
Current consumption power contacts	typ. 30 mA + load
Current consumption K-bus	typ. 30 mA
Encoder operating voltage	24 V DC
Counter	16 bit, binary
Limit frequency	1 million increments/s (with 4-fold evaluation)
Output voltage	24 V
Output current	0.5 A
Switching times	< 100 µs
Special features	electronic camshaft controller
Operating temperature	0…+55 °C
Approvals	CE, UL, Ex
Weight	approx. 60 g
Further information	KL5121

We reserve the right to make technical changes.

Position measurement | **Incremental encoder interfaces**

The KL5101 Bus Terminal processes differential signals according to the RS422/RS485 standard. This transmission type is particularly resistant to interference and is suitable for high transmission frequencies. The KL5111, KL5151 and KL5152 Bus Terminals have a single-ended input and are simple to wire up. The signal frequencies from less time-critical applications can be processed using these terminals.

All incremental encoder terminals use a quadrature decoder. Gate and latch inputs enable pre-processing in the Bus Terminal in order to be able to transfer positional values to the controller exactly upon an external event and thus support the referencing of a drive.

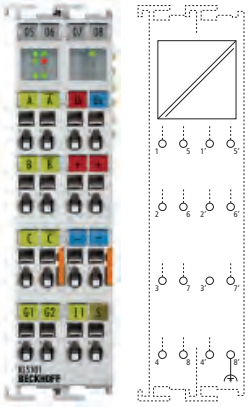
The KL5101 and KL5111 make a period duration measurement available with a resolution of 200 ns. Rotary speeds can thus be determined directly, since a calculation of the speed by means of position differences in the controller is in many cases not accurate enough due to jitter.

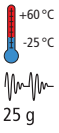
The KL5152 contains two encoders and provides a particularly inexpensive solution for a large number of channels if gate and latch functions are not needed.

The LEDs on the Bus Terminals indicate the states of the input signals for better diagnosis.

1-channel incremental encoder interface, 16 bit, differential inputs, RS485

Technical data	**KL5101** | KS5101
Technology	incremental encoder interface (RS485)
Number of channels	1 incremental encoder + 1 input
Encoder connection	A, A (inv), B, B (inv), zero, zero (inv), difference signal (RS485); status input

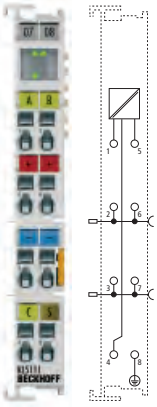
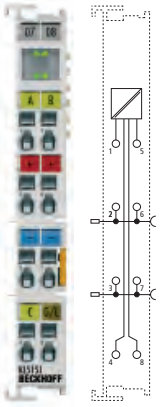
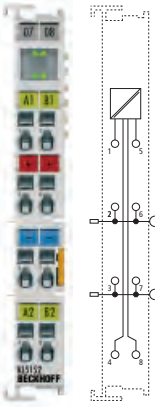




The KL5101 terminal is an interface for the direct connection of incremental encoders with difference signal (RS485) or with single inputs. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. Interval measurement with a resolution of 200 ns is possible. The G2 input allows the counter to be halted (high = stop). The value is read with a rising edge at G1.

Power supply	24 V DC (-15 %/+20 %)
Current consum. pow. cont.	– (no power contacts)
Current consumption K-bus	typ. 60 mA
Encoder operating voltage	5 V DC
Encoder output current	0.5 A
Counter	16 bit, binary
Limit frequency	4 million increments/s (with 4-fold evaluation)
Quadrature decoder	1-, 2-, or 4-fold evaluation
Zero-pulse latch	16 bit
Commands	read, set, enable
Special features	–
Operating temperature	-25…+60 °C
Approvals	CE, UL, Ex
Weight	approx. 85 g
Further information	KL5101
Special terminals	
Distinguishing features	

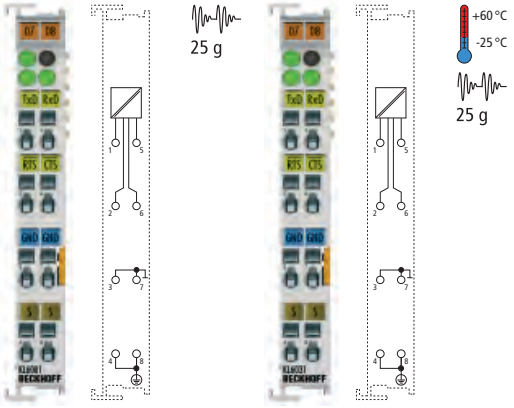
We reserve the right to make technical changes.

	1-channel incremental encoder interface, 16 bit, single-ended, 24 V DC	1-channel incremental encoder interface, 32 bit, single-ended, 24 V DC	2-channel incremental encoder interface, 32 bit, single-ended, 24 V DC
	KL5111 | KS5111	**KL5151** | KS5151	**KL5152** | KS5152
	incremental encoder interface 24 V DC, EN 61131-2, type 1, "0": < 5 V DC, "1": > 15 V DC, typ. 5 mA		
	1 incremental encoder		2 incremental encoders
	A, B, C; 24 V (low: < 3 V, high: > 18 V)	A, B, C, gate/latch, 24 V	A1, B1, A2, B2, 24 V
	 25 g	 +60 °C -25 °C 25 g	 25 g
	The KL5111 Bus Terminal is an interface for the direct connection of 24 V incremental encoders. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. The state of the counter is transmitted quickly and securely to the PC, PLC or CNC over the fieldbus. Interval measurement with a resolution of 200 ns is possible.	The KL5151 Bus Terminal is an interface with 24 V inputs for the direct connection of incremental encoders. A 32 bit counter with a quadrature decoder and a 32 bit latch for the zero pulse can be read, set or enabled. The KL5151 inputs can optionally be used as single or two-counter inputs.	The KL5152 Bus Terminal is an interface with 24 V inputs for the direct connection of incremental encoders. Two 32 bit counters with quadrature decoders can be read or set.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	–	–	–
	typ. 40 mA	typ. 40 mA	typ. 40 mA
	24 V DC	24 V DC	24 V DC
	–	–	–
	16 bit, binary	32 bit, binary	32 bit, binary
	1 million increments/s (with 4-fold evaluation)	400,000 increments/s (with 4-fold evaluation)	400,000 increments/s (with 4-fold evaluation)
	4-fold evaluation	4-fold evaluation	4-fold evaluation
	16 bit	32 bit	–
	read, set, enable	read, set, enable	read
	–	–	–
	0…+55 °C	-25…+60 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
	approx. 60 g	approx. 50 g	approx. 50 g
	KL5111	KL5151	KL5152
	KL5111-00xx	**KL5151-0021**	
	special terminals see page 711	incremental encoder 1 x 32 bit A, B, capture input and 1 driver output 24 V, 0.5 A	

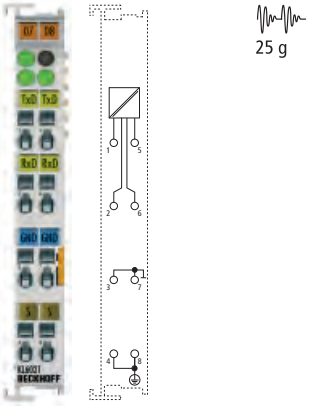
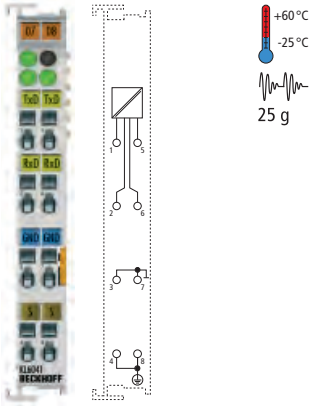
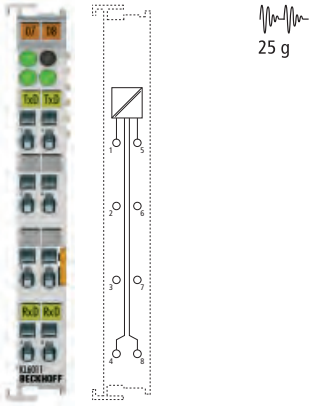
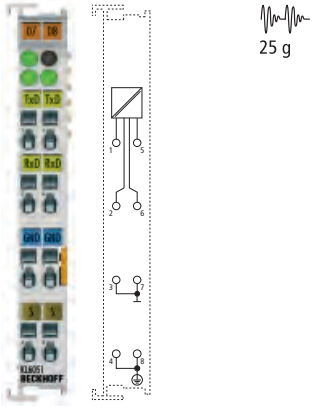
Communication | **Serial interfaces**

The KL60xx serial interfaces enable the connection of devices with RS232 or RS422/RS485 interfaces to the control level. The devices connected to the Bus Terminals communicate via the coupler and the network with the automation device. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 115.2 kbaud. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

The RS232 interface enables high resistance to interference by means of electrically isolated signals, which in the case of the KL6021 is additionally supported by differential signal transmission according to RS422.

	Serial interface RS232, up to 19,200 baud	Serial interface RS232, up to 115.2 kbaud
Technical data	**KL6001** | KS6001	**KL6031** | KS6031
Technology	RS232	
Data transfer rates	1200…19,200 baud; default: 9600 baud, 8 data bits, no parity and one stop bit	4800…115,200 baud; default: 9600 baud, 8 data bits, no parity and one stop bit
Data transfer channels	2 (1/1), TxD and RxD, full duplex	2 (1/1), TxD and RxD, full duplex
	 The KL6001 and KL6031 serial interfaces allow devices with an RS232 interface to be connected. The interface operates in conformity with the CCITT V.28/DIN 66 259-1 standards. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 19,200 baud (KL6001) or 115.2 kbaud (KL6031). The RS232 interface guarantees high immunity to interference through electrically isolated signals.	
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer	1024 bytes receive buffer, 128 bytes transmit buffer
Current consumption power contacts	– (no power contacts)	– (no power contacts)
Current consumption K-bus	typ. 55 mA	typ. 55 mA
Cable length	max. 15 m	max. 15 m
Line impedance	–	–
Special features	high interference immunity, electrically isolated signals	high interference immunity, electrically isolated signals
Operating temperature	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL
Weight	approx. 80 g	approx. 80 g
Further information	KL6001	KL6031
Special terminals	**KL6001-0020**	
Distinguishing features	standard format 5 bytes of user data	

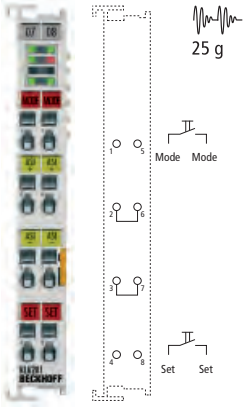
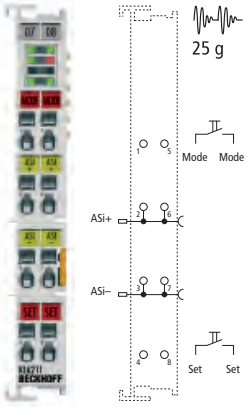
We reserve the right to make technical changes.

	Serial interface RS422/RS485, up to 19,200 baud	Serial interface RS422/RS485, up to 115.2 kbaud	Serial interface TTY, 20 mA current loop	Data exchange terminal with serial interface
	KL6021 | KS6021	**KL6041** | KS6041	**KL6011** | KS6011	**KL6051** | KS6051
	RS422/RS485		TTY	2 x RS422
	1200…19,200 baud; default: 9600 baud, 8 data bits, no parity and one stop bit	4800…115,200 baud; default: 9600 baud, 8 data bits, no parity and one stop bit	1200…19,200 baud; default: 9600 baud, 8 data bits, no parity and one stop bit	62,500 baud, 32 bit bidirectional data exchange between two KL6051
	TxD and RxD, full/half duplex	TxD and RxD, full/half duplex	2 (1/1), TxD and RxD, full duplex	TxD and RxD, full duplex
				
	The KL6021 and KL6041 serial interfaces allow devices with an RS422 or RS485 interface to be connected. The active communication channel operates independently of the higher-level bus system in full or half duplex mode at up to 19,200 baud (KL6021) or 115.2 kbaud (KL6041). The transmission of differential signals conforms to RS422 and guarantees high immunity to interference through electrically isolated signals.		The KL6011 serial interface allows devices with a 20 mA current interface to be connected. The interface operates passively. The current interface (TTY) guarantees high immunity to interference through electrically isolated signals with injected current.	Under the terminal's default setting, 32 inputs and 32 outputs are transferred between the fieldbus systems. The time to exchange the data is about 5 ms for 32 bits of I/O. The exchange of data with the Bus Coupler is indicated by the run LED. The TxD and RxD LEDs indicate the state of the signal transmission.
	128 bytes receive buffer, 16 bytes transmit buffer	1024 bytes receive buffer, 128 bytes transmit buffer	128 bytes receive buffer, 16 bytes transmit buffer	32 bit bidirectional
	– (no power contacts)	– (no power contacts)	– (no power contacts)	– (no power contacts)
	typ. 65 mA	typ. 65 mA	typ. 55 mA	typ. 65 mA
	approx. 1000 m twisted pair	approx. 1000 m twisted pair	max. 1000 m twisted pair	approx. 1000 m twisted pair
	120 Ω	120 Ω	–	120 Ω
	high interference immunity, electrically isolated signals	high interference immunity, electrically isolated signals	2 x 20 mA bit transfer	automatic data exchange
	0…+55 °C	-25…+60 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex	CE, UL, Ex
	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g
	KL6021	KL6041	KL6011	KL6051
	KL6021-002x		**KL6011-0020**	
	special terminals see page 711		standard format 5 bytes of user data	

Communication | **AS-Interface**

The AS-Interface master terminal is an extended master according to the M3 profile and enables the direct connection of AS-Interface slaves. The AS-compliant interface supports digital and analog slaves with the versions 2.0 and 2.1, safety slaves and slaves with Combined Transaction Type 1 (profile S-7.3 and 7.4). Process data exchange, parameterisation and the diagnosis are fieldbus-independent. Together with the various Bus Couplers, the KL6201 or the KL6211 represents a universal AS-Interface/fieldbus gateway. Together with the BK3120, the PROFIBUS DP V1 services can be used for communication with the KL6201 or the KL6211. Unlike the KL6201 AS-Interface master terminal, the KL6211 features power contacts. This enables direct connection to the AS-Interface supply via the KL9520 AS-Interface potential feed terminal or the KL9528 power supply terminal.

KL9520, KL9528 | AS-Interface system terminals see page 708

	AS-Interface master terminal	AS-Interface master terminal with power contacts
Technical data	**KL6201** | KS6201	**KL6211** | KS6211
Technology	AS-Interface	
Cycle time	max. 5 ms (31 devices)	
Number of channels	1	1
		
Specification version	AS-Interface V 2.0, V 2.1	AS-Interface V 2.0, V 2.1
Current consumption power contacts	– (no power contacts)	typ. 60 mA + load
Current consumption K-bus	typ. 55 mA (K-bus), approx. 60 mA (AS-Interface)	typ. 55 mA (K-bus), approx. 60 mA (AS-Interface)
Number of slaves	31 for V 2.0, 62 for V 2.1	31 for V 2.0, 62 for V 2.1
Slave types	digital and analog	digital and analog
AS-Interface address assignment	via configuration or automatic	via configuration or automatic
AS-Interface certificate	yes, ZU-No. 125801	yes, ZU-No. 125801
Diagnostics	power failure, slave failure, parameterisation fault	power failure, slave failure, parameterisation fault
Connection	2 lines via spring force technology	2 lines via spring force technology
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL
Weight	approx. 55 g	approx. 55 g
Further information	KL6201	KL6211
Special terminals	**KL6201-001x**	**KL6211-0011**
Distinguishing features	special terminals see page 711	preset to 38 bytes K-bus interface, supports up to 62 AS-Interface slaves (4 K-bus cycles)

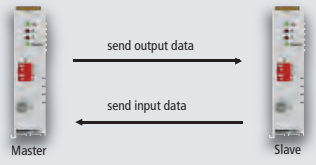
We reserve the right to make technical changes.

Communication | **Wireless data exchange**

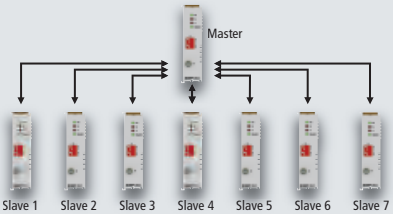
The KM6551 terminal module is a data exchange unit for radio technology. The KM module is based on the IEEE802.15.4 standard. Data are exchanged or transferred via radio between two stand-alone control units, independent of the higher-level fieldbus. The outdoor range between two KM6551 units can be up to 300 m.

The data exchange module has a reverse SMA plug (Straight Medium Adapter) for connection of various radio antennas. The free choice of antenna enables adaptation to the respective environment. Status and data exchange are displayed via LEDs, thereby offering fast and simple diagnostics. A library is available for using the KM6551 module with TwinCAT.

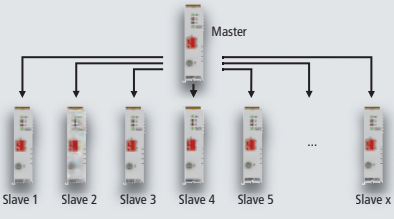
Option 1 | Data exchange peer-to-peer



Option 2 | Data exchange up to max. 7 devices



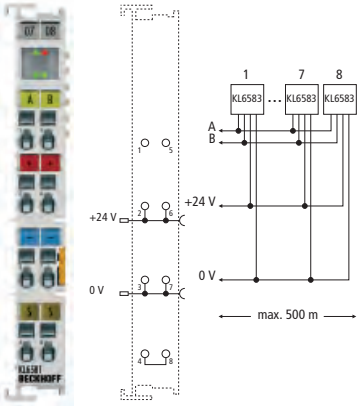
Option 3 | Broadcast up to x devices



	Wireless data exchange terminal	
Technical data	**KM6551**	
Technology	wireless data exchange	
Data transfer rates	250 kbit	
Number of channels	1 radio connection	
Protocol	IEEE 802.15.4	
Current consumption power contacts	– (no power contacts)	
Current consumption K-bus	typ. 135 mA	
Frequency band	2.4 GHz	
Antenna connection	reverse SMA plug (RP-SMA)	
Operating temperature	0…+55 °C	
Approvals	CE	
Weight	approx. 85 g	
Further information	KM6551	
Accessories		
ZS6100-0900	directional antenna 9 dBi	850
ZS6201-0410	rod antenna 4 dBi	850
ZS6201-0500	rod antenna 5 dBi	851
ZK6000-0102-0020	coaxial cable, 50 Ω impedance, 2 m	851
ZK6000-0102-0040	coaxial cable, 50 Ω impedance, 4 m	851

We reserve the right to make technical changes.

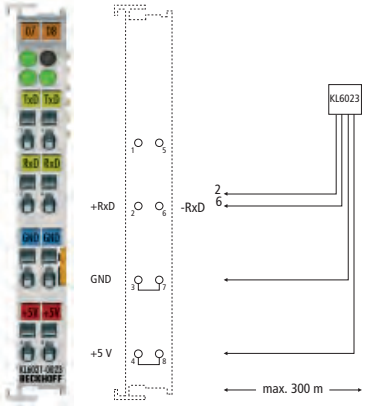
Communication | **EnOcean, bidirectional**

	EnOcean master terminal	EnOcean transmitter and receiver, 868.35 MHz
Technical data	**KL6581**	**KL6583**
Technology	EnOcean	
Data transfer rates	125 kbaud	–
Number of channels	1	–
		
	The bidirectional EnOcean technology receives signals from battery-less sensors or transmits data to actuators. With a radio signal range of 30 m, the wiring of buildings can be simplified significantly. The KL6581 EnOcean master terminal is the link between up to eight KL6583 EnOcean transmitter and receiver modules and the application.	The KL6583 EnOcean module enables EnOcean data to be transmitted and received. An antenna is integrated in the device. The KL6583 module is supplied with 24 V and offers a bus connection to the KL6581 EnOcean master terminal. The KL6583 is addressed via an address selection switch. Up to eight KL6583 modules can be connected to a KL6581.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (via KL6581)
Current consumption power contacts	typ. 20 mA + load	typ. 20 mA (24 V DC)
Current consumption K-bus	typ. 60 mA	–
Cable length	max. 500 m	max. 500 m
Connection	2 x 2-wires directly at the KL6583 (connection of max. 8 KL6583)	2 x 2-wires directly at the KL6581 Bus Terminal
Data transfer standard	–	bidirectional
Frequency band	–	868.35 MHz (CE)
Data transfer range	–	300 m in the free field, 30 m within buildings
Special features	up to 8 KL6583 EnOcean transmitter and receiver modules	connection to KL6581 EnOcean master
Operating temperature	0…+55 °C	0…+55 °C
Weight	approx. 85 g	approx. 90 g
Further information	KL6581	KL6583

We reserve the right to make technical changes.

Communication | **EnOcean, unidirectional**

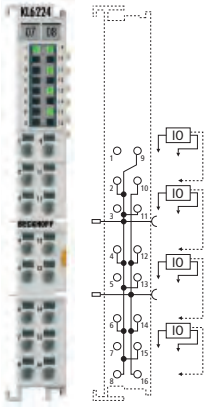
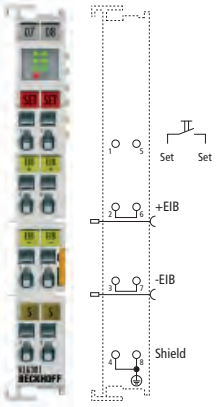
Green. Smart. Wireless.
enocean®

	Serial interface for processing signals from the KL6023 wireless adapter with EnOcean radio technology	Wireless adapter for EnOcean radio technology
Technical data	**KL6021-0023**	**KL6023**
Technology	EnOcean	
Data transfer rates	9600 baud	–
Number of channels	1	–
		
	The KL6021-0023 serial interface enables connection of a KL6023 wireless adapter. It processes the RS485 signals of the wireless adapter.	The KL6023 Wireless Adapter receives signals from battery-less sensors with EnOcean technology. These signals are converted by the Wireless Adapter to a RS485 signal and directly processed further by the KL6021-0023 serial Bus Terminal. The system does not limit the number of transmitters per receiver unit. In practice, between 25 and 100 transmitters per receiver are used.
Nominal voltage	–	via KL6021-0023
Current consumption power contacts	– (no power contacts)	–
Current consumption K-bus	typ. 65 mA	–
Cable length	max. 300 m	max. 300 m
Connection	2 x 2-wires directly at the KL6023 EnOcean module	2 x 2-wires directly at the KL6021-0023 Bus Terminal
Data transfer standard	–	unidirectional
Frequency band	–	868.35 MHz
Data transfer range	–	300 m in the free field, 30 m within buildings
Special features	high interference immunity, electrically isolated signals	connection to KL6021-0023 serial interface
Operating temperature	0…+55 °C	0…+55 °C
Weight	approx. 60 g	approx. 55 g
Further information	KL6021	KL6023

Communication | IO-Link, EIB/KNX, LON, MP-Bus, M-Bus

IO-Link

EIB/KNX

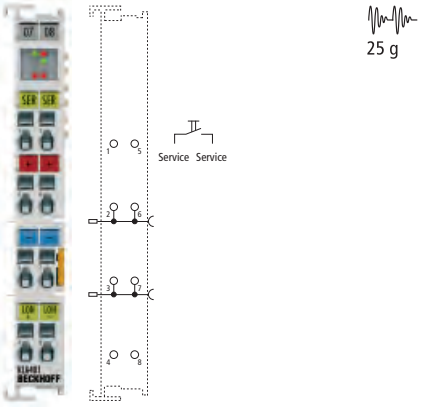
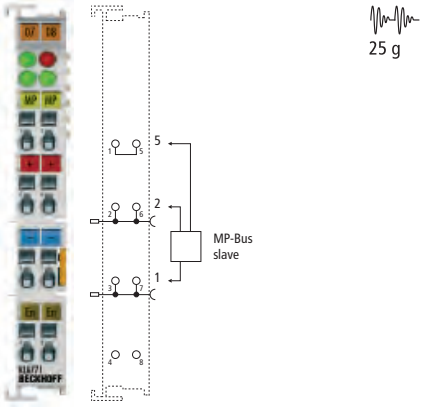
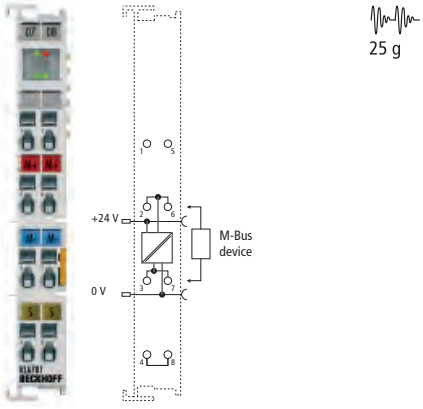
	IO-Link master terminal	EIB/KNX Bus Terminal
Technical data	**KL6224**	**KL6301**
Technology	IO-Link	EIB/KNX
Data transfer rates	4.8 kbaud, 38.4 kbaud and 230.4 kbaud	9600 baud
Number of channels	4	1
	 25 g The KL6224 IO-Link terminal enables connection of up to four IO-Link devices, e.g. actuators, sensors or combinations of both. A point-to-point connection is used between the terminal and the device. The terminal is parameterised via the master. 2-wire and 3-wire connections are supported. IO-Link is designed as an intelligent link between the fieldbus level and the sensor, wherein parameterisation information can be exchanged bidirectionally via the IO-Link connection. The parameterisation of the IO-Link devices with service data can be done from TwinCAT via register communication or very conveniently via the integrated IO-Link configuration tool. In the standard setting, the KL6224 functions as a 4-channel input terminal, 24 V DC, which communicates with connected IO-Link devices, parameterises them and, if necessary, changes their operating mode.	 25 g The KL6301 EIB/KNX Bus Terminal is integrated in an EIB/KNX network and can receive/transmit data from/to other EIB/KNX devices. The Bus Terminal is commissioned or configured via TwinCAT function blocks. Several KL6301 can be used with a single Bus Coupler or a Bus Terminal Controller. Up to 256 group addresses can be received; sending is only limited by the application.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current consumption power contacts	no data	–
Current consumption K-bus	typ. 85 mA	typ. 55 mA
Data transfer standard	–	twisted pair (TP)
Bus access	–	CSMA/CA
Special features	–	TwinCAT library: TwinCAT PLC EIB
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE, UL	CE, UL, Ex
Weight	approx. 60 g	approx. 85 g
Further information	KL6224	KL6301

We reserve the right to make technical changes.

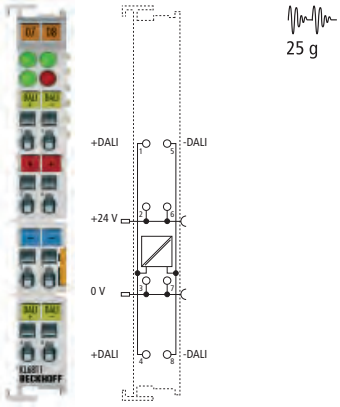
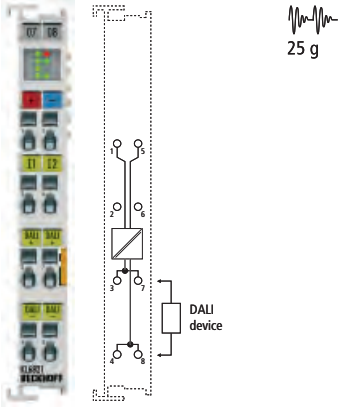
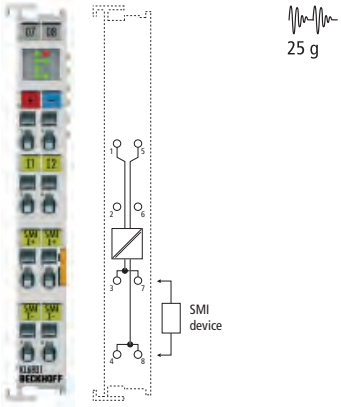
LON

MP-BUS COMPATIBLE

M-Bus

	LON Bus Terminal	MP-Bus master terminal	M-Bus master terminal
	KL6401	**KL6771** | KS6771	**KL6781**
	LON	MP-Bus	M-Bus
	78 kbit/s	1200 baud	300…9600 baud (default 2400 baud)
	1	1	1
			
	The KL6401 LON Bus Terminal enables direct connection of LON devices. Several KL6401 can be used with a single Bus Coupler or a Bus Terminal Controller. The KL6401 supports 62 SNVTs. All SNVT types can be configured as input or output variable via the KS2000 software. The KS2000 software generates an XIF file that is integrated in an LON tool.	The MP-Bus master terminal enables direct connection of MP-Bus slave devices. Up to sixteen field devices, eight drives and eight sensors can be connected to the KL6771. The Bus Terminal is configured and commissioned via TwinCAT function blocks. Several KL6771 terminals can be connected to the same Bus Coupler or Bus Terminal Controller.	The KL6781 M-Bus master terminal enables the direct connection of M-Bus devices. The M-Bus (Meter Bus) is a fieldbus for the acquisition of consumption data from electricity, water, gas or energy meters. The KL6781 does not contain the M-Bus protocol; instead, it converts the data present on the terminal bus into M-Bus compliant physics. 24 byte data are available on the K-bus for this. In conjunction with the TwinCAT M-Bus library, it is possible to work without an external M-Bus gateway, i.e. the M-Bus devices can be connected directly to the KL6781. With a total cable length of 300 m, up to 40 M-Bus devices (each with a current consumption of 1.5 mA) can be connected.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	only load	typ. 10 mA + load	max. 250 mA
	typ. 55 mA	typ. 55 mA	typ. 65 mA
	FTT-10, LPT	MP-Bus	M-Bus physics
	CSMA	polling	master-slave mode (polling)
	15 devices; TwinCAT library: TwinCAT PLC LON	8 drives/sensors; TwinCAT library: TwinCAT PLC MP-Bus	connection of up to 40 M-Bus devices; TwinCAT library: TwinCAT PLC M-Bus
	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL
	approx. 85 g	approx. 85 g	approx. 60 g
	KL6401	KL6771	KL6781

Communication | DALI, DALI 2, SMI

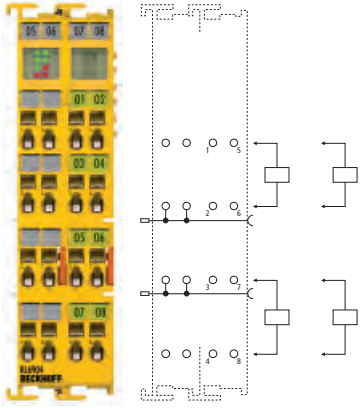
	DALI	DALI 2	SMI	
	DALI/DSI master and power supply terminal	DALI/DALI 2 multi-master and power supply terminal	SMI terminal	
Technical data	**KL6811** | KS6811	**KL6821**	**KL6831**	**KL6841**
Technology	DALI/DSI	DALI/DALI 2	SMI	
Data transfer rates	1200 baud		2400 baud	
Number of channels	1	1	1	
				
	The KL6811 enables the connection of up to 64 DALI slaves. The KS2000 software enables simple configuration via a PC that is directly coupled with the Bus Coupler via an RS232 interface or via the fieldbus. The integrated power supply unit generates an electrically isolated 24 V DC output voltage. No further components are required for the operation of the DALI slaves. The KL6811 operates fieldbus-independent.	The KL6821 enables the connection of up to 64 DALI/DALI 2 devices. The KS2000 software enables simple configuration via a PC that is directly coupled with the Bus Coupler via an RS232 interface or via the fieldbus. The integrated power supply unit generates an electrically isolated 24 V DC output voltage. No further components are required for the operation of the DALI/DALI 2 devices. The KL6821 operates fieldbus-independent.	The KL6831 and KL6841 Bus Terminals connect the Bus Terminal system with the SMI bus system. SMI (Standard Motor Interface) is used for controlling and exact positioning of roller shutter and sun protection device drives. In conjunction with intelligent energy and lighting management the blades can be positioned and moved according to the sun's position. Up to 16 drives can be connected via an SMI terminal. The KL6831 is suitable for LoVo SMI devices, the KL6841 is used for interfacing of 230 V AC SMI devices.	
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	LoVo	230 V AC
Current consumption power contacts	typ. 30 mA + load	typ. 30 mA + load	–	
Current consumption K-bus	typ. 55 mA	typ. 55 mA	typ. 55 mA	
Data transfer standard	DALI	DALI + DALI 2	SMI	
Special features	connection of up to 64 DALI slaves; TwinCAT library: TwinCAT PLC DALI	2 digital inputs for simplified installation, TwinCAT library available at delivery date, only for Beckhoff controllers	2 digital inputs for simplified commissioning, TwinCAT library: TwinCAT PLC SMI, only for Beckhoff controllers	
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C	
Approvals	CE, UL, Ex	CE	CE	
Weight	approx. 80 g	approx. 80 g	approx. 80 g	
Further information	KL6811	KL6821	KL6831	

We reserve the right to make technical changes.

Communication | **TwinSAFE**

TwinSAFE enables networks with up to 1024 TwinSAFE devices. The KL6904 Bus Terminal features certified safety function blocks, which are configured according to the application to be realised. Functions such as emergency stop, safety door monitoring etc. can thus easily be selected and linked. All blocks can be freely connected among each other and are complemented by operators such as AND, OR, etc. The necessary functions are configured using the TwinCAT System Manager and loaded into the terminal via the fieldbus.

For further information on TwinSAFE and the TwinSAFE products see page 1044

	TwinSAFE Logic Bus Terminal, 4 safe outputs
Technical data	**KL6904**
Technology	TwinSAFE Logic
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Number of outputs	4
Protocol	TwinSAFE/Safety over EtherCAT
	
	The KL6904 TwinSAFE Logic Bus Terminal can establish 15 connections (TwinSAFE connections). The TwinSAFE logic terminal has four safe, local outputs, so that safety applications can be realised with only two components (KL1904 and KL6904).
Nominal voltage	24 V DC (-15 %/+20 %)
Current consum. pow. cont.	load-dependent
Current consumption K-bus	250 mA
Cycle time	4…100 ms
Fault response time	≤ watchdog time (parameterisable)
Output current	0.5 A max./20 mA min. (per channel)
Permitted degree of contamination	2
Climate class EN 60721-3-3	3K3
Installation position	horizontal
Special features	4 safe outputs
Operating temperature	0…+55 °C
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 90 g
Further information	KL6904
Special terminals	**KL6904-0001**
Distinguishing features	pre-configured ex factory to 15 TwinSAFE connections

Manual operating modules with K-bus interface

The manual operating modules have been developed for the switching, controlling and observation of digital and analog signals. They enable the setting and reading of data and values in the case of failure of a controller, without having to open the control cabinet.

The manual operating modules can be installed in the control cabinet door using a snap-in technique; they are wired inside the control cabinet. Up to 31 modules can be inserted via the K-bus interface with K-bus extension. Connection to the KL9309 signal-independent transfer terminal takes place via the 20-pin shielded signal cable ZK8500-8282-70x0. Connection to the Bus Terminal strand takes place via the KL9020 end terminal for bus extension. The signals are electrically isolated. Power and error LEDs indicate the status of the modules.

The electrically functionless KL8500 placeholder module covers the cut-out in the control cabinet in such a way that functional units can be retrofitted simply by exchanging the module.

KL9309 | Adapter terminal for manual operating modules see page 704

KL9020 | End terminal for bus extension see page 704

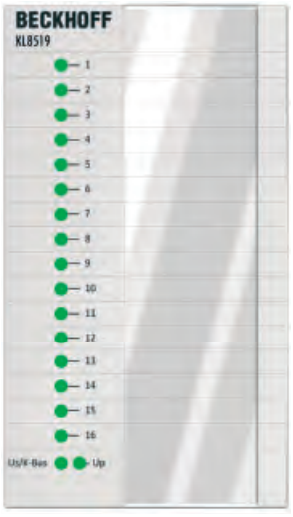
ZK8500-8282-70x0 | Signal cable for manual operating modules see page 841

ZK1090-0101-1xxx | K-bus extension cable see page 840

Additional information
▶KL85xx

16-channel digital
input signal module

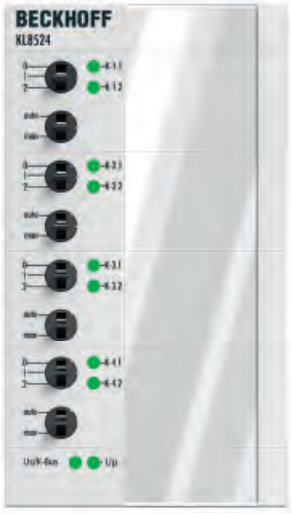
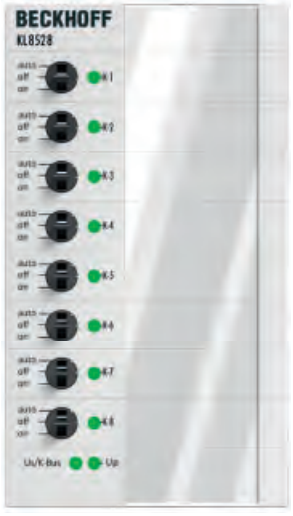
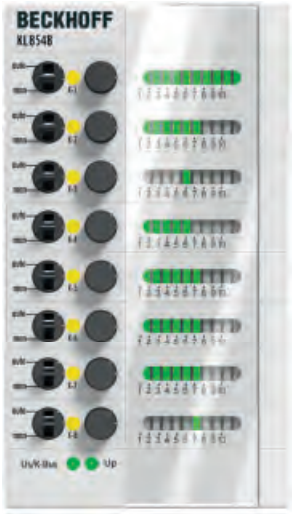
Technical data	KL8519
Number of inputs	16
Number of outputs	–
Input filter	3.0 ms
Output current	–
Resolution	–



The KL8519 is a 16-channel digital input signal module. 16 digital inputs can be connected, which indicate their status via LEDs and transmit the data to the controller. The LEDs are bicolour LEDs in the colours red and green and can be parameterised individually to suit the needs of the plant. The LEDs can also be addressed by the controller.

Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption K-bus	50 mA
Switch settings	–
Diagnostics LED	bicolor LEDs, green and red
Bus interface	K-bus connection IN/OUT
Special features	–
Weight	approx. 150 g
Operating temperature	0…+55 °C
Approvals	CE
Further information	KL8519

We reserve the right to make technical changes.

	4 x 2-channel digital output module	8-channel digital output module	8-channel analog output module 0…10 V
	KL8524	**KL8528**	**KL8548**
	–		8 (potentiometer)
	2 x 4	8	8 (0…10 V)
	–	–	–
	0.5 A	0.5 A	–
	–	–	12 bit
			
	The KL8524 is a 4 x 2-channel digital output module, each equipped with two switches. The first is for switching between manual and automatic operation, while the second is used to set a 2-stage output. It is possible to specify when and how the two outputs are switched. The status is indicated by a bicolour LED in green and yellow. The switching positions are readable via the PLC.	The KL8528 is an 8-channel digital output module. The outputs can be switched via a switch or specified by the controller. The status is indicated by a bicolour LED in green and yellow. The switching positions are readable via the PLC.	The KL8548 is an 8-channel analog output module for 0 to 10 V. The analog values must be specified individually for each channel via the controller or via a potentiometer. The actual output value is indicated by a bar graph. The position of the potentiometer is readable by the controller in each mode of operation.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	40 mA	40 mA	50 mA in ECO mode, 95 mA in full scale mode
	auto/manual, mode 0/1/2	auto/off/on	auto/manual, potentiometer
	bicolor LEDs, green and yellow	bicolor LEDs, green and yellow	yellow
	K-bus connection IN/OUT	K-bus connection IN/OUT	K-bus connection IN/OUT
	State of the switch can be read by the controller.	State of the switch can be read by the controller.	Potentiometers and switches can be read via the PLC. Analog values are displayed in the form of bar charts.
	approx. 160 g	approx. 160 g	approx. 215 g
	0…+55 °C	0…+55 °C	0…+55 °C
	CE	CE	CE
	KL8524	KL8528	KL8548

Power terminals | **Siemens contactor, series Sirius 3R**

The KL8001 power terminal, together with a power contactor, forms a complete distributed motor starter with any fieldbus connection. Apart from all the protective functions of a motor protection relay, the power terminal contains comprehensive diagnostics. By means of values such as current, voltage, active-power input and apparent power consumption or load condition, the control programmer is able to regulate the drive or a machine component in the best possible way and to protect them from damage and failure. The Bus Terminal block is fitted with a KL9060 adapter terminal instead of a KL9010 end terminal. The KL9060 is connected to a power terminal using a simple ribbon cable. Up to ten power terminals can be driven by one KL9060. No other wiring is necessary apart from a ground cable.

The power terminal switches the installed contactor and takes over all the functions of the motor protection relay. Apart from its purely protective function of switching off the motor when overloaded, the power terminal can carry out numerous diagnostic functions on the motor and make the information available to the controller via the fieldbus.

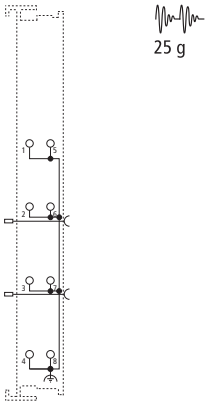
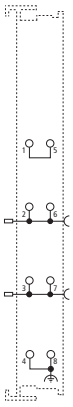
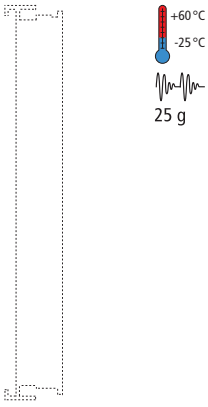
KL9060 | End terminal with adapter connection for KL8001 power terminals
see page 704

	Power terminal for Siemens contactor, series Sirius 3R
Technical data	**KL8001**
Contactor	connection mechanism for Siemens contactor series Sirius 3R (switch size S00, Typ 3RT 10 1)
Measured values	current, voltage, power
Number of power terminals	up to 10 (at 140 mA typ. current consumption per contactor)
	 Like a standard motor protection relay the KL8001 power terminal is fitted to a power contactor up to a switching capacity of 5.5 kW.
Measuring accuracy	0.1 A AC
Current consumption power contacts	typ. 7 mA + load
Current consumption K-bus	typ. 150 mA
Measuring voltage	500 V AC
Power contacts	24 V DC (-15 %/+20 %)/1.4 A max., short-circuit-proof
Setting range of nominal current	0.9…9.9 A
Current load	max. 25 A (fuse)
Short-circuit-proof	up to 5 kA
Internal resistance	< 1 mΩ
Tripping classes	class 5, 10, 15, 20, 25, 30 selectable
Type of connection power path	screw terminals up to 2 x 2.5 mm²
Type of K-bus connection	2 x flat plug socket, 10-pin
Adapter terminal	KL9060
Short circuit behaviour	conforms to EN 60947-4-1 (assignment type 2)/VDE 102
Triggering tolerance	conforms to IEC 947, as well as UL and CSA
Operating temperature	0…+55 °C
Approvals	CE
Weight	approx. 90 g
Further information	KL8001

We reserve the right to make technical changes.

System terminals | **Function terminals**

The KL9195 Bus Terminal can be used for the connection of screens. The KL9195 connects the spring force contacts directly to the DIN rail, and can optimally ground incoming electromagnetic radiation. The two power contacts are looped through by the KL9195, allowing two wires to be connected to each power contact. The KL9010 bus end terminal is necessary for data exchange between the Bus Coupler and the Bus Terminals. Each assembly must be terminated at the right hand end with a KL9010 bus end terminal. The bus end terminal does not have any other function or connection facility. The KL9080 is used to identify potential groups (e.g. 230 V AC/24 V DC). It is inserted between two potential groups, and indicates the separation through an orange coloured cover.

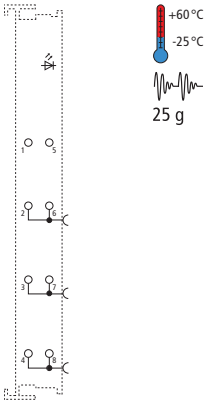
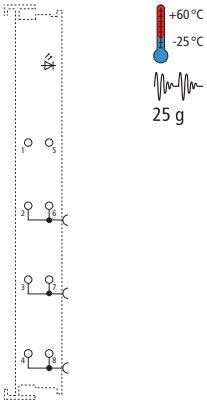
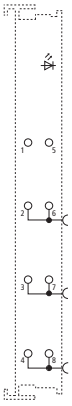
	Shield terminal	Shield terminal	Separation terminal
Technical data	**KL9070**	**KL9195** | KS9195	**KL9080**
Technology	shield terminal		separation terminal
Diagnostics in the process image	–		
			
Nominal voltage	≤ 60 V	arbitrary up to 230 V AC	separation terminal
Current load	≤ 10 A	≤ 10 A	–
Integrated fine-wire fuse	–	–	–
Power LED	–	–	–
Defect LED	–	–	–
PE contact	–	–	–
Shield connection	8 x	2 x	–
Current consumption K-bus	–	–	–
Electrical isolation	yes	–	–
Connection to DIN rail	yes	yes	–
Special features	dissipation of EMC interference via large copper surfaces on the DIN rail	–	placeholder terminal with K-bus transmission
Operating temperature	0…+55 °C	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 50 g	approx. 50 g	approx. 50 g
Further information	KL9070	KL9195	KL9080

We reserve the right to make technical changes.

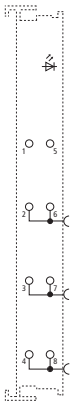
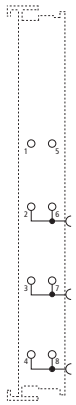
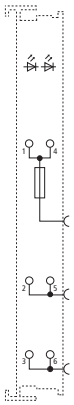
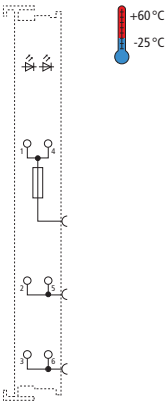
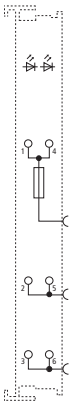
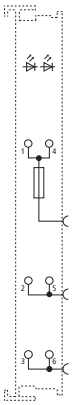
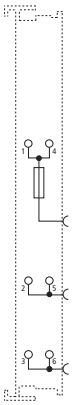
System terminals | **Function terminals**

The power feed terminals make it possible to set up various potential groups with any desired voltages (KL9190) or with the standard voltages of 24 V DC or 230 V AC (120 V AC). The power feed terminals are available with or without fine-wire fuse. In order to monitor the supply voltage, the terminals with diagnostics report the status of the power feed terminal to the Bus Coupler through two input bits. It is thus possible for the controller to check the distributed peripheral voltage over the fieldbus. The operating point performance conforms to the input terminals KL1002 (24 V) and KL1702 (230 V).

The KL9180, KL9185 and KL9195 Bus Terminals allow the supply voltage to be accessed a number of times via spring force terminals. These Bus Terminals make it unnecessary to use additional terminal blocks on the terminal strip.

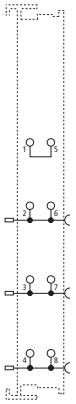
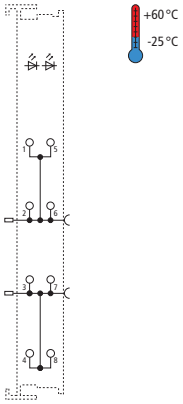
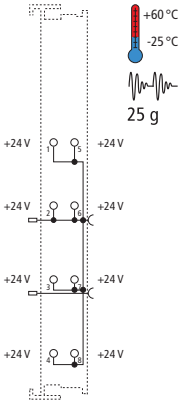
	Potential supply terminal, 24 V DC	Potential supply terminal, 24 V DC, with diagnostics	Potential supply terminal, 120…230 V AC
Technical data	**KL9100** | KS9100	**KL9110** | KS9110	**KL9150** | KS9150
Technology	potential supply terminal		
Diagnostics in the process image	–	yes	–
			
Nominal voltage	24 V DC	24 V DC	120 V AC/ 230 V AC
Current load	≤ 10 A	≤ 10 A	≤ 10 A
Integrated fine-wire fuse	–	–	–
Power LED	green	green	green
Defect LED	–	–	–
PE contact	yes	yes	yes
Shield connection	–	–	–
Current consumption K-bus	–	typ. 10 mA	–
Electrical isolation	yes	yes	yes
Connection to DIN rail	–	–	–
Special features	–	–	–
Operating temperature	-25…+60 °C	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 50 g	approx. 50 g	approx. 50 g
Further information	KL9100	KL9110	KL9150

We reserve the right to make technical changes.

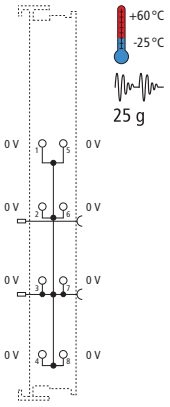
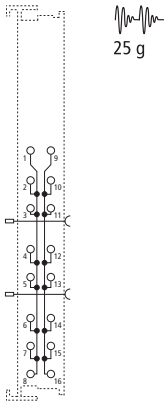
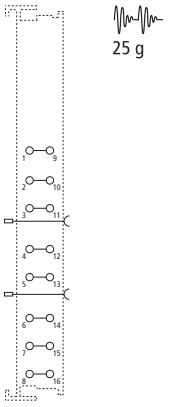
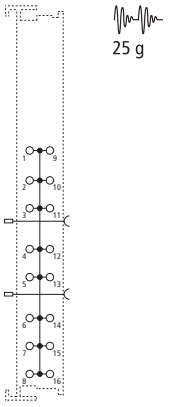
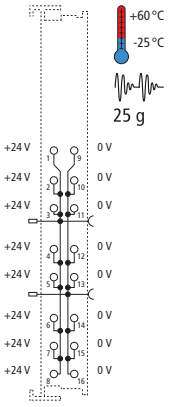
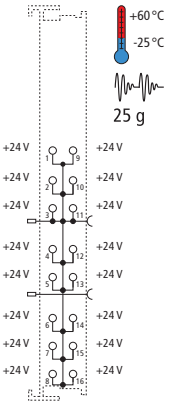
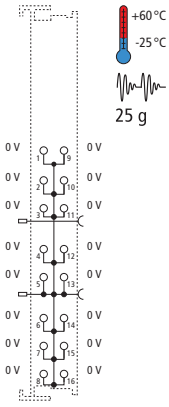
	Potential supply terminal, 120…230 V AC, with diagnostics	Potential supply terminal, any voltage up to 230 V AC	Potential supply terminal, 24 V DC, with fuse	Potential supply terminal, 24 V DC, with diagnostics and fuse	Potential supply terminal, 120…230 V AC, with fuse	Potential supply terminal, 120…230 V AC, with diagnostics and fuse	Potential supply terminal, arbitrary, with fuse
	KL9160 | KS9160	**KL9190** | KS9190	**KL9200**	**KL9210**	**KL9250**	**KL9260**	**KL9290**
	yes	–		yes	–	yes	–
							
	120 V AC/ 230 V AC	arbitrary	24 V DC	24 V DC	120 V AC/ 230 V AC	120 V AC/ 230 V AC	arbitrary up to 230 V AC/DC
	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A	≤ 10 A
	–	–	…6.3 A	…6.3 A	…6.3 A	…6.3 A	…6.3 A
	green	–	green	green	green	green	–
	–	–	red	red	red	red	–
	yes	yes	yes	yes	yes	yes	yes
	–	–	–	–	–	–	–
	typ. 10 mA	–	–	typ. 10 mA	–	typ. 10 mA	–
	yes	yes	yes	yes	yes	yes	yes
	–	–	–	–	–	–	–
	–	–	integrated fuse	integrated fuse	integrated fuse	integrated fuse	integrated fuse
	0…+55 °C	0…+55 °C	0…+55 °C	-25…+60 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
	approx. 50 g	approx. 50 g	approx. 50 g	approx. 55 g	approx. 55 g	approx. 55 g	approx. 50 g

System terminals | **Potential distribution**

The KL918x potential distribution terminals enable – depending upon the type – the distribution of ground or supply potentials to external devices. Wiring work and separate potential distributors are saved. Eight ground points are required for the ground connection of 8-channel output terminals in 2-wire operating mode, e.g. KL2008, for which the KL9187 can be used. The KL9184 and KL9188 HD Bus Terminals (High Density) even make 16 connection points available in a compact housing.

	Potential distribution terminal, 2 terminal points per power contact	Potential distribution terminal, 4 terminal points at 2 power contacts	Potential distribution terminal, 8 x 24 V
Technical data	**KL9180** | KS9180	**KL9185** | KS9185	**KL9186** | KS9186
Technology	potential distribution terminal		
Diagnostics in the process image	–		
			
Nominal voltage	arbitrary up to 230 V AC	arbitrary up to 230 V AC	≤ 60 V DC
Current load	≤ 10 A	≤ 10 A	≤ 10 A
Integrated fine-wire fuse	–	–	–
Power LED	–	–	–
Defect LED	–	–	–
PE contact	yes	–	–
Shield connection	–	–	–
Current consumption K-bus	–	–	–
Electrical isolation	–	–	yes
Connection to DIN rail	–	–	–
Special features	–	–	8 x 24 V connection
Operating temperature	0…+55 °C	-25…+60 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
Weight	approx. 50 g	approx. 50 g	approx. 50 g
Further information	KL9180	KL9185	KL9186

We reserve the right to make technical changes.

	Potential distribution terminal, 8 x 0 V	Potential distribution terminal, 2 x 8 connected terminal points	Potential distribution terminal, 8 x 2 connected terminal points	Potential distribution terminal, 1 x 16 connected terminal points	Potential distribution terminal, 8 x 24 V, 8 x 0 V	Potential distribution terminal, 16 x 24 V	Potential distribution terminal, 16 x 0 V
	KL9187 | KS9187	**KL9181**	**KL9182**	**KL9183**	**KL9184**	**KL9188**	**KL9189**
							
	≤ 60 V DC	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V AC/DC	≤ 60 V DC	≤ 60 V DC	≤ 60 V DC
	≤ 10 A	max. 10 A (per terminal point)	max. 10 A (per terminal point)	max. 10 A (per terminal point)	≤ 10 A	≤ 10 A	≤ 10 A
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	–	–	–	–	–	–	–
	yes	500 V (K-bus/ ield potential)	500 V (K-bus/ field potential)	500 V (K-bus/ field potential)	yes	yes	yes
	–	–	–	–	–	–	–
	8 x 0 V connection	2 x 8-way bridges	8 x 2-way bridges	16-way bridge	8 x 24 V and 8 x 0 V connection	16 x 24 V connection	16 x 0 V connection
	-25…+60 °C	0…+55 °C	0…+55 °C	0…+55 °C	-25…+60 °C	-25…+60 °C	-25…+60 °C
	CE, UL, Ex, GL	CE, UL	CE, UL	CE, UL	CE, UL, Ex, GL	CE, UL, Ex, GL	CE, UL, Ex, GL
	approx. 50 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g	approx. 60 g

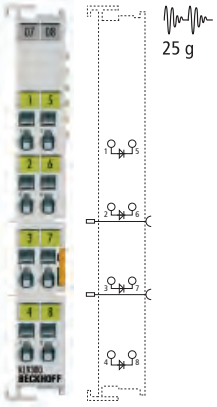
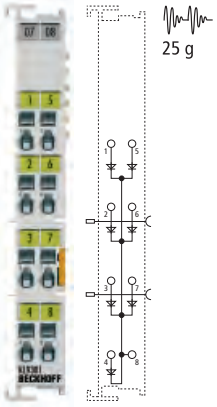
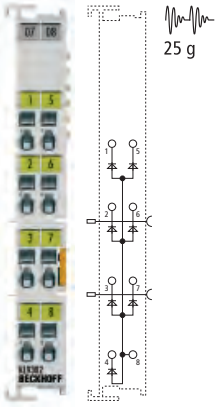
System terminals | **Function terminals**

	End terminal	End terminal with adapter for KL8001 power terminals	End terminal for bus extension	Coupler terminal for bus extension	Adapter terminal for manual operating modules
Technical data	**KL9010**	**KL9060**	**KL9020**	**KL9050**	**KL9309**
Technology	end terminal			coupler terminal	adapter terminal
	Each assembly must be terminated at the right hand end with a KL9010 bus end terminal.	The KL9060 Bus Terminal enables a connection to the KL8001. For further information see page 698	The KL9020 forms a properly working unit together with a KL9050 or a KL85xx. No further parameterisation or configuration work is necessary.	The KL9050 coupler terminal is the complement to a KL9020. The second RJ45 socket allows the whole system to be extended by 31 stations.	The KL9309 adapter terminal is connected via shielded ZK8500-8282-70x0 signal cable with the KL85xx manual operation modules. Further information see page 696
Nominal voltage	–	24 V DC (-15 %/+20 %)	–	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Current load	–	≤ 10 A	–	≤ 10 A	≤ 10 A
Power LED	–	–	–	green	green
Current consumption	–	–	typ. 70 mA (K-bus)	typ. 70 mA (24 V K-bus) + (total K-bus current)/4, max. 200 mA	–
Distance between stations	–	–	max. 5 m between KL9020 and KL9050	max. 5 m between KL9050 and KL9050	–
Starting current	–	–	–	2.5 x continuous current	–
Current supply K-bus	–	–	–	up to 400 mA	–
Electrical isolation	–	500 V (power contact/supply voltage/K-bus)	500 V (power contact/supply voltage/K-bus)	500 V (power contact/supply voltage/fieldbus)	500 V (power contact/supply voltage/fieldbus)
Special features	end terminal for bus communication	connection to KL8001 via 20-pin flat ribbon plug	end terminal for K-bus extension	coupler terminal for K-bus extension (max. 64 Bus Terminals)	passive Bus Terminal for the connection of KL85xx manual operating modules
Operating temperature	-25…+60 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE	CE, UL, Ex, GL	CE, UL, Ex, GL	CE
Weight	approx. 50 g	approx. 65 g	approx. 45 g	approx. 75 g	approx. 85 g
Further information	KL9010	KL9060	KL9020	KL9050	KL9309

We reserve the right to make technical changes.

System terminals | **Diode array Bus Terminals**

Diodes perform different tasks in control circuits. They decouple, rectify or provide for the free-running of a coil. The Bus Terminals unite diodes in different circuits and simplify integration into the control cabinet by their compact design. The circuits offered, with common anode or cathode and the individual diodes, minimise the wiring effort in the control cabinet.

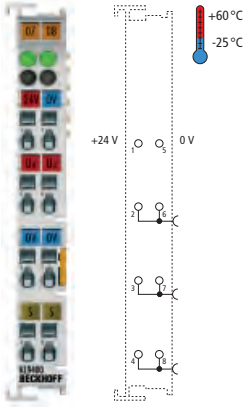
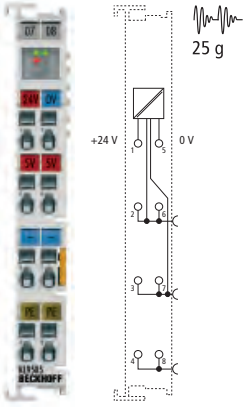
	Diode array terminal, 4 potential-free diodes	Diode array terminal, 7 diodes (with a common cathode)	Diode array terminal, 7 diodes (with a common anode)
Technical data	**KL9300** | KS9300	**KL9301** | KS9301	**KL9302** | KS9302
Technology	free-wheeling or decoupling diodes		
Number of diodes	4	7	
Interconnection	potential-free	common cathode	common anode
	 25 g	 25 g	 25 g
Nominal cut-off voltage	1000 V (diodes)	1000 V (diodes)	1000 V (diodes)
Output current	1 A on each diode	1 A on each diode	1 A on each diode
Peak current	2.5 A (100 ms)	2.5 A (100 ms)	2.5 A (100 ms)
Voltage drop	0.7 V typ.	0.7 V typ.	0.7 V typ.
Current consumption K-bus	–	–	–
Isolation voltage (channel/channel)	< 200 V	< 200 V	< 200 V
Electrical isolation	1500 V (K-bus/field)	1500 V (K-bus/field)	1500 V (K-bus/field)
Operating temperature	0…+55 °C	0…+55 °C	0…+55 °C
Approvals	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex
Weight	approx. 50 g	approx. 55 g	approx. 55 g
Further information	KL9300	KL9301	KL9302

We reserve the right to make technical changes.

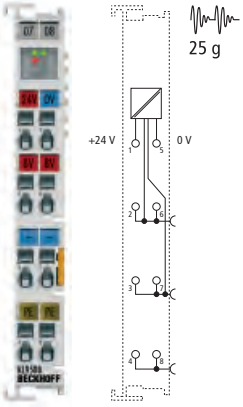
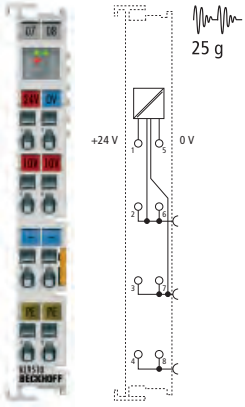
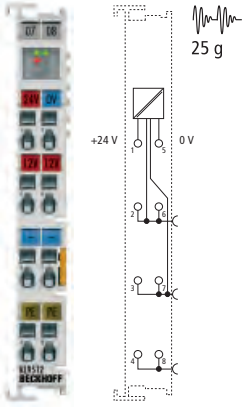
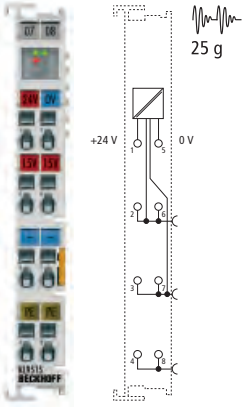
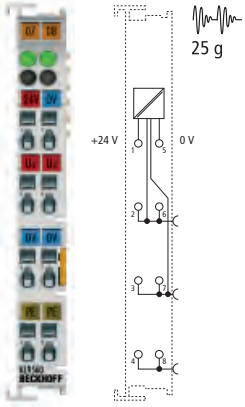
System terminals | **Power supply terminals**

The KL94xx and KL95xx terminal series are designed for the modified feeding of the operating voltage into the terminal strand. The KL9400 power supply terminal enables the refreshment of the K-bus, via which data exchange takes place between Bus Couplers and Bus Terminals. Each Bus Terminal requires a certain amount of current from the K-bus (see technical data: "Current consumption K-bus"). This current is fed into the K-bus by the relevant Bus Coupler's power supply unit. When configuring a large number of Bus Terminals, the 5 V power supply to the K-bus can be increased by 2 A via the KL9400.

The KL95xx power supply terminals produce different output voltages from the input voltage (24 V DC) that can be accessed at the terminals. The following Bus Terminals are also supplied with this voltage via the power contacts. The power LEDs indicate the operating states of the terminals; short-circuits or overloads are indicated by the overcurrent LEDs. There is no electrical isolation of the input and output voltage.

	Power supply terminal for refreshing the K-bus	Power supply terminal, 5 V DC
Technical data	**KL9400** | KS9400	**KL9505** | KS9505
Technology	power supply terminal	power supply terminal with overcurrent LED
Diagnostics in the process image	–	
		 The KL9505 generates 5 V from the fed-in 24 V without electrical isolation.
Input voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Output voltage	5 V DC	5 V DC ±1 %
Output current	2 A for K-bus supply	0.5 A
Short-circuit-proof	yes	yes
Residual ripple	–	< 5 mV
Current consumption K-bus	–	–
Electrical isolation	–	–
Special features	–	stabilised output voltage, overcurrent LED
Operating temperature	-25…+60 °C	0…+55 °C
Approvals	CE, UL, Ex, GL	CE, UL, Ex
Weight	approx. 65 g	approx. 65 g
Further information	KL9400	KL9505

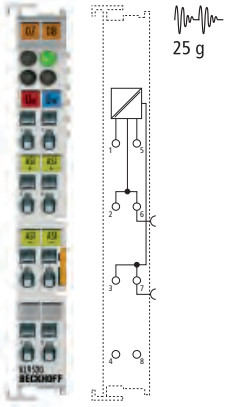
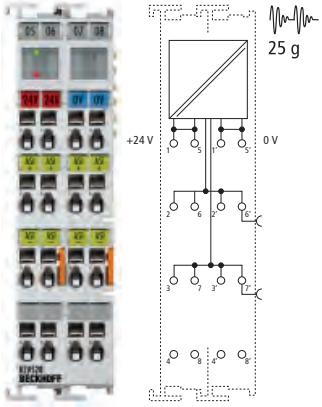
We reserve the right to make technical changes.

	Power supply terminal, 8 V DC	Power supply terminal, 10 V DC	Power supply terminal, 12 V DC	Power supply terminal, 15 V DC	Power supply terminal, 24 V DC, electrical isolation
	KL9508 | KS9508	**KL9510** | KS9510	**KL9512** | KS9512	**KL9515** | KS9515	**KL9560** | KS9560
					power supply terminal, 24 V DC
					yes
					
	The KL9508 generates 8 V from the fed-in 24 V without electrical isolation.	The KL9510 generates 10 V from the fed-in 24 V without electrical isolation.	The KL9512 generates 12 V from the fed-in 24 V without electrical isolation.	The KL9515 generates 15 V from the fed-in 24 V without electrical isolation.	The KL9560 generates potential-free 24 V from the fed-in 24 V with electrical isolation.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	8 V DC ±1 %	10 V DC ±1 %	12 V DC ±1 %	15 V DC ±1 %	24 V DC (-15 %/+5 %)
	0.5 A	0.5 A	0.5 A	0.5 A	≤ 0.1 A
	yes	yes	yes	yes	yes, automatic restart
	< 5 mV	< 5 mV	< 5 mV	< 5 mV	no data
	–	–	–	–	–
	–	–	–	–	1500 V AC constant load input/output voltage
	stabilised output voltage, overcurrent LED	stabilised output voltage, overcurrent LED	stabilised output voltage, overcurrent LED	stabilised output voltage, overcurrent LED	analog voltage with electrical isolation
	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C	0…+55 °C
	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex	CE, UL, Ex, GL
	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g	approx. 65 g
	KL9508	KL9510	KL9512	KL9515	KL9560

System terminals | **AS-Interface**

An AS-Interface network consists of a special power supply unit, a master and a larger number of slaves. Each communication device is connected in parallel to the AS-Interface cable, and receives its supply voltage and also exchanges its data via this connection. The transmitter changes its current consumption according to its transmission bits. The AS-Interface power supply unit converts this current change into a voltage change, which can be measured by all devices.
An AS-Interface power supply unit supplies the network with a voltage of 30 V DC in order to ensure that sufficient voltage is available to all devices with maximum cable length and maximum current consumption.

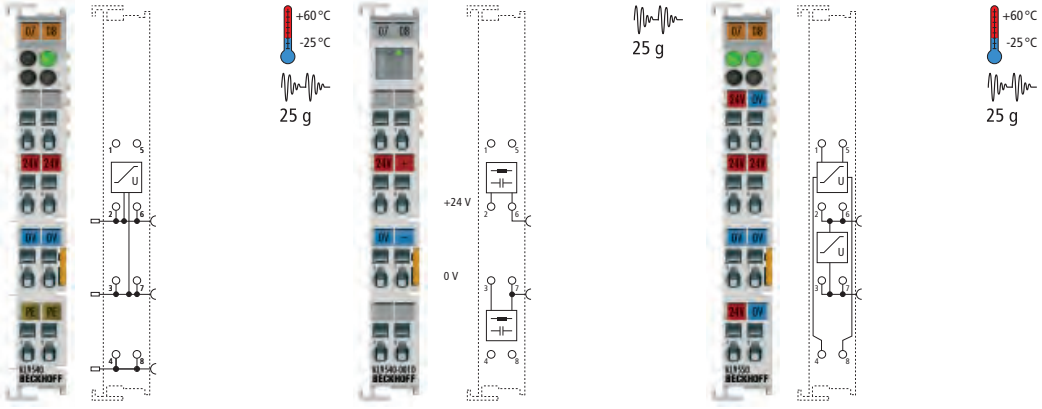
The KL9528 Bus Terminal is an AS-Interface power supply unit with an output current of up to 1.25 A. The AS-Interface supply voltage of 30 V DC is generated from the 24 V DC control voltage. The KL9520 Bus Terminal is intended for AS-Interface Power24V applications. Thanks to an internal circuit, the 24 V DC control voltage is usable for a simple AS-Interface network. An AS-Interface voltage of 24 V DC is sufficient in many small networks if the cable lengths and current consumption do not cause a large voltage drop.

	AS-Interface potential feed terminal with filter	AS-Interface power supply terminal 24 V DC/30 V DC, 1.25 A
Technical data	**KL9520** | KS9520	**KL9528** | KS9528
Technology	potential feed terminal	power supply terminal
Diagnostics	–	
		
	The KL9520 potential feed terminal uncouples the input and output signal through an integrated filter and enables the supply of AS-Interface networks from standard power supply units or another AS-Interface network.	The KL9528 power supply terminal generates a 30 V DC output voltage from the 24 V DC control voltage with high-frequency decoupling for the operation of an AS-Interface network. The connection to the KL6201 AS-Interface master is established via plugs.
Input voltage	up to 35 V DC	21…28.8 V DC
Output voltage	up to 35 V DC	30 V DC (+5 %/- 5 %)
Output current	–	max. 1.25 A
Short circuit current	–	max. 1.3 A
Current load	max. 2 A	–
Current consumption K-bus	–	typ. 10 mA
Electrical isolation	–	1500 V AC constant load field side/K-bus
Special features	no electrical isolation	–
Operating temperature	0…+55 °C	0…+55 °C
Approvals	CE	CE
Weight	approx. 90 g	approx. 150 g
Further information	KL9520	KL9528

We reserve the right to make technical changes.

System terminals | **Surge filter system and field supply**

	System terminal, surge filter field supply	System terminal, surge filter field supply for analog terminals	System terminal, surge filter system and field supply
Technical data	**KL9540** | KS9540	**KL9540-0010**	**KL9550** | KS9550
Technology	surge filter field supply		surge filter system and field supply
Diagnostics	–		



The KL9540 system terminal contains an overvoltage filter for the 24 V field supply, the KL9550 for the 24 V field and system supply. The filter protects the Bus Terminals from line-bound surge voltages that can occur due to high-energy disturbances such as switching overvoltages at inductive consumers or lightning strikes at the supply lines. The Bus Terminals KL9540 or KL9550 protect the Bus Terminal station from damage in particularly harsh environments. The use of such overvoltage filters is stipulated by the ship classification organisations in shipbuilding and on/offshore applications in which GL certification is required.

The KL9540-0010 is intended in particular for the protection of analog terminals; the standard variant KL9540 for digital terminals. The terminal does not transfer process data to the higher-level control system.

Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Surge filter field supply	yes	yes	yes
Surge filter system supply	–	–	yes
Rated current field supply	≤ 10 A	≤ 5 A	≤ 10 A
Rated current system supply	–	–	≤ 0.5 A
PE connection	yes	–	–
Operating temperature	-25…+60 °C	0…+55 °C	-25…+60 °C
Approvals	CE, UL, Ex, GL	CE, UL, GL	CE, UL, Ex, GL
Weight	approx. 40 g	approx. 65 g	approx. 50 g
Further information	KL9540	KL9540-0010	KL9550

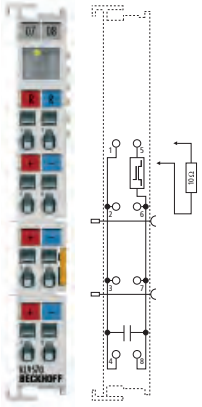
System terminals | **Buffer capacitor terminal**

The KL9570 Bus Terminal contains high-performance capacitors for stabilising supply voltages. It can be used in connection with small drive terminals. Low internal resistance and high pulsed current capability enable good buffering in parallel with a power supply unit. Return currents are stored, particularly in the context of drive applications, thereby preventing overvoltages. If the fed back energy exceeds the capacity of the capacitors, the KL9570 switches the load voltage through to the terminal points 1 and 5. The energy is dissipated by the connection of the external ZB8110 ballast resistor.

KL25xx | Motion terminals see page 651

ZB8110 | External ballast resistor see page 848

	Buffer capacitor terminal
Technical data	**KL9570** | KS9570
Technology	buffer capacitor terminal
Diagnostics	–



25 g

The KL9570 buffers the connected voltage via its integrated capacitors and connects the external ballast resistor if the internal voltage of approx. 56 V is exceeded.

Nominal voltage	50 V
Capacity	500 µF
Ripple current (max.)	10 A @ 100 kHz
Internal resistance	< 20 mΩ @ 100 kHz
Surge voltage protection	> 56 V
Recommended ballast resistor	ZB8110
Overvoltage control range	±2 V
Ballast resistor clock rate	load-dependent, 2-point control
Electrical isolation	1500 V (K-bus/field potential)
Operating temperature	0…+55 °C
Approvals	CE, Ex
Weight	approx. 65 g
Further information	KL9570

We reserve the right to make technical changes.

Ordering instructions for special terminals and couplers

All Bus Couplers and Bus Terminals are supplied with a standard configuration. The settings can be found on the relevant catalog pages. In addition to this standard configuration, specific coupler and terminal types with modified software or hardware are available. These variants have an order number with additional four figures. Therefore, if you do require a configuration other than standard, quote this extended number when you place your order. The following table provides a summary of the Bus Couplers and Bus Terminals that are available with modified default settings.

Ordering information	
Bus Coupler	
BK8100-0060	watchdog special setting 60 s
BK8100-1001	watchdog special setting 10 s
BK9055-1000	EtherNet/IP "Compact" Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), default IP address: 192.168.1.xxx
BK9105-1000	EtherNet/IP Bus Coupler for up to 64 Bus Terminals (255 with K-bus extension), default IP address: 192.168.1.xxx
Digital input	
KL1052-0010	96 V DC positive and negative switching, not in accordance with the EN 61131-2 specifications: I high = 3 mA, I low = 0.5 mA
KL1232-0001	plus-switching, positive edge-triggered input, 10 ms pulse extension, input filter 0.2 ms
KL1232-0002	plus-switching, positive edge-triggered input, 20 ms pulse extension, input filter 0.2 ms
KL1232-0010	plus-switching, positive edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-0100	plus-switching, negative edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-0110	plus-switching, negative edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-1000	negative switching, positive edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-1001	5 V, negative switching, negative edge-triggered input, 20 ms pulse extension, input filter 0.2 ms
KL1232-1010	negative switching, positive edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-1100	negative switching, negative edge-triggered input, 100 ms pulse extension, input filter 0.2 ms
KL1232-1110	negative switching, negative edge-triggered input, 100 ms pulse extension, input filter 3.0 ms
KL1232-2000	plus switching, positive edge-triggered input, 200 ms pulse extension, input filter 0.2 ms
KL1501-0010	gate-counter with auto-reset and setting A0
KL1501-0011	up/down counter with 5 V inputs, 24 V DC outputs
KL1702-0010	230 V AC input circuit with type 2 characteristics
KL1712-0010	24 V AC/DC input circuit
Digital output	
KL2502-0012	time-delayed setting of the outputs
KL2502-3020	5 V output, 30 kHz limit frequency
KL2521-0010	with additional outputs (230 V AC/DC, 100 mA) instead of the additional inputs of the default variant
KL2521-0024	for 24 V signal level
KL2541-0006	stepper motor terminal 50 V DC, 5 A, 5 V encoder supply
KL2692-1001	2 digital inputs, 2 potential-free relays, end terminal variant
KL2702-0002	2-channel solid state load relay up to 230 V AC/DC, 2 A
KL2702-0020	2-channel solid state load relay up to 230 V AC/DC, 1.5 A
KL2722-0010	without reciprocal locking of the channels, total current 1 A
KL2732-0010	without reciprocal locking of the channels, total current 1 A
KL2751-0011	dimmer terminal without power contacts
KL2751-1200	dimmer terminal for 120 V AC
KL2761-0011	1-channel universal dimmer terminal, 230 V AC, 600 VA (W), 50 Hz, without power contacts
KL2791-0011	1-channel AC motor speed controller, 230 V AC, 200 VA, max. 0.9 A, without power contacts
KL2791-1200	1-channel AC motor speed controller, 120 V AC, 100 VA
Analog input	
KL3002-0010	Siemens S5 format
KL3002-0011	fast µP, scan time approx. 0.5 ms
KL3002-0050	Siemens S7 format
KL3012-0011	altered range: 0…21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL3012-0012	fast µP, scan time approx. 0.5 ms
KL3012-0050	Siemens S7 format
KL3022-0010	Siemens S5 format
KL3022-0011	fast µP, scan time approx. 0.5 ms

KL3022-0050	Siemens S7 format
KL3042-0010	Siemens S5 format
KL3042-0011	fast µP, scan time approx. 0.5 ms
KL3042-0012	altered range: 0…21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL3042-0050	Siemens S7 format
KL3052-0010	Siemens S5 format
KL3052-0011	fast µP, scan time approx. 0.5 ms
KL3052-0012	changed diagnostic level (< 3.5 mA or > 21.5 mA)
KL3052-0050	Siemens S7 format
KL3054-0050	Siemens S7 format
KL3062-0010	Siemens S5 format
KL3062-0011	voltage level 0…20 V
KL3062-0012	fast µP, scan time approx. 0.5 ms
KL3062-0013	voltage level 0…30 V
KL3062-0014	voltage level 0…50 V
KL3062-0050	Siemens S7 format
KL3064-0010	Siemens S5 format
KL3064-0011	voltage level 0…20 V
KL3064-0050	Siemens S7 format
KL3102-0050	Siemens S7 format
KL3112-0050	Siemens S7 format
KL3122-0050	Siemens S7 format
KL3172-0500	2-channel analog input terminal, 0…500 mV
KL3202-0010	PT200
KL3202-0011	PT200 in Siemens S5 format
KL3202-0012	PT500
KL3202-0013	PT500 in Siemens S5 format
KL3202-0014	PT1000
KL3202-0015	PT1000 in Siemens S5 format
KL3202-0016	Ni100
KL3202-0017	Ni100 in Siemens S5 format
KL3202-0020	resistance measurement 0…1.2 kΩ
KL3202-0021	PT100 in Siemens S5 format
KL3202-0023	Ni120
KL3202-0024	Ni120 in Siemens S5 format
KL3202-0025	Ni1000
KL3202-0026	Ni1000 in Siemens S5 format
KL3202-0027	resistance measurement 10…10 kΩ
KL3202-0028	Resolution increased to 0.01 °C; the measurement range is reduced to -40 °C to +128 °C. The absolute accuracy is 0.3 °C, differential error is 0.1 °C.
KL3202-0029	Ni1000 per Landis&Staefa characteristic curve (Siemens, 100° corresponds to 1500 Ω)
KL3204-0014	PT1000
KL3204-0021	PT100 in Siemens S5 format
KL3204-0025	Ni1000, 4-channel
KL3204-0029	Ni1000 per Landis&Staefa characteristic curve (Siemens, 100° corresponds to 1500 Ω)
KL3312-0010	type J
KL3312-0011	type J in Siemens S5 format
KL3312-0012	type L
KL3312-0013	type L in Siemens S5 format
KL3312-0014	type B
KL3312-0015	type B in Siemens S5 format
KL3312-0016	type E
KL3312-0017	type E in Siemens S5 format
KL3312-0018	type N
KL3312-0019	type N in Siemens S5 format
KL3312-0020	type R
KL3312-0021	type R in Siemens S5 format

We reserve the right to make technical changes.

KL3312-0022	type S
KL3312-0023	type S in Siemens S5 format
KL3312-0024	type T
KL3312-0025	type T in Siemens S5 format
KL3312-0026	type U
KL3312-0027	type U in Siemens S5 format
KL3312-0028	0…120 mV measurement
KL3312-0029	type K in Siemens S5 format
KL3312-0040	expanded temperature range for type S and L type S: -50…+1700 °C (as supplied type L: -100…+900 °C)
KL3312-0110	type J, Fahrenheit scaling
KL3312-2000	setting of reference junction temperature via process image, unit 1/256° C in a 16 bit word
KL3312-2100	external reference point temperature specification via process image is possible, the unit is 1/256 °C in 16-bit format, fast conversion time 65 ms
KL3351-0001	1-channel resistor bridge terminal (strain gauge), with faster measurement time approx. 10 ms
KL3403-0010	3-phase power measurement terminal, current path designed for 5 A transducer (1 % measuring accuracy I)
KL3403-0020	3-phase power measurement terminal, current path designed for 20 mA, optimised for electronic current transformer
KL3403-0022	3-phase power measurement terminal, current path and voltage input designed for 20 mA
KL3403-0333	3-phase power measurement terminal, 500 V AC, 333 mV AC
KM3701-0340	differential pressure up to 340 hPa
Analog output	
KL4002-0010	Siemens S5 format
KL4002-0011	fast µP, scan time approx. 0.15 ms
KL4002-0050	Siemens S7 format
KL4004-0050	Siemens S7 format
KL4012-0010	Siemens S5 format
KL4012-0011	altered range: 0…21.5 mA, maximum value corresponds to 21.5 mA instead of 20 mA
KL4012-0050	Siemens S7 format
KL4022-0010	Siemens S5 format
KL4022-0050	Siemens S7 format
KL4032-0010	Siemens S5 format
KL4032-0011	fast µP, scan time approx. 0.15 ms
KL4032-0050	Siemens S7 format
KL4034-0010	Siemens S5 format
KL4112-0010	Siemens S5 format
KL4112-0050	Siemens S7 format
KL4132-0010	Siemens S5 format
KL4132-0050	Siemens S7 format
Special functions	
KL5111-0010	A, B, C signals: 5 V inputs
KL5111-0011	special function: latch input sets counter to zero
KL5111-0012	latches on both edges, A, B, C inputs 24 V
KL5111-0013	latches on both edges, A, B, C inputs 5 V
KL5111-0015	frequency measurement over a selectable time window; 24 V inputs
KL5111-0016	frequency measurement over a selectable time window; 5 V inputs
KL5111-0020	12 V input circuit
KL5151-0021	incremental encoder 1 x 32 bit A, B, capture input and 1 driver output 24 V, 0.5 A
KL5151-0050	incremental encoder 2 x 32 bit A, B-track
KL6001-0020	standard format 5 bytes of user data
KL6011-0020	standard format 5 bytes of user data
KL6021-0020	standard format 5 bytes of user data (rest default)
KL6021-0021	standard format 5 bytes of user data (7 bits, even, 1 stop bit, 9600 baud)
KL6201-0010	preset to 22 bytes K-bus interface, supports up to 31 AS-Interface slaves (2 K-bus cycles)
KL6201-0011	preset to 38 bytes K-bus interface, supports up to 62 AS-Interface slaves (4 K-bus cycles)
KL6211-0011	preset to 38 bytes K-bus interface, supports up to 62 AS-Interface slaves (4 K-bus cycles)
KL6904-0001	TwinSAFE Logic Bus Terminal, pre-configured ex factory to 15 TwinSAFE connections
System terminals	
KL9210-0020	with 2 A fuse (slow-blow) and modified label

Highlights

- Open, fieldbus-neutral I/O system
- 12 fieldbus systems, 24 signal types
- Compact and robust
- Mounting directly on machines, outside of control cabinet or terminal box
- IO-Link box modules for inexpensive point-to-point connections

Fieldbus Box

The compact IP 67 modules

▸ FieldbusBox

716 Product overview
719 System description
720 Features
722 Technical data

726 **Fieldbus systems**

727 EtherCAT IL230x-B110
727 Lightbus IPxxxx-B200, IL230x-B200
728 PROFIBUS IPxxxx-B31x, IL230x-B31x, IL230x-C31x
729 Interbus IPxxxx-B400, IL230x-B400
730 CANopen IPxxxx-B51x, IL230x-B51x
731 DeviceNet IPxxxx-B52x, IL230x-B52x
732 Modbus IPxxxx-B730, IL230x-B730
732 RS485/RS232 IPxxxx-B8x0, IL230x-B8x0, IL230x-C810
734 Ethernet IL230x-B90x, IL230x-C900
735 PROFINET IL230x-B903
735 EtherNet/IP IL230x-B905

736 **Signal types Coupler Box**

738 Digital combi IL230x-Bxxx

736 **Signal types PLC Box**

740 Digital combi IL230x-Cxxx

742 **Signal types Compact Box**

746 Digital input IP1xxx-Bxxx
748 Digital output IP2xxx-Bxxx
752 Digital combi IP23xx-Bxxx, IP24xx-Bxxx
756 Analog input IP3xxx-Bxxx
758 Analog output IP4xxx-Bxxx
760 Special functions IP5xxx-Bxxx, IP6xxx-Bxxx

744 **Signal types Extension Box**

746 Digital input IE1xxx
748 Digital output IE2xxx
752 Digital combi IE23xx, IE24xx
756 Analog input IE3xxx
758 Analog output IE4xxx
760 Special functions IE5xxx, IE6xxx

764 **IO-Link box (industrial housing)**

766 Digital input EPI1xxx
768 Digital output EPI2xxx
770 Digital combi EPI23xx
772 Analog input EPI3xxx
773 Analog output EPI4xxx

764 **IO-Link box (zinc die-cast housing)**

766 Digital input ERI1xxx
768 Digital output ERI2xxx
770 Digital combi ERI23xx
772 Analog input ERI3xxx
773 Analog output ERI4xxx

1020 **Software**

1020 Programming system TwinCAT
842 Configuration software KS2000

774 **Fieldbus Modules**

774 EtherCAT Fieldbus Module FM33xx-B110
776 PROFIBUS Fieldbus Module FM33xx-B310

800 **Accessories**

Product overview Compact Box, Coupler Box, PLC Box, Extension Box

Fieldbus Box	Compact Box		Coupler Box		PLC Box	
Fieldbus	Fieldbus Box without IP-Link interface		Fieldbus Box with IP-Link interface		Controller IEC 61131-3 with IP-Link interface	
EtherCAT			IL230x-B110 727			
LIGHTBUS	IPxxxx-B200 727		IL230x-B200 727			
PROFIBUS	IPxxxx-B310 728	IPxxxx-B318 728 with integrated tee-connector	IL230x-B310 728	IL230x-B318 728 with integrated tee-connector	IL230x-C310 729	IL230x-C318 729 with integrated tee-connector
InterBus	IPxxxx-B400 729		IL230x-B400 729			
CANopen	IPxxxx-B510 730	IPxxxx-B518 730 with integrated tee-connector	IL230x-B510 730	IL230x-B518 730 with integrated tee-connector		
DeviceNet	IPxxxx-B520 731	IPxxxx-B528 731 with integrated tee-connector	IL230x-B520 731	IL230x-B528 731 with integrated tee-connector		
Modbus	IPxxxx-B730 732		IL230x-B730 732			
RS485	IPxxxx-B800 732		IL230x-B800 733			
RS232	IPxxxx-B810 733		IL230x-B810 733		IL230x-C810 733	
Ethernet TCP/IP			IL230x-B900 734	IL230x-B901 734	IL230x-C900 734	
PROFINET			IL230x-B903 735			
EtherNet/IP			IL230x-B905 735			

Fieldbus Box | Compact Box and Extension Box: Digital I/O

Input		8 mm	M8	M12
24 V DC	8-channel filter 3.0 ms	IP1000-Bxxx, IE1000 746	IP1001-Bxxx, IE1001 747	IP1002-Bxxx, IE1002 747
	8-channel filter 0.2 ms	IP1010-Bxxx, IE1010 746	IP1011-Bxxx, IE1011 747	IP1012-Bxxx, IE1012 747
Counter	2-channel up/down counter 24 V DC, 100 kHz			IP1502-Bxxx, IE1502 747

Output		8 mm	M8	M12
24 V DC	8-channel I_{MAX} = 0.5 A	IP2000-Bxxx, IE2000 748	IP2001-Bxxx, IE2001 748	IP2002-Bxxx, IE2002 749
	8-channel I_{MAX} = 2 A, ∑ 4 A	IP2020-Bxxx, IE2020 749	IP2021-Bxxx, IE2021 749	IP2022-Bxxx, IE2022 749
	8-channel I_{MAX} = 2 A, ∑ 12 A	IP2040-Bxxx, IE2040 750	IP2041-Bxxx, IE2041 750	IP2042-Bxxx, IE2042 750
	16-channel I_{MAX} = 0.5 A, ∑ 4 A, D-sub socket			IE2808 751 IE2808-0001 751
PWM	2-channel PWM, 24 V DC, I_{MAX} = 2.5 A			IP2512-Bxxx, IE2512 751

We reserve the right to make technical changes.

Fieldbus Box | Compact Box, Coupler Box, PLC Box and Extension Box: Digital I/O

Combi		8 mm		M8		M12	
24 V DC	8-channel 4 inputs + 4 outputs, filter 3.0 ms, I_{MAX} = 0.5 A	IL2300-Bxxx	738	IL2301-Bxxx	738	IL2302-Bxxx	738
		IL2300-Cxxx	740	IL2301-Cxxx	740	IL2302-Cxxx	740
		IP2300-Bxxx, IE2300	752	IP2301-Bxxx, IE2301	753	IP2302-Bxxx, IE2302	753
	8-channel 4 inputs + 4 outputs, filter 0.2 ms, I_{MAX} = 0.5 A	IP2310-Bxxx	752	IP2311-Bxxx	753	IP2312-Bxxx	753
		IE2310	752	IE2311	753	IE2312	753
	8-channel 4 inputs + 4 outputs, filter 3.0 ms, I_{MAX} = 2 A, ∑ 4 A	IP2320-Bxxx	754	IP2321-Bxxx	754	IP2322-Bxxx	755
		IE2320	754	IE2321	754	IE2322	755
	8-channel 4 inputs + 4 outputs, filter 0.2 ms, I_{MAX} = 2 A, ∑ 4 A	IP2330-Bxxx	754	IP2331-Bxxx	754	IP2332-Bxxx	755
		IE2330	754	IE2331	754	IE2332	755
	16-channel combi inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A	IP2400-Bxxx	755	IP2401-Bxxx	755		
		IE2400	755	IE2401	755		
	16-channel combi inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A, IP 20 connector	IE2403	753				

Fieldbus Box | Compact Box and Extension Box: Analog I/O

Input		M12	
±10 V	4-channel differential inputs, 16 bit	IP3102-Bxxx, IE3102	756
0/4…20 mA	4-channel differential inputs, 16 bit	IP3112-Bxxx, IE3112	757
Resistance thermometer	4-channel resistance thermometer (RTD), PT100, PT200, PT500, PT1000, Ni100, 16 bit	IP3202-Bxxx, IE3202	757
Thermocouple/mV	4-channel thermocouple, type J, K, L, B, E, N, R, S, T, U, 16 bit	IP3312-Bxxx, IE3312	757

Output		M12	
±10 V	4-channel 16 bit	IP4132-Bxxx, IE4132	758
0/4…20 mA	4-channel 16 bit	IP4112-Bxxx, IE4112	758

Fieldbus Box | Compact Box and Extension Box: Special functions

Function		M12		M23	
Position measurement	1-channel SSI encoder interface			IP5009-Bxxx, IE5009	760
	1-channel incremental encoder interface, 1 MHz			IP5109-Bxxx, IE5109	761
	1-channel SinCos encoder interface			IP5209-Bxxx (1 V_{PP})	761
				IP5209-Bxxx-1000 (11 μA_{PP})	
Communication	1-channel serial interface, RS232	IP6002-Bxxx, IE6002	762		
	1-channel serial interface, 0 … 20 mA (TTY)	IP6012-Bxxx, IE6012	763		
	1-channel serial interface, RS422/RS485	IP6022-Bxxx, IE6022	763		

We reserve the right to make technical changes.

Product overview IO-Link box

Fieldbus Box | IO-Link box: Digital I/O

Input		8 x M8	16 x M8	4 x M12	8 x M12
24 V DC	8-channel filter 3.0 ms	EPI1008-0001 766 ERI1008-0001 766		EPI1008-0002 766 ERI1008-0002 766	
	16-channel filter 3.0 ms		EPI1809-0021 767 ERI1809-0021 767		EPI1809-0022 767 ERI1809-0022 767
Output		**8 x M8**	**16 x M8**	**4 x M12**	**8 x M12**
24 V DC	8-channel I_{MAX} = 0.5 A	EPI2008-0001 768 ERI2008-0001 768		EPI2008-0002 768 ERI2008-0002 768	
	16-channel I_{MAX} = 0.5 A, ∑ 4 A		EPI2809-0021 769 ERI2809-0021 769		EPI2809-0022 769 ERI2809-0022 769
Combi		**8 x M8**	**16 x M8**	**4 x M12**	**8 x M12**
24 V DC	8-channel 8 inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A	EPI2338-0001 770 ERI2338-0001 770		EPI2338-0002 770 ERI2338-0002 770	
	16-channel 16 inputs/outputs, filter 3.0 ms, I_{MAX} = 0.5 A, ∑ 4 A		EPI2339-0021 771 ERI2339-0021 771		EPI2339-0022 771 ERI2339-0022 771

Fieldbus Box | IO-Link box: Analog I/O

Input		M12
±10 V, 0/4…20 mA	4-channel parameterisable, differential input, 16 bit	EPI3174-0002 772 ERI3174-0002 772
Output		**M12**
±10 V, 0/4…20 mA	4-channel 2 inputs + 2 outputs, parameterisable, 16 bit	EPI4374-0002 773 ERI4374-0002 773

EPIxxxx: industrial housing in IP 67, ERIxxxx: zinc die-cast housing in IP 67

We reserve the right to make technical changes.

The Fieldbus Box

The Beckhoff Fieldbus Box system is the culmination of the fieldbus concept:

Robust
Robust construction allows fieldbus modules to be fitted directly to machines. Control cabinets and terminal boxes are now no longer required.

Sealed
The modules meet the protection class IP 65, IP 66 and IP 67, are fully casted and thus ideally prepared for use in wet, dirty and dusty working environments.

Small
The modules are extremely small and are thus suitable for use in applications where there is very little space available. The low weight of the Fieldbus Box modules makes them useful in applications where the I/O interface is in motion (e.g. on a robot arm).

Open
All the most important fieldbus systems are supported. This substantially frees electrical design from the particular bus system in use. Fast, flexible reactions to customers' requirements are possible. The Fieldbus Box modules are, of course, certified by the respective fieldbus user organisations, and can be combined with Beckhoff Bus Terminals and with devices from third-party manufacturers.

Modular
Conventional fieldbuses such as PROFIBUS or CANopen are connected via Coupler Box modules. These are modularly extendable through cost-effective extension modules.

Quickly wired
The wiring of the fieldbus and of signals is significantly simplified through the use of pre-assembled cables. Wiring errors are minimised and the system setup is finished quickly.

Flexible
In addition to the pre-assembled cables, field wireable connectors and cables are also available for maximum flexibility.

Economical
Combined I/O modules and fine signal granularity lead to low system costs – you only have to buy what you really need.

Intelligent
Even the standard modules are intelligent fieldbus devices – with self-diagnosis and versatile functions. The Fieldbus Box is furthermore available as a small local controller – the PLC Box: programmable in all five languages in accordance with IEC 61131-3, with floating point arithmetic and with sufficient performance and memory for the majority of decentralised control and regulation tasks.

Complete
The wide variety of signal types allows the connection of almost any kind of sensor. The communication modules enable decentralised connection of, e.g., label printers, identification systems or special equipment. The Fieldbus Box range also includes encoder interfaces for displacement and angle measurement.

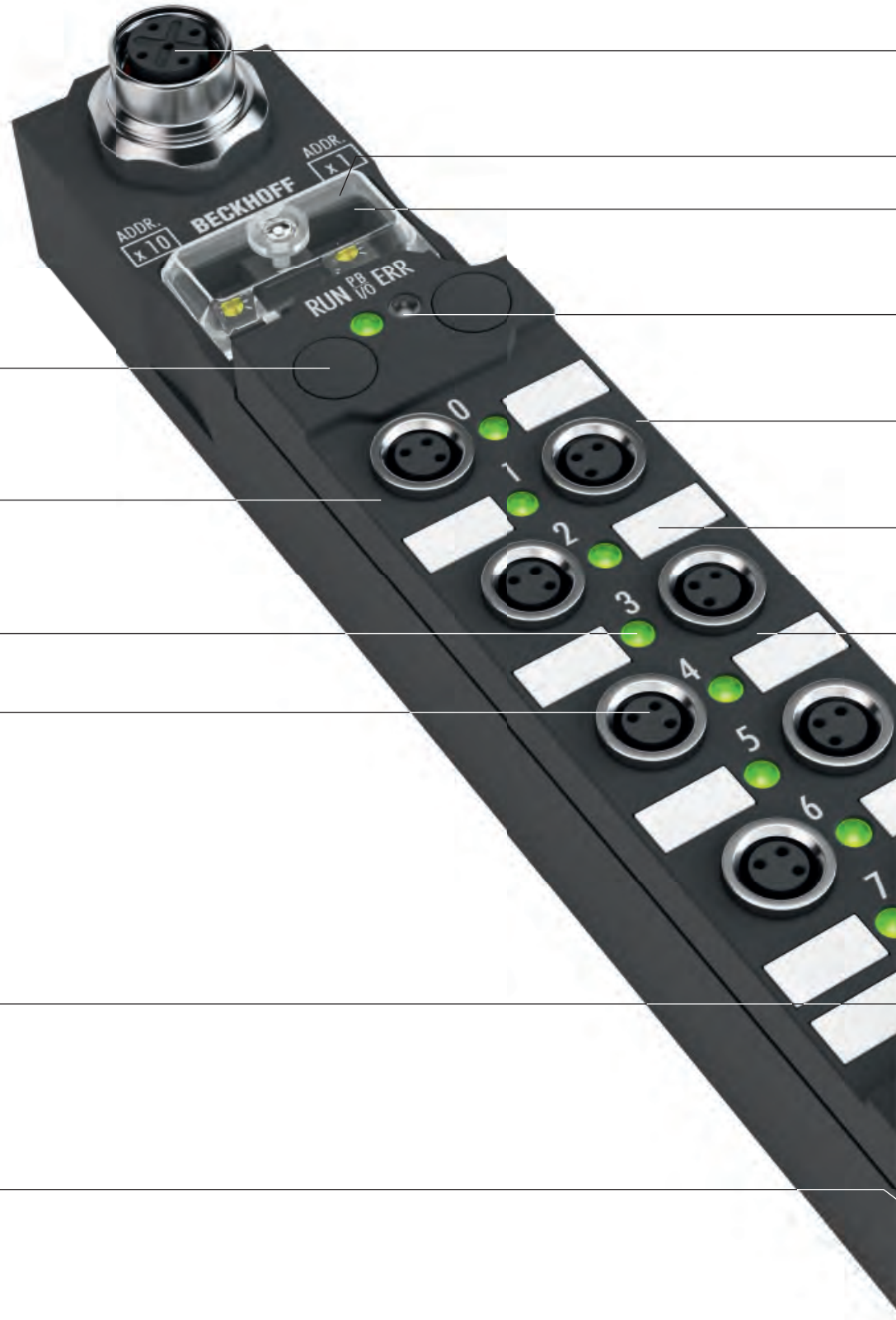
Fitting
Sensors and actuators are connected through 8 mm diameter snap type or through screw type connectors (M8 or M12). The snap type connectors lock in place positively, forming a vibration-proof connection, while the screw type connectors offer the advantage of high resistance to being pulled out.

Compatible
The Fieldbus Box devices behave very much like the Beckhoff Bus Terminals – this means that the ideal distributed peripheral device can be used, whatever the particular application.

IO-Link
The Fieldbus Box modules with IO-Link interface complement the connection possibilities at the sensor/actuator level. This way, IO-Link and standard sensors can be acquired with one IO-Link master.

We reserve the right to make technical changes.

Fieldbus Box features



IP-Link interface on the Coupler Box and PLC Box for the connection of extension modules

Watertight and dust-proof, due to protection class IP 65/66/67 (fully potted)

Signal status display

Connection of sensors/ actuators via connector:
- M8, screw type
- M12, screw type
- 8 mm, snap type

Power supply input
- box supply
- auxiliary voltage

Mounting holes

Fieldbus interface (connection depends on the particular fieldbus)

Hinged inspection window

Address selection switch and diagnostic interface

Fieldbus status display
Module or IP-Link status display

Robust housing for industrial application

Standard labels

Ultra compact dimensions 175 x 30 x 26.5 mm (H x W x D)

Power supply status display: box supply and auxiliary voltage

Power supply downstream connection

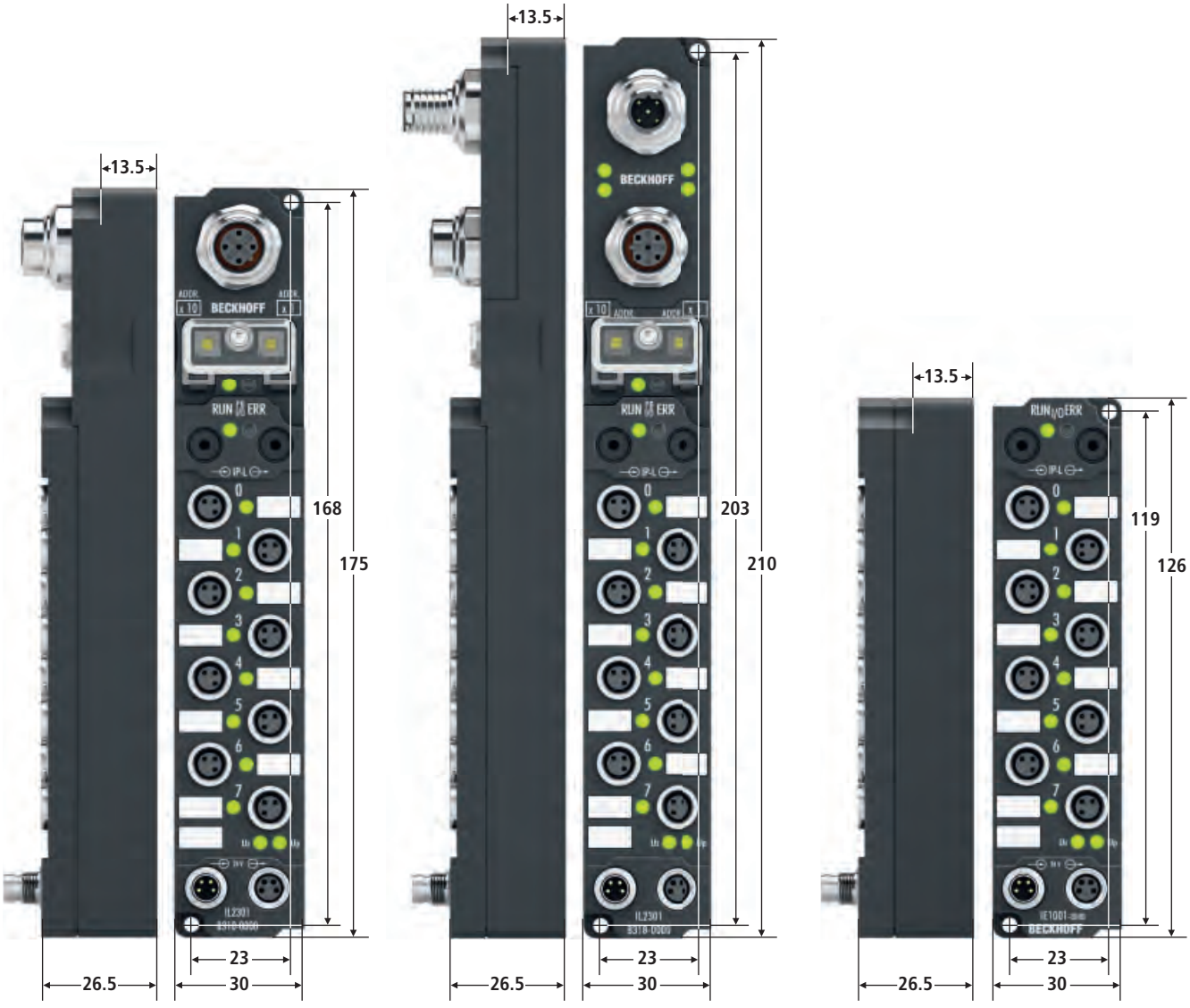
M8 screw type connector

M12 screw type connector

8 mm snap type connector

Housing types Fieldbus Box

Industrial housing



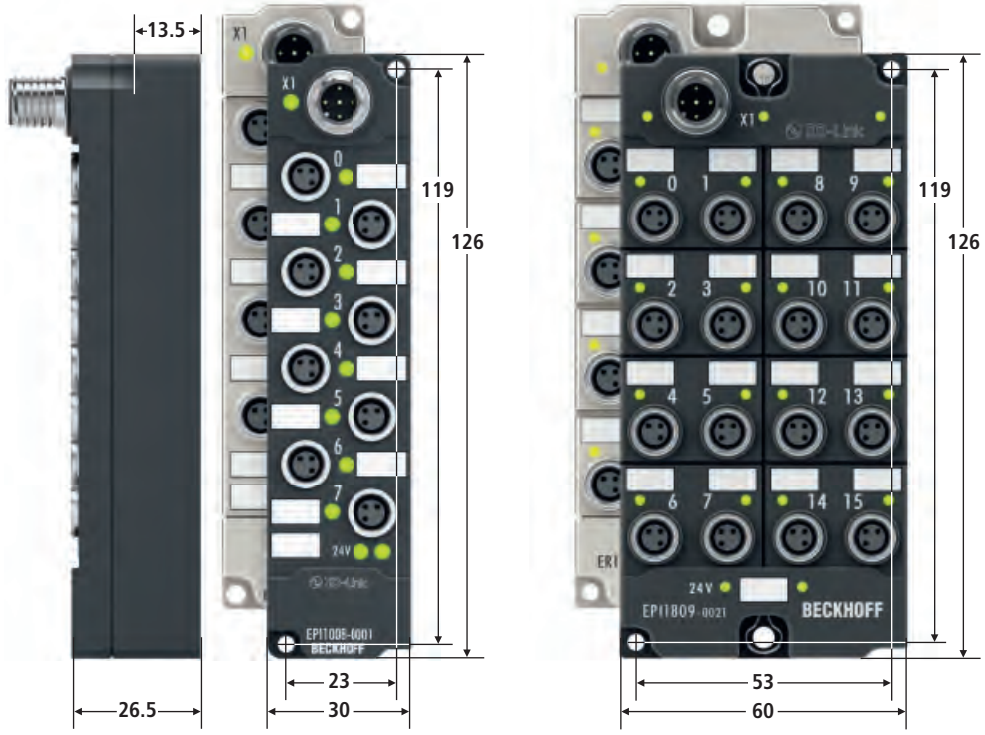
Standard housing | XXL housing | Extension Box

Technical data	Standard housing	XXL housing	Extension Box
Dimensions (W x H x D)	30 mm x 175 mm x 26.5 mm	30 mm x 210 mm x 26.5 mm	30 mm x 126 mm x 26.5 mm
Weight	depending on device	depending on device	depending on device (typ. 150 g)
Material	PA6 (polyamide)		
Installation	2 fixing holes 3 mm diameter for M3		
Operating/storage temperature	0…+55 °C/-25…+85 °C		
Vibration resistance	conforms to EN 60068-2-6		
Shock resistance	conforms to EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable		
Approval	UL E172151, CE		
Power feed through	I_{MAX} = 4 A		

We reserve the right to make technical changes.

Housing types IO-Link box

Industrial and zinc die-cast housing



Technical data	8 x M8, 4 x M12	16 x M8, 8 x M12
Dimensions (W x H x D)	30 mm x 126 mm x 26.5 mm	60 mm x 126 mm x 26.5 mm
Weight	depending on device (typ. 150 g)	depending on device (typ. 310 g)
Material	PA6 (polyamide) for EPIxxxx or zinc die-cast for ERIxxxx	
Installation	2 fixing holes 3 mm diameter for M3	2 fixing holes 3 mm diameter for M3; 2 fixing holes 4.5 mm diameter for M4
Operating/storage temperature	-25…+60 °C/-40…+85 °C	
Vibration resistance	conforms to EN 60068-2-6: 1 g (extended range: 5 g)	
Shock resistance	conforms to EN 60068-2-27: 15 g, 11 ms (extended range: 35 g, 11 ms); 1000 shocks per direction, 3 axes	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable	
Approval	CE, UL in preparation	
Power feed through	–	

We reserve the right to make technical changes.

Fieldbus Box

▶ FieldbusBox

IL230x-Bxxx | **Coupler Box**
- corresponds to the Bus Coupler in the Beckhoff Bus Terminal system
- bus module with IP-Link extension interface
- for 120 extension modules (IExxxx)
- combines four digital inputs and four digital outputs in one device

See page 736

IExxxx | **Extension Box**
- connection via IP-Link for all signal types
- 8 mm or screw type M8 and M12 connectors
- wide range of I/O functionalities
- support of all relevant industrial signals

See page 744

We reserve the right to make technical changes.

IL230x-Cxxx | **PLC Box**

- IEC 61131-3 intelligence in the smallest amount of space
- extendable with 120 IP-Link modules
- 16-bit controller, 32/96 kbyte program memory, 32/64 kbyte data memory
- 512 bytes non-volatile memory
- combines four digital inputs and four digital outputs in one device

See page 736

IPxxxx-Bxxx | **Compact Box**

- rugged signal variety
- for 12 bus systems
- 8 mm or screw type M8 and M12 connectors
- wide range of I/O functionalities
- support of all relevant industrial signals

See page 742

EPIxxxx, ERIxxx | **IO-Link box**

- cost-effective and flexible sensor connections in extremely harsh environments
- can be combined with EP622x (IP 67), EL6224 or KL6224 (both IP 20) IO-Link masters
- 28 module variants in plastic or zinc die-cast housing
- M8 or M12 screw type connection
- digital and analog I/O modules
- IO-Link specification V1.1

See page 764

FM33xx | **Fieldbus Modules**

- high-speed EtherCAT communication or PROFIBUS DP
- direct connection of 12 or 32 thermocouples
- compact, splash-proof housing

See page 774

We reserve the right to make technical changes.

Fieldbus systems

▶ Fieldbus-systems

The Beckhoff Fieldbus Box modules are available for various fieldbuses. The Compact Box serves as a fieldbus station – without expansion options – with a wide variety of I/O functions.

The Coupler Box and PLC Box can be extended by the Extension Box modules. Communication takes place via IP-Link. IP-Link is a fibre optic communication link with a transmission rate of 2 Mbits/s which is capable of transmitting 1000 items of binary I/O data in approx. 1 ms, rapidly and securely. Smaller configurations are correspondingly faster. Because of the high usable data rate, the IP-Link coupling does not reduce the performance of the fieldbus at all.

The Coupler Box gathers the I/O data and corresponds to the Bus Coupler from the Beckhoff Bus Terminal system.

The PLC Box is an intelligent fieldbus module for local pre-processing of the I/O signals and thus corresponds to the Bus Terminal Controller in the Bus Terminal system. This is a way of removing parts of the application out of the central control system to relieve the CPU and the fieldbus. Decentralised counting, control or switching are typical applications for the Fieldbus Box with integrated small controller. The reaction times are independent of the bus communication and of the supervising controller. In the event of a bus or controller failure, maintenance of function (e.g. bringing the process to a safe state in an orderly manner) is possible.

For further information on the individual fieldbuses see page 262

IPxxxy-Bzzz | Compact Box

IL230y-Bzzz | Coupler Box

IL230y-Czzz | PLC Box

We reserve the right to make technical changes.

EtherCAT, Lightbus | **Fieldbus Box modules**

EtherCAT LIGHTBUS

	EtherCAT Coupler Box	Lightbus Compact Box	Lightbus Coupler Box
Technical data	**IL230x-B110**	**IPxxxx-B200**	**IL230x-B200**
Extension modules	max. 78 with max. 512 byte input and 512 byte output data	–	max. 120 with max. 512 byte input and 512 byte output data
Data transfer rates	100 Mbaud	2.5 Mbaud	2.5 Mbaud
Configuration possibility	via KS2000	via KS2000 or the controller	via KS2000 or the controller
	A station consists of an IL230x-B110 Coupler Box and any number of up to 78 Extension Box modules that are connected via IP-Link.	Compact Box modules for Lightbus are available for all relevant industrial signals.	The Lightbus Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable.
Bus interface	2 x M12 socket, 4-pin (D-coded)	2 x fibre optic socket for plug ZS1020-0010	2 x fibre optic socket for plug ZS1020-0010
Digital peripheral signals	4 x digital input + 4 x digital output on-board + extension modules	according to I/O type, see page 746	4 x digital input + 4 x digital output on-board + extension modules
Analog peripheral signals	max. 127 inputs and 127 outputs	according to I/O type, see page 756	max. 124 inputs and 124 outputs
Approvals	CE, UL	CE, UL	CE, UL
Further information	IL230x-B110	IPxxxx-B200	IL230x-B200
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
TwinCAT 2 PLC	–	–	–

PROFIBUS, Interbus | **Fieldbus Box modules**

	PROFIBUS Compact Box	PROFIBUS Compact Box with integrated tee-connector	PROFIBUS Coupler Box	PROFIBUS Coupler Box with integrated tee-connector
Technical data	**IPxxxx-B310**	**IPxxxx-B318**	**IL230x-B310**	**IL230x-B318**
Extension modules	–	–	max. 120 with max. 128 byte input and 128 byte output data	
Data transfer rates	automatic detection up to 12 Mbaud		automatic detection up to 12 Mbaud	
Configuration possibility	via KS2000 or the controller, DP-V1 extensions are supported		via KS2000 or the controller, DP-V1 extensions are supported	
	Compact Box modules for PROFIBUS are available for all relevant industrial signals.	In the Compact Box with integrated tee-connector, the PROFIBUS is relayed forward in the module.	The PROFIBUS Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable.	In the Coupler Box with integrated tee-connector, the PROFIBUS is relayed forward in the module.
Bus connection	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, 1 x M12 plug, 5-pin (tee-connector integrated), B-coded	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, 1 x M12 plug, 5-pin (tee-connector integrated), B-coded
Digital peripheral signals	according to I/O type, see page 746	according to I/O type, see page 746	4 x digital input + 4 x digital output on-board + extension modules	
Analog peripheral signals	according to I/O type, see page 756	according to I/O type, see page 756	max. 60 inputs and 60 outputs	max. 60 inputs and 60 outputs
Approvals	CE, UL	CE, UL	CE, UL	CE, UL
Further information	IPxxxx-B310	IPxxxx-B318	IL230x-B310	IL230x-B318
Accessories				
Cordsets and connectors	see page 800	see page 800	see page 800	see page 800
TwinCAT 2 PLC	–	–	–	–

We reserve the right to make technical changes.

	PROFIBUS PLC Box	PROFIBUS PLC Box with integrated tee-connector	Interbus Compact Box	Interbus Coupler Box
	IL230x-C310	**IL230x-C318**	**IPxxxx-B400**	**IL230x-B400**
	max. 120 with max. 128 byte input and 128 byte output data		–	max. 120 with max. 64 byte input and 64 byte output data
	automatic detection up to 12 Mbaud		500 kbaud	500 kbaud
	via KS2000 or the controller, DP-V1 extensions are supported		via KS2000	via KS2000
	The PLC Box is an intelligent PROFIBUS node that can perform decentralised processing of I/O data and execute control tasks independently of the function of the PROFIBUS network.	In the PLC Box with integrated tee-connector, the PROFIBUS is relayed forward in the module.	Compact Box modules for Interbus are available for all relevant industrial signals.	The Interbus Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable.
	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, 1 x M12 plug, 5-pin (tee-connector integrated), B-coded	1 x M23 socket, 9-pin, 1 x M23 plug, 9-pin	1 x M23 socket, 9-pin, 1 x M23 plug, 9-pin
	4 x digital input + 4 x digital output on-board + extension modules	4 x digital input + 4 x digital output on-board + extension modules	according to I/O type, see page 746	4 x digital input + 4 x digital output on-board + extension modules
	max. 60 inputs and 60 outputs	max. 60 inputs and 60 outputs	according to I/O type, see page 756	max. 28 inputs and 28 outputs
	CE, UL	CE, UL	CE, UL	CE, UL
	see page 800	see page 800	see page 800	see page 800
	see page 1022	see page 1022	–	–

CANopen, DeviceNet | **Fieldbus Box modules**

CANopen

	CANopen Compact Box	CANopen Compact Box with integrated tee-connector	CANopen Coupler Box	CANopen Coupler Box with integrated tee-connector
Technical data	**IPxxxx-B510**	**IPxxxx-B518**	**IL230x-B510**	**IL230x-B518**
Extension modules	–	–	max. 120 with max. 128 byte input and 128 byte output data	
Data transfer rates	automatic detection of 10 kbaud up to 1 Mbaud		automatic detection of 10 kbaud up to 1 Mbaud	
Configuration possibility	through KS2000 or the controller (service data objects)	through KS2000 or the controller (service data objects)	through KS2000 or the controller (service data objects)	through KS2000 or the controller (service data objects)
	Compact Box modules for CANopen are available for all relevant industrial signals.	In the Compact Box with integrated tee-connector, CANopen is relayed forward in the module.	The CANopen Coupler Box has four digital inputs and four digital outputs. Other kinds of signals are available in the Extension Box modules.	In the Coupler Box with integrated tee-connector, CANopen is relayed forward in the module.
Bus interface	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)
Digital peripheral signals	according to I/O type, see page 746	according to I/O type, see page 746	4 x digital input + 4 x digital output on-board + extension modules	
Analog peripheral signals	according to I/O type, see page 756	according to I/O type, see page 756	max. 60 inputs and 60 outputs	max. 60 inputs and 60 outputs
Approvals	CE, UL	CE, UL	CE, UL	CE, UL
Further information	IPxxxx-B510	IPxxxx-B518	IL230x-B510	IL230x-B518
Accessories				
Cordsets and connectors	see page 800	see page 800	see page 800	see page 800
TwinCAT 2 PLC	–	–	–	–

We reserve the right to make technical changes.

DeviceNet

	DeviceNet Compact Box	DeviceNet Compact Box with integrated tee-connector	DeviceNet Coupler Box	DeviceNet Coupler Box with integrated tee-connector
	IPxxxx-B520	**IPxxxx-B528**	**IL230x-B520**	**IL230x-B528**
	–	–	max. 120 with max. 512 byte input and 512 byte output data	
	automatic detection up to 500 kbaud		automatic detection up to 500 kbaud	
	through KS2000 or the controller (explicit messaging)	through KS2000 or the controller (explicit messaging)	through KS2000 or the controller (explicit messaging)	through KS2000 or the controller (explicit messaging)
	Compact Box modules for DeviceNet are available for all relevant industrial signals.	In the Compact Box with integrated tee-connector, DeviceNet is relayed forward in the module.	The DeviceNet Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable.	In the Coupler Box with integrated tee-connector, DeviceNet is relayed forward in the module.
	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)	1 x M12 plug, 5-pin	1 x M12 plug, 5-pin, 1 x M12 socket, 5-pin (tee-connector integrated)
	according to I/O type, see page 746	according to I/O type, see page 746	4 x digital input + 4 x digital output on-board + extension modules	4 x digital input + 4 x digital output on-board + extension modules
	according to I/O type, see page 756	according to I/O type, see page 756	max. 252 inputs and 252 outputs	max. 252 inputs and 252 outputs
	CE, UL	CE, UL	CE, UL	CE, UL
	see page 800	see page 800	see page 800	see page 800
	–	–	–	–

Modbus, RS485/RS232 | **Fieldbus Box modules**

Modbus

RS232 / RS485

	Modbus Compact Box	Modbus Coupler Box	RS485 Compact Box
Technical data	**IPxxxx-B730**	**IL230x-B730**	**IPxxxx-B800**
Extension modules	–	max. 120 with max. 512 byte input and 512 byte output data	–
Data transfer rates	150 to 38,400 baud RTU/ASCII	150 to 38,400 baud RTU/ASCII	9.6 kbaud, 19.2 kbaud, 38.4 kbaud (default)
Configuration possibility	by means of address selection switch or KS2000	by means of address selection switch or KS2000	via KS2000
	Compact Box modules for Modbus are available for all relevant industrial signals.	The Modbus Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable.	Compact Box modules for RS485 are available for all relevant industrial signals.
Bus interface	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, B-coded
Digital peripheral signals	according to I/O type, see page 746	4 x digital input + 4 x digital output on-board + extension modules	according to I/O type, see page 746
Analog peripheral signals	according to I/O type, see page 756	max. 255 inputs and 255 outputs	according to I/O type, see page 756
Approvals	CE, UL	CE, UL	CE, UL
Further information	IPxxxx-B730	IL230x-B730	IPxxxx-B800
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
TwinCAT 2 PLC	–	–	–

We reserve the right to make technical changes.

	RS485 Coupler Box	RS232 Compact Box	RS232 Coupler Box	RS232 PLC Box
	IL230x-B800	**IPxxxx-B810**	**IL230x-B810**	**IL230x-C810**
	max. 120 with max. 512 byte input and 512 byte output data	–	max. 120 with max. 512 byte input and 512 byte output data	
	9.6 kbaud, 19.2 kbaud, 38.4 kbaud (default)	9.6 kbaud, 19.2 kbaud, 38.4 kbaud (default)	9.6 kbaud, 19.2 kbaud, 38.4 kbaud (default)	
	via KS2000	via KS2000	via KS2000	via KS2000
	The serial Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image.	Compact Box modules for RS232 are available for all relevant industrial signals.	The serial Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link fibre optic cable. It detects the connected modules and automatically allocates the input and output data to the process image.	The PLC Box is an intelligent RS232 coupler that can perform non-central decentralised processing of I/O data and execute control tasks. Like the Coupler Box, it has four digital inputs and four digital outputs.
	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, B-coded	1 x M12 socket, 5-pin, B-coded
	4 x digital input + 4 x digital output on-board + extension modules	according to I/O type, see page 746	4 x digital input + 4 x digital output on-board + extension modules	4 x digital input + 4 x digital output on-board + extension modules
	max. 252 inputs and 252 outputs	according to I/O type, see page 756	max. 252 inputs and 252 outputs	max. 252 inputs and 252 outputs
	CE, UL	CE, UL	CE, UL	CE, UL
	IL230x-B800	IPxxxx-B810	IL230x-B810	IL230x-C810
	see page 800	see page 800	see page 800	see page 800
	–	–	–	see page 1022

We reserve the right to make technical changes.

Ethernet, PROFINET, EtherNet/IP | **Fieldbus Box modules**

Ethernet

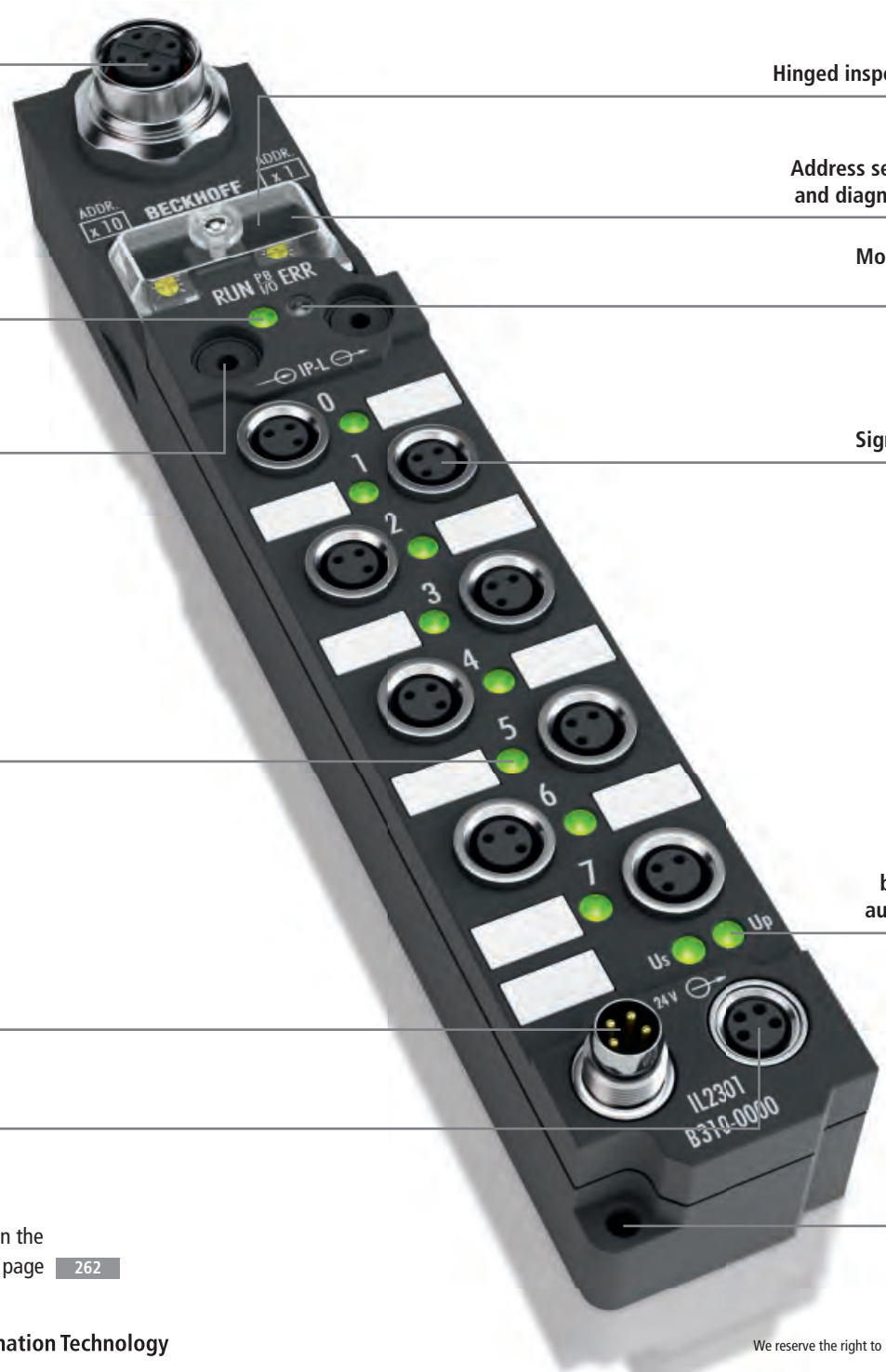
	Ethernet Coupler Box with RJ45 connection	Ethernet Coupler Box with M12 connection	Ethernet PLC Box with RJ45 connection
Technical data	**IL230x-B900**	**IL230x-B901**	**IL230x-C900**
Extension modules	max. 120 with max. 512 byte input and 512 byte output data		max. 120 with max. 512 byte input and 512 byte output data
Data transfer rates	10/100 Mbaud, automatic recognition of the transmission rate		10/100 Mbaud, automatic recognition of the transmission rate
Configuration possibility	via KS2000	via KS2000	via KS2000
	The Ethernet Coupler Box with RJ45 connection gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image.	The Ethernet Coupler Box with M12 connection gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image.	The PLC Box is an intelligent Ethernet node that can perform decentralised processing of I/O data and execute control tasks independently of the function of the Ethernet network. The PLC Box, like the Coupler Box, has four digital inputs and four digital outputs.
Bus interface	1 x RJ45 socket	1 x M12 socket, 4-pin (D-coded)	1 x RJ45 socket
Digital peripheral signals	4 x digital input + 4 x digital output on-board + extension modules	4 x digital input + 4 x digital output on-board + extension modules	4 x digital input + 4 x digital output on-board + extension modules
Analog peripheral signals	max. 127 inputs and 127 outputs	max. 127 inputs and 127 outputs	max. 127 inputs and 127 outputs
Approvals	CE, UL	CE, UL	CE, UL
Further information	IL230x-B900	IL230x-B901	IL230x-C900
Accessories			
Cordsets and connectors	see page 800	see page 800	see page 800
TwinCAT 2 PLC	–	–	see page 1022

We reserve the right to make technical changes.

	PROFINET Coupler Box	EtherNet/IP Coupler Box
	IL230x-B903	**IL230x-B905**
	max. 120 with max. 512 byte input and 512 byte output data	max. 120 with max. 512 byte input and 512 byte output data
	10/100 Mbaud, automatic recognition of the transmission rate	10/100 Mbaud, automatic recognition of the transmission rate
	via KS2000	via KS2000
	The PROFINET Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image. The Coupler Box has four digital inputs and four digital outputs.	The EtherNet/IP Coupler Box gathers the I/O data from the Extension Box modules over the interference-free IP-Link optical fibre cable. It detects the connected modules and automatically allocates the input and output data to the process image. The Coupler Box has four digital inputs and four digital outputs.
	1 x M12 socket, 4-pin (D-coded)	1 x M12 socket, 4-pin (D-coded)
	4 x digital input + 4 x digital output	4 x digital input + 4 x digital output
	on-board + extension modules	on-board + extension modules
	max. 127 inputs and 127 outputs	max. 127 inputs and 127 outputs
	CE, UL	CE, UL
	IL230x-B903	IL230x-B905
	see page 800	see page 800
	–	–

Signal types | Coupler Box and PLC Box

▶ Coupler-Box ▶ PLC-Box



Fieldbus interface (connection depends on the particular fieldbus)

Hinged inspection window

Address selection switch and diagnostic interface

Fieldbus status display

Module or IP-Link status display

IP-Link interface for the connection of extension modules

Signal connection

Signal status display

Status display power supply: box supply and auxiliary voltage

Power supply input
– box supply
– auxiliary voltage

Power supply downstream connection

Mounting holes

For further information on the individual fieldbuses see page 262

We reserve the right to make technical changes.

Standard housing

XXL housing

Signal connections

Connector 8 mm, snap type, 3-pin

Connector M8, screw type, 3-pin

Connector M12, screw type, 5-pin

Coupler Box
Up to 120 extension modules, spaced up to 15 metres apart, can be connected to one Coupler Box. The Coupler Box modules are capable of automatically recognising the extension modules connected to them during start-up, and map the I/O data automatically into the fieldbus process image – it is not necessary to configure them. The coupler appears, from the fieldbus point of view, along with all of the networked extension modules, as a single participating bus device with a corresponding number of I/O signals.

The Coupler Box corresponds to the Bus Coupler in the Beckhoff Bus Terminal system. Beckhoff fieldbus devices with protection class IP 20 (Bus Terminals) and IP 67 (Fieldbus Box) can be combined without difficulty – the data is handled in the same way in either case.

Low-priced plug connectors with protection class IP 67 can be used for the rapid and simple preparation of the IP-Link fibre optic cable. The connection does not require special tools and can be performed quickly and simply. The IP-Link cables can also be obtained with prepared plugs if required.

PLC Box
Almost unlimited I/O application possibilities result from the extendable Coupler Box with PLC functionality and IP-Link. Up to 120 extension modules, with 960 I/Os, can be directly addressed from the PLC program. The programmable PLC Box modules are therefore particularly suitable as autonomous small PLCs for the control of parts of a plant or of small machines.

Programming is carried out with TwinCAT in accordance with IEC 61131-3. Five different manufacturer independent programming languages are available: Instruction List (IL), Function Block Diagram (FBD), Ladder Diagram (LD), Sequential Function Chart (SFC) and the high-level language Structured Text (ST). The program download occurs either via the fieldbus or via the programming interface. Extensive debugging functions (breakpoint, single step, monitoring, etc.) are also available.

Coupler Box

IL230y-Bzzz

- 110 = EtherCAT
- 200 = Lightbus
- 310/318 = PROFIBUS
- 400 = Interbus
- 510/518 = CANopen
- 520/528 = DeviceNet
- 730 = Modbus
- 800 = RS485
- 810 = RS232
- 900/901 = Ethernet TCP/IP
- 903 = PROFINET
- 905 = Ethernet/IP

- 0 = connector 8 mm, snap type, 3-pin
- 1 = connector M8, screw type, 3-pin
- 2 = connector M12, screw type, 5-pin

PLC Box

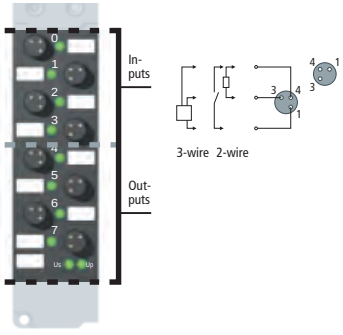
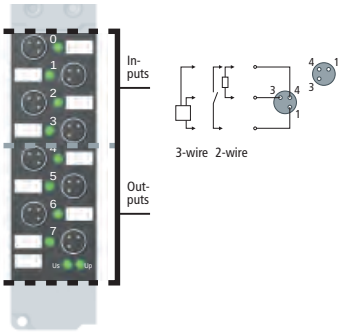
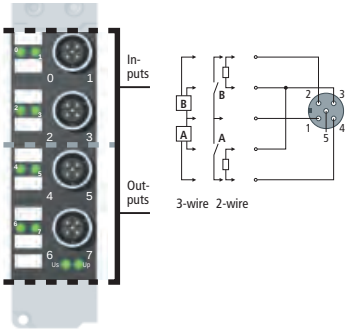
IL230y-Czzz

- 310/318 = PROFIBUS
- 810 = RS232
- 900 = Ethernet TCP/IP

- 0 = connector 8 mm, snap type, 3-pin
- 1 = connector M8, screw type, 3-pin
- 2 = connector M12, screw type, 5-pin

We reserve the right to make technical changes.

Coupler Box | **Digital combi, 24 V DC**

	4 x digital input + 4 x digital output, 24 V DC, 8 mm, I_{MAX} = 0.5 A	4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 0.5 A	4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 0.5 A
Technical data	**IL2300-Bxxx**	**IL2301-Bxxx**	**IL2302-Bxxx**
Connection technology	8 mm, snap type	M8, screw type	M12, screw type
Specification	EN 61131-2, type 2	EN 61131-2, type 2	EN 61131-2, type 2
Number of channels	4 inputs + 4 outputs	4 inputs + 4 outputs	4 inputs + 4 outputs
Input filter	3.0 ms	3.0 ms	3.0 ms
			
	The IL2300 Coupler Box module combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via 8 mm snap type connectors.	The IL2301 Coupler Box module combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.	The IL2302 Coupler Box module combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof	derived from control voltage, max. 0.5 A total, short-circuit-proof	derived from control voltage, max. 0.5 A total, short-circuit-proof
Max. output current	0.5 A on each channel, individually short-circuit-proof	0.5 A on each channel, individually short-circuit-proof	0.5 A on each channel, individually short-circuit-proof
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Short circuit current	typ. 1.5 A	typ. 1.5 A	typ. 1.5 A
Auxiliary power current	typ. 20 mA	typ. 20 mA	typ. 20 mA
Current consumption from U_S	see documentation	see documentation	see documentation
Special features	IP-Link coupler	IP-Link coupler	IP-Link coupler
Approvals	CE, UL	CE, UL	CE, UL
Further information	IL2300-Bxxx	IL2301-Bxxx	IL2302-Bxxx

We reserve the right to make technical changes.

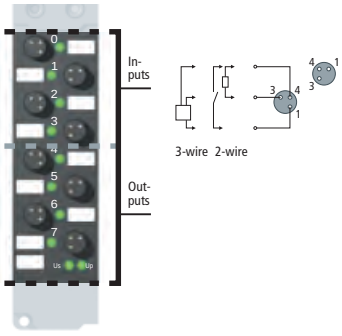
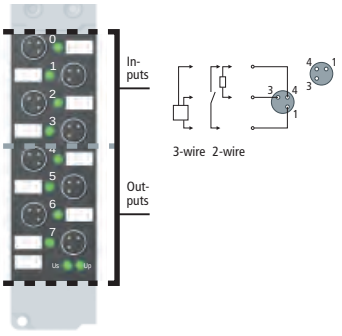
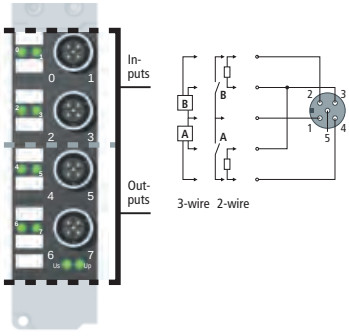
Extension Box

Up to 120 Extension Box modules can be connected to the Coupler Box via the IP-Link communication facility. The Extension Box modules cover the full spectrum of I/O signals with various connection techniques. See page 744

IExxxx	Extension Box	Plug	Page
Digital input			
IE1000	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	746
IE1001	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	747
IE1002	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	747
IE1010	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	746
IE1011	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	747
IE1012	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	747
IE1502	Extension Box, up/down counter, 24 V DC, 100 kHz	M12	747
Digital output			
IE2000	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 0.5 A	8 mm	748
IE2001	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 0.5 A	M8	748
IE2002	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 0.5 A	M12	749
IE2020	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	8 mm	749
IE2021	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M8	749
IE2022	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M12	749
IE2040	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 12 A)	8 mm	750
IE2041	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 12 A)	M8	750
IE2042	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 12 A)	M12	750
IE2808	Extension Box, 16 digital outputs 24 V DC, I_{MAX} = 0.5 A ($\sum$ 4 A)	D-sub	751
IE2512	Extension Box, 2 digital pulse width outputs 24 V DC, I_{MAX} = 2.5 A	M12	751
Digital combi			
IE2300	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	8 mm	752
IE2301	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M8	753
IE2302	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M12	753
IE2310	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	8 mm	752
IE2311	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M8	753
IE2312	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M12	753
IE2320	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	8 mm	754
IE2321	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M8	754
IE2322	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M12	755
IE2330	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	8 mm	754
IE2331	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M8	754
IE2332	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M12	755
IE2400	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I_{MAX} = 0.5 A	8 mm	755
IE2401	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I_{MAX} = 0.5 A	M8	755
IE2403	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I_{MAX} = 0.5 A	IP 20 connector	753
Analog input			
IE3102	Extension Box, 4 differential analog inputs ±10 V, 16 bit	M12	756
IE3112	Extension Box, 4 differential analog inputs 0/4…20 mA, 16 bit	M12	757
IE3202	Extension Box, 4 analog inputs for resistance thermometer, PT100…1000, Ni100, 16 bit	M12	757
IE3312	Extension Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	757
Analog output			
IE4112	Extension Box, 4 differential analog outputs 0/4…20 mA, 16 bit	M12	758
IE4132	Extension Box, 4 analog outputs ±10 V, 16 bit	M12	758
Special functions			
IE5009	Extension Box, 1 SSI encoder interface	M23	760
IE5109	Extension Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	761
IE6002	Extension Box, 1 serial interface RS232C	M12	762
IE6012	Extension Box, 1 serial interface, 0…20 mA (TTY)	M12	763
IE6022	Extension Box, 1 serial interface, RS422, RS485	M12	763

We reserve the right to make technical changes.

PLC Box | **Digital combi, 24 V DC**

	4 x digital input + 4 x digital output, 24 V DC, 8 mm, I_{MAX} = 0.5 A	4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 0.5 A	4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 0.5 A
Technical data	**IL2300-Cxxx**	**IL2301-Cxxx**	**IL2302-Cxxx**
Connection technology	8 mm, snap type	M8, screw type	M12, screw type
Specification	EN 61131-2, type 2	EN 61131-2, type 2	EN 61131-2, type 2
Number of channels	4 inputs + 4 outputs	4 inputs + 4 outputs	4 inputs + 4 outputs
Input filter	3.0 ms	3.0 ms	3.0 ms
			
	The IL2300 PLC Box module combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via 8 mm snap type connectors. Unlike the Coupler Box, the PLC Box can be programmed via TwinCAT and thus used as a small controller.	The IL2301 PLC Box module combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors. Unlike the Coupler Box, the PLC Box can be programmed via TwinCAT and thus used as a small controller.	The IL2302 PLC Box module combines four digital inputs and four digital outputs in one device. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors. Unlike the Coupler Box, the PLC Box can be programmed via TwinCAT and thus used as a small controller.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof	derived from control voltage, max. 0.5 A total, short-circuit-proof	derived from control voltage, max. 0.5 A total, short-circuit-proof
Max. output current	0.5 A on each channel, individually short-circuit-proof	0.5 A on each channel, individually short-circuit-proof	0.5 A on each channel, individually short-circuit-proof
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Short circuit current	typ. 1.5 A	typ. 1.5 A	typ. 1.5 A
Auxiliary power current	typ. 20 mA	typ. 20 mA	typ. 20 mA
Current consumption from U_S	see documentation	see documentation	see documentation
Special features	IP-Link coupler	IP-Link coupler	IP-Link coupler
Approvals	CE, UL	CE, UL	CE, UL
Further information	IL2300-Cxxx	IL2301-Cxxx	IL2302-Cxxx

We reserve the right to make technical changes.

Extension Box

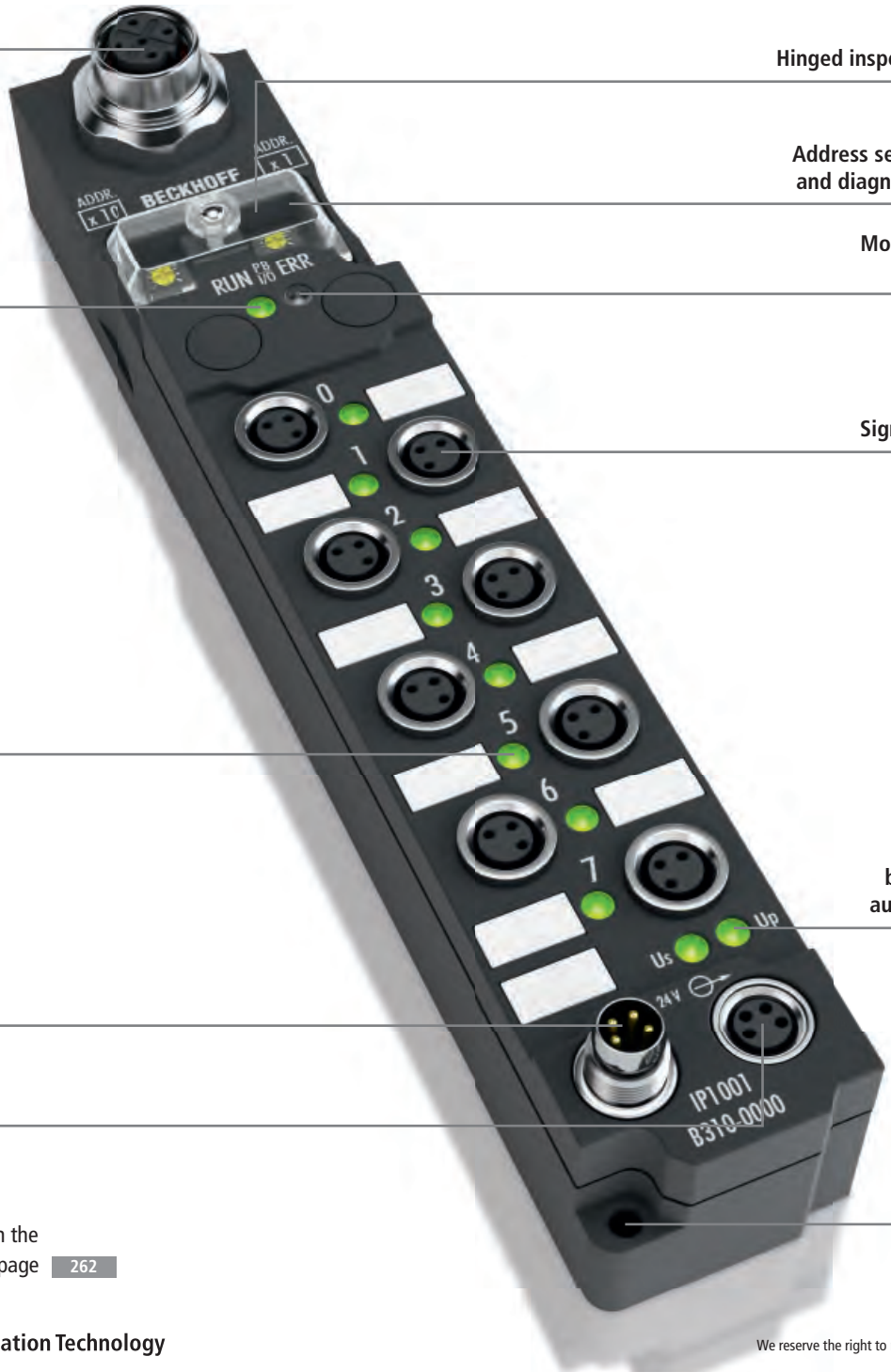
Up to 120 Extension Box modules can be connected to the PLC Box via the IP-Link communication facility. The Extension Box modules cover the full spectrum of I/O signals with various connection techniques. See page 744

IExxxx	Extension Box	Plug	Page
Digital input			
IE1000	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	8 mm	746
IE1001	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M8	747
IE1002	Extension Box, 8 digital inputs 24 V DC, 3.0 ms filter	M12	747
IE1010	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	8 mm	746
IE1011	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M8	747
IE1012	Extension Box, 8 digital inputs 24 V DC, 0.2 ms filter	M12	747
IE1502	Extension Box, up/down counter, 24 V DC, 100 kHz	M12	747
Digital output			
IE2000	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 0.5 A	8 mm	748
IE2001	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 0.5 A	M8	748
IE2002	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 0.5 A	M12	749
IE2020	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	8 mm	749
IE2021	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M8	749
IE2022	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M12	749
IE2040	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 12 A)	8 mm	750
IE2041	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 12 A)	M8	750
IE2042	Extension Box, 8 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 12 A)	M12	750
IE2808	Extension Box, 16 digital outputs 24 V DC, I_{MAX} = 0.5 A ($\sum$ 4 A)	D-sub	751
IE2512	Extension Box, 2 digital pulse width outputs 24 V DC, I_{MAX} = 2.5 A	M12	751
Digital combi			
IE2300	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	8 mm	752
IE2301	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M8	753
IE2302	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M12	753
IE2310	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	8 mm	752
IE2311	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M8	753
IE2312	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 0.5 A	M12	753
IE2320	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	8 mm	754
IE2321	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M8	754
IE2322	Extension Box, 4 digital inputs 24 V DC, 3 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M12	755
IE2330	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	8 mm	754
IE2331	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M8	754
IE2332	Extension Box, 4 digital inputs 24 V DC, 0.2 ms filter, 4 digital outputs 24 V DC, I_{MAX} = 2 A ($\sum$ 4 A)	M12	755
IE2400	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I_{MAX} = 0.5 A	8 mm	755
IE2401	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I_{MAX} = 0.5 A	M8	755
IE2403	Extension Box, 16 digital combination inputs/outputs 24 V DC, 3 ms filter, I_{MAX} = 0.5 A	IP 20 connector	753
Analog input			
IE3102	Extension Box, 4 differential analog inputs ±10 V, 16 bit	M12	756
IE3112	Extension Box, 4 differential analog inputs 0/4…20 mA, 16 bit	M12	757
IE3202	Extension Box, 4 analog inputs for resistance thermometer, PT100…1000, Ni100, 16 bit	M12	757
IE3312	Extension Box, 4 analog inputs for thermocouple, types J, K, L, B, E, N, R, S, T, U, 16 bit	M12	757
Analog output			
IE4112	Extension Box, 4 differential analog outputs 0/4…20 mA, 16 bit	M12	758
IE4132	Extension Box, 4 analog outputs ±10 V, 16 bit	M12	758
Special functions			
IE5009	Extension Box, 1 SSI encoder interface	M23	760
IE5109	Extension Box, 1 incremental encoder interface with complementary inputs, 1 MHz	M23	761
IE6002	Extension Box, 1 serial interface RS232C	M12	762
IE6012	Extension Box, 1 serial interface, 0…20 mA (TTY)	M12	763
IE6022	Extension Box, 1 serial interface, RS422, RS485	M12	763

We reserve the right to make technical changes.

Signal types | Compact Box

▶ Compact-Box



Fieldbus interface (connection depends on the particular fieldbus)

Hinged inspection window

Address selection switch and diagnostic interface

Fieldbus status display

Module or IP-Link status display

Signal connection

Signal status display

Status display power supply: box supply and auxiliary voltage

Power supply input
– box supply
– auxiliary voltage

Power supply downstream connection

Mounting holes

For further information on the individual fieldbuses see page 262

We reserve the right to make technical changes.

Standard housing

XXL housing

Signal connections

Connector 8 mm, snap type, 3-pin

Connector M8, screw type, 3-pin

Connector M12, screw type, 5-pin

Compact Box modules are robust fieldbus stations for different fieldbus systems. They offer a wide range of I/O functionality. All relevant industrial signals are supported. In addition to digital and analog inputs and outputs including thermocouple and RTD inputs, there are also incremental encoder interfaces available for displacement and angle measurement in addition to serial interfaces to solve a large number of communication tasks. The digital inputs and outputs can be connected with snap type 8 mm diameter plugs, screw type M8 connectors, or with screw type M12 pendants. The M12 version is provided for analog signals.

Special input and output channels on the combination I/O modules can be used for either input or output. It is not necessary to configure them, since the fieldbus provides both input and output data for each combination channel. The combination modules give the user all of the advantages of fine signal granularity.

The processor logic, the input circuitry and the sensor power supply are fed from the box supply voltage, the auxiliary power for the outputs can be routed separately. In this way it is possible to achieve cascadable emergency off concepts. In Fieldbus Box modules in which only inputs are available the auxiliary power supply U_P can optionally be connected in order to pass it on downstream.

The state of the fieldbus connection, the module status, the status of the power supply and of the signals is indicated by LEDs. The label strips can be machine printed elsewhere and then inserted.

IPxxxy-Bzzz

- xxx:
  - 200 = Lightbus
  - 310/318 = PROFIBUS
  - 400 = Interbus
  - 510/518 = CANopen
  - 520/528 = DeviceNet
  - 730 = Modbus
  - 800 = RS485
  - 810 = RS232
- y:
  - 0 = connector 8 mm, snap type, 3-pin
  - 1 = connector M8, screw type, 3-pin
  - 2 = connector M12, screw type, 5-pin
  - 8 = D-sub, 25-pin
- zzz: Signals see page 746

Signal types | Extension Box

▶ Extension-Box

Fieldbus status display

IP-Link interface for the connection of extension modules

Signal status display

Power supply input
– box supply
– auxiliary voltage

Power supply downstream connection

Module or IP-Link status display

Signal connection 8 mm, M8 or M12

Status display power supply: box supply and auxiliary voltage

Mounting holes

We reserve the right to make technical changes.

Digital input

Digital output

Analog input

Analog output

Special functions

The Extension Box modules cover the full spectrum of I/O signals: digital inputs with different filters, digital outputs with 0.5 and 2 A output currents, analog inputs and outputs with a 16 bit resolution, thermocoupler and RTD inputs, serial interfaces and encoder inputs.

Similarly to the Compact Box modules, the digital inputs and outputs can be connected either through 8 mm snap type connectors or screw type connectors (M8 and M12). Analog signal types are provided with the M12 version. The snap type connectors lock in place positively, forming a vibration-proof connection, while the screw type connectors offer the advantage of high resistance to being pulled out.

The extension modules are connected to the process level via the fieldbus coupler. Up to 120 extension modules can be connected at distances of 15 m from box to box via the IP-Link communication connection.

IExxxy

- **0 = connector 8 mm, snap type, 3-pin**
- **1 = connector M8, screw type, 3-pin**
- **2 = connector M12, screw type, 5-pin**
- **3 = IP 20 connector**
- **8 = D-sub, 25-pin**
- **9 = connector M23, screw type, 12-pin**

Signals see page 746

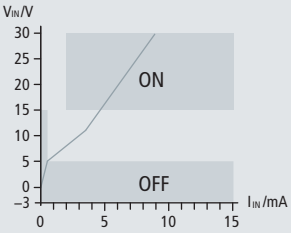
We reserve the right to make technical changes.

Digital input | 24 V DC, positive switching

The digital inputs on a 24 V supply are among the most frequently used signals. The EN 61131-2 standard describes the input characteristic and distinguishes three types. Type 1 has a small input current with low power dissipation. This input is optimised for mechanical switches and actively-switched electronic outputs. Type 2 has a significantly larger input current and is optimised for 2-wire sensors with a high quiescent current consumption. Type 3 is a combination between type 1, with low current in switched-on state, and a satisfactorily high quiescent current for the majority of modern 2-wire sensors. The type 3 input can be used in almost all applications as a replacement for type 1. The diagram shows the typical current/voltage curves of the module inputs and the allowable range of conformity in accordance with the standard.

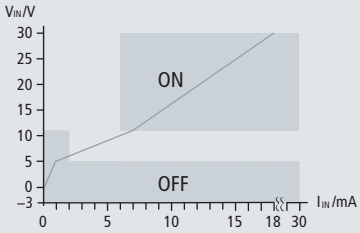
The input circuits differ in their filtering functions. The filtering has the task of suppressing electromagnetic interference. However, this does have the drawback of signal deceleration. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and delivers a stable signal for simple PLC applications. Filter times of 0.2 ms are suitable for applications with shortest possible reaction times and should be used for mechanical switches only in a restricted manner.

Type 1



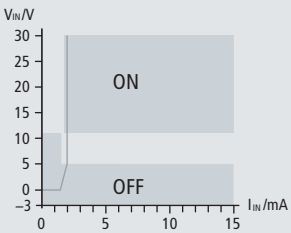
Signal voltage "0": -3…5 V DC
Signal voltage "1": 15…30 V DC

Type 2



Signal voltage "0": -3…5 V DC
Signal voltage "1": 11…30 V DC

Type 3



Signal voltage "0": -3…5 V DC
Signal voltage "1": 11…30 V DC

Characteristics of the 3 input types according to EN 61131-2 (24 V DC)

8-channel digital input, 24 V DC, 8 mm, type 2

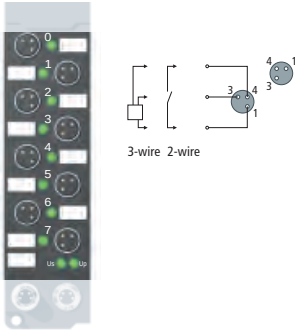
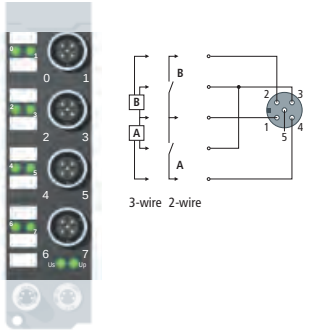
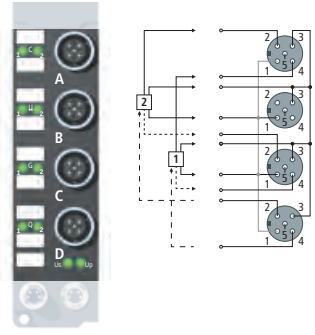
Compact Box / Extension Box	IP1000-Bxxx / IE1000	IP1010-Bxxx / IE1010
Connection technology	8 mm, snap type	
"0" signal voltage	-3…+5 V (EN 61131-2, type 2)	
"1" signal voltage	11…30 V (EN 61131-2, type 2)	
Input filter	3.0 ms	0.2 ms
Number of inputs	8	
Nominal voltage	24 V DC (-15 %/+20 %)	

The IP10x0 and IE10x0 digital input modules acquire the binary control signals from the process level and transmit them to the higher-level automation unit. The signals are connected via 8 mm snap type connectors.

The sensors are supplied from the box supply voltage U_S.

Number of counters	–
Counting frequency	–
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S (without sensor current)	IP10x0-Bxxx: see document. IE10x0: 25 mA
Bit width in the process image	8 inputs
Electrical isolation	channel/U_S, channel/ch.: no, U_S/fieldbus: depend. on fieldb.
Approvals	CE, UL
Further information	IP1000 IE1000

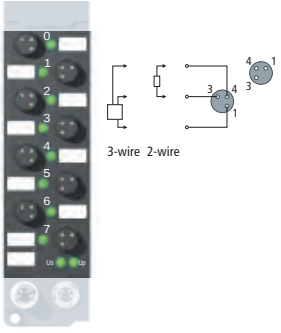
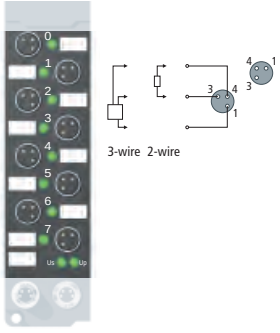
We reserve the right to make technical changes.

	8-channel digital input, 24 V DC, M8, type 2		8-channel digital input, 24 V DC, M12, type 2		2-channel up/down counter, 24 V DC, 100 kHz, type 2
	IP1001-Bxxx IE1001	**IP1011-Bxxx IE1011**	**IP1002-Bxxx IE1002**	**IP1012-Bxxx IE1012**	**IP1502-Bxxx IE1502**
	M8, screw type		M12, screw type		M12, screw type
	-3…+5 V (EN 61131-2, type 2)		-3…+5 V (EN 61131-2, type 2)		-3…+5 V (EN 61131-2, type 2)
	11…30 V (EN 61131-2, type 2)		11…30 V (EN 61131-2, type 2)		11…30 V (EN 61131-2, type 2)
	3.0 ms	0.2 ms	3.0 ms	0.2 ms	–
	8		8		2 counter inputs + 2 gate inputs + 2 up/down switches
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
					
	The IP10x1 and IE10x1 digital input modules acquire the binary control signals from the process level and transmit them to the higher-level automation unit. The signals are connected via M8 screw type connectors. These versions are distinguished by input filters of different speeds. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.		The IP10x2 and IE10x2 digital input modules acquire the binary control signals from the process level and transmit them to the higher-level automation unit. The signals are connected via M12 screw type connectors. These versions are distinguished by input filters of different speeds. The sensors are supplied from the box supply voltage U_S. The auxiliary voltage U_P is not used in the input module, but may be connected in order to be relayed downstream.		The counter module has two fast counters running at up to 100 kHz. It counts binary pulses and transmits the counter state to the higher-level automation unit. The up/down input allows the counters to be switched between upwards and downwards counting (in 32 bits). The gate signals (gate inputs) allow the counters to be triggered: Depending on the level at the gate input, the counting function is halted or enabled. The outputs can be switched according to the counter state. From the controller it is possible to set the counter state, to start or halt the counter function, and to set the outputs.
	–		–		2, each with a depth of 32 bits
	–		–		100 kHz (2 kHz for switching between up and down)
	derived from control voltage, max. 0.5 A total, short-circuit-proof		derived from control voltage, max. 0.5 A total, short-circuit-proof		derived from control voltage, max. 0.5 A total, short-circuit-proof
	IP10x1-Bxxx: see documentation IE10x1: 25 mA		IP10x2-Bxxx: see documentation IE10x2: 25 mA		IP1502-Bxxx: see documentation IE1502: 25 mA
	8 inputs		8 inputs		2 x 32 bit input/2 x 8 bit control/status
	channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus		channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus		channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus
	CE, UL		CE, UL		CE, UL
	IP1001 IE1001		IP1002 IE1002		IP1502 IE1502

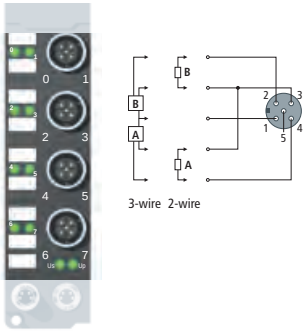
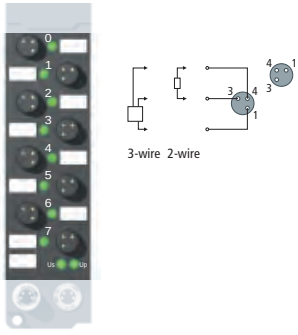
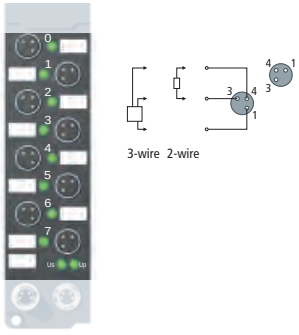
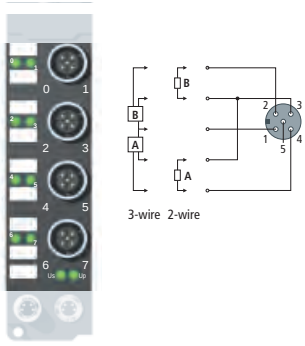
Digital output | 24 V DC, positive switching

Many actuators are driven or controlled with 24 V DC. The Fieldbus Box modules in the category "positive switching" switch all output channels to 24 V DC. The output circuit offers further functions such as short-circuit-current limitation, short-circuit switch-off and the depletion of inductive energy from the coil.

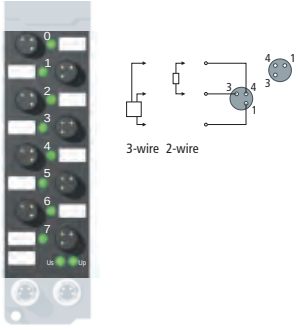
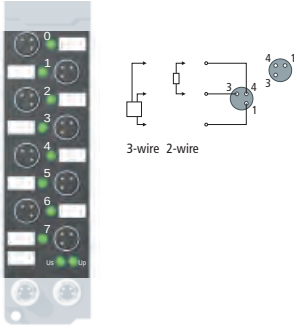
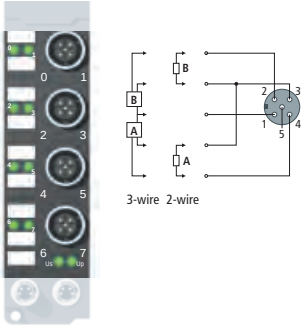
The most common output circuit delivers a maximum continuous current of 0.5 A. Special Fieldbus Box modules are available for higher currents. Any type of load (ohmic, capacitive, inductive) can be connected to an output module.

	8-channel digital output, 24 V DC, 8 mm, I_{MAX} = 0.5 A	8-channel digital output, 24 V DC, M8, I_{MAX} = 0.5 A
Compact Box Extension Box	**IP2000-Bxxx IE2000**	**IP2001-Bxxx IE2001**
Connection technology	8 mm, snap type	M8, screw type
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	max. 0.5 A on each channel, individually short-circuit safe	max. 0.5 A on each channel, individually short-circuit safe
Number of outputs	8	8
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	 The IP2000/IE2000 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are short-circuit-proof and protected against inverse connection.	 The IP2001/IE2001 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are short-circuit-proof and protected against inverse connection.
Current consumption from U_S (without sensor current)	IP2000-Bxxx: see documentation IE2000: 25 mA	IP2001-Bxxx: see documentation IE2001: 25 mA
Short circuit current	typ. 1.5 A	typ. 1.5 A
Auxiliary power current	typ. 20 mA per channel	typ. 20 mA per channel
Bit width in the process image	8 outputs	8 outputs
Electrical isolation	channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus	channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus
Approvals	CE, UL	CE, UL
Further information	IP2000 IE2000	IP2001 IE2001

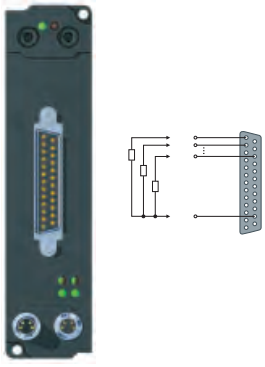
We reserve the right to make technical changes.

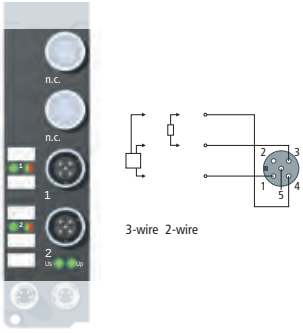
	8-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A	8-channel digital output, 24 V DC, 8 mm, I_{MAX} = 2 A (∑ 4 A)	8-channel digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 4 A)	8-channel digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 4 A)
	IP2002-Bxxx IE2002	**IP2020-Bxxx IE2020**	**IP2021-Bxxx IE2021**	**IP2022-Bxxx IE2022**
	M12, screw type	8 mm, snap type	M8, screw type	M12, screw type
	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	max. 0.5 A on each channel, individually short-circuit safe	2 A each channel, individually short-circuit safe, total current max. 4 A	2 A each channel, individually short-circuit safe, total current max. 4 A	2 A each channel, individually short-circuit safe, total current max. 4 A
	8	8	8	8
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
				
	The IP2002/IE2002 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are short-circuit-proof and protected against inverse connection.	The IP2020/IE2020 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are short-circuit-proof and protected against inverse connection.	The IP2021/IE2021 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are short-circuit-proof and protected against inverse connection.	The IP2022/IE2022 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are short-circuit-proof and protected against inverse connection.
	IP2002-Bxxx: see documentation IE2002: 25 mA	IP2020-Bxxx: see documentation IE2020: 25 mA	IP2021-Bxxx: see documentation IE2021: 25 mA	IP2022-Bxxx: see documentation IE2022: 25 mA
	typ. 1.5 A	max. 4 A	max. 4 A	max. 4 A
	typ. 20 mA per channel	typ. 30 mA per channel	typ. 30 mA per channel	typ. 30 mA per channel
	8 outputs	8 outputs	8 outputs	8 outputs
	channel/U_s, channel/channel: no, U_s/fieldbus: depending on fieldbus	channel/U_s, channel/channel: no, U_s/fieldbus: depending on fieldbus	channel/U_s, channel/channel: no, U_s/fieldbus: depending on fieldbus	channel/U_s, channel/channel: no, U_s/fieldbus: depending on fieldbus
	CE, UL	CE, UL	CE, UL	CE, UL
	IP2002 IE2002	IP2020 IE2020	IP2021 IE2021	IP2022 IE2022

Digital output | 24 V DC, positive switching

	8-channel digital output, 24 V DC, 8 mm, I_{MAX} = 2 A (∑ 12 A)	8-channel digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 12 A)	8-channel digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 12 A)
Compact Box Extension Box	**IP2040-Bxxx IE2040**	**IP2041-Bxxx IE2041**	**IP2042-Bxxx IE2042**
Connection technology	8 mm, snap type	M8, screw type	M12, screw type
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	2 A each channel, individ. short-circuit-proof, total current max. 12 A (channel 0…3: ∑ 4 A, 4+5: ∑ 4 A, 6+7: ∑ 4 A)	2 A each channel, individ. short-circuit-proof, total current max. 12 A (channel 0…3: ∑ 4 A, 4+5: ∑ 4 A, 6+7: ∑ 4 A)	2 A each channel, individ. short-circuit-proof, total current max. 12 A (channel 0…3: ∑ 4 A, 4+5: ∑ 4 A, 6+7: ∑ 4 A)
Number of outputs	8	8	8
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
			
	The IP2040/IE2040 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are supplied by three load circuits; for this reason these modules do not relay the supply voltage. The outputs are short-circuit-proof and protected against inverse connection.	The IP2041/IE2041 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are supplied by three load circuits; for this reason these modules do not relay the supply voltage. The outputs are short-circuit-proof and protected against inverse connection.	The IP2042/IE2042 digital output modules connect the binary control signals from the automation unit on to the actuators at the process level. The outputs are supplied by three load circuits; for this reason these modules do not relay the supply voltage. The outputs are short-circuit-proof and protected against inverse connection.
Current consumption from U_S (without sensor current)	IP2040-Bxxx: see documentation IE2040: 25 mA	IP2041-Bxxx: see documentation IE2041: 25 mA	IP2042-Bxxx: see documentation IE2042: 25 mA
Short circuit current	typ. 4 A	typ. 4 A	typ. 4 A
Auxiliary power current	typ. 50 mA per channel	typ. 50 mA per channel	typ. 50 mA per channel
Bit width in the process image	8 outputs	8 outputs	8 outputs
Electrical isolation	channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus	channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus	channel/U_S, channel/channel: no, U_S/fieldbus: depending on fieldbus
Approvals	CE, UL	CE, UL	CE, UL
Further information	IP2040 IE2040	IP2041 IE2041	IP2042 IE2042

We reserve the right to make technical changes.

	16-channel digital output, 24 V DC, D-sub, I_{MAX} = 0.5 A (∑ 4 A)
	IE2808, IE2808-0001
	D-sub socket, 25-pin
	ohmic, inductive, lamp load
	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
	16
	24 V DC (-15 %/+20 %)
	
	In the IE2808 digital output module an output short-circuit is recognised and passed on to the controller. After a fault, e.g. a short circuit at an output, the IE2808-0001 version starts up again automatically. The IE2808 version waits for the fault to be reset by the master (CTRL byte).
	25 mA
	max. 1.5 A
	typ. 30 mA
	16 outputs, 16 inputs (diagnostics) optional: control/status
	channel/U_s, channel/channel: no, U_s/fieldbus: depending on fieldbus
	CE, UL
	IE2808

	2-channel pulse width output, 24 V DC, M12, I_{MAX} = 2.5 A
Compact Box **Extension Box**	**IP2512-Bxxx** **IE2512**
Connection technology	M12, screw type
Load type	ohmic, inductive
Max. output current	2.5 A on each channel, individually short-circuit-proof
Number of outputs	2
Nominal voltage	24 V DC (-15 %/+20 %)
	
	The outputs of the IP2512/IE2512 module provide a pulse width modulated version of a binary signal. The keying ratio is prescribed by a 16 bit value from the automation unit. The output is protected against overload and short circuit.
Current consumption from U_s (without sensor current)	IP2512-Bxxx: see documentation IE2512: 25 mA
Up/down channel	24 V DC, 0.5 A, short-circuit-proof
Base frequency	8 Hz…40 kHz, default: 250 Hz
Duty factor	0…100 % (T_{ON} > 750 ns, T_{OFF} > 500 ns)
Resolution	max. 10 bit
Bit width in the process image	48 inputs/outputs: 2 x 16 bit data + 2 x 8 bit status
Electrical isolation	channel/U_s, channel/channel: no, U_s/fieldbus: depending on fieldbus
Approvals	CE, UL
Further information	IP2512 IE2512

Digital combi | 24 V DC, positive switching

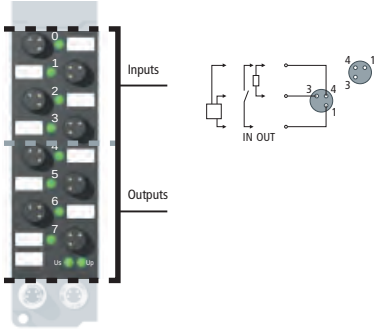
The digital combination modules combine inputs and outputs in one module. The input circuits differ in their filtering functions. The filtering has the task of suppressing electromagnetic interference. However, this does have the drawback of signal deceleration. The filter time of 3 ms is comparatively slow, but it can suppress the bouncing of a mechanical switch and delivers a stable signal for simple PLC applications. Filter times of 0.2 ms are suitable for applications with shortest possible reaction times and should be used for mechanical switches only in a restricted manner.

The output channels supply a max. continuous current of 0.5 A. Special output modules are available for higher currents. Any type of load (ohmic, capacitive, inductive) can be connected to an output module. As lamp and capacitive loads are critical due to their high starting currents, they are limited by the output circuits of the modules. This ensures that the upstream circuit-breaker is not triggered. Inductive loads are problematic at switch-off, as high induction voltages develop, if the current is interrupted too fast. An integrated freewheeling diode prevents this voltage peak. However, the current is reduced so slowly that it leads to faults in many technical control applications. A valve remains open for many milliseconds. The modules represent a compromise between prevention of overvoltage and switch-off. They suppress the induction voltage to about 24 V DC and realise switch-off times which approximately correspond to the switch-on time of the coil.

In the event of a short circuit, the module switches the corresponding output off and cyclically attempts to switch it on again. This continues until either the short circuit is eliminated or the controller resets the output. The clock frequency depends on the ambient temperature and the loads on the other channels. The total current specified should be observed.

4 x digital input +
4 x digital output,
24 V DC, 8 mm, I_{MAX} = 0.5 A

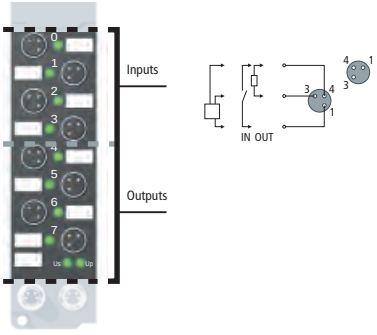
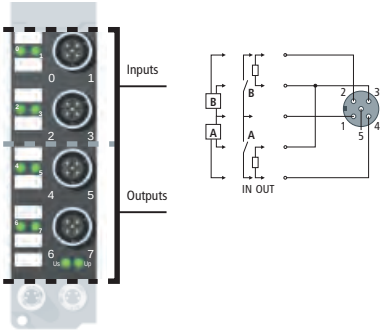
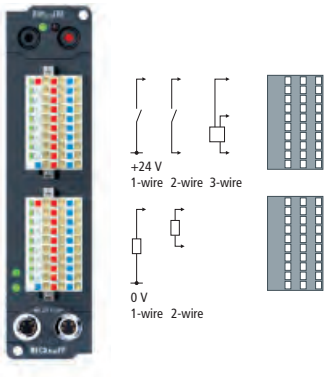
Compact Box Extension Box	IP2300-Bxxx IE2300	IP2310-Bxxx IE2310
Connection technology	8 mm, snap type	
Input filter	3.0 ms	0.2 ms
Number of channels	4 inputs + 4 outputs	



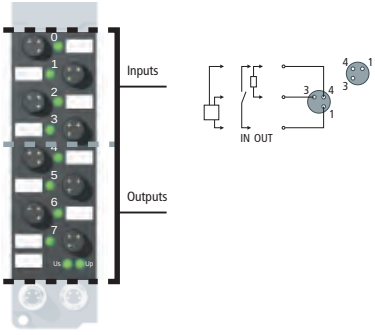
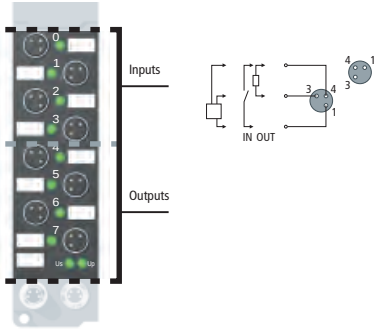
The IP23x0/IE23x0 digital I/O module combines four digital inputs and four digital outputs in one device. The outputs are short-circuit-proof and protected against inverse polarity. The signals are connected via 8 mm diameter snap type connectors.

Nominal voltage	24 V DC (-15 %/+20 %)
"0" signal voltage	-3…+5 V
"1" signal voltage	11…30 V, 6 mA input current (EN 61131-2, type 2)
Max. output current	0.5 A per channel, individually short-circuit-proof
Load type	ohmic, inductive, lamp load
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof
Short circuit current	typ. 1.5 A
Auxiliary power current	typ. 20 mA per channel
Current consumption from U_S (without sensor current)	IP23x0-Bxxx: see documentation IE23x0: 25 mA
Approvals	CE, UL
Further information	IP2300 IE2300

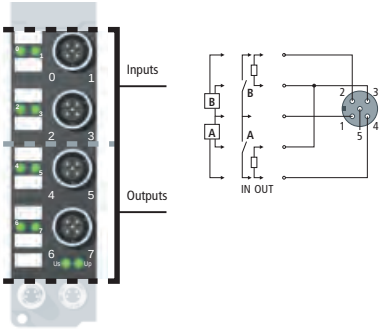
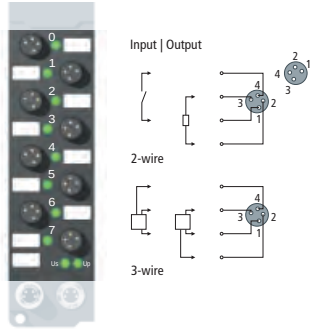
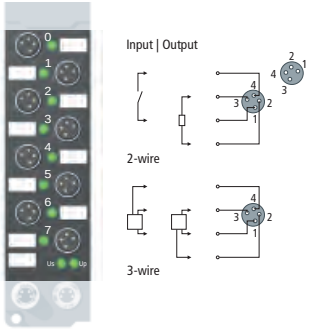
We reserve the right to make technical changes.

	4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 0.5 A		4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 0.5 A		16-channel digital combi input/output, 24 V DC, IP 20 connector, I_{MAX} = 0.5 A
	IP2301-Bxxx IE2301	**IP2311-Bxxx IE2311**	**IP2302-Bxxx IE2302**	**IP2312-Bxxx IE2312**	**IE2403**
	M8, screw type		M12, screw type		connector with spring-loaded technique
	3.0 ms	0.2 ms	3.0 ms	0.2 ms	3 ms
	4 inputs + 4 outputs		4 inputs + 4 outputs		16 channels (8 inputs and 8 outputs)
					
	The IP23x1/IE23x1 digital I/O module combines four digital inputs and four digital outputs in one device. The outputs are short-circuit-proof and protected against inverse polarity. The signals are connected via screw type M8 connectors.		The IP23x2/IE23x2 digital I/O module combines four digital inputs and four digital outputs in one device. The outputs are short-circuit-proof and protected against inverse polarity. The signals are connected via screw type M12 connectors.		The digital IE2403 I/O module has sixteen channels with eight inputs and eight outputs. The device can therefore be flexibly adapted to the requirements of the application. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. For the signal connection IP 20 connectors with a spring-loaded system are used, optionally available with 1 or 3 pins. The module is supplied without connectors. Accessories: – ZS2001-0001: connector, 1-pin, without LED – ZS2001-0002: connector, 1-pin, with LED – ZS2001-0004: connector, 3-pin, with LED
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)
	-3…+5 V		-3…+5 V		-3…+5 V
	11…30 V, 6 mA input current (EN 61131-2, type 2)		11…30 V, 6 mA input current (EN 61131-2, type 2)		11…30 V, 6 mA input current (EN 61131-2, type 2)
	0.5 A per channel, individually short-circuit-proof		0.5 A per channel, individually short-circuit-proof		max. 0.5 A on each channel, individually short-circuit safe
	ohmic, inductive, lamp load		ohmic, inductive, lamp load		ohmic, inductive, lamp load
	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof
	typ. 1.5 A		typ. 1.5 A		typ. 1.5 A
	typ. 20 mA per channel		typ. 20 mA per channel		typ. 20 mA per channel
	IP23x1-Bxxx: see documentation IE23x1: 25 mA		IP23x2-Bxxx: see documentation IE23x2: 25 mA		25 mA
	CE, UL		CE, UL		CE
	IP2301 IE2301		IP2302 IE2302		IE2403

Digital combi | 24 V DC, positive switching

	4 x digital input + 4 x digital output, 24 V DC, 8 mm, I_{MAX} = 2 A (∑ 4 A)		4 x digital input + 4 x digital output, 24 V DC, M8, I_{MAX} = 2 A (∑ 4 A)	
Compact Box **Extension Box**	**IP2320-Bxxx** **IE2320**	**IP2330-Bxxx** **IE2330**	**IP2321-Bxxx** **IE2321**	**IP2331-Bxxx** **IE2331**
Connection technology	8 mm, snap type		M8, screw type	
Input filter	3.0 ms	0.2 ms	3.0 ms	0.2 ms
Number of channels	4 inputs + 4 outputs		4 inputs + 4 outputs	
				
	The IP23x0/IE23x0 digital I/O modules combine four digital inputs and four digital outputs in one device. The outputs are short-circuit-proof and protected against inverse polarity. The signals are connected via 8 mm diameter snap type connectors.		The IP23x1/IE23x1 digital I/O modules combine four digital inputs and four digital outputs in one device. The outputs are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.	
Nominal voltage	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	
"0" signal voltage	-3…+5 V		-3…+5 V	
"1" signal voltage	11…30 V, 6 mA input current (EN 61131-2, type 2)		11…30 V, 6 mA input current (EN 61131-2, type 2)	
Max. output current	2 A per channel, individually short-circuit safe, total current max. 4 A		2 A per channel, individually short-circuit safe, total current max. 4 A	
Load type	ohmic, inductive, lamp load		ohmic, inductive, lamp load	
Sensor supply	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	
Short circuit current	typ. 4 A		typ. 4 A	
Auxiliary power current	typ. 30 mA per channel		typ. 30 mA per channel	
Current consumption from U_S (without sensor current)	IP23x0-Bxxx: see documentation IE23x0: 25 mA		IP23x1-Bxxx: see documentation IE23x1: 25 mA	
Approvals	CE, UL		CE, UL	
Further information	IP2320 IE2320		IP2321 IE2321	

We reserve the right to make technical changes.

	4 x digital input + 4 x digital output, 24 V DC, M12, I_{MAX} = 2 A (∑ 4 A)		16-channel digital combi input/output, 24 V DC, 8 mm, I_{MAX} = 0.5 A	16-channel digital combi input/output, 24 V DC, M8, I_{MAX} = 0.5 A
	IP2322-Bxxx IE2322	**IP2332-Bxxx IE2332**	**IP2400-Bxxx IE2400**	**IP2401-Bxxx IE2401**
	M12, screw type		8 mm, snap type	M8, screw type
	3.0 ms	0.2 ms	3.0 ms	3.0 ms
	4 inputs + 4 outputs		16 channels, useable optionally as input and output	16 channels, useable optionally as input and output
				
	The IP23x2/IE23x2 digital I/O modules combine four digital inputs and four digital outputs in one device. The outputs are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.		The IP2400/IE2400 digital I/O modules have sixteen channels that can be used as eight inputs and eight outputs. The signals are connected through snap type 8 mm diameter connectors, which have four pins (with separate input and output pins). This makes it possible to connect antivalent sensors. Adapter cables are available for use in input-only or output-only cases, as well as connectors for field wireable. It is also possible to use the power supply cable directly as the sensor cable. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity.	The IP2401/IE2401 digital I/O modules have sixteen channels that can be used as eight inputs and eight outputs. The signals are connected through M8 screw type connectors, which have four pins (with separate input and output pins). This makes it possible to connect antivalent sensors. Adapter cables are available for use in input-only or output-only cases, as well as connectors for field wireable. It is also possible to use the power supply cable directly as the sensor cable. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity.
	24 V DC (-15 %/+20 %)		24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	-3…+5 V		-3…+5 V	-3…+5 V
	11…30 V, 6 mA input current (EN 61131-2, type 2)		11…30 V, 6 mA input current (EN 61131-2, type 2)	11…30 V, 6 mA input current (EN 61131-2, type 2)
	2 A per channel, individually short-circuit safe, total current max. 4 A		0.5 A per channel, individually short-circuit-proof	0.5 A per channel, individually short-circuit-proof
	ohmic, inductive, lamp load		ohmic, inductive, lamp load	ohmic, inductive, lamp load
	from control voltage, max. 0.5 A total, short-circuit-proof		from control voltage, max. 0.5 A total, short-circuit-proof	from control voltage, max. 0.5 A total, short-circuit-proof
	typ. 4 A		typ. 1.5 A	typ. 1.5 A
	typ. 30 mA per channel		typ. 20 mA per channel	typ. 20 mA per channel
	IP23x2-Bxxx: see documentation IE23x2: 25 mA		IP2400-Bxxx: see documentation IE2400: 25 mA	IP2401-Bxxx: see documentation IE2401: 25 mA
	CE, UL		CE, UL	CE, UL
	IP2322 IE2322		IP2400 IE2400	IP2401 IE2401

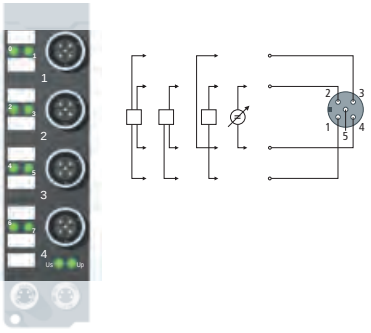
Analog input | -10…+10 V, 0/4…20 mA, PT100, temperature

The IP/IE3102 Fieldbus Box modules evaluate analogue standard signals in the range of -10/0 V to +10 V with 16-bit resolution and the IP/IE3112 modules in the range of 0/4 mA to 20 mA.

The IP/IE3202 analog input module is intended for the direct connection of resistance thermometers. The resistance is measured with a low signal current, linearised and represented in 0.1 °C. The module supports 2-, 3- and 4-wire measurement on all four channels. The measurements serve to eliminate or deduct the parasitic resistance of the sensor cable. All inputs are separately configurable for a wide range of sensors, for the three measurement procedures and for the direct measurement of resistance.

The IP/IE3312 Fieldbus Box enables the measurement of temperature using thermocouples. The measured thermovoltage is linearised in accordance with the characteristic of the respective type and transferred to the controller as a temperature value in 1/10 °C or 1/100 °C. The inputs are separately configurable for a wide range of different sensor types. Parasitic thermovoltages arise at the interface of the measuring cable and the module, significantly falsifying the measurement. This error is eliminated by the ZS2000-3712 compensation plug.

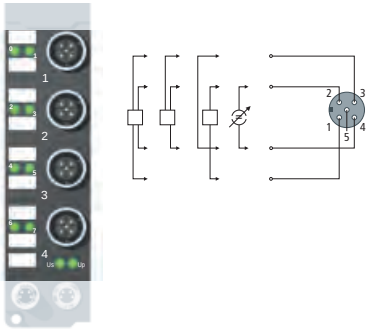
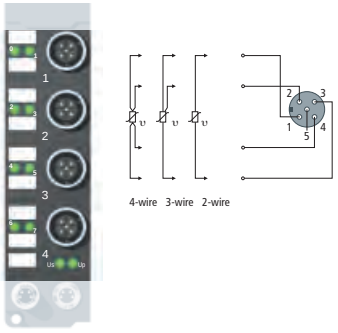
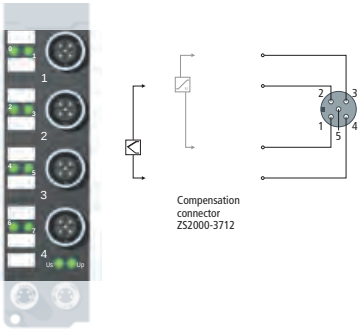
	4-channel analog input, -10…+10 V, M12, 16 bit
Compact Box **Extension Box**	**IP3102-Bxxx** **IE3102**
Connection technology	M12, screw type
Signal type	-10/0…+10 V
Resolution	16 bit (for 0…10 V range: resolution 15 bit)
Conversion time	250 ms, configurable to 5 ms
Number of inputs	4



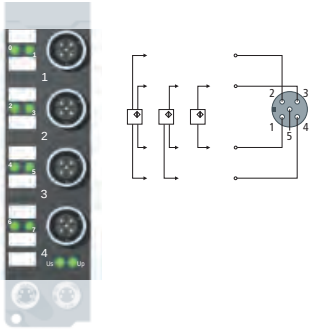
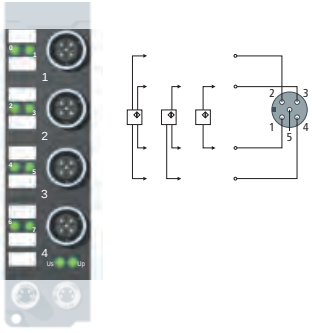
The IP3102/IE3102 analog input module handles signals in the range from -10 to +10 V. The voltage is digitised to a resolution of 16 bits and is transmitted, electrically isolated, to the higher-level automation device. The four input channels have differential inputs and possess a common, internal ground potential. The applied auxiliary voltage (which can be any value up to 30 V DC) is fed through to supply the sensor. It is thus possible, for instance, to supply a measuring potentiometer with 10 V DC from an external voltage source.

Nominal voltage	24 V DC (-15 %/+20 %)
Measuring accuracy	< ±0.3 % (relative to full scale value)
Sensor types	2-, 3-, 4-wire
Measuring range	-10…+10 V, 0…+10 V, user scale
Internal resistance	> 100 kΩ
Sensor supply	from load supply voltage U_P, DC, any value up to 30 V
Current consumption from U_S (without sensor current)	IP3102-Bxxx: see documentation IE3102: 55 mA
Approvals	CE, UL
Further information	IP3102 IE3102

We reserve the right to make technical changes.

	4-channel analog input, 0/4…20 mA, M12, 16 bit	4-channel analog input, PT100 (RTD), M12	4-channel analog input, thermocouple, M12
	IP3112-Bxxx **IE3112**	**IP3202-Bxxx** **IE3202**	**IP3312-Bxxx** **IE3312**
	M12, screw type	M12, screw type	M12, screw type
	0/4…20 mA	PT100, resistance	thermocouple, mV
	16 bit	0.1 °C per digit	0.1 °C per digit
	250 ms, configurable to 5 ms	approx. 250 ms, configurable up to 65 ms	approx. 250 ms, configurable up to 70 ms
	4	4	4
			
	The IP3112/IE3112 analog input module handles signals in the range from 0/4 to 20 mA. The input current is digitised to a resolution of 16 bits (the default is 15 bits), and is transmitted, electrically isolated, to the higher-level automation device. The four input channels have differential inputs and possess a common, internal ground potential. The applied load voltage (which can be any value up to 30 V DC) is fed through to supply the sensor.	The IP3202/IE3202 analog input module allows resistance sensors to be connected directly. The module's circuitry can operate the sensors using 2-, 3- or 4-wire connection techniques. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The module can also be used for simple resistance measurement with the output in ohms. The module's standard settings are: resolution 0.1°C in the temperature range of PT100 sensors in 4-wire connection.	The IP3312/IE3312 analog input module permits four thermocouples to be directly connected. The module's circuit can operate thermocouple sensors using the 2-wire technique. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The IE3312 can also be used for mV measurement. Accessories: – ZS2000-3712: connector with temperature compensation
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	< ±0.3 % (relative to full scale value)	< ±1 °C	< ±0.5 % (relative to full scale value)
	2-, 3-, 4-wire	PT100, PT200, PT500, PT1000, Ni100, Ni120, Ni1000 resistance measurement (e.g. potentiometer)	types J, K, L, B, E, N, R, S, T, U (default setting type K), mV measurement
	0…20 mA, 4…20 mA, user scale	-200…+850 °C (PT sensors); -60…+250 °C (Ni sensors)	depending on sensor type; preset value is type K, -100…+1370 °C
	80 Ω measuring shunt	–	–
	from load supply voltage U_P, DC, any value up to 30 V	–	–
	IP3112-Bxxx: see documentation IE3112: 55 mA	IP3202-Bxxx: see documentation IE3202: 40 mA	IP3312-Bxxx: see documentation IE3312: 40 mA
	CE, UL	CE, UL	CE, UL
	IP3112 IE3112	IP3202 IE3202	IP3312 IE3312

Analog output | 0/4…20 mA, -10…+10 V

	4-channel analog output, 0/4…20 mA, M12, 15/16 bit	4-channel analog output, -10…+10 V, M12, 16 bit
Compact Box **Extension Box**	**IP4112-Bxxx** **IE4112**	**IP4132-Bxxx** **IE4132**
Connection technology	M12, screw type	M12, screw type
Signal type	0/4…20 mA	-10/0…+10 V
Resolution	15 bit, configurable to 16 bit	16 bit
Conversion time	< 4 ms	< 4 ms
Number of outputs	4	4
		
	The IP4112/IE4112 analog output module generates analog output signals in the range from 0/4 to 20 mA. The power is supplied to the process level with a resolution of 15 bits (default), and is electrically isolated. If the input is transmitted without an arithmetical sign, 16 bit resolution may also be selected. If necessary, the output scaling can be altered. Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are powered by the load voltage. The applied load voltage (which can be any value up to 30 V DC) is fed through to supply the actuators.	The IP4132/IE4132 analog output module generates analog output signals in the range from -10 to +10 V. The voltage is supplied to the process level with a resolution of 16 bits, and is electrically isolated. If necessary, the output scaling can be altered. Ground potential for the four output channels is common with the 24 V DC supply. The analog actuators are powered by the control voltage. The applied load voltage (which can be any value up to 30 V DC) is available for supply of the actuators.
Nominal voltage	24 V DC	24 V DC
Load	< 500 Ω	> 5 kΩ
Measuring accuracy	< ±0.1 % (relative to full scale value)	< ±0.1 % (relative to full scale value)
Actuator supply	from the auxiliary voltage U_P	from the auxiliary voltage U_P
Current consumption from U_S (without sensor current)	IP4112-Bxxx: see documentation IE4112: 40 mA	IP4132-Bxxx: see documentation IE4132: 40 mA
Approvals	CE, UL	CE, UL
Further information	IP4112 IE4112	IP4132 IE4132

RUN I/O ERR
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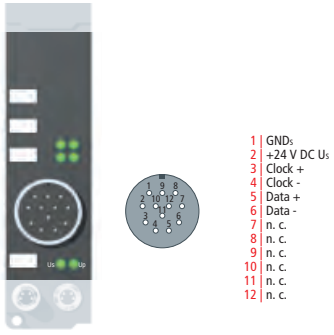
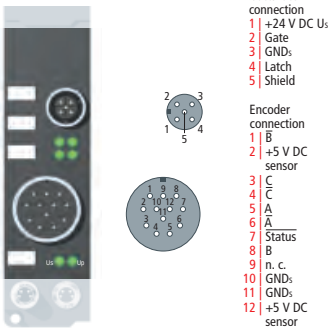
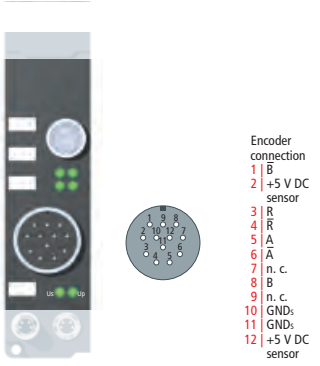
Position measurement | **SSI encoder, incremental encoder**

The IP5009/IE5009 SSI encoder interface is used for the direct connection of an SSI encoder that is powered via the SSI interface. The interface circuit generates a pulse for reading the sensor, and makes the incoming data stream available to the controller as a data word in the process image. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register.

The IP5109/IE5109 Fieldbus Box processes differential signals according to the RS422/RS485 standard. This method of transmission is particularly resistant to interference and is suitable for high transmission frequencies. The incremental encoder interface uses a quadrature decoder. Gate and latch inputs enable pre-processing in the module in order to be able to transfer positional values to the controller exactly upon an external event and thus support the referencing of a drive.

	1-channel SSI encoder interface, M23
Compact Box **Extension Box**	**IP5009-Bxxx** **IE5009**
Connection technology	M23 connector with outer thread, 12-pin
Nominal voltage	24 V DC (-15 %/+20 %)
Number of channels	1
	 The IP5009/IE5009 SSI interface module allows an SSI encoder to be connected directly. The encoder is powered via the SSI interface. The interface circuit generates a pulse for reading the encoder and makes the incoming data stream available to the controller as a data word in the process image. The module can optionally provide the data as binary numbers or as a binary gray code. Various operating modes, transmission frequencies and bit widths can be permanently stored in a control register.
Signal input	difference signal (RS485)
Encoder supply	24 V DC, from load voltage
Data transfer rates	variable up to 1 MHz, 250 kHz default
Counter	–
Limit frequency	–
Resolution	32 bit counter value
Commands	–
Sensor supply	derived from control voltage, max. 0.5 A total, short-circuit-proof
Current consumption from U_S (without sensor current)	IP5009-Bxxx: see documentation IE5009: 55 mA
Approvals	CE, UL
Further information	IP5009 IE5009

We reserve the right to make technical changes.

	1-channel incremental encoder interface, 1 MHz, M23	1-channel SinCos encoder interface, M23	
	IP5109-Bxxx IE5109	**IP5209-Bxxx**	**IP5209-Bxxx-1000**
	encoder/sensor: M23 connector with outer thread, 12-pin, gate/latch: M12, screw type	M23 connector with outer thread, 12-pin	
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)	
	1	1	
	 Gate/Latch connection 1 | +24 V DC U_S 2 | Gate 3 | GND_S 4 | Latch 5 | Shield Encoder connection 1 | B 2 | +5 V DC sensor 3 | $\overline{C}$ 4 | C 5 | $\overline{A}$ 6 | A 7 | Status 8 | $\overline{B}$ 9 | n. c. 10 | GND_S 11 | GND_S 12 | +5 V DC sensor	 Encoder connection 1 | $\overline{B}$ 2 | +5 V DC sensor 3 | R 4 | $\overline{R}$ 5 | $\overline{A}$ 6 | A 7 | n. c. 8 | $\overline{B}$ 9 | n. c. 10 | GND_S 11 | GND_S 12 | +5 V DC sensor	
	The IP5109/IE5109 module is an interface for the direct connection of incremental encoders with differential inputs (RS485) or with single inputs. A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. The inputs can optionally be used as complementary or as single inputs. Incremental encoders with alarm outputs can be connected at the interface's status input. Interval measurement with a resolution of 200 ns is possible. The gate input allows the counter to be halted (high = stop). The value is read with a rising edge at the latch input.	The SinCos module IP5209-Bxxx serves as interface for the direct connection of a measuring sensor, for example a measuring probe with sinusoidal voltage output 1 V_{PP} to the higher-level fieldbus. In contrast to the standard version, instead of a voltage input the special IP5209-Bxxx-1000 version has a current input for 11 μA_{PP} measuring probes. The measuring signal is processed, interpolated and made available as a 32 bit value. The signal period resolution is 10 bits, i.e. 1024 steps. The reference mark is also stored in a 32 bit value. The current count and the reference mark value can be read. The limit frequency for the measuring signal inputs is 100 kHz.	
	difference signal (RS485)	1 V_{PP}	11 μA_{PP}
	+5 V DC	+5 V DC	
	–	–	
	16 bit, binary	–	
	1 MHz (with 4-fold evaluation)	100 kHz (scanning of the input signals with 500 kHz)	
	16 bit binary value	10 bit, 1024 steps per period	
	read, set, enable	set count, evaluate reference mark latch, change of direction, frequency control	
	derived from control voltage, max. 0.5 A total, short-circuit-proof	5 V DC from control voltage, max. 0.5 A	
	IP5109-Bxxx: see documentation IE5109: 55 mA	130 mA	
	CE, UL	CE, UL	
	IP5109 IE5109	IP5209	

Communication | **Serial interfaces**

The IP60x2/IE60x2 serial interfaces enable the connection of devices with RS232 or RS422/RS485 interfaces to the control level. The active communication channel operates independently of the higher-level bus system in full duplex mode at up to 115.2 kbaud. This way, any desired number of serial interfaces can be used in the application without having to consider structural restrictions in the control device. The serial interface can be positioned close to the place of use, this way reducing the necessary cable lengths.

The RS232 interface enables high resistance to interference by means of electrically isolated signals, which in the case of the IP6022/IE6022 module is additionally supported by differential signal transmission according to RS422.

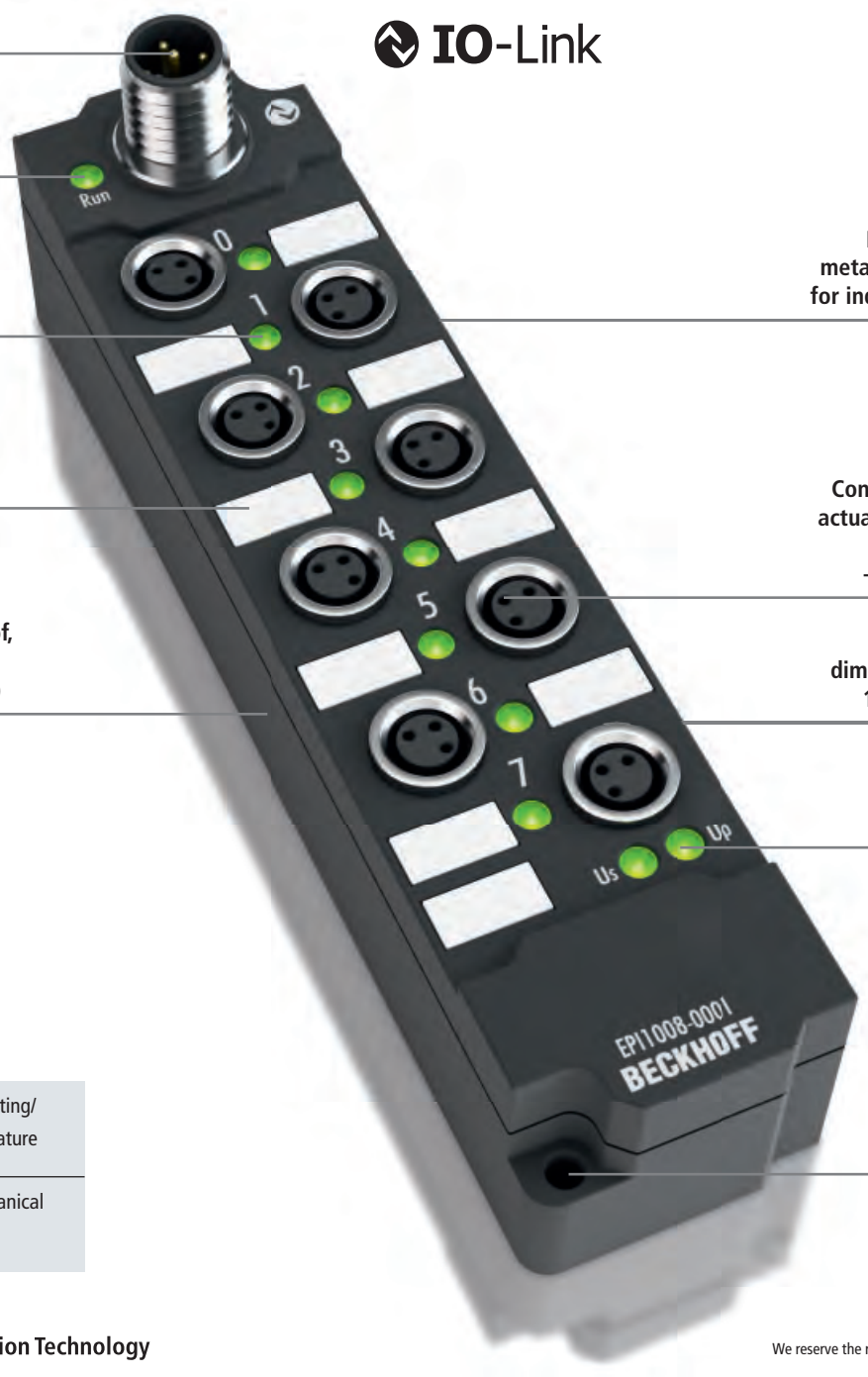
	1-channel serial interface, RS232, M12
Compact Box **Extension Box**	**IP6002-Bxxx** **IE6002**
Connection technology	M12, screw type
Data transfer rates	1200…115,200 baud, 9600 baud (8 bits, no parity, 1 stop bit) is preset
Data transfer channels	2 (1/1), TxD and RxD, full duplex
	  The IP6002/IE6002 serial interface module allows the connection of devices with an RS232 interface, which operates in conformity with the CCITT V.28/DIN 66 259-1 standards. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The RS232 interface guarantees high immunity to interference through electrically isolated signals.
Nominal voltage	24 V DC (-15 %/+20 %)
Bit transfer	RS232 (EIA-232)
Specification	“0”: -18…+3 V; “1”: 3…18 V
Cable length	max. 15 m
Data buffer	128 bytes receive buffer, 16 bytes transmit buffer
Bit width in the process image	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
Current consumption from U_S (without sensor current)	IP6002-Bxxx: see documentation IE6002: 40 mA
Approvals	CE, UL
Further information	IP6002 IE6002

We reserve the right to make technical changes.

	1-channel serial interface TTY, 20 mA current loop, M12	1-channel serial interface, RS422/RS485, M12
	IP6012-Bxxx **IE6012**	**IP6022-Bxxx** **IE6022**
	M12, screw type	M12, screw type
	1200…115,200 baud, 9600 baud (8 bits, no parity, 1 stop bit) is preset	1200…115,200 baud, 9600 baud (8 bits, no parity, 1 stop bit) is preset
	2 (1/1), TxD and RxD	TxD and RxD, full/half duplex
	The IP6012/IE6012 serial interface module allows the connection of devices with a 20 mA current interface. The interface operates passively. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The current interface guarantees high immunity to interference through electrically isolated signals with injected current.	The IP6022/IE6022 serial interface module allows the connection of devices with a RS422 or RS485 interface. The module transmits the data in a fully transparent manner to the higher-level automation device. The data is transferred via the fieldbus using a simple handshake protocol. This does not have any effect on the protocol of the serial interface. The transmission of differential signals according to RS232 guarantees high immunity to interference through electrically isolated signals.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	2 x 20 mA	RS422/RS485
	load: < 500 Ω	line impedance: 120 Ω
	max. 1000 m twisted pair	max. 500 m twisted pair
	128 bytes receive buffer, 16 bytes transmit buffer	128 bytes receive buffer, 16 bytes transmit buffer
	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)	input/output: 3 x 8 bit user data, 1 x 8 bit control/status (up to 5 x 8 bit user data are possible)
	IP6012-Bxxx: see documentation IE6012: 40 mA	IP6022-Bxxx: see documentation IE6022: 40 mA
	CE, UL	CE, UL
	IP6012 IE6012	IP6022 IE6022

EPIxxxx, ERIxxxx | IO-Link box

▶ IO-Link-box



IO-Link interface

Signal status

Signal status display

Standard labels

Watertight and dust-proof, due to protection class IP 65/66/67 (fully potted)

Robust (EPIxxxx) or metal housing (ERIxxxx) for industrial application

Connection of sensors/ actuators via connector:
- **M8, screw type**
- **M12, screw type**

Ultra compact dimensions (H x W x D) 126 x 30 x 26.5 mm

Power supply status display: LED 24 V (L_+)

Mounting holes

+60 °C -25 °C	Extended operating/ storage temperature
35 g	Extended mechanical load

We reserve the right to make technical changes.

Industrial housing (EPIxxxx)

Zinc die-cast housing (ERIxxxx)

I/O connections

Connector M8, screw type, 3-pin

Connector M12, screw type, 5-pin

Since 2013, the IO-Link communication system has been available worldwide as an international standard according to IEC 61131-9 and is thus the first globally standardised technology for communication with sensors and actuators below the fieldbus level. Based on this standard Beckhoff offers a new, extensive range of IO-Link box modules with IP 67 protection for the implementation of inexpensive point-to-point connections directly in the field.

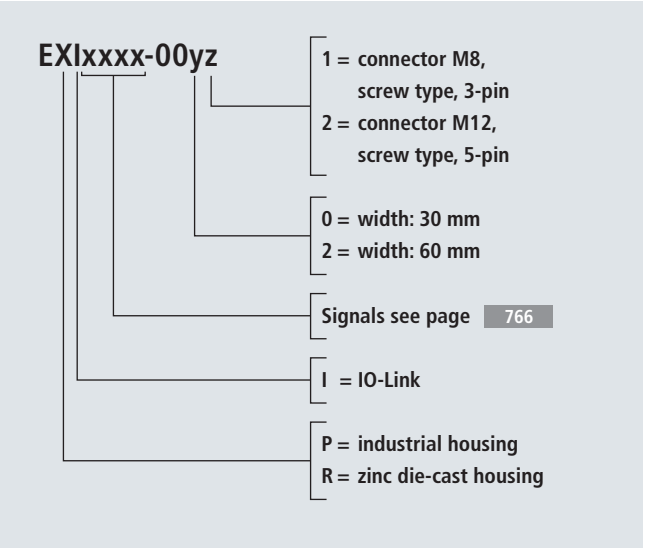
The EPIxxxx and ERIxxxx IO-Link box modules enable the connection of binary and complex sensors and actuators in the field. The connection between the modules and the respective IO-Link master is made via an M12 connecting line (port class A). In case of modules with increased power consumption, an additional voltage infeed is possible (port class B). Economical wiring is possible through the use of unshielded industrial cables. The modules are designed according to IO-Link specification V1.1; the range of the point-to-point connection is 20 m in accordance with the specification. All connected IO-Link devices can be identified, diagnosed and if necessary simply replaced without parameterisation having to be carried out again.

With their compact and space-saving design the IO-Link box modules are suitable for the most diverse applications. The IO-Link connections are integrated both in the proven plastic housings (EPI) and in the die-cast zinc housings (ERI) for additional protection in extremely harsh environments. Binary sensors can be connected to 8- or 16-channel modules with an M8 or M12 screw connection. The universal digital I/O modules with 8 or 16 freely usable input/output channels are particularly flexible in use. Analog signals can be acquired and output with the 4-channel analog input box or combi box with two analog inputs and two analog outputs. In combination with a V1.1 master this allows the sensor parameters to be saved in the master and reloaded.

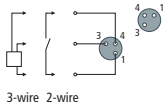
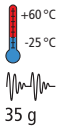
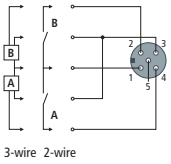
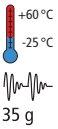
Apart from process data, acyclic data such as device information (parameters, identification data, diagnosis, etc.) and events (e.g. error message, warning) can be transmitted with the IO-Link box modules. Beckhoff offers IO-Link masters in IP 20 and IP 67 execution:

- EL6224 EtherCAT Terminal (IP 20)
- EP6224 EtherCAT Box (IP 67)
- KL6224 Bus Terminal (IP 20)

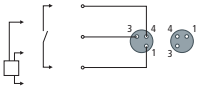
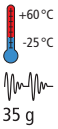
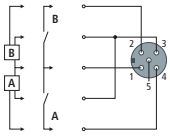
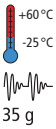
The IO-Link configuration tool is directly integrated into the TwinCAT software system. Apart from the programming of the control system, cyclic data from various fieldbuses are collected in process images in TwinCAT, including data from the IO-Link devices, and thus no separate configuration tool is required. With TwinCAT, higher-level fieldbuses such as EtherCAT can be conveniently connected to the sensor/actuator level and simply configured via one software platform. Moreover, the scan function of the IO-Link devices facilitates their integration. In connection with the import of the device description file IODD (IO Device Description), parameters and diagnostic data can be accessed directly via the configuration tool. With the aid of the TwinCAT software system, IO-Link parameters and diagnostic data can also be accessed simply and conveniently from a user program.



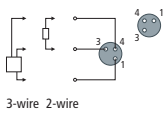
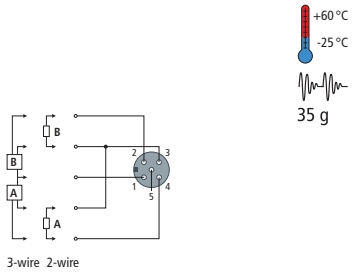
Digital input | 24 V DC, positive switching

	8-channel digital input, 24 V DC, M8, positive switching	8-channel digital input, 24 V DC, M12, positive switching
Industrial housing **Zinc die-cast housing**	**EPI1008-0001** **ERI1008-0001**	**EPI1008-0002** **ERI1008-0002**
Connection technology	M8, screw type	M12, screw type
Specification version	IO-Link V1.1, Class A	IO-Link V1.1, Class A
Input filter	3.0 ms (default), adjustable 0…20 ms	3.0 ms (default), adjustable 0…20 ms
Number of inputs	8	8
	    The EPI1008/ERI1008 IO-Link box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M8 screw type connectors.	   The EPI1008/ERI1008 IO-Link box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M12 screw type connectors.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Data transfer rates	230.4 kbaud (COM 3)	230.4 kbaud (COM 3)
Interfaces	1 x M12 plug, A-coded	1 x M12 plug, A-coded
Sensor supply	max. 0.5 A total, U_{S1} (derived from L_+), short-circuit-proof	max. 0.5 A total, U_{S1} (derived from L_+), short-circuit-proof
Current consumption	typ. 100 mA from L_+	typ. 100 mA from L_+
Electrical isolation	control voltage/communication: yes	control voltage/communication: yes
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE	CE
Protection class	IP 65/66/67 (according to EN 60529)	IP 65/66/67 (according to EN 60529)
Further information	EPI1008 ERI1008	EPI1008 ERI1008

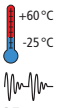
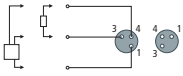
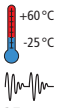
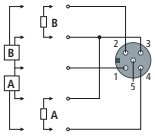
We reserve the right to make technical changes.

	16-channel digital input, 24 V DC, M8, positive switching	16-channel digital input, 24 V DC, M12, positive switching
	EPI1809-0021 **ERI1809-0021**	**EPI1809-0022** **ERI1809-0022**
	M8, screw type	M12, screw type
	IO-Link V1.1, Class A	IO-Link V1.1, Class A
	3.0 ms (default), adjustable 0…20 ms	3.0 ms (default), adjustable 0…20 ms
	16	16
	   3-wire 2-wire  35 g	  3-wire 2-wire  35 g
	The EPI1809/ERI1809 IO-Link box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M8 screw type connectors.	The EPI1809/ERI1809 IO-Link box with digital inputs acquires the binary control signals from the process level and transmits them, in an electrically isolated form, to the controller. The state of the signals is indicated by light emitting diodes. The signals are connected via M12 screw type connectors.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	230.4 kbaud (COM 3)	230.4 kbaud (COM 3)
	1 x M12 plug, A-coded	1 x M12 plug, A-coded
	max. 0.5 A total, U_{S1} (derived from L_+), short-circuit-proof	max. 0.5 A total, U_{S1} (derived from L_+), short-circuit-proof
	typ. 100 mA from L_+	typ. 100 mA from L_+
	control voltage/communication: yes	control voltage/communication: yes
	-25…+60 °C	-25…+60 °C
	CE	CE
	IP 65/66/67 (according to EN 60529)	IP 65/66/67 (according to EN 60529)
	EPI1809 ERI1809	EPI1809 ERI1809

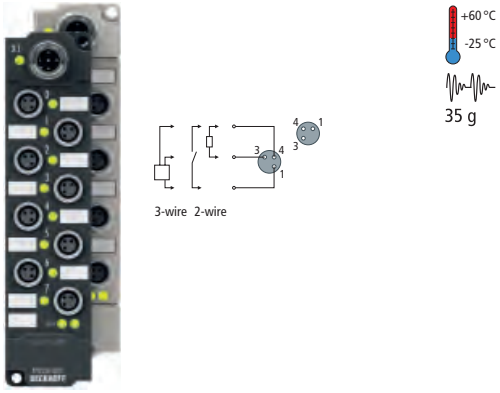
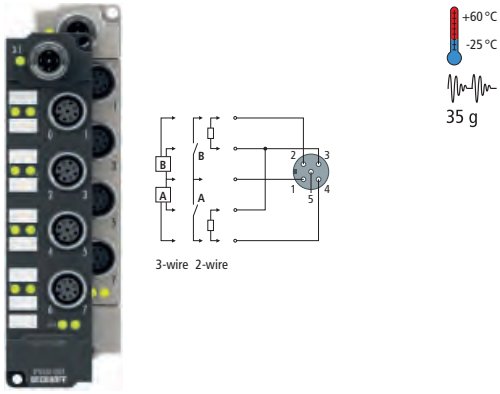
Digital output | 24 V DC, positive switching

	8-channel digital output, 24 V DC, M8, I_{MAX} = 0.5 A	8-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A
Industrial housing **Zinc die-cast housing**	**EPI2008-0001** **ERI2008-0001**	**EPI2008-0002** **ERI2008-0002**
Connection technology	M8, screw type	M12, screw type
Specification version	IO-Link V1.1, Class B	IO-Link V1.1, Class B
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Max. output current	0.5 A per channel, individually short-circuit-proof	0.5 A per channel, individually short-circuit-proof
Number of outputs	8	8
		
	The EPI2008/ERI2008 IO-Link box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A each. The signals are optionally connected via M8 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.	The EPI2008/ERI2008 IO-Link box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The eight outputs handle load currents of up to 0.5 A each. The signals are optionally connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Data transfer rates	230.4 kbaud (COM 3)	230.4 kbaud (COM 3)
Short circuit current	typ. 1.5 A	typ. 1.5 A
Current consumption	typ. 100 mA from L_+	typ. 100 mA from L_+
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Interfaces	1 x M12 plug, A-coded	1 x M12 plug, A-coded
Electrical isolation	control voltage/communication: yes	control voltage/communication: yes
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE	CE
Further information	EPI2008 ERI2008	EPI2008 ERI2008

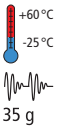
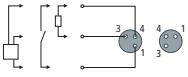
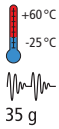
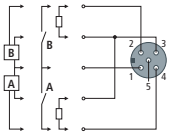
We reserve the right to make technical changes.

	16-channel digital output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 4 A)	16-channel digital output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 4 A)
	EPI2809-0021 **ERI2809-0021**	**EPI2809-0022** **ERI2809-0022**
	M8, screw type	M12, screw type
	IO-Link V1.1, Class B	IO-Link V1.1, Class B
	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	0.5 A each channel, individually short-circuit-proof, total current max. 4 A	0.5 A each channel, individually short-circuit-proof, total current max. 4 A
	16	16
	   35 g  3-wire 2-wire	  35 g  3-wire 2-wire
	The EPI2809/ERI2809 IO-Link box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. The signals are optionally connected via M8 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.	The EPI2809/ERI2809 IO-Link box with digital outputs connects the binary control signals from the controller on to the actuators at the process level. The 16 outputs handle load currents of up to 0.5 A each, although the total current is limited to 4 A. This makes these modules particularly suitable for applications in which not all of the outputs are active at the same time, or in which not all of the actuators draw 0.5 A current. The signals are optionally connected via M12 screw type connectors. All outputs are short-circuit-proof and protected against inverse connection.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	230.4 kbaud (COM 3)	230.4 kbaud (COM 3)
	typ. 1.5 A	typ. 1.5 A
	typ. 100 mA from L_+	typ. 100 mA from L_+
	typ. 20 mA + load	typ. 20 mA + load
	1 x M12 plug, A-coded	1 x M12 plug, A-coded
	control voltage/communication: yes	control voltage/communication: yes
	-25…+60 °C	-25…+60 °C
	CE	CE
	EPI2809 ERI2809	EPI2809 ERI2809

Digital combi | 24 V DC, positive switching

	8-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A	8-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A
Industrial housing **Zinc die-cast housing**	**EPI2338-0001** **ERI2338-0001**	**EPI2338-0002** **ERI2338-0002**
Connection technology	M8, screw type	M12, screw type
Specification version	IO-Link V1.1, Class B	IO-Link V1.1, Class B
Input filter	3.0 ms (default), adjustable 0…20 ms	3.0 ms (default), adjustable 0…20 ms
Number of channels	8 digital inputs or outputs	8 digital inputs or outputs
		
	The EPI2338/ERI2338 IO-Link box has eight digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.	The EPI2338/ERI2338 IO-Link box has eight digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A, are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.
Nominal voltage	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
Data transfer rates	230.4 kbaud (COM 3)	230.4 kbaud (COM 3)
Max. output current	0.5 A per channel, individually short-circuit-proof	0.5 A per channel, individually short-circuit-proof
Load type	ohmic, inductive, lamp load	ohmic, inductive, lamp load
Sensor supply	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
Short circuit current	max. 1.5 A	max. 1.5 A
Interfaces	1 x M12 plug, A-coded	1 x M12 plug, A-coded
Auxiliary power current	typ. 20 mA + load	typ. 20 mA + load
Current consumption	typ. 100 mA from L_+	typ. 100 mA from L_+
Electrical isolation	control voltage/communication: yes	control voltage/communication: yes
Operating temperature	-25…+60 °C	-25…+60 °C
Approvals	CE	CE
Further information	EPI2338 ERI2338	EPI2338 ERI2338

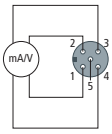
We reserve the right to make technical changes.

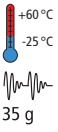
	16-channel digital input or output, 24 V DC, M8, I_{MAX} = 0.5 A (∑ 4 A)	16-channel digital input or output, 24 V DC, M12, I_{MAX} = 0.5 A (∑ 4 A)
	EPI2339-0021 **ERI2339-0021**	**EPI2339-0022** **ERI2339-0022**
	M8, screw type	M12, screw type
	IO-Link V1.1, Class B	IO-Link V1.1, Class B
	3.0 ms (default), adjustable 0…20 ms	3.0 ms (default), adjustable 0…20 ms
	16 digital inputs or outputs	16 digital inputs or outputs
	    The EPI2339/ERI2339 IO-Link box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M8 screw type connectors.	   The EPI2339/ERI2339 IO-Link box has 16 digital channels, each of which can optionally be operated as an input or as an output. A configuration for using a channel as input or output is not necessary; the input circuit is internally connected to the output driver, so that a set output is displayed automatically in the input process image. The outputs handle load currents of up to 0.5 A (the total current is limited to 4 A). They are short-circuit-proof and protected against inverse polarity. The signals are connected via M12 screw type connectors.
	24 V DC (-15 %/+20 %)	24 V DC (-15 %/+20 %)
	230.4 kbaud (COM 3)	230.4 kbaud (COM 3)
	0.5 A per channel, individually short-circuit-proof, total current max. 4 A	0.5 A per channel, individually short-circuit-proof, total current max. 4 A
	ohmic, inductive, lamp load	ohmic, inductive, lamp load
	from load supply voltage, max. 0.5 A total, short-circuit-proof	from load supply voltage, max. 0.5 A total, short-circuit-proof
	max. 1.5 A	max. 1.5 A
	1 x M12 plug, A-coded	1 x M12 plug, A-coded
	typ. 20 mA + load	typ. 20 mA + load
	typ. 100 mA from L_+	typ. 100 mA from L_+
	control voltage/communication: yes	control voltage/communication: yes
	-25…+60 °C	-25…+60 °C
	CE	CE
	EPI2339 ERI2339	EPI2339 ERI2339

Analog input | -10…+10 V, 0/4…20 mA

The EPI3174 and ERI3174 IO-Link box modules evaluate analog standard signals within the range of -10/0 V to +10 V or 0/4 mA to 20 mA with 16-bit resolution. The signal form is separately configurable for each channel. The EPI3174/ERI3174 evaluates the difference between the two input signals Input+ and Input-. These must be referred to the ground potential of the load voltage U_P. The DC component does not affect the measurement, as long as it is in the common mode range.

	4-channel analog input, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit
Industrial housing	**EPI3174-0002**
Zinc die-cast housing	**ERI3174-0002**
Connection technology	M12, screw type
Specification version	IO-Link V1.1, Class B
Signal type	-10/0…+10 V | 0/4…20 mA
Resolution	16 bit (incl. sign)
Conversion time	~ 100 µs
Number of inputs	4





The IO-Link box EPI3174/ERI3174 has four analog inputs which can be individually parameterised, so that they process signals either in the -10 to +10 V or the 0/4 to 20 mA range. The voltage or input current is digitised with a resolution of 16 bits, and is transmitted (electrically isolated) to the higher-level automation device. The four input channels have a common, internal ground potential. The input filter/conversion times are configurable in a wide range.

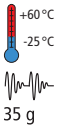
Measuring error	< ±0.3 % (relative to full scale value)
Data transfer rates	230.4 kbaud (COM 3)
Internal resistance	> 200 kΩ | 85 Ω typ. + diode voltage
Sensor supply	from additional power supply $2L_+$, DC, freely selectable up to 30 V
Current consumption	typ. 100 mA from L_+
Interfaces	1 x M12 plug, A-coded
Special features	current or voltage parameterisable (0/4…20 mA, -10/0…10 V)
Operating temperature	-25…+60 °C
Approvals	CE
Further information	EPI3174 ERI3174

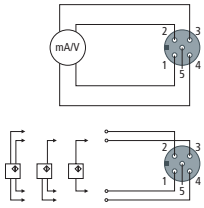
We reserve the right to make technical changes.

Analog output | -10…+10 V, 0/4…20 mA

The EPI4374 and ERI4374 IO-Link box modules acquire/output analog standard signals within the range of -10/0 V to +10 V or 0/4 mA to 20 mA with 16-bit resolution. The type of signal is separately configurable for each channel. The output signals U_S, U_P and the fieldbus are electrically isolated from one another and have a common ground potential (Output-).

	2-channel analog input + 2-channel analog output, -10/0…+10 V or 0/4…20 mA, parameterisable, 16 bit
Industrial housing **Zinc die-cast housing**	**EPI4374-0002** **ERI4374-0002**
Connection technology	M12, screw type
Specification version	IO-Link V1.1, Class B
Signal type	-10/0…+10 V | 0/4…20 mA
Resolution	16 bit (incl. sign)
Conversion time	input: ~ 100 µs, output: ~ 40 µs
Number of outputs	2
Number of inputs	2





The EPI4374/ERI4374 IO-Link box combines two analog inputs and two analog outputs which can be individually parameterised, so that they process/generate signals either in the -10 to +10 V or the 0/4 to 20 mA range. The resolution for the current and voltage signals is 16 bit (signed).

The voltage or output current is supplied to the process level with a resolution of 15 bit (default), and is electrically isolated. Ground potential for the two output channels is common with the 24 V DC supply.

Measuring error	< 0.1 % (relative to full scale value)
Data transfer rates	230.4 kbaud (COM 3)
Load	> 5 kΩ | < 500 Ω
Internal resistance	input: > 200 kΩ | 85 Ω typ. + diode voltage
Sensor supply	from load supply voltage U_P, DC, any value up to 30 V
Current consumption	typ. 100 mA from L_+
Interfaces	1 x M12 plug, A-coded
Special features	combi module, current or voltage parameterisable per channel
Operating temperature	-25…+60 °C
Approvals	CE
Further information	EPI4374 ERI4374

We reserve the right to make technical changes.

Housing type A

Housing type B

FM33xx-B110 | **Thermocouple Fieldbus Modules with EtherCAT interface**

EtherCAT®

The FM33xx-B110 fieldbus modules allow 12 or 32 thermocouples to be connected to a module. The connecting circuitry for these multiple thermocouples is housed in a compact, splash-proof housing and has an EtherCAT IN and an EtherCAT OUT interface. The modules are supplied with power via separate M8 connections and are "daisy-chain"-capable on both the power supply and EtherCAT sides, i.e. several modules can be wired in series in a line topology.

The module's circuit can operate thermocouple sensors using a 2-wire connection. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The Fieldbus Modules have back-voltage protection circuitry to protect against external voltages applied to the thermocouple inputs. Voltages of up to 230 V AC are withstood without damage to the module. Those thermocouple inputs that are not affected remain functionally operative or are only affected for a short time.

The extended parameterisation is carried out via EtherCAT. The parameters are stored in the module. The status of the Fieldbus Module is indicated via LEDs.

The different versions of the FM33xx Fieldbus Module differ in terms of the number of available thermocouple input channels (12 or 32 channels) and the housing type (clip-on housing A or add-on housing B). The add-on housing (type B) features two locking latches and a continuous rubber seal to provide an IP 65 connection to the socket element. In addition, housing type B features two cast brackets with holes for attaching the FM module to mounting plates (through-hole mounting).

Ordering information	FM33xx-B110
FM3312-B110-0010	Fieldbus Module, thermocouple, 12-channel, type J, EtherCAT IN/OUT interface, housing type A
FM3312-B110-1010	Fieldbus Module, thermocouple, 12-channel, type J, EtherCAT IN/OUT interface, housing type B
FM3332-B110-0010	Fieldbus Module, thermocouple, 32-channel, type J, EtherCAT IN/OUT interface, housing type A
FM3332-B110-1010	Fieldbus Module, thermocouple, 32-channel, type J, EtherCAT IN/OUT interface, housing type B

We reserve the right to make technical changes.

Technical data	FM3312-B110	FM3332-B110
Fieldbus	EtherCAT	
Data transfer rates	100 Mbaud	
Configuration possibility	via the controller	
Fieldbus connection method	2 x M12 socket, 4-pin (D-coded)	
Thermocouple channels	12	32
Thermocouple connections	industrial plug-in connection (Han24E, Han64D), 2-wire connection	
Cable length	max. 100 m	
Sensor types	type J, mV measurement (other types on request)	
Measuring range	type J: -10…+900 °C	
Resolution	0.1 °C per digit	
Conversion time	approx. 250 ms	
Measuring accuracy	< ±0.5 % (of the full scale value)	
Input filter	5 variations, configurable	
Power supply	24 V DC (-15 %/+20 %), feed: 1 x M8 plug, 4-pin; downstream connection: 1 x M8 socket, 4-pin	
Current consumption	typ. 120 mA/max. 150 mA	typ. 150 mA/max. 180 mA
Bit width in the process image	input: 1 x 16 bit data, 2 x 8 bit status (per channel), 1 bit WcState, 10 bytes InfoData	
Electrical isolation	channels/control voltage: 500 V, between the channels: no, control voltage/fieldbus: 500 V (EtherCAT)	
Housing type A	industrial plug-in connector, Han24B	
Housing type B	add-on housing AGG + locking bracket	
Housing pin insert	Han24E	Han64D
Contacts	hard gold plated	
Dimensions (L x W x H)	type A: 120 mm x 52 mm x 129 mm, type B: 150 mm x 52 mm x 129 mm	
Weight	type A: 950 g, type B: 1030 g	
Operating/storage temperature	0…+55 °C/-25…+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	housing to IP 65 (EtherCAT connector: IP 67)/variable	
Further information	FM3312-B110	

Accessories

Ordering information		
ZK1090-6xxx-xxxx	M12 EtherCAT/Ethernet cables	810
ZK2020-3xxx-xxxx	M8 power cables	813

We reserve the right to make technical changes.

Housing type A

Housing type B

FM33xx-B310 | Thermocouple Fieldbus Modules with PROFIBUS interface

The FM33xx-B310 Fieldbus Modules allow 12 or 32 thermocouples to be connected to a module. The connecting circuitry for these multiple thermocouples is housed in a compact, splash-proof housing and has a PROFIBUS DP interface with a transmission rate of 12 Mbaud. Data are mainly exchanged cyclically, although acyclic services ("DP-V1") are also available for parameterisation and diagnosis.

The module's circuit can operate thermocouple sensors using a 2-wire connection. Linearisation over the full temperature range is realised with the aid of a microprocessor. The temperature range can be selected freely. The error LEDs indicate a broken wire. Compensation for the cold junction is made through a temperature measurement in the connecting plugs. This means that standard extension leads can be connected. The Fieldbus Modules have back-voltage protection circuitry to protect against external voltages applied to the thermocouple inputs. Voltages of up to 230 V AC are withstood without damage to the module. Those thermocouple inputs that are not affected remain functionally operative or are only affected for a short time.

The extended parameterisation may be carried out either via the fieldbus or, using the KS2000 software tool, through the configuration interface. The parameters are stored in the module. The status of the Fieldbus Module is indicated via LEDs.

The different versions of the FM33xx-B310 Fieldbus Module differ in terms of the number of available thermocouple input channels (12 or 32 channels), the type of thermocouple that is implemented (type J or K), and the housing type (clip-on housing A or add-on housing B). The add-on housing (type B) features two locking latches and a continuous rubber seal to provide an IP 65 connection to the socket element. In addition, housing type B features two cast brackets with holes for attaching the FM module to mounting plates (through-hole mounting).

Ordering information	FM33xx-B310
FM3312-B310-0000	Fieldbus Module, thermocouple, 12-channel, type K, PROFIBUS interface, housing type A
FM3312-B310-0010	Fieldbus Module, thermocouple, 12-channel, type J, PROFIBUS interface, housing type A
FM3312-B310-1000	Fieldbus Module, thermocouple, 12-channel, type K, PROFIBUS interface, housing type B
FM3312-B310-1010	Fieldbus Module, thermocouple, 12-channel, type J, PROFIBUS interface, housing type B
FM3332-B310-0000	Fieldbus Module, thermocouple, 32-channel, type K, PROFIBUS interface, housing type A
FM3332-B310-0010	Fieldbus Module, thermocouple, 32-channel, type J, PROFIBUS interface, housing type A
FM3332-B310-1000	Fieldbus Module, thermocouple, 32-channel, type K, PROFIBUS interface, housing type B
FM3332-B310-1010	Fieldbus Module, thermocouple, 32-channel, type J, PROFIBUS interface, housing type B

We reserve the right to make technical changes.

Technical data	FM3312-B310	FM3332-B310
Fieldbus	PROFIBUS DP	
Data transfer rates	max. 12 Mbaud	
Configuration possibility	via KS2000 or the controller	
Fieldbus connection method	DIN 45322, 6-pin, screwed	
Thermocouple channels	12	32
Thermocouple connections	industrial plug-in connection (Han24E, Han64D), 2-wire connection	
Cable length	max. 10 m	
Sensor types	type J, K, mV measurement	
Temperature range	type J: -10…+900 °C; type K: -100…+1370 °C	
Resolution	0.1 °C per digit	
Conversion time	approx. 250 ms	
Measuring error	< ±0.5 % (of the full scale value)	
Input filter	5 variations, configurable	
Power supply	24 V DC (-15 %/+20 %)	
Current consumption	typ. 90 mA/max. 120 mA	typ. 100 mA/max. 130 mA
Bit width in the process image	input: 4 x 16 bit data, optional: 4 x 8 bit control/status	
Electrical isolation	channels/control voltage: 500 V_{rms}, between the channels: no, control voltage/fieldbus: 100 V_{rms} (PROFIBUS)	
Housing type A	industrial plug-in connector, Han24B	
Housing type B	add-on housing AGG + locking bracket	
Housing pin insert	Han24E	Han64D
Contacts	hard gold plated	
Dimensions (L x W x H)	type A: 120 mm x 52 mm x 129 mm, type B: 150 mm x 52 mm x 129 mm	
Weight	type A: 950 g, type B: 1030 g	
Operating/storage temperature	0…+55 °C/-25…+85 °C	
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27	
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4	
Protect. class/installation pos.	housing to IP 65 (PROFIBUS connector: IP 67)/variable	
Further information	FM3312-B310	

Accessories

Ordering information	
ZS3100-0831	M16, plug, metal, shielded, soldered, angled, male, 6-pin, DIN 45322, PROFIBUS
ZS3100-0841	M16, socket, metal, shielded, soldered, angled, female, 6-pin, DIN 45322, PROFIBUS
ZS3100-1810	PROFIBUS terminating resistor, plug, straight, 6-pin
ZB3300	PROFIBUS cable, 12 Mbaud, 2 x 0.25 mm², 3 x 0.75 mm², 5-wire, suitable as trailing cable
KS2000	configuration software for project design, commissioning and parameterisation of Beckhoff Fieldbus Box modules and Bus Terminals 842

We reserve the right to make technical changes.

Highlights

- PC cards for all common fieldbus systems
- Industrial Ethernet switches
- EtherCAT junctions and media converters in IP 20 and IP 67 ratings

Infrastructure Components

PC Fieldbus Cards, Switches, Media Converters

▸ Infrastructure-components

781 **PC Fieldbus Cards**

781 **PCI Fieldbus Cards**
781 Lightbus FC2001, FC2002
782 PROFIBUS FC3101, FC3102
784 CANopen FC5101, FC5102
786 DeviceNet FC5201, FC5202
787 SERCOS FC7501, FC7502
788 Ethernet FC9001-0010, FC9011, FC9002, FC9004
791 EtherCAT slave FC1100

782 **Mini PCI Fieldbus Cards**
782 PROFIBUS FC3151
784 CANopen FC5151
786 DeviceNet FC5251
787 SERCOS interface FC7551
790 Ethernet FC9051, FC9551

783 **PCI Express Fieldbus Cards**
783 PROFIBUS FC3121, FC3122
785 CANopen FC5121, FC5122
789 Ethernet FC9022, FC9024
791 EtherCAT slave FC1121

792 **Infrastructure Components IP 20**

792 **Ethernet Switches**
792 CU2005 (5-port)
792 CU2008 (8-port)
792 CU2016 (16-port)
793 CU2208 (8-port, GBit)

794 **Port multiplier**
794 CU2508

795 **EtherCAT junction**
795 CU1128

796 **EtherCAT media converters**
796 CU15xx

797 **Infrastructure Components IP 67**

797 **Ethernet Switch**
797 CU2608 (8-port)

798 **EtherCAT junction**
798 EP9128

799 **EtherCAT media converters**
799 EP9521

800 **Accessories**

Infrastructure Components

PCI/PCIe Fieldbus Cards
Beckhoff rounds off its range of fieldbus components with the PCI-based PC Fieldbus Cards for Lightbus, PROFIBUS, CANopen, DeviceNet, SERCOS interface, Ethernet and the PCI Express v1.1 cards for PROFIBUS, CANopen and Ethernet. The cards were specifically developed for fast controllers and real-time tasks such as drive position control. To enable universal application, the interface cards are fitted with either one or two fieldbus channels. The Ethernet cards offer a maximum of four channels. The fieldbus cards can optionally be equipped with non-volatile memory (NOVRAM), hence enabling the fail-safe storage of data. Features:

- fast data exchange through short cycle times (e.g. EtherCAT: down to 12.5 µs)
- process data communication can either be free running, synchronised, synchronised with a delay, or equidistant
- powerful parameter and diagnostics interfaces
- freely configurable bus management for every device

Mini PCI Fieldbus Cards
The Mini PCI cards for PROFIBUS, CANopen, DeviceNet, SERCOS interface and Ethernet complement the PC fieldbus card range. Just like the standard PCI cards from Beckhoff, the interfaces are specifically optimised for fast controllers with compact size and real-time tasks. The bus interface is not implemented on the fieldbus card, but separately in the respective Industrial PC housing (device-specific).

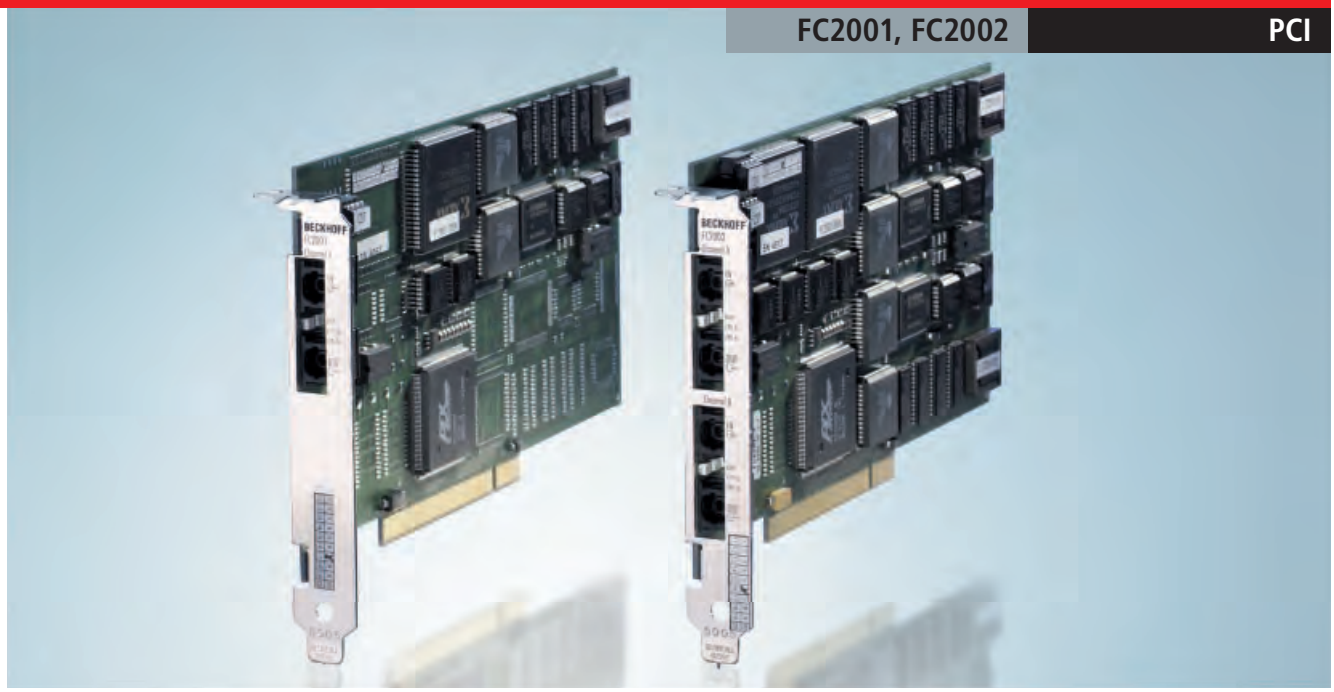
Switches
The Ethernet switches in industrial design forward incoming Ethernet frames to the target ports and prevent collisions in full duplex mode. They can be used universally in automation and office networks. User-friendly installation via integrated DIN rail adapter.

Infrastructure Components
The real-time Ethernet port multiplier allows the connection of eight independent Ethernet networks.

The EtherCAT junction serves as 8-way network access junction for configuring star topologies.

The EtherCAT media converters (optical fibre to copper and vice versa) meet the requirements for a highly deterministic EtherCAT network. They are useful in applications where EtherCAT is to be transmitted over long distances or where increased electromagnetic interference is to be expected. The EtherCAT media converters can also be used for other Industrial Ethernet protocols.

We reserve the right to make technical changes.



FC2001, FC2002 | Lightbus PCI interface cards

LIGHTBUS

The PCI Fieldbus Cards from Beckhoff are characterised by outstanding features. They are tailor-made for TwinCAT, the software solution for PC-compatible control technology. The power of TwinCAT comes into its own with this interface generation:

- Cycle times up to 100 µs are possible.
- Process data communication can either be free running or synchronised.
- It is possible to select two parallel fieldbus channels on one card.
- powerful parameter and diagnostics interfaces (ADS)

TwinCAT I/O provides configuration tools and drivers for different Windows versions for programs in any desired high-level language (DLLs) and for Visual Basic applications (ActiveX). Applications with OPC interface can access the cards via an OPC server.

Technical data	FC2001	FC2002
Fieldbus	Lightbus	
Number of fieldbus channels	1	2
Data transfer rates	2.5 Mbaud, 32 bits of process data in 25 µs	
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM for 8 communication channels, data, control and status register	
Bus interface	2 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)	4 x standard fibre optic connector Z1000 (plastic fibre), Z1010 (HCS fibre)
Communication	8 priority controlled logical communication channels	
Bus device	max. 254 nodes with a max. of 65,280 I/O points per fieldbus connection	
Interrupt	initiation of 2 PC hardware interrupts is possible	
Hardware diagnosis	3 LEDs per channel	
Dimensions	approx. 106 mm x 187 mm	
Operating temperature	0…55 °C	
Further information	FC2001	FC2002

Ordering information	FC2001-0000	FC2002-0000
FC200x-0000	standard configuration	

Accessories		
TwinCAT I/O	I/O driver	1025
Cordsets	cordsets and connectors	800

FC3101, FC3102 | **PCI PROFIBUS**
FC3151 | **Mini PCI PROFIBUS**

PROFIBUS DP, DP-V1 and DP-V2 (MC): the PROFIBUS PCI Fieldbus Cards from Beckhoff can master the PROFIBUS protocol with all its features. Thanks to the PROFIBUS chip developed in-house, the cards are equipped with the latest version of the PROFIBUS technology.

The FC3151 Mini PCI Card brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific).

Technical data	FC3101	FC3102	FC3151*
Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1 (Cl. 1+2: acyclic services, alarms), DP-V2, PROFIBUS MC (equidistant)		
Number of fieldbus channels	1	2	1
Data transfer rates	9.6 kbaud…12 Mbaud		
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	Mini PCI interface 32 bit with 4 kbyte DPRAM per channel
Bus interface	1 x D-sub socket, 9-pin, galvanically decoupled	2 x D-sub socket, 9-pin, galvanically decoupled	1 x D-sub socket, 9-pin, galvanically decoupled
Communication	master and slave functionality (also mixed)		
Bus device	per channel: max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave		max. 125 slaves
Cycle time	differing DP cycle times per slave are possible using the CDL concept		
Hardware diagnosis	2 LEDs per channel		
Bit width in the process image	total max.: 3 kbyte input and output data		
Dimensions	approx. 106 mm x 175 mm	approx. 106 mm x 175 mm	59.75 mm x 50.95 mm (type III A)
Driver	TwinCAT I/O and higher levels		
Further information	FC3101	FC3102	FC3151

Ordering information	FC3101-000x	FC3102-000x	FC3151-000x*
FC31xx-0000	standard configuration		
FC31xx-0002	configuration with 32 kbytes NOVRAM	configuration with 32 kbytes NOVRAM	configuration with 128 kbytes NOVRAM

*FC3151-000x can only be ordered with a Beckhoff Industrial PC with Mini PCI option.

Accessories		
TwinCAT I/O	I/O driver	1025
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

FC3121, FC3122 | **PCIe PROFIBUS**

PROFIBUS DP and DP-V1: the PROFIBUS PCIe (PCI Express) Fieldbus Cards from Beckhoff can master the following PROFIBUS features:

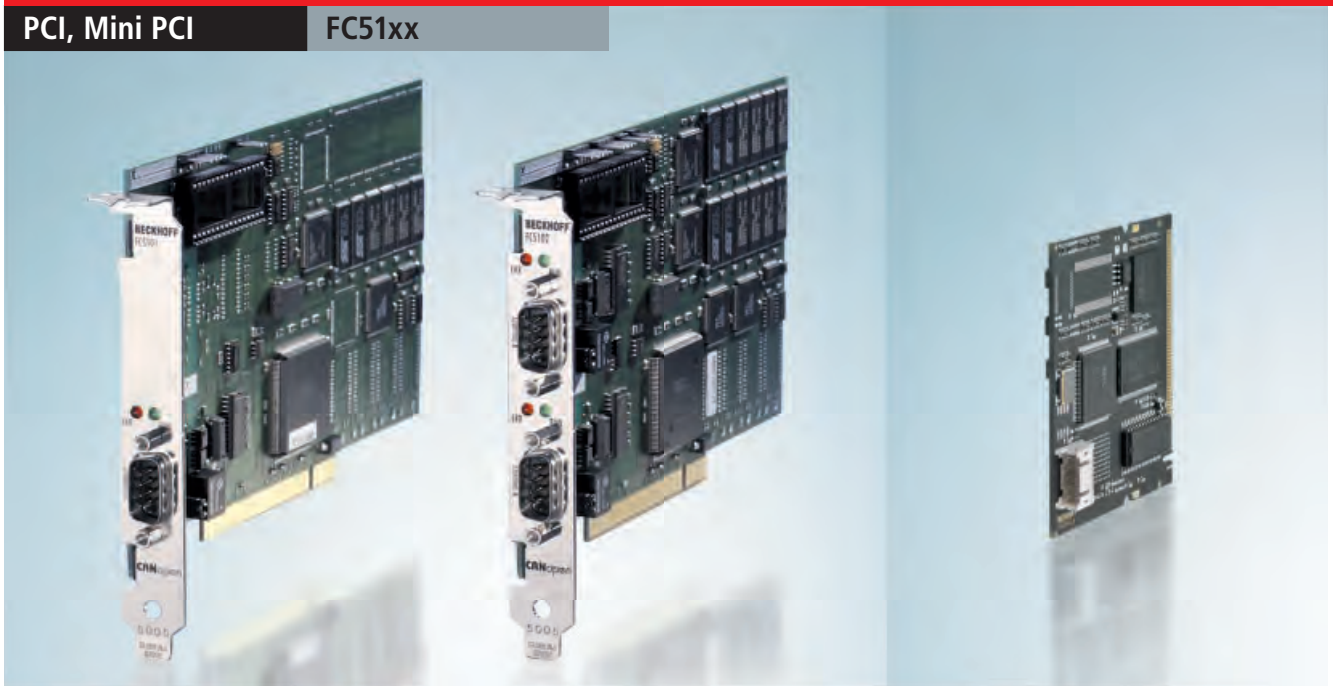
- master, slave and PROFIBUS monitor up to 12 Mbit/s
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- It is possible to read the bus configuration and automatically assign the "GSE" files.

In TwinCAT, all functions are conveniently available. Other applications also benefit from the diverse features: general drivers for different Windows versions and convenient configuration tools are included in the TwinCAT I/O software package. High-level language programs use the DLL, Visual Basic applications the ActiveX interface. Applications with OPC interface can access process data and parameters via an OPC server.

The PCIe fieldbus cards offer the possibility of optionally adding a NOVRAM card (FC600x). The fieldbus cards automatically recognise the connection of these memory cards, which can also be plugged into the card later. The FC600x cards offer simple data backup on the NOVRAM memory and are available from 128 to 512 kbyte.

Technical data	FC3121	FC3122
Fieldbus	PROFIBUS DP (standard), PROFIBUS DP-V1	
Number of fieldbus channels	1	2
Data transfer rates	9.6 kbaud…12 Mbaud	
Bus interface	1 x D-sub socket, 9-pin, galvanically decoupled	2 x D-sub socket, 9-pin, galvanically decoupled
Communication	master and slave functionality	
Bus device	per channel: max. 125 slaves with up to 244 bytes input, output, parameter, configuration or diagnostic data per slave	
Bit width in the process image	total max.: 30.5 kbyte input and output data	
Dimensions	approx. 100 mm x 130 mm	
Operating temperature	0…+55 °C	
Driver	TwinCAT 2.11 R3 and higher	
Further information	FC3121	FC3122

We reserve the right to make technical changes.



FC5101, FC5102 | **PCI CANopen**
FC5151 | **Mini PCI CANopen**

CANopen

The FC510x PC plug-in cards link the PC to a CANopen network. They optionally act as network master or slave. In addition, general CAN messages can be sent or received – without having to bother with CAN frames in the application program. The cards provide a powerful implementation of the protocol.

The FC5151 Mini PCI Card brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific).

Technical data	FC5101	FC5102	FC5151*
Fieldbus	CANopen		
Number of fieldbus channels	1	2	1
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbaud		
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	Mini PCI interface 32 bit with 4 kbyte DPRAM per channel
Bus interface	D-sub connector, 9-pin according to CANopen specification, galvanically decoupled		
Communication	CANopen network master and CANopen manager, optionally CANopen slave		
Bus device	per channel: max. 127 slaves	per channel: max. 127 slaves	max. 127 slaves
Termination resistor	switchable	switchable	externally, e.g. with ZS1051-3000
Hardware diagnosis	2 LEDs per channel		
Bit width in the process image	total max.: 3 kbyte input and output data		
Dimensions	approx. 106 mm x 175 mm	approx. 106 mm x 175 mm	59.75 mm x 50.95 mm (type III A)
Operating temperature	0…+55 °C		
Driver	TwinCAT I/O and higher levels		
Further information	FC5101	FC5102	FC5151

Ordering information	FC5101-000x	FC5102-000x	FC5151-000x*
FC51xx-0000	standard configuration		
FC51xx-0002	configuration with 32 kbytes NOVRAM	configuration with 32 kbytes NOVRAM	configuration with 128 kbytes NOVRAM

*FC5151-000x can only be ordered with a Beckhoff Industrial PC with Mini PCI option.

Accessories		
TwinCAT I/O	I/O driver	1025
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

FC5121, FC5122 | **PCIe CANopen**

CANopen

The FC512x PC plug-in cards link the PC (PCI Express) to a CANopen network. They optionally act as network master or slave. In addition, general CAN messages can be sent or received – without having to bother with CAN frames in the application program. The cards provide a powerful implementation of the protocol, offering many desirable features:

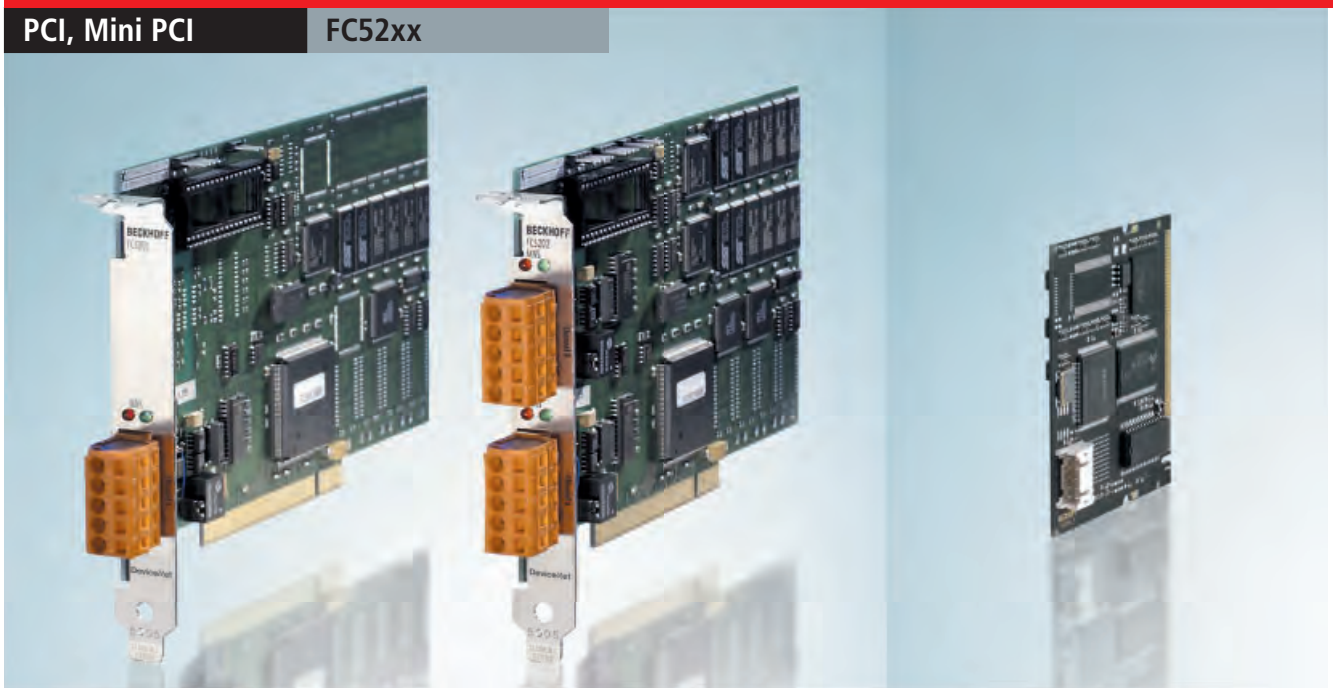
- All CANopen PDO communication types are supported: event driven, time driven (using an event timer), synchronous, polling.
- individual monitoring of the process data objects
- synchronisation with the PC controller's task cycle
- SDO parameter communication at start-up and runtime
- emergency message handling
- Guarding and Heartbeat
- boot-up according to DS 302
- powerful parameter and diagnostics interfaces
- The error management for each bus user is freely configurable.
- It is possible to read the bus configuration and the node parameters.
- online bus load display

In TwinCAT, all functions are conveniently available.

The PCIe fieldbus cards offer the possibility of optionally adding a NOVRAM card (FC600x). The fieldbus cards automatically recognise the connection of these memory cards, which can also be plugged into the card later. The FC600x cards offer simple data backup on the NOVRAM memory and are available from 128 to 512 kbyte.

Technical data	FC5121	FC5122
Fieldbus	CANopen	
Number of fieldbus channels	1	2
Data transfer rates	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbaud	
Bus interface	1 x D-sub socket, 9-pin, galvanically decoupled	2 x D-sub socket, 9-pin, galvanically decoupled
Communication	CANopen network master and CANopen manager	
Bus device	per channel: max. 127 slaves	
Termination resistor	switchable	
Bit width in the process image	total max.: 4 kbyte input and output data	
Dimensions	approx. 100 mm x 130 mm	
Operating temperature	0…+55 °C	
Driver	TwinCAT 2.11 R3 and higher	
Further information	FC5121	FC5122

We reserve the right to make technical changes.



FC5201, FC5202 | **PCI DeviceNet**
FC5251 | **Mini PCI DeviceNet**

DeviceNet™

The FC520x PC plug-in cards link the PC to a DeviceNet network. They can act there as master or as slave modules. The PCI bus interface ensures both high transmission rates to the PC and fully automatic configuration of the cards in the PC hardware.

The FC5251 Mini PCI Card brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific).

Technical data	FC5201	FC5202	FC5251*
Fieldbus	DeviceNet		
Number of fieldbus channels	1	2	1
Data transfer rates	125, 250, 500 kbaud		
Interface to the PC	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	plug-and-play PCI interface 32 bit with 4 kbyte DPRAM per channel	Mini PCI interface 32 bit with 4 kbyte DPRAM per channel
Bus interface	open style connector, 5-pin, according to DeviceNet specification, galvanically decoupled (Connector is supplied.)		
Communication	DeviceNet network master (scanner), optionally DeviceNet slave		
Bus device	per channel: max. 63 slaves	per channel: max. 63 slaves	max. 63 slaves
Termination resistor	switchable	switchable	externally, e.g. with ZS1052-3000
Hardware diagnosis	2 LEDs per channel		
Bit width in the process image	total max.: 3 kbyte input and output data		
Dimensions	approx. 106 mm x 175 mm	approx. 106 mm x 175 mm	59.75 mm x 50.95 mm (type III A)
Operating temperature	0…+55 °C		
Driver	TwinCAT I/O and higher levels		
Further information	FC5201	FC5202	FC5251

Ordering information	FC5201-000x	FC5202-000x	FC5251-000x*
FC52xx-0000	standard configuration		
FC52xx-0002	configuration with 32 kbytes NOVRAM	configuration with 32 kbytes NOVRAM	configuration with 128 kbytes NOVRAM

*FC5251-000x can only be ordered with a Beckhoff Industrial PC with Mini PCI option.

Accessories		
TwinCAT I/O	I/O driver	1025
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

FC7501, FC7502 | **PCI SERCOS II**
FC7551 | **Mini PCI SERCOS II**

sercos
the automation bus

The SERCOS II PCI Fieldbus Cards from Beckhoff allow direct access to the SERCON816-ASIC. The driver for these passive cards is incorporated into the TwinCAT software and allows optimum access to the SERCOS interface. There are no artificial limitations with regard to the number of bus devices and I/O data per device.

The FC7551 Mini PCI Card brings fieldbus functionalities to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific).

Technical data	FC7501	FC7502	FC7551*
Fieldbus	SERCOS II		
Number of fieldbus channels	1	2	1
Data transfer rates	2, 4, 8, 16 Mbaud		
Interface to the PC	plug-and-play PCI interface 32 bit, direct access to DPRAM and SERCON816 register		Mini PCI interface 32 bit with 4 kbyte DPRAM per channel
Bus interface	2 x connector FSMA according to IEC 874-2	4 x connector FSMA according to IEC 874-2	4 x connector FSMA according to IEC 874-2
Communication	SERCON816 chip		
Synchronisation	synchronisation of several cards via ribbon cable		–
Bus device	≤ 254		
Cycle time	all cycle times supported by SERCOS interface (down to 62.5 µs)		
Hardware diagnosis	1 LED per channel		
Dimensions	approx. 95 mm x 120 mm	approx. 95 mm x 120 mm	59.75 mm x 50.95 mm (type III A)
Driver	TwinCAT I/O and higher levels		
Further information	FC7501	FC7502	FC7551

Ordering information	FC7501-0000	FC7502-0000	FC7551-000x*
FC75xx-0000	standard configuration		
FC75xx-0002	–	–	configuration with 128 kbytes NOVRAM

*FC7551-000x can only be ordered with a Beckhoff Industrial PC with Mini PCI option.

Accessories		
TwinCAT I/O	I/O driver	1025
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

FC9001-0010, FC9011 | **PCI Ethernet**

Ethernet TCP/IP

The Ethernet PCI network cards can be used in office and automation networks and offer the following benefits:

- plug-and-play interface
- 10/100/1000 Mbit/s (FC9011), 10/100 Mbit/s (FC9001-0010), full duplex
- automatic baud rate setting according to IEEE 802.3u
- maximum performance through hardware-integrated checksum creation and verification
- The hardware side supports Quality of Service (QoS) through prioritised multiple queues.
- Wake on LAN
- Boot from LAN (PXE) (only FC9011)

The cards (or individual channels) can also be operated with TwinCAT drivers – and therefore in real-time.

Technical data	FC9001-0010	FC9011
Fieldbus	all Ethernet (IEEE 802.3) based protocols	
Number of Ethernet channels	1	
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s	10/100/1000 Mbit/s, IEEE 802.3ab auto-negotiation, full duplex at 10, 100 and 1000 Mbit/s
Interface to the PC	plug-and-play PCI interface 32 bit	
Ethernet interface	10BASE-T/100BASE-TX Ethernet	10BASE-T/100BASE-TX/1000BASE-TX Ethernet
Ethernet plug	1 x RJ45	
Cable length	100 m (up to switch or end device)	
Standard drivers	standard operating system drivers for Intel®-compatible NIC real-time driver or Beckhoff driver for different Windows versions (available from Beckhoff website)	
Real-time drivers	TwinCAT drivers for EtherCAT/real-time Ethernet. Drivers can be selected separately for each channel.	
Hardware diagnosis	2 LEDs per channel (activity, link)	
Dimensions	approx. 51 mm x 120 mm	
Operating temperature	0…+55 °C	
Further information	FC9001	FC9011

Ordering information	FC9001-0010	FC9011-0000
FC90xx-00xx	standard configuration	

Accessories		
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

FC9002, FC9004, FC9022, FC9024 | PCI/PCIe Ethernet

Ethernet TCP/IP

The Ethernet PCI network cards can be used in office and automation networks and offer the following benefits:

- plug-and-play interface
- 10/100/1000 Mbit/s (FC9022, FC9024) or 10/100 Mbit/s (FC9002, FC9004), full duplex
- automatic baud rate setting according to IEEE 802.3u for each channel
- maximum performance through hardware-integrated checksum creation and verification
- The hardware side supports Quality of Service (QoS) through prioritised multiple queues.

The cards (or individual channels) can also be operated with TwinCAT drivers – and therefore in real-time.

Technical data	FC9002	FC9004	FC9022	FC9024
Fieldbus	all Ethernet (IEEE 802.3) based protocols			
Number of Ethernet channels	2	4	2	4
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s, separate settings for each channel		10/100/1000 Mbit/s, IEEE 802.3ab auto-negotiation, full duplex at 10, 100 and 1000 Mbit/s	
Interface to the PC	plug-and-play PCI interface 32 bit	plug-and-play PCI interface 32 bit	PCI Express x1	PCI Express 2.1 x1 (5.0 GT/s)
Ethernet interface	10BASE-T/100BASE-TX Ethernet	10BASE-T/100BASE-TX Ethernet	10BASE-T/100BASE-TX/ 1000BASE-T Ethernet	10BASE-T/100BASE-TX/ 1000BASE-T Ethernet
Ethernet plug	2 x RJ45	4 x RJ45	2 x RJ45	4 x RJ45
Cable length	100 m (up to hub, switch or end device)	100 m (up to hub, switch or end device)	100 m (up to switch or end device)	100 m (up to hub, switch or end device)
Standard drivers	standard drivers for Intel® 8255xER series or Beckhoff driver for different Windows versions (available from Beckhoff website)		standard operating system drivers for Intel®-compatible NIC real-time driver or Beckhoff driver for different Windows versions (available from Beckhoff website)	
Real-time drivers	TwinCAT drivers for EtherCAT/real-time Ethernet. Drivers can be selected separately for each channel.			
Hardware diagnosis	2 LEDs per channel (activity, link)		2 LEDs per channel (activity, link)	
Dimensions	approx. 95 mm x 125 mm	approx. 95 mm x 125 mm	approx. 62 mm x 100 mm	approx. 98 mm x 98 mm
Operating temperature	0…+55 °C			
Further information	FC9002 FC9004 FC9022 FC9024			

Ordering information	FC9002-0000	FC9004-0000	FC9022-0000	FC9024-0000
FC90xx-0000	standard configuration			

Accessories		
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

FC9051, FC9151 | Mini PCI Ethernet

Ethernet TCP/IP

The FC9x51 Mini PCI Card brings further Ethernet ports to the Industrial PC in a compact construction. The bus interface is not implemented on the fieldbus card, but separately in the respective housing (device-specific). The FC9x51 is available for Beckhoff Industrial PCs with Mini PCI option. Like the standard PCI cards, the Mini PCI variants are specifically optimised for fast controllers and real-time tasks:

- automatic baud rate setting according to IEEE 802.3u
- Ethernet and real-time Ethernet protocols, EtherCAT-ready
- full duplex at 10 and 100 Mbit/s

In combination with the Ethernet Mini PCI Cards, a third Ethernet port is available in the Industrial PC with 10 Mbit/s, 100 Mbit/s or 1000 Mbit/s. While the 100 Mbit/s Ethernet port offers optimum performance for all EtherCAT control tasks, a gigabit port is available for connecting the higher-level network.

The power of the Fieldbus Cards can be most easily seen in combination with the TwinCAT software PLC and NC. But other applications also benefit from the intelligent PCI cards that handle the fieldbus protocol efficiently on their own processors.

Technical data	FC9051	FC9151
Bus system	Ethernet (all IEEE 802.3-based protocols), EtherCAT	
Number of Ethernet channels	1	
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s, separate settings for each channel	10/100/1000 Mbit/s, IEEE 802.3u auto-negotiation, full duplex at 10 and 100 Mbit/s, separate settings for each channel
Interface to the PC	Mini PCI interface	
Communication	Ethernet and real-time Ethernet protocols, EtherCAT-ready	
Bus device	Ethernet standard	
Standard drivers	standard operating system drivers for Intel®-compatible NIC real-time driver	
Real-time drivers	TwinCAT drivers for real-time Ethernet. Drivers can be selected separately for each channel.	
Dimensions	59.75 mm x 44.60 mm (type III B)	
Operating temperature	0…+55 °C	
Further information	FC9051	FC9151

Ordering information	FC9051-0000	FC9151-0000
FC9x51-0000	standard configuration (can only be ordered with a Beckhoff Industrial PC with Mini PCI option)	

Accessories		
TwinCAT I/O	I/O driver	1025

We reserve the right to make technical changes.

FC1100, FC1121 | PCI/PCIe EtherCAT slave card

EtherCAT

The FC1100 PCI EtherCAT card and the FC1121 PCIe (PCI Express) EtherCAT card can be used to integrate a PC as a slave in an EtherCAT network. The cards have an EtherCAT channel with two ports (IN/OUT). They can therefore also be used for the development of EtherCAT slave software on the PC.

The FC1121 PCIe card can optionally be retrofitted with the FC600x NOVRAM cards in order to backup data on the NOVRAM. Three NOVRAM sizes are available: 128, 256 and 512 kbyte.

Technical data	FC1100	FC1121
Fieldbus	EtherCAT (direct mode)	
EtherCAT plug	2 x RJ45, EtherCAT IN/OUT	
Data transfer rates	100 Mbit/s	
Interface to the PC	PCI 32 bit	PCIe (PCI Express) interface
EtherCAT Slave Controller	ET1100	
RAM	8 kbyte	
SYNC manager	8	4
FMMUs	8	3
Cable length	up to 100 m	
Hardware diagnosis	2 LEDs per channel (activity, link)	
Dimensions	approx. 65 mm x 125 mm	approx. 100 mm x 130 mm
Operating temperature	0…+55 °C	
Driver	TwinCAT driver for EtherCAT	
Further information	FC1100	FC1121

Accessories		
TwinCAT I/O	I/O driver	1025
Cordsets	cordsets and connectors	800

CU20xx | **Ethernet Switches**

The Beckhoff Ethernet Switches offer five (CU2005), eight (CU2008) or 16 (CU2016) RJ45 Ethernet ports. Switches relay incoming Ethernet frames to the destination ports. In full duplex mode, they prevent collisions. They can be used universally in automation and office networks. User-friendly installation via integrated DIN rail adapter.

The switches meet the special requirements of real-time-capable Industrial Ethernet solutions through several outstanding features:

- compact design in full metal housing
- half or full duplex, with automatic baud rate detection
- 10/100 Mbits/s Ethernet
- cross-over detection: automatic detection and correction of crossover and straight-through Ethernet cables
- clear, quick diagnosis, two LEDs for each Ethernet port
- fast DIN rail mounting
- industrial design

Technical data	CU2005	CU2008	CU2016
Bus system	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode, unmanaged	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode
Number of Ethernet ports	5	8	16
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 5 x RJ45	10BASE-T/100BASE-TX Ethernet with 8 x RJ45	10BASE-T/100BASE-TX Ethernet with 16 x RJ45
Cable length	up to 100 m twisted pair		
Data transfer rates	IEEE 802.3u auto-negotiation, half or full duplex, automatic settings	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Hardware diagnosis	2 LEDs per channel (activity, link)	2 LEDs per channel (activity, link, 10/100 Mbit)	2 LEDs per channel (activity, link, 10/100 Mbit)
Power supply	24 (18…30) V DC, 3-pin connection (+, -, PE)	24 (18…30) V DC, 100 mA, 3-pin connection (+, -, PE)	24 (18…30) V DC, 150 mA, 3-pin connection (+, -, PE)
Weight	approx. 260 g	320 g	400 g
Dimensions (W x H x D)	approx. 73 mm x 100 mm x 30 mm	approx. 85 mm x 100 mm x 30 mm	approx. 146 mm x 100 mm x 30 mm
Operating/storage temperature	0…+55 °C/-25…+85 °C		
Protect. class/installation pos.	IP 20/variable		
Further information	CU2005	CU2008	CU2016

Accessories		
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

CU2208 | 8-port Gbit Ethernet Switch

The Beckhoff Ethernet Switch offers eight RJ45 Gbit Ethernet ports. Switches relay incoming Ethernet frames to the destination ports. In full duplex mode, they prevent collisions. They can be used universally in automation and office networks. User-friendly installation via integrated DIN rail adapter.

The switches meet the special requirements of real-time-capable Industrial Ethernet solutions through several outstanding features:

- compact design in full metal housing
- half or full duplex, with automatic baud rate detection
- 10/100/1000 Mbits/s Ethernet
- cross-over detection: automatic detection and correction of crossover and straight-through Ethernet cables
- clear, quick diagnosis, two LEDs for each Ethernet port
- fast DIN rail mounting
- industrial design

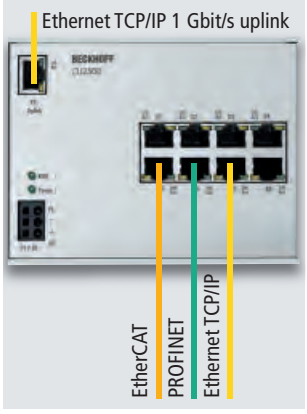
Technical data	CU2208
Bus system	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode, unmanaged
Number of Ethernet ports	8
Ethernet interface	10BASE-T/100BASE-TX/1000BASE-T Ethernet
Cable length	up to 100 m twisted pair
Data transfer rates	IEEE 802.3u auto-negotiation, half or full duplex, automatic settings
Hardware diagnosis	2 LEDs per channel (activity, link)
Power supply	24 (18…30) V DC, 3-pin connector (+, -, PE)
Weight	430 g
Dimensions (W x H x D)	approx. 122 mm x 100 mm x 30 mm
Operating/storage temperature	0…+55 °C/-25…+85 °C
Protect. class/installation pos.	IP 20/variable
Further information	CU2208

Accessories		
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

CU2508 | Real-time Ethernet port multiplier

The real-time Ethernet port multiplier allows the connection of eight independent Ethernet networks. The CU2508 is connected to the PC via a gigabit uplink. The PC offers high-performance data transfer to the multiplier, which allocates the data to the relevant 100BASE-TX port based on an analysis of a frame prefix and sends them time-controlled with µs precision. Received frames are also allocated a prefix including a timestamp and sent to the PC. With the support of a driver, users have eight independent ports with full real-time characteristics available. The CU2508 is used in applications in which several Ethernet ports are required that need to be realised outside the PC. TwinCAT supports the CU2508 and makes further network ports at the PC unnecessary. For extremely high demands, an EtherCAT installation can, for example, be distributed or expanded to up to eight lines in order to multiply the performance. The distributed clocks of the EtherCAT lines are synchronised. An EtherCAT cable redundancy with simultaneous usage of distributed clocks can also be realised using two ports of the CU2508.



Technical data	CU2508
Protocol	Ethernet TCP/IP; real-time protocols: EtherCAT, PROFINET, EtherNet/IP and others (depending on driver)
Number of Ethernet ports	8 x 100 Mbit/s and 1 x 1 Gbit/s (uplink)
Ethernet interface	RJ45
Cable length	up to 100 m twisted pair
Data transfer rates	100BASE-TX and 1 Gbit/s
Hardware diagnosis	LEDs
Power supply	24 (18…30) V DC, 100 mA, 3-pin connection (+, -, PE)
Dimensions (W x H x D)	approx. 146 mm x 100 mm x 30 mm
Operating/storage temperature	0…+55 °C/-25…+85 °C
Protect. class/installation pos.	IP 20/variable
Further information	CU2508

Accessories		
Cordsets	cordsets and connectors	800

We reserve the right to make technical changes.

CU1128 | **EtherCAT junction**

Line, tree or star: EtherCAT supports almost any topology. If a star topology requires several branches at a particular point, the 8-way CU1128 EtherCAT junction can be used instead of several EK1122 devices. Port 1 is the input port for the network.

Further EK1100 or EtherCAT Box modules can be connected at ports 2 to 8. The EtherCAT junctions are connected via RJ45 sockets with direct display of link and activity status.

In conjunction with TwinCAT or other suitable EtherCAT masters the CU1128 also supports coupling and uncoupling of EtherCAT strands during operation (Hot Connect). The device cannot be used as a standard Ethernet switch.

Technical data	CU1128
Task within EtherCAT system	coupling of EtherCAT junctions
Data transfer medium	Ethernet/EtherCAT cable (min. Cat.5), shielded
Bus interface	8 x RJ45
Distance between stations	max. 100 m (100BASE-TX)
Protocol	EtherCAT
Delay	approx. 1 µs per port
Data transfer rates	100 Mbaud
Configuration	not required
Power supply	24 (18…30) V DC, 185 mA, 3-pin connection (+, -, PE)
Weight	approx. 430 g
Operating/storage temperature	0…+55 °C/-25…+85 °C
Relative humidity	95 %, no condensation
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4
Protect. class/installation pos.	IP 20/variable
Approvals	CE
Further information	CU1128

CU15xx | EtherCAT media converters fibre optic

The EtherCAT-capable CU1521, CU1521-0010 and CU1561 for Industrial Fast Ethernet/ 100 Mbaud serve as media converters from optical fibre to copper and vice versa. The CU1521 is suitable for multimode, the CU1521-0010 for singlemode optical fibre and therefore significantly longer transmission links. The CU1561 is suitable for POF (plastic optical fibre) cables, which are particularly easy to install in the field.

The media converters always operate bidirectionally and collision-free with constant delay. They can be diagnosed as a separate EtherCAT devices. In this way, unlike standard media converters, they enable fast link control and the safe closing of the EtherCAT strand even in the event of a fault. Since the transfer direction (copper to optical fibre | optical fibre to copper) is relevant for the bus, the devicse can be configured via a switch. Via this switch "Link Loss Forwarding" for normal Ethernet operation can also be selected. The CU15xx are useful in applications where higher EMC loads on the bus line are to be expected.

Technical data	CU1521-0000	CU1521-0010	CU1561
Task within EtherCAT system	media transition from RJ45 copper physics to multimode fibre optic and back	media transition from RJ45 copper physics to singlemode fibre optic and back	media transition from RJ45 copper physics to POF and back
Data transfer medium	multimode glass fibre 50/125 µm (MM); Ethernet/EtherCAT cable (min. Cat.5), shielded	singlemode glass fibre 9/125 µm (SM); Ethernet/EtherCAT cable (min. Cat.5), shielded	plastic optic fibre 980/1000 µm (POF); Ethernet/EtherCAT cable (min. Cat.5), shielded
Bus interface	1 x SC Duplex; 1 x RJ45		
Distance between stations	max. 2000 m (100BASE-FX); max. 100 m (100BASE-TX)	max. 20,000 m (100BASE-FX); max. 100 m (100BASE-TX)	max. 50 m (POF); max. 100 m (100BASE-TX)
Protocol	EtherCAT		
Delay	approx. 1 µs		
Data transfer rates	100 Mbaud		
Configuration	per rotary switch		
Power supply	24 (18…30) V DC, 3-pin connector (+, -, PE)		
Current consumption 24 V DC	approx. 100 mA		
Dimensions (W x H x D)	34 mm x 98 mm x 77 mm		
Weight	approx. 120 g		
Operating/storage temperature	0…+55 °C/-25…+85 °C		
Relative humidity	95 %, no condensation		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27		
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Protect. class/installation pos.	IP 20/variable		
Approvals	CE		
Further information	CU1521	CU1521	CU1561

We reserve the right to make technical changes.

CU2608 | 8-port Ethernet Switch, IP 67

The CU2608 Ethernet Switch offers eight D-coded M12 Ethernet ports. Switches relay incoming Ethernet frames to the destination ports. In full duplex mode, they prevent collisions. They can be used universally in automation and office networks. Mounting can easily be carried out by the user with two central M4 fixings or alternatively via two offset M3 holes.

The CU2608 meets the special requirements of real-time-capable Industrial Ethernet solutions through several outstanding features:

- compact design in IP 67 plastic housing
- 8 D-coded M12 sockets
- 10/100 Mbit/s, half or full duplex, with automatic baud rate detection
- cross-over detection: automatic detection and correction of crossover and straight-through Ethernet cables
- clear, quick diagnosis, 1 LED for each Ethernet port
- easy on-site installation

Technical data	CU2608
Bus system	all Ethernet (IEEE 802.3)-based protocols, store and forward switching mode
Number of Ethernet ports	8
Ethernet interface	10BASE-T/100BASE-TX Ethernet with 8 x M12 socket, D-coded, 4-pin
Cable length	up to 100 m twisted pair
Data transfer rates	10/100 Mbit/s, IEEE 802.3u auto-negotiation, half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Hardware diagnosis	1 LED per channel (activity, link)
Power supply	24 V DC (-15 %/+20 %), feed/downstream connection: M8, 4-pin
Weight	approx. 300 g
Dimensions (W x H x D)	60 mm x 126 mm x 26.5 mm
Operating/storage temperature	-30…+70 °C/-40…+85 °C
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Further information	CU2608

We reserve the right to make technical changes.

EP9128-0021 | EtherCAT junction, IP 67

Line, tree or star: EtherCAT supports virtually any topologies, which can also be directly branched in the field using the EtherCAT Box modules. If several junctions are required at one point in the star topology, an EtherCAT junction can be used to branch the topology further.

Analogous to the infrastructure components with IP 20 protection, the EP9128-0021 eight-way EtherCAT junction offers the possibility to construct the branches of the topology with the smallest possible number of components in the IP 67 world as well. The EtherCAT network is connected to the input port of the EP9128-0021 and can be extended at ports 2 to 8. EtherCAT topologies can be arranged even more flexibly with the multiple junctions with IP 67 protection, since connection to the IP 20 world is also possible via the ports. The EtherCAT junctions are connected via shielded M8 sockets with direct display of link and activity status. Suitable accessories (cables and connectors) are available.

In conjunction with TwinCAT or other suitable EtherCAT masters the EP9128-0021 also supports coupling and uncoupling of EtherCAT strands during operation (Hot Connect). The device cannot be used as a standard Ethernet switch.

Technical data	EP9128-0021
Connection method	M8, screw type, 4-pin
Nominal voltage	24 V DC (-15 %/+20 %)
Task within EtherCAT system	coupling of EtherCAT junctions
Data transfer medium	Ethernet/EtherCAT cable (min. Cat.5), shielded
Bus interface	8 x M8, shielded, screw type
Distance between stations	max. 100 m (100BASE-TX)
Protocol	EtherCAT
Delay	approx. 1 µs per port
Data transfer rates	100 Mbaud
Configuration	not required
Power supply	24 V DC (-15 %/+20 %)
Current consumption 24 V DC	approx. 150 mA
Dimensions (W x H x D)	60 mm x 126 mm x 26.5 mm
Operating/storage temperature	-25…+60 °C/-40…+85 °C
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Approvals	CE, UL
Further information	EP9128

We reserve the right to make technical changes.

EP9521-0020 | **EtherCAT media converter fibre optic (multi mode), IP 67**

The EtherCAT/Industrial Ethernet module EP9521 for Industrial Fast Ethernet/100 Mbaud serves as media converter from optical fibre to copper and vice versa. The media converter is suitable for multimode fibre-optic cables. The single-channel EP9521 EtherCAT Box is used for direct transfer between the two media. The media converter operates bidirectionally and collision-free with constant delay. It can be diagnosed as a separate EtherCAT device. In this way, unlike standard media converters, it enables fast link control and the safe closing of the EtherCAT strand even in the event of a fault. Since the transfer direction (copper to optical fibre | optical fibre to copper) is relevant for the bus, the device can be configured via a switch. Via this switch "Link Loss Forwarding" for normal Ethernet operation can also be selected.

The EP9521 is useful in applications where EtherCAT transfers over large distances are required or where higher EMC loads on the bus line are to be expected.

Technical data	EP9521-0020
Number of channels	1
Task within EtherCAT system	media transition from M8 copper physics to multimode fibre optic and back
Data transfer medium	multimode glass fibre 50/125 µm; Ethernet/EtherCAT cable (min. Cat.5), shielded
Bus interface	1 x LC Duplex; 2 x M8, shielded, screw type
Distance between stations	max. 2000 m (100BASE-FX); max. 100 m (100BASE-TX)
Protocol	EtherCAT/Industrial Fast Ethernet
Delay	approx. 1 µs
Data transfer rates	100 Mbaud
Configuration	per rotary switch
Power supply	24 V DC (-15 %/+20 %)
Current consumption 24 V DC	approx. 150 mA
Dimensions (W x H x D)	85 mm x 126 mm x 26.5 mm
Weight	approx. 250 g
Operating/storage temperature	-25…+60 °C/-40…+85 °C
Protect. class/installation pos.	IP 65/66/67 (conforms to EN 60529)/variable
Approvals	CE, UL
Further information	EP9521

We reserve the right to make technical changes.

Highlights

- I/O accessories from sensor to controller
- Extensive portfolio of pre-assembled cables, goods sold by the metre and connectors
- Optimised and tested for use with Beckhoff products

I/O Accessories

Cables, connectors and further accessories

▸ **io-accessories**

802 System overviews

802 EtherCAT Box
804 EtherCAT P Box
806 EtherCAT Terminal

808 Cables

808 RJ45 | EtherCAT cable (copper-based)
809 SC | EtherCAT cable (fibre optic)
809 M8 | EtherCAT cable
810 M12 | Ethernet/EtherCAT cable
812 M8, M12 | Ethernet/EtherCAT connectors
812 M8 | EtherCAT P cable for flexible applications
813 M8 | EtherCAT P connectors, field assembly
813 M8 | EtherCAT P coupler
813 M8 | Power cable
814 7/8" | Power cable
815 M8 | Sensor cable
816 M12 | Sensor cable
817 M12 | Sensor cable, shielded

818 Connectors

818 M8 | Connectors for field assembly
818 M12 | Connectors for field assembly
819 7/8" | Connectors for field assembly
819 Special connectors

820 Power distribution box

821 ENP/ECP connector system

822 ENP B12 | ENP connector family in size B12, 2-pin
823 ECP B12 | ECP connector family in size B12, 2-pin
824 ENP B17 | ENP connector family in size B17, 3-pin
826 ECP B17 | ECP connector family in size B17, 3-pin
828 ENP B17 | ENP connector family in size B17, 4-/5-pin
830 ECP B17 | ECP connector family in size B17, 4-/5-pin
832 ENP B23 | ENP connector family in size B23
833 ECP B23 | ECP connector family in size B23
834 ENP/ECP | Accessories for ENP/ECP connector family

836 Fieldbus cables

836 Lightbus
836 PROFIBUS, Modbus, RS232, RS485
838 CANopen, DeviceNet
840 Interbus
840 SERCOS interface
840 K-bus, signal cables, IP-Link

842 Software and programming

842 Configuration software KS2000
842 USB cable
843 RS232 programming cable
843 EtherCAT demokit

844 Spare parts

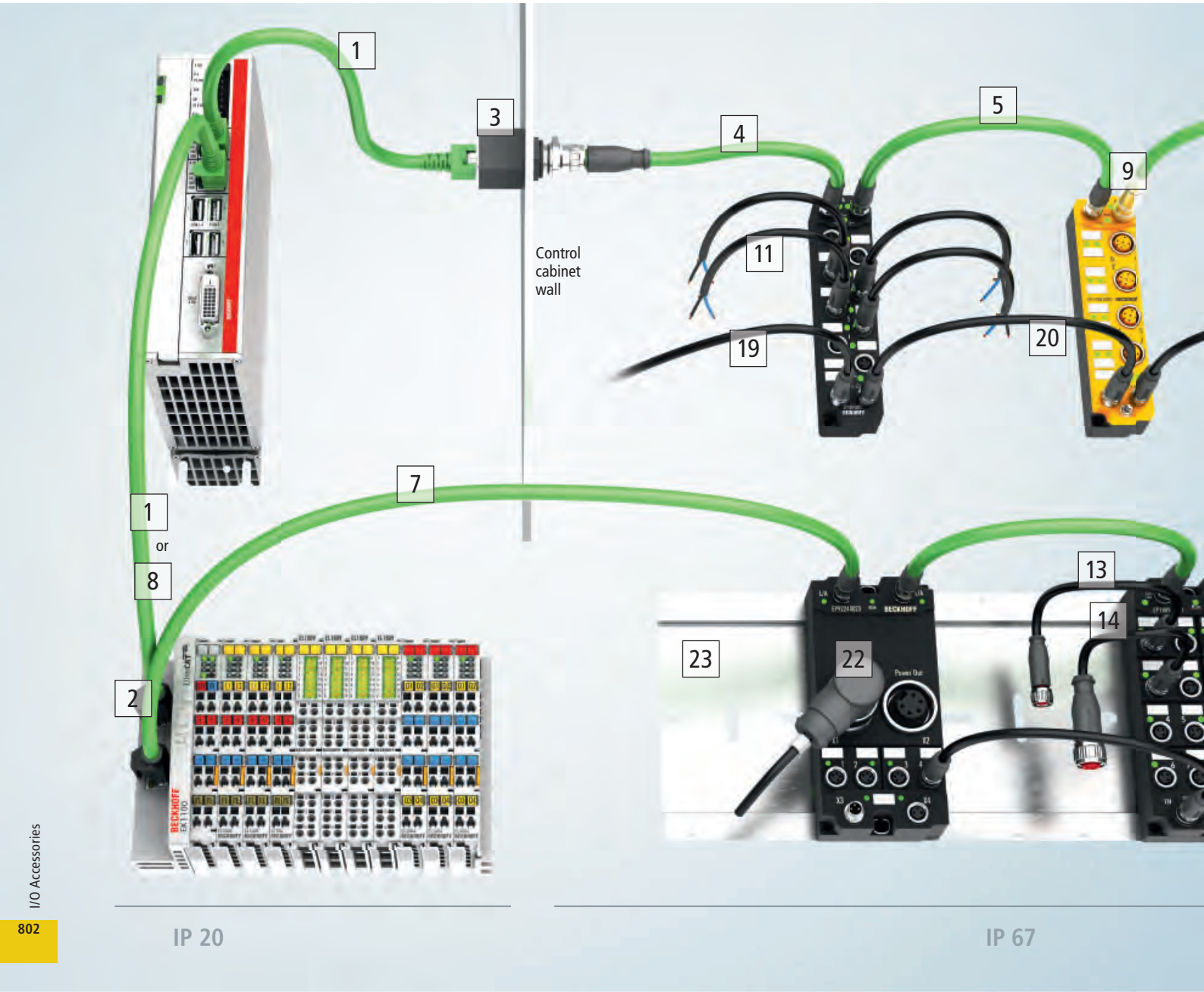
844 Marking material and coding pins

846 Housings and assembly

846 Shielding connection system
846 Bus system housings
847 Tools
848 External ballast resistor
849 Fan cartridge
850 Antennas

Accessories EtherCAT Box ▸

ethercat-box-accessories



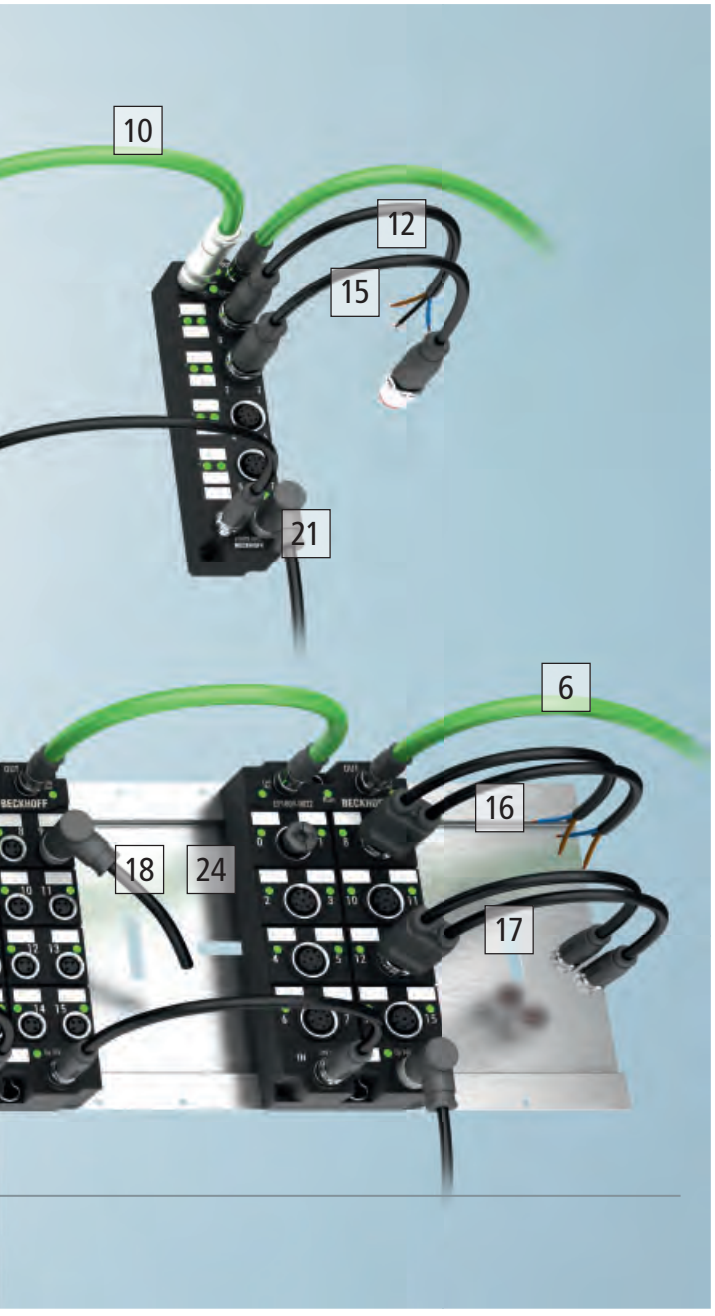
IP 20 | EtherCAT cable

1	ZK1090-9191-xxxx | Industrial Ethernet/EtherCAT patch cable, Cat.5, PUR, 4 x 2 x AWG26	808
2	ZS1090-0003 | RJ45, IP 20, plug, for field assembly, plastic, IDC, straight, male, 4-pin, AWG24-22	808

IP 67 | EtherCAT cable

3	ZK1090-6292-xxxx | M12, flange, straight, 4-pin – RJ45, socket, straight, 8-pin	811
4	ZK1090-3161-xxxx | M8, plug, straight, 4-pin – M12, plug, straight, 4-pin	810
5	ZK1090-3131-xxxx | M8, plug, straight, 4-pin – M8, plug, straight, 4-pin	809
6	ZK1090-3100-xxxx | M8, plug, straight, 4-pin – open end	809
7	ZK1090-3191-xxxx | M8, plug, straight, 4-pin – RJ45, plug, straight, 8-pin	809

We reserve the right to make technical changes.



IP 67 | Sensor cable

11	ZK2000-2100-xxxx | M8, plug, straight, 3-pin – open end	815
12	ZK2000-6100-xxxx | M12, plug, straight, 4-pin – open end	816
13	ZK2000-2122-xxxx | M8, plug, straight, 3-pin – M8, socket, straight, 3-pin	815
14	ZK2000-2162-xxxx | M8, plug, straight, 3-pin – M12, socket, straight, 4-pin	815
15	ZK2000-6162-xxxx | M12, plug, straight, 4-pin – M12, socket, straight, 4-pin	816
16	ZK2000-6500-xxxx | M12, plug, straight, 4-pin – DUO: 2 x open end	817
17	ZK2000-6522-xxxx | M12, plug, straight, 4-pin – DUO: 2 x M8, socket, straight, 2 x 3-pin	817
18	ZK2000-6300-xxxx | M12, plug, angled, 4-pin – open end	817

IP 67 | Power cable

19	ZK2020-3200-xxxx | M8, plug, straight, 4-pin – open end	813
20	ZK2020-3132-xxxx | M8, plug, straight, 4-pin – M8, socket, straight, 4-pin	813
21	ZK2020-3334-xxxx | M8, plug, angled, 4-pin – M8, socket, angled, 4-pin	813
22	ZK2030-1400-xxxx | 7/8", socket, angled, 5-pin – open end	814

Assembly

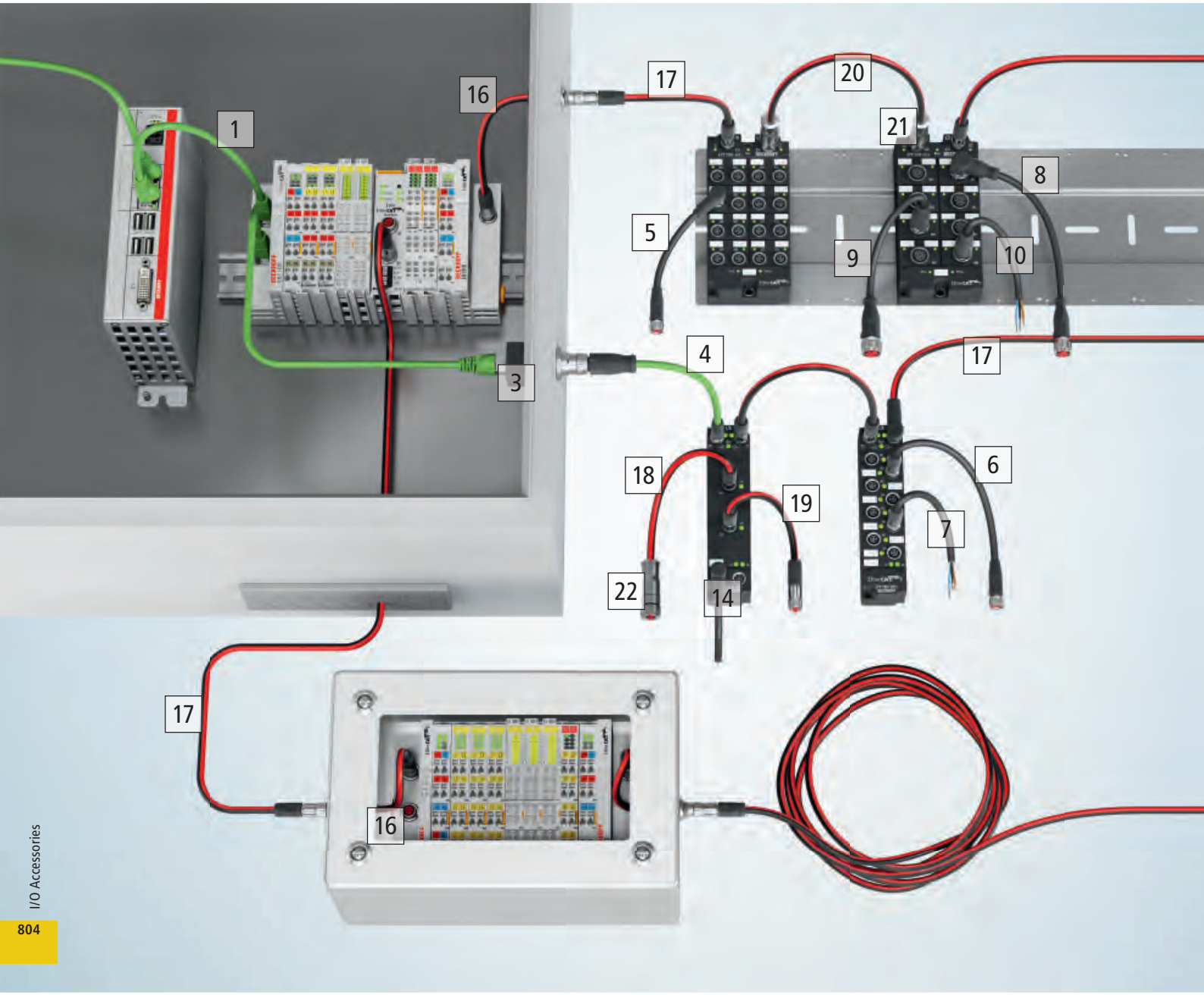
23	ZS5300-0001 | Mounting plate for 15 Extension Box or EtherCAT Box modules, stainless steel, 500 mm	847
24	ZS5000-0020 | Blanking plug, plastic (IP 67) for M12 external thread	847

8	ZB9010 | Industrial Ethernet/EtherCAT cable, fixed installation, AWG22 ZB9020 | Industrial Ethernet/EtherCAT cable, PUR, AWG22, drag-chain suitable	811
9	ZS1090-1006 | M8, plug, metal, screwed, straight, male, 4-pin	812
10	ZB9030 | Industrial Ethernet/EtherCAT cable, PVC, AWG26, fixed installation ZB9032 | Industrial Ethernet/EtherCAT cable, PUR, AWG26, drag-chain suitable	810

Note: The pictured products give examples of the wide range of EtherCAT Box accessories. For further variants and connection possibilities please see the respective catalog pages.

Accessories EtherCAT P Box ▸

ethercat-p-box-accessories



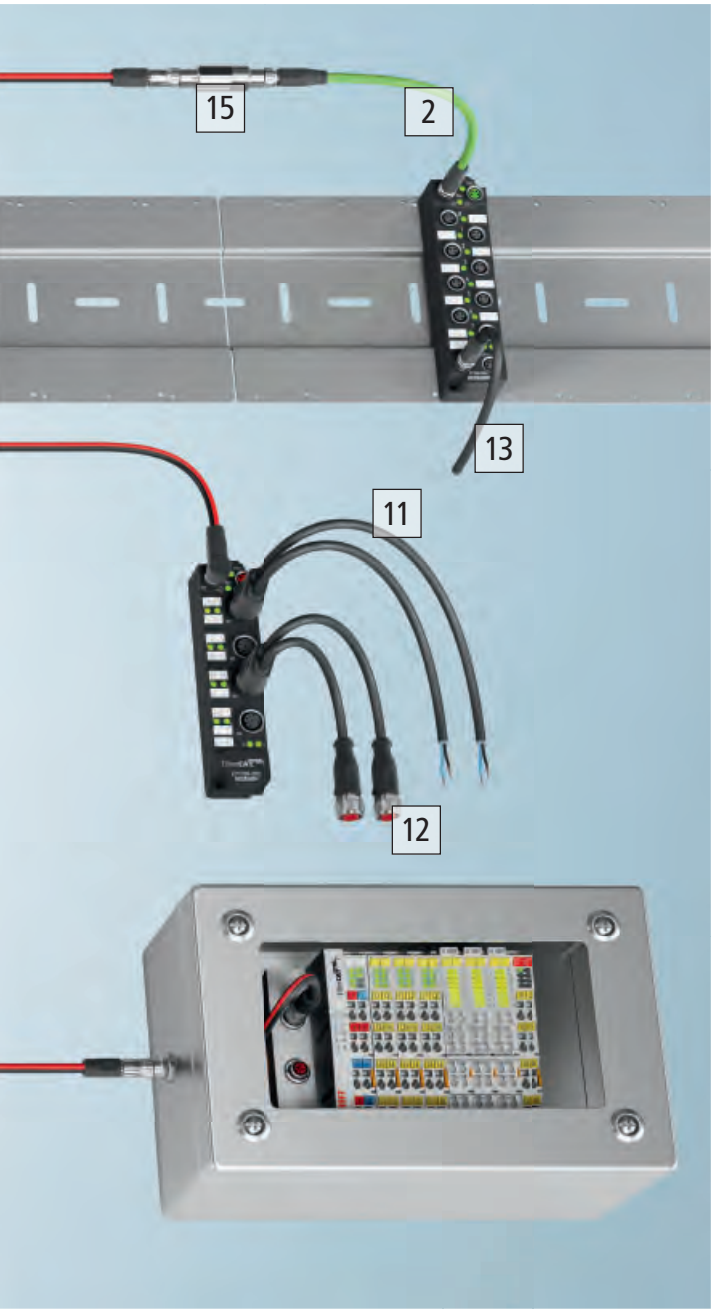
EtherCAT cable

1	ZK1090-9191-xxxx | Industrial Ethernet/EtherCAT patch cable, Cat.5, PUR, 4 x 2 x AWG26	808
2	ZK1090-3131-xxxx | M8, plug, straight, 4-pin – M8, plug, straight, 4-pin	809
3	ZK1090-6292-0000 | M12, flange, straight, 4-pin – RJ45, socket, straight, 8-pin	811
4	ZK1090-3161-xxxx | M8, plug, straight, 4-pin – M12, plug, straight, 4-pin	810

M8 | Sensor cable

5	ZK2000-2322-xxxx | M8, plug, angled, 3-pin – M8, socket, straight, 3-pin	815
6	ZK2000-2122-xxxx | M8, plug, straight, 3-pin – M8, socket, straight, 3-pin	815
7	ZK2000-2100-xxxx | M8, plug, straight, 3-pin – open end	815

We reserve the right to make technical changes.



M12 | Sensor cable

8	ZK2000-6362-xxxx | M12, plug, angled, 4-pin – M12, socket, straight, 4-pin	817
9	ZK2000-6162-xxxx | M12, plug, straight, 4-pin – M12, socket, straight, 4-pin	816
10	ZK2000-6100-xxxx | M12, plug, straight, 4-pin – open end	816
11	ZK2000-6500-xxxx | M12, plug, straight, 4-pin – DUO: 2 x open end	817
12	ZK2000-6562-xxxx | M12, plug, straight, 4-pin – DUO: 2 x M12, socket, straight, female, 2 x 4-pin	817

M8 | Power cable

13	ZK2020-3200-xxxx | M8, plug, straight, 4-pin – open end	813
14	ZK2020-3400-xxxx | M8, socket, angled, 4-pin – open end	813

EtherCAT P to EtherCAT

15	ZS7000-0005 | Cable adapter passive, EtherCAT P to EtherCAT: M8 socket, EtherCAT-P-coded – M8 socket, EtherCAT	813

M8 | EtherCAT P cable

16	ZK700x-0105-0xxx | M8, plug, straight, 4-pin – M8, flange, straight, 4-pin	812
17	ZK700x-0101-0xxx | M8, plug, straight, 4-pin – M8, plug, straight, 4-pin	812
18	ZK700x-0100-0xxx | M8, plug, straight, 4-pin – open end	812
19	ZK700x-0102-0xxx | M8, plug, straight, 4-pin – M8, socket, straight, 4-pin	812

M8 | EtherCAT P, field assembly

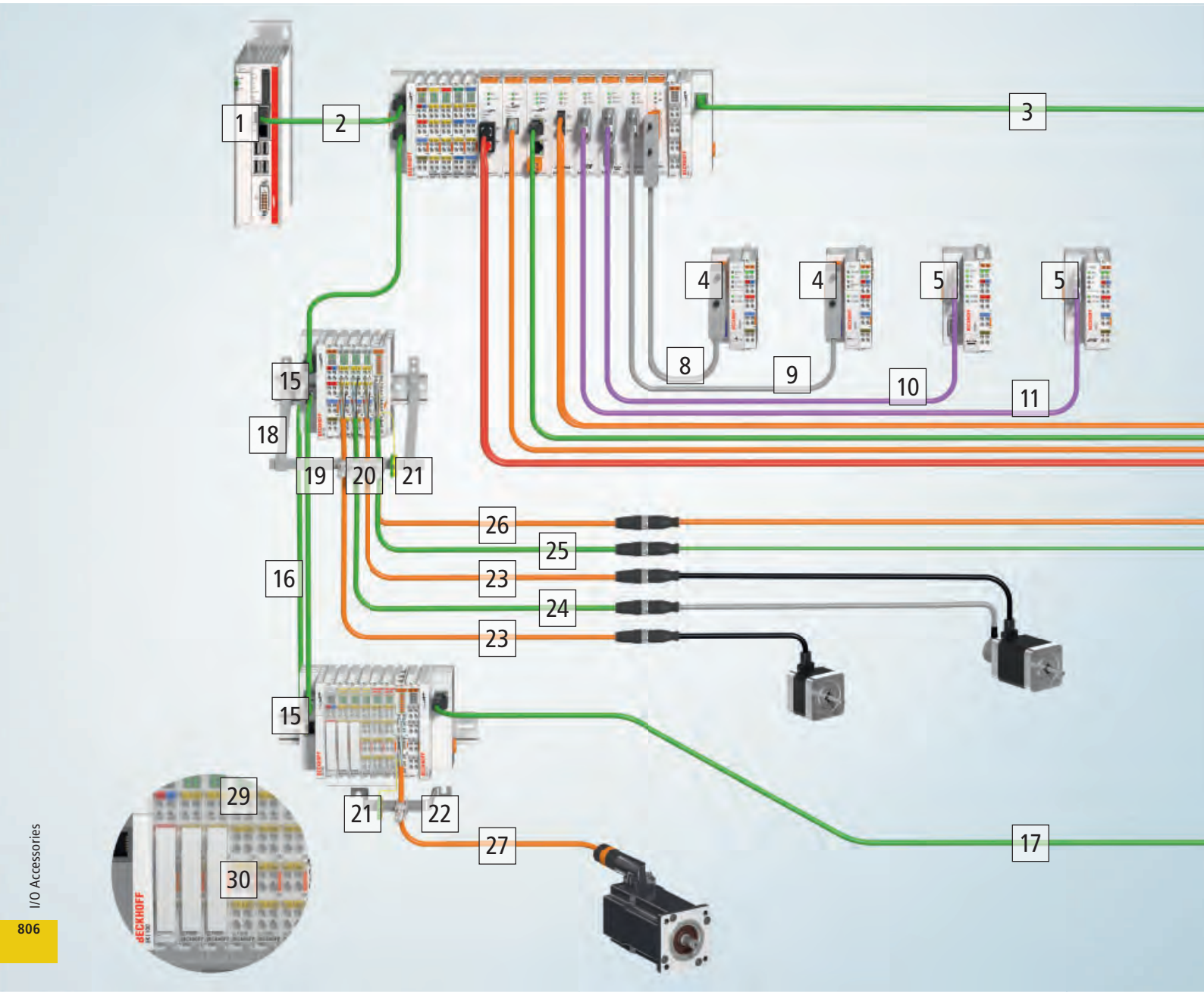
20	ZB700x | EtherCAT P cable, shielded, PUR, drag-chain suitable	812
21	ZS7000-0001 | M8, plug, 4-pin, straight, EtherCAT-P-coded, field assembly, metal, crimping method	813
22	ZS7000-0003 | M8, socket, 4-pin, straight, EtherCAT-P-coded, field assembly, metal, crimping method	813

Note: The pictured products give examples of the wide range of EtherCAT P Box accessories. For further variants and connection possibilities please see the respective catalog pages.

We reserve the right to make technical changes.

Accessories EtherCAT Terminal

▶ EtherCAT-accessories



Cordsets and connectors

1 ZS1090-0003 | EtherCAT/Ethernet RJ45 plug, IP 20, 4-pin, field assembly 808

2 ZB9010 | Industrial Ethernet/EtherCAT cable, fixed installation Cat.5ᴇ, 4-wire 808

3 ZK1090-9191-xxxx | Industrial Ethernet/EtherCAT patch cable 808

4 ZS1052-3000 | 5-pin open style connector for CANopen/DeviceNet with integrated termination resistor 838

5 ZS1031-3000 | 9-pin D-sub connector for PROFIBUS (12 Mbaud) with integrated termination resistor 837

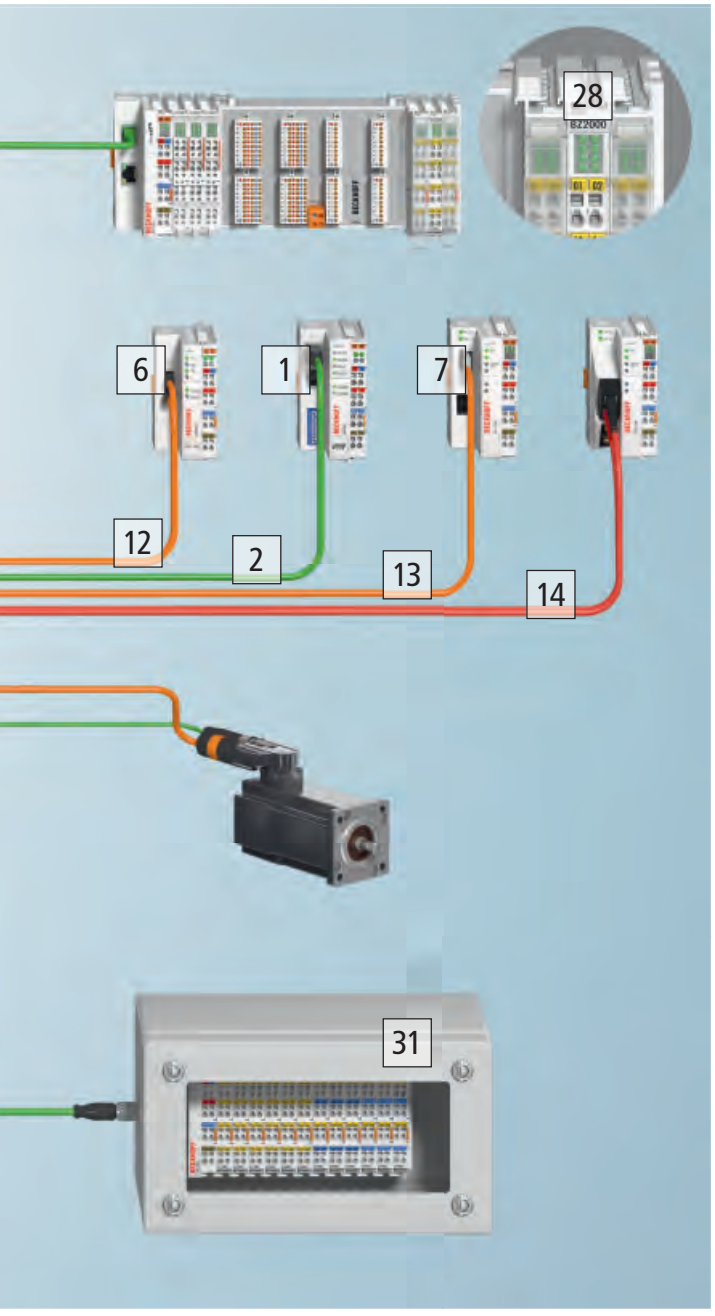
6 Z1000 | Standard connector for 1000 µm plastic fibre 836

7 ZS1090-0008 | Connector set for direct connector assembly of POF cables 809

8 ZB5200 | DeviceNet cable 838

9 ZB5100 | CAN cable 838

We reserve the right to make technical changes.



10	ZB4200 | Interbus remote bus cable	840
11	ZB3200 | PROFIBUS cable	837
12	Z1100 | Plastic fibre optic	836
13	Z1190 | POF fibre-optic duplex cable for direct connector assembly	809
14	ZK1091-1001-xxxx | Fibre-optic multimode cable, SC duplex plug	809
15	ZS1090-0005 | EtherCAT/Ethernet RJ45 plug, 8-pin, IP 20, field assembly	808
16	ZB9020 | Industrial Ethernet/EtherCAT cable, drag-chain suitable	808
17	ZK1090-6191-0xxx | EtherCAT cable, M12 plug, straight, D-coded, 4-pin – RJ45 plug, straight	811

Shielding connection system

18	ZB8520 | Mounting rail holder for shield busbar	846
19	ZB8510 | Shield busbar 10 x 3 mm	846
20	ZB8500 | Clamp strap for shield connection with knurled screw	846
21	ZB8530 | U-clamp terminal up to 4 mm² for PE connection to the rail	846
22	ZB8511 | Shield busbar clamp	846

Motor cables

23	ZK4000-6700-2xxx | Motor cable, shielded, for AS1000 stepper motors	938
24	ZK4000-5100-2xxx | Encoder cable for AS1000 stepper motors	935
25	ZK4724-0410 | Resolver cable for AM8100 and AM3100 servomotors	930
26	ZK4704-0411 | Motor cable for AM8100 and AM3100 servomotors	930
27	ZK4704-0421 | Motor cable for AM8100 servomotors with OCT	930

Marking materials and assembly

28	BZ1xxx, BZ200x | Marking material, contact labels	844
29	BZ3200 | Insertable label cover, transparent, pluggable	845
30	BZ5100 | Push-in strip for labels	845
31	BG155x | Bus system housing with mounting rails and holes	846

Note: The pictured products give examples of the wide range of EtherCAT Terminal accessories. For further variants and connection possibilities please see the respective catalog pages.

We reserve the right to make technical changes.

RJ45 | EtherCAT cable (copper-based)

Pre-assembled cable/patch cable

The pre-assembled Industrial Ethernet/EtherCAT cables with RJ45 plug enable fast, easy wiring inside the control cabinet and are suitable for short distances on the machine. The robust, industrial quality PUR cables distinguish themselves from office cables by both their mechanical and their EMC characteristics. Further lengths and variants on request.

Technical data	ZK1090-9191-xxxx	A
Cross-section	4 x 2 x AWG26/7…4 x 2 x 0.128 mm²	
Cable sheath material	PUR	
Colour	green (RAL 6018)	
Line configuration	SF/UTP (screened)	
Diameter	sheath: typ. 5.8 mm ±0.2 mm	
Bending radius	> 5 x diameter (fixed installation)	
Category/class	Cat.5, class D	
Operating/installation temperature	-40…+80 °C/-10…+60 °C	
Insertion cycles	min. 750	

Ordering information	For pre-assembled EtherCAT/Ethernet patch cables depending on cable length				
ZK1090-9191-0001	0.17 m	ZK1090-9191-0017	1.75 m	ZK1090-9191-0100	10.0 m
ZK1090-9191-5023	0.23 m	ZK1090-9191-0020	2.0 m	ZK1090-9191-0150	15.0 m
ZK1090-9191-0002	0.26 m	ZK1090-9191-0025	2.5 m	ZK1090-9191-0200	20.0 m
ZK1090-9191-5032	0.32 m	ZK1090-9191-0030	3.0 m	ZK1090-9191-0250	25.0 m
ZK1090-9191-5042	0.42 m	ZK1090-9191-0050	5.0 m	ZK1090-9191-0300	30.0 m
ZK1090-9191-0005	0.5 m	ZK1090-9191-0055	5.5 m	ZK1090-9191-0350	35.0 m
ZK1090-9191-5075	0.75 m	ZK1090-9191-0060	6.0 m	ZK1090-9191-0400	40.0 m
ZK1090-9191-0010	1.0 m	ZK1090-9191-0070	7.0 m	ZK1090-9191-0450	45.0 m
ZK1090-9191-0012	1.25 m	ZK1090-9191-0080	8.0 m	ZK1090-9191-0500	50.0 m
ZK1090-9191-0015	1.5 m	ZK1090-9191-0090	9.0 m		

Cables sold by the metre and connectors for field assembly

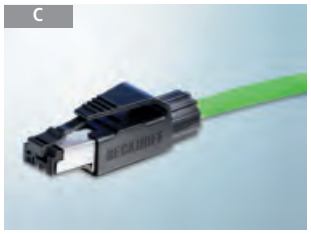
Ordering information	Industrial Ethernet/EtherCAT cable
ZB9032	Industrial Ethernet/EtherCAT cable, PUR, AWG26, highflex, drag-chain suitable, 20 million bending cycles
ZB9020	Industrial Ethernet/EtherCAT cable, PUR, AWG22, flex, 4 wires, SF/UTP, Cat.5ᴇ, drag-chain suitable, green, 3 million bending cycles
ZB9030	Industrial Ethernet/EtherCAT cable, PVC, AWG26, standard, 4-wire, SF/UTP, green
ZB9010	Industrial Ethernet/EtherCAT cable, PVC, AWG22, standard, 4 wires, SF/UTP, Cat.5ᴇ, green

Ordering information	RJ45 Ethernet/EtherCAT connectors IP 20 and IP 65/67	Pict.
ZS1090-0002	RJ45, IP 67, plug, plastic, straight, male, 8-pin, 0.14…0.34 mm², Ø 4…5.4 mm	B
ZS1090-0003	RJ45, IP 20, plug, plastic, IDC, straight, male, 4-pin, AWG24-22, Ø 6…6.9 mm	C
ZS1090-0005	RJ45, IP 20, plug, plastic, IDC, straight, male, 8-pin, AWG26-22, Ø 5.5…8.5 mm	D

A

B

C



Illustrations similar

We reserve the right to make technical changes.

D

SC | EtherCAT cable (fibre optic)

Pre-assembled cable

Unlike the glass fibre, the POF fibre is easily wireable in the field. The combination of cable sold by metre and connector is available for EK1541, EK1561 and CU1561.

Ordering information	Fibre-optic cables for EK1501, EK1521, CU1521, CU1521-0010 (multimode 50/125 µm)		
ZK1091-1001-0001	fibre-optic duplex cable, SC connector, 1 m	ZK1091-1001-0010	fibre-optic duplex cable, SC connector, 10 m
ZK1091-1001-0005	fibre-optic duplex cable, SC connector, 5 m		

Further lengths and variants on request

Cables sold by the metre and connectors

Ordering information	POF fibre-optic for EK1561 and CU1561
Z1190	POF fibre-optic duplex cable 980/1000 µm for direct connector assembly, sold by metre, PUR, 2-wire, drag-chain suitable, red
ZS1090-0008	connector set for direct connector assembly for POF cables, contains 10 connectors and 1 polishing set including sanding gauge and polishing paper

M8 | EtherCAT cable

For highly flexible applications

Ordering information	Sold by the metre
ZB9032	Industrial Ethernet/EtherCAT cable, PUR, AWG26, highflex, drag-chain suitable, 20 million bending cycles

Ordering information	AWG26 cable, pre-assembled with M8 plug (4-pin/straight) to	Pict.
ZK1090-3100-0xxx	open end	A
ZK1090-3131-0xxx	M8 plug (4-pin/straight)	B
ZK1090-3132-0xxx	M8 socket (4-pin/straight)	C
ZK1090-3134-0xxx	M8 socket (4-pin/angled)	D
ZK1090-3161-0xxx	M12 plug (4-pin/straight), D-coded	E
ZK1090-3163-0xxx	M12 plug (4-pin/angled), D-coded	F
ZK1090-3166-0xxx	M12 socket flange (4-pin/straight), D-coded	G
ZK1090-3191-0xxx	RJ45 plug (straight)	H

Ordering information	AWG26 cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK1090-3200-0xxx	open end	I
ZK1090-3232-0xxx	M8 socket (4-pin/straight)	J
ZK1090-3291-0xxx	RJ45 plug (straight)	K

Ordering information	AWG26 cable, pre-assembled with M8 plug (4-pin/angled) to	Pict.
ZK1090-3333-0xxx	M8 plug (4-pin/angled)	L

Illustrations see next page

We reserve the right to make technical changes.

For flexible applications

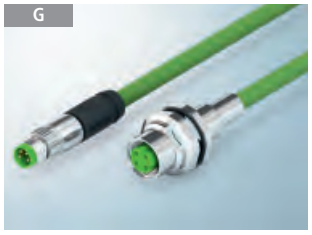
Ordering information	Sold by the metre
ZB9020	Industrial Ethernet/EtherCAT cable, PUR, AWG22, flex, 4 wires, SF/UTP, Cat.5E, drag-chain suitable, green, 3 million bending cycles

Ordering information	AWG22 cable, pre-assembled with M8 plug (4-pin/straight) to	Pict.
ZK1090-3100-1xxx	open end	A
ZK1090-3131-1xxx	M8 plug (4-pin/straight)	B
ZK1090-3132-1xxx	M8 socket (4-pin/straight)	C
ZK1090-3161-1xxx	M12 plug (4-pin/straight), D-coded	E
ZK1090-3191-1xxx	RJ45 plug (straight)	H

For fixed installation

Ordering information	Sold by the metre
ZB9030	Industrial Ethernet/EtherCAT cable, PVC, AWG26, standard, 4-wire, SF/UTP, green

Ordering information	Cable, pre-assembled with M8 plug (4-pin/straight) to	Pict.
ZK1090-3100-3xxx	open end	A
ZK1090-3131-3xxx	M8 plug (4-pin/straight)	B
ZK1090-3132-3xxx	M8 socket (4-pin/straight)	C
ZK1090-3191-3xxx	RJ45 plug (straight)	H



M12 | Ethernet/EtherCAT cable

For highly flexible applications

Ordering information	Sold by the metre
ZB9032	Industrial Ethernet/EtherCAT cable, PUR, AWG26, highflex, drag-chain suitable, 20 million bending cycles

Ordering information	AWG26 cable, pre-assembled with M12 plug (4-pin/straight), D-coded, to	Pict.
ZK1090-6100-4xxx	open end	A
ZK1090-6161-4xxx	M12 plug (4-pin/straight), D-coded	B
ZK1090-6191-4xxx	RJ45 plug (straight)	C

Ordering information	AWG26 cable, pre-assembled with M12 socket flange (4-pin/straight), D-coded, to	Pict.
ZK1090-6292-4xxx	RJ45 plug (straight)	D
ZK1090-6600-4xxx	open end	E

For flexible applications

Ordering information	Sold by the metre
ZB9020	Industrial Ethernet/EtherCAT cable, PUR, AWG22, flex, 4 wires, SF/UTP, Cat.5E, drag-chain suitable, green, 3 million bending cycles

Ordering information	AWG22 cable, pre-assembled with M12 plug (4-pin/straight), D-coded, to	Pict.
ZK1090-6100-0xxx	open end	A
ZK1090-6161-0xxx	M12 plug (4-pin/straight), D-coded	B
ZK1090-6166-0xxx	M12 socket flange (4-pin/straight), D-coded	F
ZK1090-6191-0xxx	RJ45 plug (straight)	C

Ordering information	AWG22 cable, pre-assembled with M12 socket flange (4-pin/straight), D-coded, to	Pict.
ZK1090-6292-0xxx	RJ45 plug (straight)	D
ZK1090-6600-0xxx	open end	E

Ordering information	AWG22 cable, pre-assembled with M12 plug (4-pin/angled), D-coded, to	Pict.
ZK1090-6300-0xxx	open end	G
ZK1090-6363-0xxx	M12 plug (4-pin/angled), D-coded	

For fixed installation

Ordering information	Sold by the metre
ZB9010	Industrial Ethernet/EtherCAT cable, PVC, AWG22, standard, 4 wires, SF/UTP, Cat.5E, green

Ordering information	AWG22 cable, pre-assembled with M12 plug (4-pin/straight), D-coded, to	Pict.
ZK1090-6191-3xxx	RJ45 plug (straight)	C

A

B

C

D

E

F

G

We reserve the right to make technical changes.

M8, M12 | **Ethernet/EtherCAT connectors**

Ordering information	M8 Ethernet/EtherCAT connectors IP 65/67
ZS1090-1006	M8, plug, metal, screwed, straight, male, 4-pin, 0.14…0.5 mm², Ø 4.9…6.5 mm
ZS1090-1007	M8, socket, metal, screwed, straight, female, 4-pin, 0.14…0.5 mm², Ø 4.9…6.5 mm

Ordering information	M12 Ethernet/EtherCAT connectors IP 65/67	Pict.
ZS1090-0004	M12, plug, metal, screwed, straight, male, 4-pin, D-coded, 0.25…0.75 mm², Ø 5…8 mm	A
ZS1090-0010	M12, socket, metal, screwed, straight, female, 4-pin, D-coded, 0.25…0.75 mm², Ø 5…8 mm	
ZK1090-6292-0000	M12, flange, straight, female, 4-pin, D-coded – RJ45, socket, straight, female, 8-pin	B

A

B

Illustrations similar

M8 | **EtherCAT P cable for flexible applications**

AWG24

Ordering information	Sold by the metre
ZB7001	EtherCAT P cable, shielded, PUR, drag-chain suitable, (1 x 4 x AWG24/7), black with red stripe, OD = 5.2 mm (±0.2 mm)

Ordering information	AWG24 cable, pre-assembled with M8 plug (4-pin/straight), EtherCAT-P-coded, to	Pict.
ZK7001-0100-0xxx	open end	A
ZK7001-0101-0xxx	M8 plug (4-pin/straight), EtherCAT-P-coded	B
ZK7001-0102-0xxx	M8 socket (4-pin/straight), EtherCAT-P-coded	C
ZK7001-0105-0xxx	M8 flange, socket (4-pin/straight), EtherCAT-P-coded	D

AWG22

Ordering information	Sold by the metre
ZB7000	EtherCAT P cable, shielded, PUR, drag-chain suitable, (1 x 4 x AWG22/7), black with red stripe, OD = 6.5 mm (±0.2 mm)

Ordering information	AWG22 cable, pre-assembled with M8 plug (4-pin/straight), EtherCAT-P-coded, to	Pict.
ZK7000-0100-0xxx	open end	A
ZK7000-0101-0xxx	M8 plug (4-pin/straight), EtherCAT-P-coded	B
ZK7000-0102-0xxx	M8 socket (4-pin/straight), EtherCAT-P-coded	C
ZK7000-0105-0xxx	M8 flange, socket (4-pin/straight), EtherCAT-P-coded	D

A

B

C

D

We reserve the right to make technical changes.

M8 | EtherCAT P connectors, field assembly

Ordering information	EtherCAT P connectors IP 65/67	Pict.
ZS7000-0001	M8, plug, metal, crimping method, straight, male, 4-pin, straight, EtherCAT-P-coded, IP 65/67, Ø ≤ 6.5 mm	A
ZS7000-0002	M8, plug, metal, screw type, straight, male, 4-pin, straight, EtherCAT-P-coded, IP 65/67, Ø ≤ 6.5 mm	B
ZS7000-0003	M8, socket, metal, crimping method, straight, 4-pin, socket, EtherCAT-P-coded, IP 65/67, Ø ≤ 6.5 mm	
ZS7000-0004	M8, socket, metal, screw type, straight, 4-pin, socket, EtherCAT-P-coded, IP 65/67, Ø ≤ 6.5 mm	

A

B

M8 | EtherCAT P coupler

Ordering information		Pict.
ZS7002-0001	EtherCAT P flange, M8 socket (4-pin/straight), EtherCAT-P-coded, rear assembly, PCB contact, soldered connection	A
ZS7000-0005	cable adapter, passive, EtherCAT P to EtherCAT: M8 socket, EtherCAT-P-coded – M8 socket, EtherCAT	

A

M8 | Power cable

For flexible applications

Ordering information	Sold by the metre
ZB9050	PUR, flex, 4-wire, 4 x 0.34 mm², drag-chain suitable, black

Ordering information	Cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK2020-3132-0xxx	M8 plug (4-pin/straight)	A
ZK2020-3200-0xxx	open end, 4-wire	B
ZK2020-3332-0xxx	M8 plug (4-pin/angled)	C

Ordering information	Cable, pre-assembled with M8 socket (4-pin/angled) to	Pict.
ZK2020-3334-0xxx	M8 plug (4-pin/angled)	D
ZK2020-3400-0xxx	open end, 4-wire	E

For fixed installation

Ordering information	Sold by the metre
ZB9051	PVC, standard, 4-wire, 4 x 0.34 mm², grey

Ordering information	Cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK2020-3132-3xxx	M8 plug (4-pin/straight)	A
ZK2020-3200-3xxx	open end, 4-wire	B

Illustrations see next page

We reserve the right to make technical changes.

A

B

C

D

E

7/8" | Power cable

For flexible applications 1.5 mm²

Ordering information	Material specification
ZB9050-0007	TPE-U (PUR), flex, 5-wire, 5 x 1.5 mm², 5Li 9Y11Y, drag-chain suitable, black

Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/straight) to	Pict.
ZK2030-1200-0xxx	open end	A
ZK2030-1112-0xxx	7/8" plug (5-pin/straight)	B

Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/angled) to	Pict.
ZK2030-1400-0xxx	open end	C
ZK2030-1314-0xxx	7/8" plug (5-pin/angled)	D
ZK2030-1114-0xxx	7/8" plug (5-pin/straight)	E

For flexible applications 2.5 mm²

Ordering information	Material specification
ZK2031-xxxx-0xxx	TPE-U (PUR), flex, 5-wire, 5 x 2.5 mm², 5Li 9Y11Y, drag-chain suitable, black

Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/straight) to	Pict.
ZK2031-1200-0xxx	open end	A

Ordering information	Cable, pre-assembled with 7/8" socket (5-pin/angled) to	Pict.
ZK2031-1400-0xxx	open end	C

A

B

C

D

We reserve the right to make technical changes.

E

M8 | Sensor cable

For flexible applications 3 x 0.25 mm²

Ordering information	Sold by the metre
ZB9040	PUR, flex, 3-wire, 3 x 0.25 mm², drag-chain suitable, black

Ordering information	Cable, pre-assembled with M8 plug (3-pin/straight) to	Pict.
ZK2000-2100-0xxx	open end	A
ZK2000-2122-0xxx	M8 socket (3-pin/straight)	B
ZK2000-2124-0xxx	M8 socket (3-pin/angled)	C
ZK2000-2132-00xx	M8 socket (4-pin/straight)	
ZK2000-2162-0xxx	M12 socket (4-pin/straight)	
ZK2000-2164-0xxx	M12 socket (4-pin/angled)	

Ordering information	Cable, pre-assembled with M8 socket (3-pin/straight) to
ZK2000-2200-00xx	open end

Ordering information	Cable, pre-assembled with M8 plug (3-pin/angled) to	Pict.
ZK2000-2300-0xxx	open end	D
ZK2000-2322-0xxx	M8 socket (3-pin/straight)	E
ZK2000-2324-0xxx	M8 socket (3-pin/angled)	F
ZK2000-2362-0xxx	M12 socket (4-pin/straight)	
ZK2000-2364-0xxx	M12 socket (4-pin/angled)	

Ordering information	Cable, pre-assembled with M8 socket (3-pin/angled) to	Pict.
ZK2000-2400-00xx	open end	G

For flexible applications 4 x 0.25 mm²

Ordering information	Sold by the metre
ZB9041	PUR, flex, 4-wire, 4 x 0.25 mm², drag-chain suitable, black

Ordering information	Cable, pre-assembled with M8 plug (4-pin/straight) to
ZK2000-3100-0xxx	open end
ZK2000-3122-0xxx	M8 socket (3-pin/straight)
ZK2000-3124-0xxx	M8 socket (3-pin/angled)

Ordering information	Cable, pre-assembled with M8 plug (4-pin/angled) to
ZK2000-3300-0xxx	open end

Ordering information	Cable, pre-assembled with DUO M8 plug (4-pin/straight) to	Pict.
ZK2000-3500-0xxx	2 x open end, 3-wire	H
ZK2000-3522-0xxx	2 x M8 socket (3-pin/straight)	I
ZK2000-3532-0xxx	2 x M8 socket (4-pin/straight)	J

Illustrations see next page

We reserve the right to make technical changes.

For fixed installation 3 x 0.25 mm²

Ordering information	Sold by the metre
ZB9042	PVC, standard, 3-wire, 3 x 0.25 mm², grey

For fixed installation 4 x 0.25 mm²

Ordering information	Sold by the metre
ZB9043	PVC, standard, 4-wire, 4 x 0.25 mm², grey

Ordering information	Cable, pre-assembled with M8 socket (4-pin/straight) to	Pict.
ZK2000-3132-3xxx	M8 plug (4-pin/straight)	K

M12 | Sensor cable

For flexible applications

Ordering information	Sold by the metre
ZB9041	PUR, flex, 4-wire, 4 x 0.25 mm², drag-chain suitable, black

Ordering information	Cable, pre-assembled with M12 plug (4-pin/straight) to	Pict.
ZK2000-6100-0xxx	open end	A
ZK2000-6162-0xxx	M12 socket (4-pin/straight)	
ZK2000-6164-0xxx	M12 socket (4-pin/angled)	

Ordering information	Cable, pre-assembled with M12 socket (4-pin/straight) to	Pict.
ZK2000-6200-0xxx	open end, 4-wire	B

We reserve the right to make technical changes.

Ordering information	Cable, pre-assembled with M12 plug (4-pin/angled) to	Pict.
ZK2000-6300-0xxx	open end	C
ZK2000-6362-0xxx	M12 socket (4-pin/straight)	

Ordering information	Cable, pre-assembled with M12 socket (4-pin/angled) to	Pict.
ZK2000-6400-0xxx	open end, 4-wire	D

Ordering information	Cable, pre-assembled with M12 plug DUO (4-pin/straight) to	Pict.
ZK2000-6500-0xxx	2 x open end, 4-wire	E
ZK2000-6522-0xxx	2 x M8 socket (3-pin/straight)	
ZK2000-6562-0xxx	2 x M12 socket (4-pin/straight)	

For fixed installation

Ordering information	Sold by the metre
ZB9043	PVC, standard, 4-wire, 4 x 0.25 mm², grey

A

B

C

D

E

M12 | Sensor cable, shielded

For flexible applications

Ordering information	Cable, pre-assembled with M12 plug (5-pin/straight) incl. shield to	Pict.
ZK2000-7100-0xxx	open end, 5-wire incl. shield	A
ZK2000-7122-0xxx	M8 socket (3-pin/angled), shielded	B
ZK2000-7171-0xxx	M12 plug (5-pin/straight), shielded	C
ZK2000-7172-0xxx	M12 socket (5-pin/straight), shielded	D

A

B

C

D

We reserve the right to make technical changes.

M8 | Connectors for field assembly

Ordering information	Plugs, 3-pin, field assembly	Pict.
ZS2000-1213	M8, plug, metal, IDC, straight, male, 3-pin, 0.14…0.34 mm², Ø 3.5…5 mm	
ZS2000-2210	M8, plug, plastic, screwed, straight, male, 3-pin, 0.14…0.5 mm², Ø 4…5.5 mm	A

Ordering information	Plugs, 4-pin, field assembly	Pict.
ZS2000-1313	M8, socket, plastic, IDC, straight, female, 4-pin, 0.14…0.34 mm², Ø 3.5…5 mm	
ZS2000-2310	M8, plug, plastic, screwed, straight, male, 4-pin, 0.14…0.5 mm², Ø 4…5.5 mm	A
ZS2000-2311	M8, plug, plastic, soldered, straight, male, 4-pin, 0.14…0.34 mm², Ø 4…5.5 mm	B
ZS2000-2331	M8, plug, plastic, soldered, angled, male, 4-pin, 0.14…0.25 mm², Ø 3.5…5 mm	C

Ordering information	Sockets, 3-pin, field assembly	Pict.
ZS2000-1223	M8, socket, metal, IDC, straight, female, 3-pin, 0.14…0.34 mm², Ø 3.5…5 mm	
ZS2000-2220	M8, socket, plastic, screwed, straight, female, 3-pin, 0.14…0.5 mm², Ø 4…5.5 mm	D
ZS2000-2221	M8, socket, plastic, soldered, straight, female, 3-pin, 0.14…0.25 mm², Ø 3.5…5 mm	E
ZS2000-2241	M8, socket, plastic, soldered, angled, female, 3-pin, 0.14…0.25 mm², Ø 3.5…5 mm	F

Ordering information	Sockets, 4-pin, field assembly	Pict.
ZS2000-1323	M8, socket, plastic, IDC, straight, female, 4-pin, 0.14…0.34 mm², Ø 3.5…5 mm	
ZS2000-2320	M8, socket, plastic, screwed, straight, female, 4-pin, 0.14…0.5 mm², Ø 4…5.5 mm	D
ZS2000-2321	M8, socket, plastic, soldered, straight, female, 4-pin, 0.14…0.34 mm², Ø 4…5.5 mm	E
ZS2000-2341	M8, socket, plastic, soldered, angled, female, 4-pin, 0.14…0.25 mm², Ø 3.5…5 mm	F

Illustrations similar

M12 | Connectors for field assembly

Ordering information	Plugs, 4-pin, field assembly	Pict.
ZS2000-1613	M12, plug, metal, IDC, straight, male, 4-pin, A-coded, 0.14…0.34 mm², Ø 2.9…5.1 mm	
ZS2000-2610	M12, plug, metal, screwed, straight, male, 4-pin, A-coded, 0.14…1.5 mm², Ø 4…8 mm	A
ZS2000-2630	M12, plug, plastic, screwed, angled, male, 4-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	B
ZS2000-6610	M12, plug, plastic, screwed, straight, male, 4-pin, A-coded, 0.14…0.75 mm², Ø 4…8 mm	

Ordering information	Plugs, 4/5-pin, field assembly	Pict.
ZS2000-2710	M12, plug, plastic, screwed, straight, male, 5-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	A
ZS2000-2730	M12, plug, plastic, screwed, angled, male, 5-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	B
ZS2000-6710	M12, plug, metal, screwed, straight, male, 5-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	

Ordering information	Sockets, 4-pin, field assembly	Pict.
ZS2000-2620	M12, socket, plastic, screwed, straight, female, 4-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	C
ZS2000-2640	M12, socket, plastic, screwed, angled, female, 4-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	D
ZS2000-6620	M12, socket, plastic, screwed, straight, female, 4-pin, A-coded, 0.25…0.75 mm², Ø 4…8 mm	C

Ordering information	Sockets, 4/5-pin, field assembly	Pict.
ZS2000-2720	M12, socket, plastic, screwed, angled, female, 5-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	C
ZS2000-2740	M12, socket, plastic, screwed, angled, female, 5-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	D
ZS2000-6720	M12, socket, metal, screwed, straight, female, 5-pin, A-coded, 0.25…1.5 mm², Ø 4…8 mm	

A

B

C

D

Illustrations similar

7/8" | Connectors for field assembly

Ordering information	Plugs, 5-pin, field assembly
ZS2020-2810	7/8", plug, plastic, screwed, straight, male, 5-pin, 0.5…1.5 mm², Ø 6…12 mm
ZS2020-2830	7/8", plug, plastic, screwed, angled, male, 5-pin, 0.5…1.5 mm², Ø 6…8 mm

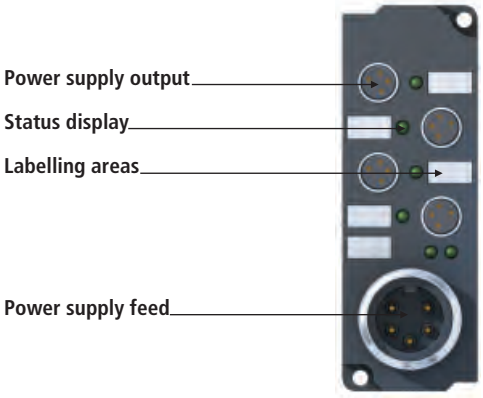
Ordering information	Sockets, 5-pin, field assembly
ZS2020-2820	7/8", socket, plastic, screwed, straight, female, 5-pin, 0.5…1.5 mm², Ø 6…12 mm
ZS2020-2840	7/8", socket, plastic, screwed, angled, female, 5-pin, 0.5…1.5 mm², Ø 6…8 mm

Special connectors

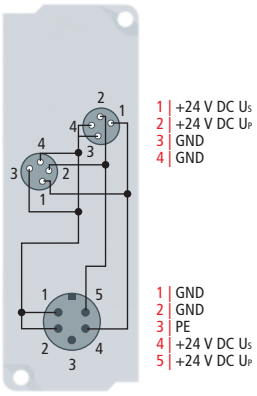
Ordering information	
ZS2000-3711	M12, plug, plastic, screwed, straight, male, 5-pin, 0.25…0.75 mm², Ø 3…6.5 mm
ZS2000-3712	M12, plug, plastic, screwed, straight, male, 5-pin, thermocouples with temperature compensation element
ZS2000-4722	splitter, 1 x M12 (plug) – 2 x M12 (socket), straight, 5-pin, unshielded
ZS2000-5911	M23, plug, metal, soldered, straight, male, 12-pin, 0.14…1.5 mm², Ø 4.5…8.5 mm
ZS2002-0111	D-sub, IP 67, plug, plastic, soldered, straight, male, 25-pin, up to 0.5 mm², Ø 6…12 mm

We reserve the right to make technical changes.

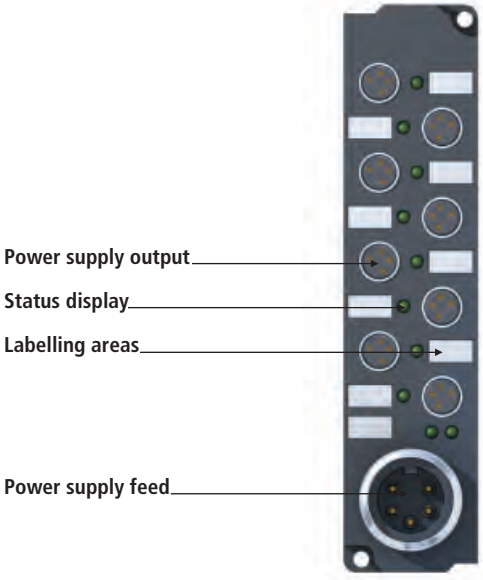
Power distribution box



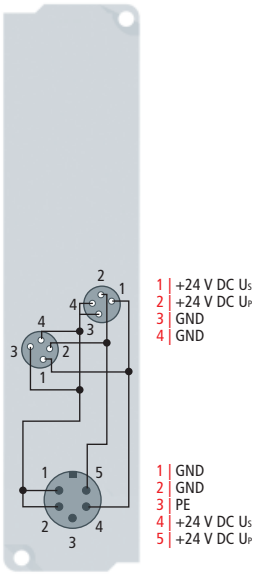
Power distribution box ZS2020-4304



Connector assignment



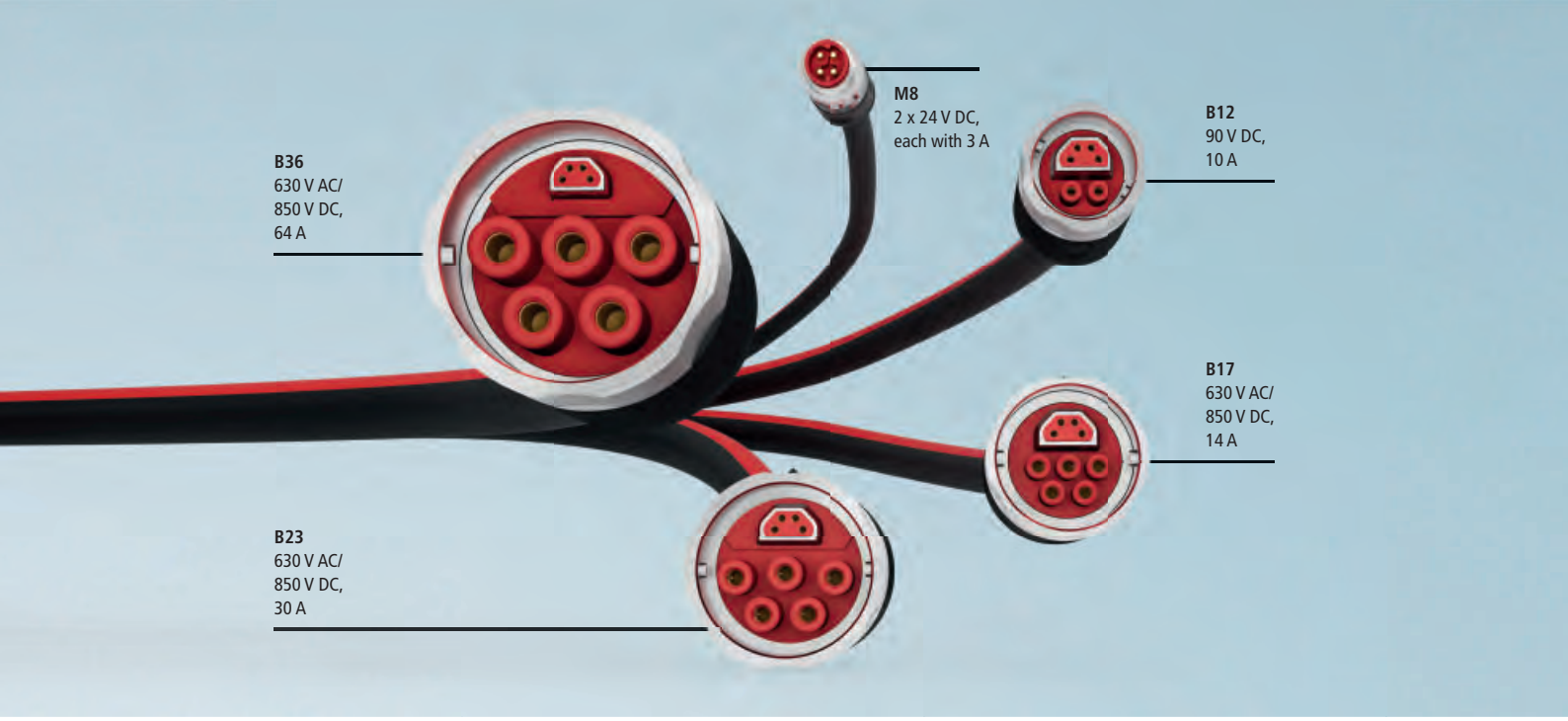
Power distribution box ZS2020-4308



Connector assignment

Technical data	ZS2020-4304	ZS2020-4308
Number of circuits	4	8
Power supply connection	7/8" plug, 5-pin	
Circuit connection	M8, screw type, 4-pin	
Current load	I_{Σ} = 4 A	
Dimensions (W x H x D)	30 mm x 86 mm x 31 mm	30 mm x 126 mm x 31 mm
Operating temperature	-25…+60 °C	
Storage temperature	-40…+85 °C	
Protection class	IP 65/66/67 (according to EN 60529)	
Installation position	variable	

We reserve the right to make technical changes.



One Cable Automation: A matching connector for every performance class

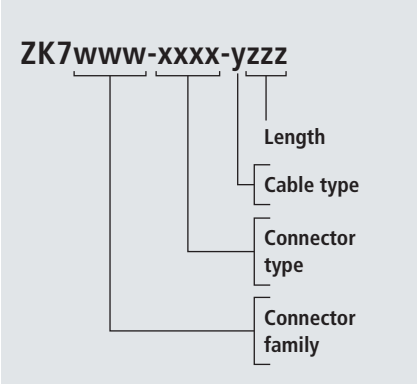
The One Cable Automation (OCA) concept is based on a single EtherCAT P cable that integrates communication and power supply and enables end-to-end connection of components, terminal boxes and machine modules. With a uniform design across all sizes, the ECP and ENP connector families for OCA are available for all applications ranging from 24 V DC at the I/O level up to drives with 400 V AC or 630 V AC/850 V DC and 64 A.

The ECP connectors are designed to provide an integrated 24 V DC power supply in the trapezoidal core element according to the EtherCAT P specification, while ENP connectors are designed for EtherCAT/Ethernet applications without integrated 24 V DC power supply. The ENP family can be distinguished from the ECP family through coloured product elements on the housing and the mechanically inverse design of the trapezoidal element.

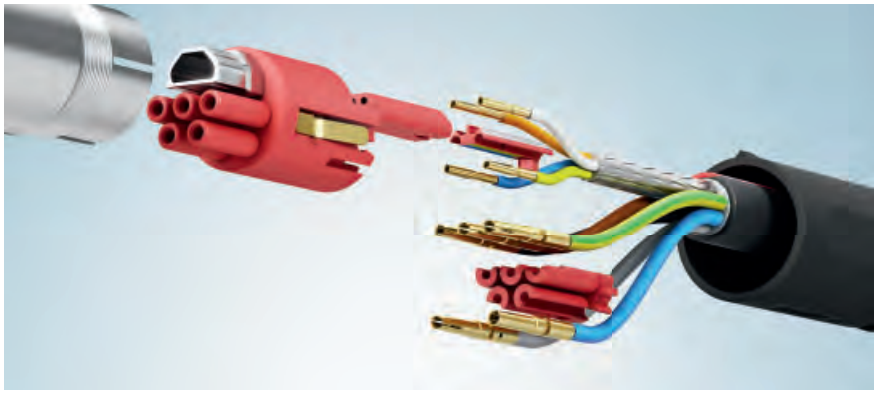
Sizes B12 to B36 with different numbers of power pins (2- to 6-pin) are available for diverse network configurations and current consumptions of the connected components.

All sizes include a Cat.5-enabled Ethernet element in trapezoidal form. The seamless and integrated 360° shielding of the Ethernet element enables the familiar high EtherCAT performance. The compact design provides installation space to accommodate the power pins and enables a high current carrying capacity and dielectric strength of the power pins. The bayonet fitting ensures fast cabling and installation. A two-stage coding system (visual coding with coloured rings, mechanical coding) prevents mismating. Suitable flanges are available to match the standard housing types for rear, front or square flange assembly.

For applications where pre-assembled cables cannot be used, all connectors are also available as field-configurable versions. The poka-yoke principle ensures that the connector can only be assembled in the correct configuration and reliably prevents installation errors. The colour coding printed on the contact holder and optional pre-configuration of the cable makes connector assembly quick and reliable.



Consistent identification system for the ECP/ENP connector family



The integrated shielding of the Ethernet element enables high EtherCAT performance and at the same time high current carrying capacity and dielectric strength of the power pins.

We reserve the right to make technical changes.

ENP B12 | **ENP connector family in size B12, 2-pin**

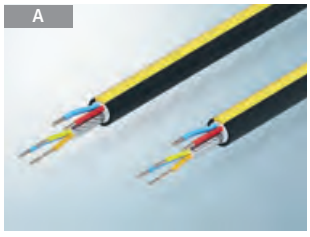
B12 | **EtherCAT/Ethernet cable for flexible applications, 2 x 0.75 mm²**

Ordering information	Cable type/specification			Pict.
ZB7101	EtherCAT/Ethernet cable, no complete shield, PUR, drag-chain suitable, 2 x 0.75 mm² + (1 x 4 x AWG22), black with yellow stripe, OD = 9.0 mm (±0.2 mm)			A
Ordering information	**ENP cable, pre-assembled with B12 plug, straight, female+male, 2+4-pin, EtherCAT-coded, to**			**Pict.**
ZK7102-0607-Axxx	B12, plug, straight, male+female, 2+4-pin, EtherCAT-coded			B
ZK7102-0700-Axxx	open end			C
Ordering information	**ENP cable, pre-assembled with RJ45+open end to B12 flange**			**Pict.**
ZK7102-AA00-Axxx	square flange	straight, 2+4-pin, EtherCAT-coded	short, female+male	D
ZK7102-AB00-Axxx	square flange	straight, 2+4-pin, EtherCAT-coded	short, male+female	E
ZK7102-BE00-Axxx	square flange	straight, 2+4-pin, EtherCAT-coded	long, female+male	
ZK7102-BF00-Axxx	square flange	straight, 2+4-pin, EtherCAT-coded	long, male+female	
ZK7102-AC00-Axxx	rear assembly	straight, 2+4-pin, EtherCAT-coded	short, female+male	F
ZK7102-AD00-Axxx	rear assembly	straight, 2+4-pin, EtherCAT-coded	short, male+female	G
ZK7102-BG00-Axxx	rear assembly	straight, 2+4-pin, EtherCAT-coded	long, female+male	
ZK7102-BH00-Axxx	rear assembly	straight, 2+4-pin, EtherCAT-coded	long, male+female	
ZK7102-AE00-Axxx	front assembly	straight, 2+4-pin, EtherCAT-coded	short, female+male	H
ZK7102-AF00-Axxx	front assembly	straight, 2+4-pin, EtherCAT-coded	short, male+female	I
ZK7102-BI00-Axxx	front assembly	straight, 2+4-pin, EtherCAT-coded	long, female+male	
ZK7102-BJ00-Axxx	front assembly	straight, 2+4-pin, EtherCAT-coded	long, male+female	

B12 | **EtherCAT/Ethernet connectors for field assembly***

Ordering information	B12 EtherCAT connectors, 2+4-pin	Pict.
ZS7100-A001	B12, plug, metal, shielded, crimp, straight, male+female, 2+4-pin, EtherCAT-coded, IP 65/67, Ø 9 mm	J
ZS7100-A002	B12, plug, metal, shielded, crimp, straight, female+male, 2+4-pin, EtherCAT-coded, IP 65/67, Ø 9 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834



We reserve the right to make technical changes.

ECP B12 | **ECP connector family in size B12, 2-pin**

B12 | **EtherCAT P cable for flexible applications, 2 x 0.75 mm²**

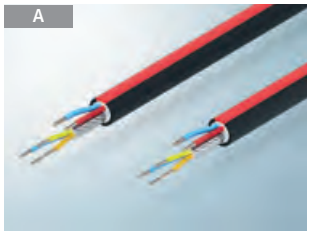
Ordering information	Cable type/specification			Pict.
ZB7100	EtherCAT P cable, no complete shield, PUR, drag-chain suitable, 2 x 0.75 mm² + (1 x 4 x AWG22), black with red stripe, OD = 9.0 mm (±0.2 mm)			A
Ordering information	**ECP cable, pre-assembled with B12 plug, straight, female+female, 2+4-pin, EtherCAT-P-coded, to**			**Pict.**
ZK7102-0607-0xxx	B12, plug, straight, male+male, 2+4-pin, EtherCAT-P-coded			B
ZK7102-0700-0xxx	open end			C
Ordering information	**ECP cable, pre-assembled with M8+open end to B12 flange**			**Pict.**
ZK7102-AA00-0xxx	square flange	straight, 2+4-pin, EtherCAT-P-coded	short, female+female	D
ZK7102-AB00-0xxx	square flange	straight, 2+4-pin, EtherCAT-P-coded	short, male+male	E
ZK7102-BE00-0xxx	square flange	straight, 2+4-pin, EtherCAT-P-coded	long, female+female	
ZK7102-BF00-0xxx	square flange	straight, 2+4-pin, EtherCAT-P-coded	long, male+male	
ZK7102-AC00-0xxx	rear assembly	straight, 2+4-pin, EtherCAT-P-coded	short, female+female	F
ZK7102-AD00-0xxx	rear assembly	straight, 2+4-pin, EtherCAT-P-coded	short, male+male	G
ZK7102-BG00-0xxx	rear assembly	straight, 2+4-pin, EtherCAT-P-coded	long, female+female	
ZK7102-BH00-0xxx	rear assembly	straight, 2+4-pin, EtherCAT-P-coded	long, male+male	
ZK7102-AE00-0xxx	front assembly	straight, 2+4-pin, EtherCAT-P-coded	short, female+female	H
ZK7102-AF00-0xxx	front assembly	straight, 2+4-pin, EtherCAT-P-coded	short, male+male	I
ZK7102-BI00-0xxx	front assembly	straight, 2+4-pin, EtherCAT-P-coded	long, female+female	
ZK7102-BJ00-0xxx	front assembly	straight, 2+4-pin, EtherCAT-P-coded	long, male+male	

B12 | **EtherCAT P connectors for field assembly***

Ordering information	B12 EtherCAT P connectors, 2+4-pin	Pict.
ZS7100-0001	B12, plug, metal, shielded, crimp, straight, male+male, 2+4-pin, EtherCAT-P-coded, IP 65/67, Ø 9 mm	J
ZS7100-0002	B12, plug, metal, shielded, crimp, straight, female+female, 2+4-pin, EtherCAT-P-coded, IP 65/67, Ø 9 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834

A



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ENP B17 | **ENP connector family in size B17, 3-pin**

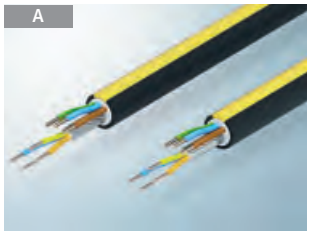
B17 3+4 | **EtherCAT/Ethernet cable for flexible applications, 3 G 1.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7202	EtherCAT/Ethernet cable, no complete shield, PUR, drag-chain suitable, 3 G 1.5 mm² + (1 x 4 x AWG22), black with yellow stripe, OD = 10.0 mm (±0.2 mm)			A
Ordering information	**ENP cable, pre-assembled with B17 plug, straight, female+male, 3+4-pin, EtherCAT-coded, to**			**Pict.**
ZK7206-1819-Axxx	B17, plug, straight, male+female, 3+4-pin, EtherCAT-coded			B
ZK7206-1900-Axxx	open end			C
Ordering information	**ENP cable, pre-assembled with RJ45+open end to B17 flange**			**Pict.**
ZK7206-AG00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	short, female+male	D
ZK7206-AH00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	short, male+female	E
ZK7206-BK00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	long, female+male	
ZK7206-BL00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	long, male+female	
ZK7206-AI00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	short, female+male	F
ZK7206-AJ00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	short, male+female	G
ZK7206-BM00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	long, female+male	
ZK7206-BN00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	long, male+female	
ZK7206-AK00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	short, female+male	H
ZK7206-AL00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	short, male+female	I
ZK7206-BO00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	long, female+male	
ZK7206-BP00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	long, male+female	

B17 | **EtherCAT/Ethernet connectors for field assembly, 3 G 1.5 mm²***

Ordering information	B17 EtherCAT connectors, 3+4-pin	Pict.
ZS7200-A001	B17, plug, metal, shielded, crimp, straight, male+female, 3+4-pin, EtherCAT-coded, IP 65/67, Ø 10 mm	J
ZS7200-A002	B17, plug, metal, shielded, crimp, straight, female+male, 3+4-pin, EtherCAT-coded, IP 65/67, Ø 10 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834



We reserve the right to make technical changes.

B17 3+4 | **EtherCAT/Ethernet cable for flexible applications 3 G 2.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7211	EtherCAT/Ethernet cable, no complete shield, PUR, drag-chain suitable, 3 G 2.5 mm² + (1 x 4 x AWG22), black with yellow stripe, OD = 11.1 mm (±0.2 mm)			A
Ordering information	**ENP cable, pre-assembled with B17 plug, straight, female+male, 3+4-pin, EtherCAT-coded, to**			**Pict.**
ZK7210-1819-Axxx	B17, plug, straight, male+female, 3+4-pin, EtherCAT-coded			B
ZK7210-1900-Axxx	open end			C
Ordering information	**ENP cable, pre-assembled with RJ45+open end to B17 flange**			**Pict.**
ZK7210-AG00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	short, female+male	D
ZK7210-AH00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	short, male+female	E
ZK7210-BK00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	long, female+male	
ZK7210-BL00-Axxx	square flange	straight, 3+4-pin, EtherCAT-coded	long, male+female	
ZK7210-AI00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	short, female+male	F
ZK7210-AJ00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	short, male+female	G
ZK7210-BM00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	long, female+male	
ZK7210-BN00-Axxx	rear assembly	straight, 3+4-pin, EtherCAT-coded	long, male+female	
ZK7210-AK00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	short, female+male	H
ZK7210-AL00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	short, male+female	I
ZK7210-BO00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	long, female+male	
ZK7210-BP00-Axxx	front assembly	straight, 3+4-pin, EtherCAT-coded	long, male+female	

B17 | **EtherCAT/Ethernet connectors for field assembly, 3 G 2.5 mm²***

Ordering information	B17 EtherCAT connectors, 3+4-pin	Pict.
ZS7200-A003	B17, plug, metal, shielded, crimp, straight, male+female, 3+4-pin, EtherCAT-coded, IP 65/67, Ø 11.1 mm	J
ZS7200-A004	B17, plug, metal, shielded, crimp, straight, female+male, 3+4-pin, EtherCAT-coded, IP 65/67, Ø 11.1 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834

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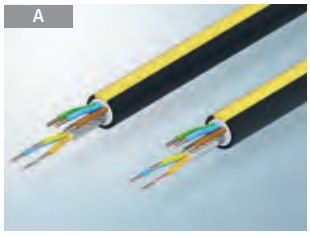

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ECP B17 | **ECP connector family in size B17, 3-pin**

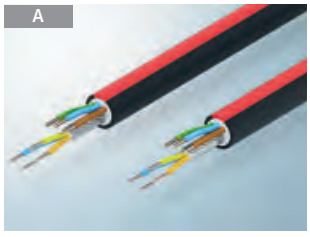
B17 3+4 | **EtherCAT P cable for flexible applications, 3 G 1.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7200	EtherCAT P cable, no complete shield, PUR, drag-chain suitable, 3 G 1.5 mm² + (1 x 4 x AWG22), black with red stripe, OD = 10.0 mm (±0.2 mm)			A
Ordering information	**ECP cable, pre-assembled with B17 plug, straight, female+female, 3+4-pin, EtherCAT-P-coded, to**			**Pict.**
ZK7206-1819-0xxx	B17, plug, straight, male+male, 3+4-pin, EtherCAT-P-coded			B
ZK7206-1900-0xxx	open end			C
Ordering information	**ECP cable, pre-assembled with M8+open end to B17 flange**			**Pict.**
ZK7206-AG00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	short, female+female	D
ZK7206-AH00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	short, male+male	E
ZK7206-BK00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	long, female+female	
ZK7206-BL00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	long, male+male	
ZK7206-AI00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	short, female+female	F
ZK7206-AJ00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	short, male+male	G
ZK7206-BM00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	long, female+female	
ZK7206-BN00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	long, male+male	
ZK7206-AK00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	short, female+female	H
ZK7206-AL00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	short, male+male	I
ZK7206-BO00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	long, female+female	
ZK7206-BP00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	long, male+male	

B17 | **EtherCAT P connectors for field assembly***

Ordering information	B17 EtherCAT P connectors, 3+4-pin	Pict.
ZS7200-0001	B17, plug, metal, shielded, crimp, straight, male+male, 3+4-pin, EtherCAT-P-coded, IP 65/67, Ø 10 mm	J
ZS7200-0002	B17, plug, metal, shielded, crimp, straight, female+female, 3+4-pin, EtherCAT-P-coded, IP 65/67, Ø 10 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834



We reserve the right to make technical changes.

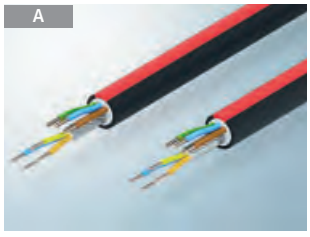
B17 3+4 | **EtherCAT P cable for flexible applications, 3 G 2.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7210	EtherCAT P cable, no complete shield, PUR, drag-chain suitable, 3 G 2.5 mm² + (1 x 4 x AWG22), black with red stripe, OD = 11.1 mm (±0.2 mm)			A
Ordering information	**ECP cable, pre-assembled with B17 plug, straight, female+female, 3+4-pin, EtherCAT-P-coded, to**			**Pict.**
ZK7210-1819-0xxx	B17, plug, straight, male+male, 3+4-pin, EtherCAT-P-coded			B
ZK7210-1900-0xxx	open end			C
Ordering information	**ECP cable, pre-assembled with M8+open end to B17 flange**			**Pict.**
ZK7210-AG00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	short, female+female	D
ZK7210-AH00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	short, male+male	E
ZK7210-BK00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	long, female+female	
ZK7210-BL00-0xxx	square flange	straight, 3+4-pin, EtherCAT-P-coded	long, male+male	
ZK7210-AI00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	short, female+female	F
ZK7210-AJ00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	short, male+male	G
ZK7210-BM00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	long, female+female	
ZK7210-BN00-0xxx	rear assembly	straight, 3+4-pin, EtherCAT-P-coded	long, male+male	
ZK7210-AK00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	short, female+female	H
ZK7210-AL00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	short, male+male	I
ZK7210-BO00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	long, female+female	
ZK7210-BP00-0xxx	front assembly	straight, 3+4-pin, EtherCAT-P-coded	long, male+male	

B17 | **EtherCAT P connectors for field assembly***

Ordering information	B17 EtherCAT P connectors, 3+4-pin	Pict.
ZS7200-0003	B17, plug, metal, shielded, crimp, straight, male+male, 3+4-pin, EtherCAT-P-coded, IP 65/67, Ø 11.1 mm	J
ZS7200-0004	B17, plug, metal, shielded, crimp, straight, female+female, 3+4-pin, EtherCAT-P-coded, IP 65/67, Ø 11.1 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834



ENP B17 | **ENP connector family in size B17, 4-/5-pin**

B17 4+4 | **EtherCAT/Ethernet cable for flexible applications, 4 x 1.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7213	EtherCAT/Ethernet cable, no complete shield, PUR, drag-chain suitable, 4 x 1.5 mm² + (1 x 4 x AWG22), black with yellow stripe, OD = 10.8 mm (±0.2 mm)			A
Ordering information	**ENP cable, pre-assembled with B17 plug, straight, female+male, 4+4-pin, EtherCAT-coded, to**			**Pict.**
ZK7224-2425-Axxx	B17, plug, straight, male+female, 4+4-pin, EtherCAT-coded			B
ZK7224-2500-Axxx	open end			C
Ordering information	**ENP cable, pre-assembled with RJ45+open end to B17 flange**			**Pict.**
ZK7224-AM00-Axxx	square flange	straight, 4+4-pin, EtherCAT-coded	short, female+male	D
ZK7224-AN00-Axxx	square flange	straight, 4+4-pin, EtherCAT-coded	short, male+female	E
ZK7224-BQ00-Axxx	square flange	straight, 4+4-pin, EtherCAT-coded	long, female+male	
ZK7224-BR00-Axxx	square flange	straight, 4+4-pin, EtherCAT-coded	long, male+female	
ZK7224-AO00-Axxx	rear assembly	straight, 4+4-pin, EtherCAT-coded	short, female+male	F
ZK7224-AP00-Axxx	rear assembly	straight, 4+4-pin, EtherCAT-coded	short, male+female	G
ZK7224-BS00-Axxx	rear assembly	straight, 4+4-pin, EtherCAT-coded	long, female+male	
ZK7224-BT00-Axxx	rear assembly	straight, 4+4-pin, EtherCAT-coded	long, male+female	
ZK7224-AQ00-Axxx	front assembly	straight, 4+4-pin, EtherCAT-coded	short, female+male	H
ZK7224-AR00-Axxx	front assembly	straight, 4+4-pin, EtherCAT-coded	short, male+female	I
ZK7224-BU00-Axxx	front assembly	straight, 4+4-pin, EtherCAT-coded	long, female+male	
ZK7224-BV00-Axxx	front assembly	straight, 4+4-pin, EtherCAT-coded	long, male+female	

B17 | **EtherCAT/Ethernet connectors for field assembly, 4 x 1.5 mm²***

Ordering information	B17 EtherCAT connectors, 4+4-pin	Pict.
ZS7200-A005	B17, plug, metal, shielded, crimp, straight, male+female, 4+4-pin, EtherCAT-coded, IP 65/67, Ø 10.8 mm	J
ZS7200-A006	B17, plug, metal, shielded, crimp, straight, female+male, 4+4-pin, EtherCAT-coded, IP 65/67, Ø 10.8 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834

We reserve the right to make technical changes.

B17 5+4 | **EtherCAT/Ethernet cable for flexible applications 5 G 1.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7203	EtherCAT/Ethernet cable, no complete shield, PUR, drag-chain suitable, 5 G 1.5 mm² + (1 x 4 x AWG22), black with yellow stripe, OD = 11.0 mm (±0.2 mm)			A
Ordering information	**ENP cable, pre-assembled with B17 plug, straight, female+male, 5+4-pin, EtherCAT-coded, to**			**Pict.**
ZK7208-3031-Axxx	B17, plug, straight, male+female, 5+4-pin, EtherCAT-coded			B
ZK7208-3100-Axxx	open end			C
Ordering information	**ENP cable, pre-assembled with RJ45+open end to B17 flange**			**Pict.**
ZK7208-AS00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	short, female+male	D
ZK7208-AT00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	short, male+female	E
ZK7208-BW00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	long, female+male	
ZK7208-BX00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	long, male+female	
ZK7208-AU00-Axxx	rear assembly	straight, 5+4-pin, EtherCAT-coded	short, female+male	F
ZK7208-AV00-Axxx	rear assembly	straight, 5+4-pin, EtherCAT-coded	short, male+female	G
ZK7208-BY00-Axxx	rear assembly	straight, 5+4-pin, EtherCAT-coded	long, female+male	
ZK7208-BZ00-Axxx	rear assembly	straight, 5+4-pin, EtherCAT-coded	long, male+female	
ZK7208-AW00-Axxx	front assembly	straight, 5+4-pin, EtherCAT-coded	short, female+male	H
ZK7208-AX00-Axxx	front assembly	straight, 5+4-pin, EtherCAT-coded	short, male+female	I
ZK7208-CA00-Axxx	front assembly	straight, 5+4-pin, EtherCAT-coded	long, female+male	
ZK7208-CB00-Axxx	front assembly	straight, 5+4-pin, EtherCAT-coded	long, male+female	

B17 | **EtherCAT/Ethernet connectors for field assembly, 5 G 1.5 mm²***

Ordering information	B17 EtherCAT connectors, 5+4-pin	Pict.
ZS7200-A007	B17, plug, metal, shielded, crimp, straight, male+female, 5+4-pin, EtherCAT-coded, IP 65/67, Ø 11 mm	J
ZS7200-A008	B17, plug, metal, shielded, crimp, straight, female+male, 5+4-pin, EtherCAT-coded, IP 65/67, Ø 11 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834

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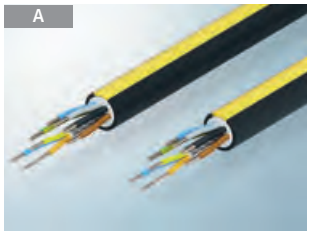

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ECP B17 | **ECP connector family in size B17, 4-/5-pin**

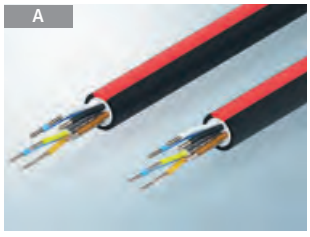
B17 4+4 | **EtherCAT P cable for flexible applications, 4 x 1.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7215	EtherCAT P cable, no complete shield, PUR, drag-chain suitable, 4 x 1.5 mm² + (1 x 4 x AWG22), black with red stripe, OD = 10.8 mm (±0.2 mm)			A
Ordering information	**ECP cable, pre-assembled with B17 plug, straight, female+female, 4+4-pin, EtherCAT-P-coded, to**			**Pict.**
ZK7224-2425-0xxx	B17, plug, straight, male+male, 4+4-pin, EtherCAT-P-coded			B
ZK7224-2500-0xxx	open end			C
Ordering information	**ECP cable, pre-assembled with M8+open end to B17 flange**			**Pict.**
ZK7224-AM00-0xxx	square flange	straight, 4+4-pin, EtherCAT-P-coded	short, female+female	D
ZK7224-AN00-0xxx	square flange	straight, 4+4-pin, EtherCAT-P-coded	short, male+male	E
ZK7224-BQ00-0xxx	square flange	straight, 4+4-pin, EtherCAT-P-coded	long, female+female	
ZK7224-BR00-0xxx	square flange	straight, 4+4-pin, EtherCAT-P-coded	long, male+male	
ZK7224-AO00-0xxx	rear assembly	straight, 4+4-pin, EtherCAT-P-coded	short, female+female	F
ZK7224-AP00-0xxx	rear assembly	straight, 4+4-pin, EtherCAT-P-coded	short, male+male	G
ZK7224-BS00-0xxx	rear assembly	straight, 4+4-pin, EtherCAT-P-coded	long, female+female	
ZK7224-BT00-0xxx	rear assembly	straight, 4+4-pin, EtherCAT-P-coded	long, male+male	
ZK7224-AQ00-0xxx	front assembly	straight, 4+4-pin, EtherCAT-P-coded	short, female+female	H
ZK7224-AR00-0xxx	front assembly	straight, 4+4-pin, EtherCAT-P-coded	short, male+male	I
ZK7224-BU00-0xxx	front assembly	straight, 4+4-pin, EtherCAT-P-coded	long, female+female	
ZK7224-BV00-0xxx	front assembly	straight, 4+4-pin, EtherCAT-P-coded	long, male+male	

B17 | **EtherCAT P connectors for field assembly, 4 x 1.5 mm²***

Ordering information	B17 EtherCAT P connectors, 4+4-pin	Pict.
ZS7200-0005	B17, plug, metal, shielded, crimp, straight, male+male, 4+4-pin, EtherCAT-P-coded, IP 65/67, Ø 10.8 mm	J
ZS7200-0006	B17, plug, metal, shielded, crimp, straight, female+female, 4+4-pin, EtherCAT-P-coded, IP 65/67, Ø 10.8 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834



We reserve the right to make technical changes.

B17 5+4 | **EtherCAT P cable for flexible applications, 5 G 1.5 mm²**

Ordering information	Cable type/specification			Pict.
ZB7201	EtherCAT P cable, no complete shield, PUR, drag-chain suitable, 5 G 1.5 mm² + (1 x 4 x AWG22), black with red stripe, OD = 11.0 mm (±0.2 mm)			A
Ordering information	**ECP cable, pre-assembled with B17 plug, straight, female+female, 5+4-pin, EtherCAT-P-coded, to**			**Pict.**
ZK7208-3031-0xxx	B17, plug, straight, male+male, 5+4-pin, EtherCAT-P-coded			B
ZK7208-3100-0xxx	open end			C
Ordering information	**ECP cable, pre-assembled with M8+open end to B17 flange**			**Pict.**
ZK7208-AS00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	short, female+female	D
ZK7208-AT00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	short, male+male	E
ZK7208-BW00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	long, female+female	
ZK7208-BX00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	long, male+male	
ZK7208-AU00-0xxx	rear assembly	straight, 5+4-pin, EtherCAT-P-coded	short, female+female	F
ZK7208-AV00-0xxx	rear assembly	straight, 5+4-pin, EtherCAT-P-coded	short, male+male	G
ZK7208-BY00-0xxx	rear assembly	straight, 5+4-pin, EtherCAT-P-coded	long, female+female	
ZK7208-BZ00-0xxx	rear assembly	straight, 5+4-pin, EtherCAT-P-coded	long, male+male	
ZK7208-AW00-0xxx	front assembly	straight, 5+4-pin, EtherCAT-P-coded	short, female+female	H
ZK7208-AX00-0xxx	front assembly	straight, 5+4-pin, EtherCAT-P-coded	short, male+male	I
ZK7208-CA00-0xxx	front assembly	straight, 5+4-pin, EtherCAT-P-coded	long, female+female	
ZK7208-CB00-0xxx	front assembly	straight, 5+4-pin, EtherCAT-P-coded	long, male+male	

B17 | **EtherCAT P connectors for field assembly, 5 G 1.5 mm²***

Ordering information	B17 EtherCAT P connectors, 5+4-pin	Pict.
ZS7200-0007	B17, plug, metal, shielded, crimp, straight, male+male, 5+4-pin, EtherCAT-P-coded, IP 65/67, Ø 11 mm	J
ZS7200-0008	B17, plug, metal, shielded, crimp, straight, female+female, 5+4-pin, EtherCAT-P-coded, IP 65/67, Ø 11 mm	K

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834

ENP B23 | **ENP connector family in size B23**

B23 5+4 | **EtherCAT/Ethernet cable for flexible applications, 5 G 4 mm²**

Ordering information	Cable type/specification
ZB7305	EtherCAT/Ethernet cable, no complete shield, PUR, drag-chain suitable, 5 G 4 mm² + (1 x 4 x AWG22), black with yellow stripe, OD = 15.0 mm (±0.2 mm)

Ordering information	ENP cable, pre-assembled with B23 plug, straight, female+male, 5+4-pin, EtherCAT-coded, to	Pict.
ZK7314-3031-Axxx	B23, plug, straight, male+female, 5+4-pin, EtherCAT-coded	A
ZK7314-3100-Axxx	open end	

Ordering information	ENP cable, pre-assembled with RJ45+open end to B23 flange		
ZK7314-AS00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	short, female+male
ZK7314-AT00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	short, male+female
ZK7314-BW00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	long, female+male
ZK7314-BX00-Axxx	square flange	straight, 5+4-pin, EtherCAT-coded	long, male+female

B23 | **EtherCAT/Ethernet connectors for field assembly, 5 G 4 mm²***

Ordering information	B23 EtherCAT/Ethernet connectors, 5+4-pin
ZS7300-A001	B23, plug, metal, shielded, crimp, straight, male+female, 5+4-pin, EtherCAT-coded, IP 65/67, Ø 15 mm
ZS7300-A002	B23, plug, metal, shielded, crimp, straight, female+male, 5+4-pin, EtherCAT-coded, IP 65/67, Ø 15 mm

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834

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For availability status see Beckhoff website at:

We reserve the right to make technical changes.

ECP B23 | **ECP connector family in size B23**

B23 5+4 | **EtherCAT P cable for flexible applications, 5 G 4 mm²**

Ordering information	Cable type/specification
ZB7304	EtherCAT P cable, no complete shield, PUR, drag-chain suitable, 5 G 4 mm² + (1 x 4 x AWG22), black with red stripe, OD = 15.0 mm (±0.2 mm)

Ordering information	ECP cable, pre-assembled with B23 plug, straight, female+female, 5+4-pin, EtherCAT-P-coded, to	Pict.
ZK7314-3031-0xxx	B23, plug, straight, male+male, 5+4-pin, EtherCAT-P-coded	A
ZK7314-3100-0xxx	open end	

Ordering information	ECP cable, pre-assembled with M8+open end to B23 flange		
ZK7314-AS00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	short, female+female
ZK7314-AT00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	short, male+male
ZK7314-BW00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	long, female+female
ZK7314-BX00-0xxx	square flange	straight, 5+4-pin, EtherCAT-P-coded	long, male+male

B23 | **EtherCAT P connectors for field assembly, 5 G 4 mm²***

Ordering information	B23 EtherCAT P connectors, 5+4-pin
ZS7300-0001	B23, plug, metal, shielded, crimp, straight, male+male, 5+4-pin, EtherCAT-P-coded, IP 65/67, Ø 15 mm
ZS7300-0002	B23, plug, metal, shielded, crimp, straight, female+female, 5+4-pin, EtherCAT-P-coded, IP 65/67, Ø 15 mm

*Connectors for field assembly are delivered without crimp contacts. Please order crimp contacts separately, see page 834

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For availability status see Beckhoff website at:

ENP/ECP | Accessories for ENP/ECP connector family

For connectors for field assembly

Ordering information	Tools and inserts
ZB8810-0000	crimping tool for Ethernet element, M8, B12, B17, B23 contacts
ZB8810-0001	crimping insert/locator for Ethernet element, M8, B12, B17 contacts
ZB8810-0002	crimping insert/locator for B23 contacts

Ordering information	Crimp contacts for trapezoidal Ethernet element	Pict.
ZS7000-C001	crimp contacts Ethernet element, male, packaging unit = 50 pieces	A
ZS7000-C002	crimp contacts Ethernet element, female, packaging unit = 50 pieces	A

Ordering information	Crimp contacts for power pins	Pict.
ZS7000-C003	B12 crimp contact, male, 0.75 mm², packaging unit = 50 pieces	B
ZS7000-C004	B12 crimp contact, female, 0.75 mm², packaging unit = 50 pieces	B
ZS7000-C005	B17 crimp contact, male, 1.5 mm², packaging unit = 50 pieces	B
ZS7000-C006	B17 crimp contact, female, 1.5 mm², packaging unit = 50 pieces	B
ZS7000-C007	B17 crimp contact, male, 2.5 mm², packaging unit = 50 pieces	B
ZS7000-C008	B17 crimp contact, female, 2.5 mm², packaging unit = 50 pieces	B
ZS7000-C009	B23 crimp contact, male, 4 mm², packaging unit = 50 pieces	B
ZS7000-C010	B23 crimp contact, female, 4 mm², packaging unit = 50 pieces	B

For B12

Ordering information		Pict.
ZS7100-B001	B12 protection cap, socket/flange, plastic, black, IP 67, packaging unit = 10 pieces	C
ZS7100-B002	B12 protection cap, socket/flange, metal, IP 67, packaging unit = 5 pieces	D
ZS7100-B003	B12 protection cap, plug, plastic, black, IP 67, packaging unit = 10 pieces	E
ZS7100-B004	B12 protection cap, plug, metal, IP 67, packaging unit = 5 pieces	
ZS7100-B005	B12 colour coding connector, red, packaging unit = 10 pieces	F
ZS7100-B006	B12 colour coding connector, yellow, packaging unit = 10 pieces	F
ZS7100-B007	B12 colour coding connector, blue, packaging unit = 10 pieces	F
ZS7100-B008	B12 colour coding connector, green, packaging unit = 10 pieces	F
ZS7100-B009	B12 colour coding flange, red, packaging unit = 10 pieces	G
ZS7100-B010	B12 colour coding flange, yellow, packaging unit = 10 pieces	G
ZS7100-B011	B12 colour coding flange, blue, packaging unit = 10 pieces	G
ZS7100-B012	B12 colour coding flange, green, packaging unit = 10 pieces	G

For B17

Ordering information		Pict.
ZS7200-B001	B17 protection cap, socket/flange, plastic, black, IP 67, packaging unit = 10 pieces	C
ZS7200-B002	B17 protection cap, socket/flange, metal, IP 67, packaging unit = 5 pieces	D
ZS7200-B003	B17 protection cap, plug, plastic, black, IP 67, packaging unit = 10 pieces	E
ZS7200-B004	B17 protection cap, plug, metal, IP 67, packaging unit = 5 pieces	
ZS7200-B005	B17 colour coding connector, red, packaging unit = 10 pieces	F
ZS7200-B006	B17 colour coding connector, yellow, packaging unit = 10 pieces	F
ZS7200-B007	B17 colour coding connector, blue, packaging unit = 10 pieces	F
ZS7200-B008	B17 colour coding connector, green, packaging unit = 10 pieces	F
ZS7200-B009	B17 colour coding flange, red, packaging unit = 10 pieces	G
ZS7200-B010	B17 colour coding flange, yellow, packaging unit = 10 pieces	G
ZS7200-B011	B17 colour coding flange, blue, packaging unit = 10 pieces	G
ZS7200-B012	B17 colour coding flange, green, packaging unit = 10 pieces	G

We reserve the right to make technical changes.

For B23

Ordering information		Pict.
ZS7300-B001	B23 protection cap, socket/flange, plastic, black, IP 67, packaging unit = 10 pieces	C
ZS7300-B002	B23 protection cap, socket/flange, metal, IP 67, packaging unit = 5 pieces	D
ZS7300-B003	B23 protection cap, plug, plastic, black, IP 67, packaging unit = 10 pieces	E
ZS7300-B004	B23 protection cap, plug, metal, IP 67, packaging unit = 5 pieces	
ZS7300-B005	B23 colour coding connector, red, packaging unit = 10 pieces	F
ZS7300-B006	B23 colour coding connector, yellow, packaging unit = 10 pieces	F
ZS7300-B007	B23 colour coding connector, blue, packaging unit = 10 pieces	F
ZS7300-B008	B23 colour coding connector, green, packaging unit = 10 pieces	F
ZS7300-B009	B23 colour coding flange, red, packaging unit = 10 pieces	G
ZS7300-B010	B23 colour coding flange, yellow, packaging unit = 10 pieces	G
ZS7300-B011	B23 colour coding flange, blue, packaging unit = 10 pieces	G
ZS7300-B012	B23 colour coding flange, green, packaging unit = 10 pieces	G

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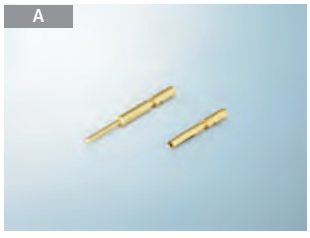

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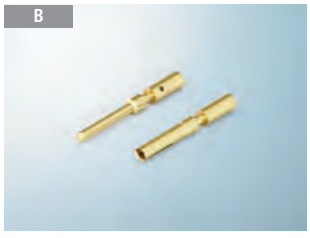

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For availability status see Beckhoff website at:

Fieldbus cables

Lightbus

Ordering information	Components for Lightbus cables for field assembly
Z1000	standard connector for 1000 µm plastic fibre
Z1010	standard connector for 200 µm PCS fibre
Z1020	coupling for Z1000
Z1100	plastic fibre optic, core Ø 1000 µm, single core, diameter 2.2 mm
Z1101	plastic fibre optic, core Ø 1000 µm, PUR sheat Ø 5.5 mm, Kevlar strain relief, drag-chain suitable

PROFIBUS, Modbus, RS232, RS485

Pre-assembled cables for flexible applications

Material characteristics	
ZK1031-6xxx-1xxx	PUR, 2-wire, (2 x 0.25 mm²), shielded, drag-chain suitable, purple

Ordering information	Cable, pre-assembled with M12 socket (5-pin/straight) to	Pict.
ZK1031-6200-1xxx	open end	A
ZK1031-6251-1xxx	M12 plug (4-pin/straight)	B

Ordering information	Cable, pre-assembled with M12 socket (5-pin/angled) to	Pict.
ZK1031-6400-1xxx	open end	C
ZK1031-6451-1xxx	M12 plug (4-pin/straight), reverse-keyed	D

Ordering information	Cable, pre-assembled with M12 plug (5-pin/straight) to	Pict.
ZK1031-6100-1xxx	open end	E

Ordering information	Cable, pre-assembled with M12 plug (5-pin/angled) to	Pict.
ZK1031-6300-1xxx	open end	F
ZK1031-6354-1xxx	M12 plug (5-pin/angled)	G

Accessories

Ordering information	Connecting elements for pre-assembled cables	Pict.
ZS1031-2600	tee-connector, 12 Mbaud	
ZS1031-2610	tee-connector, 12 Mbaud for direct connection to other tee-connectors	
ZS1000-2600	Y-connector, 12 Mbaud (plug, socket)	
ZS1000-1610	termination resistor (plug)	H
ZS1031-6610	control cabinet feed through M12, plug-coupling	I

Ordering information	Connectors for field assembly	Pict.
ZS1000-0610	plug for field assembly, straight	J
ZS1000-0620	socket for field assembly, straight	K
ZS1000-0630	plug for field assembly, angled	L
ZS1000-0640	socket for field assembly, angled	M

We reserve the right to make technical changes.

Ordering information	Components for field assembly of PROFIBUS cables	Pict.
ZB3100	9-pin D-sub connector for PROFIBUS (12 Mbaud) with switchable termination resistor	N
ZB3101	9-pin D-sub connector for PROFIBUS (12 Mbaud) with switchable termination resistor and programming interface	O
ZB3102	9-pin D-sub connector for PROFIBUS (12 Mbaud) (180° orientation) with switchable termination resistor	P
ZS1031-3000	9-pin D-sub connector for PROFIBUS (12 Mbaud) with integrated termination resistor	Q
ZS1031-3500	fibre optic connector for Bus Couplers BK3500 and BK3520	
ZB3200	PROFIBUS cable 12 Mbaud 1 x 2 x 0.64 mm²	
ZB3300	PROFIBUS cable, 12 Mbaud, 2 x 0.25 mm² + 3 x 0.75 mm², 5-wire, suitable as trailing cable	
Z1100	plastic fibre optic, core Ø 1000 µm, single core, diameter 2.2 mm	
Z1101	plastic fibre optic, core Ø 1000 µm, PUR sheat Ø 5.5 mm, Kevlar strain relief, drag-chain suitable	

Ordering information	Components for field assembly of RS232/RS485 cables	Pict.
ZB3180	9-pin D-sub connector for CX8080 (RS232/RS485) with switchable termination resistor	N

Illustrations similar

CANopen, DeviceNet

Pre-assembled cables for fixed installation

Material characteristics	
ZK1052-6xxx-3xxx	PVC, 4-wire, (4 x 0.32 mm²), shielded, fixed installation, grey

Ordering information	Cable, pre-assembled with M12 socket (5-pin/straight) to	Pict.
ZK1052-6200-3xxx	open end	A

Ordering information	Cable, pre-assembled with M12 socket (5-pin/angled) to	Pict.
ZK1052-6400-3xxx	open end	B

Ordering information	Cable, pre-assembled with M12 plug (5-pin/straight) to	Pict.
ZK1052-6100-3xxx	open end	C
ZK1052-6152-3xxx	M12 socket (5-pin/straight)	D
ZK1052-6154-3xxx	M12 socket (5-pin/angled)	E

Ordering information	Cable, pre-assembled with M12 plug (5-pin/angled) to	Pict.
ZK1052-6300-3xxx	open end	F
ZK1052-6354-3xxx	M12 socket (5-pin/angled)	G

Accessories

Ordering information	Connecting elements for pre-assembled cables	Pict.
ZS1052-2600	Y-connector (plug, socket)	
ZS1052-2602	Y-connector with stub, 1 m (plug, socket)	
ZS1052-1610	termination resistor (plug, 120 Ω pin 4–5)	H
ZS1052-6610	control cabinet lead-in M12, plug-coupling	I
ZS5052-4500	distribution box: 1 x 5-pin plug, 4 x 5-pin socket	J

Ordering information	Connectors for field assembly
ZS1052-0620	straight socket, screw type connection
ZS1052-0640	angled socket, screw type connection
ZS1052-0610	straight plug, screw type connection
ZS1052-0630	angled plug, screw type connection

Ordering information	Components for field assembly of CANopen/DeviceNet cables	Pict.
ZS1051-3000	9-pin D-sub connector for CANopen with integrated termination resistor	K
ZS1052-3000	5-pin open style connector for CANopen/DeviceNet with integrated termination resistor	L
ZS1052-5150	CAN diagnostic interface	
ZB5100	CAN cable, 4-core, fixed laying 2 x 2 x 0.25 mm²	
ZB5200	DeviceNet cable, 4-core with shield, fixed laying 2 x 2 x AWG22	

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We reserve the right to make technical changes.

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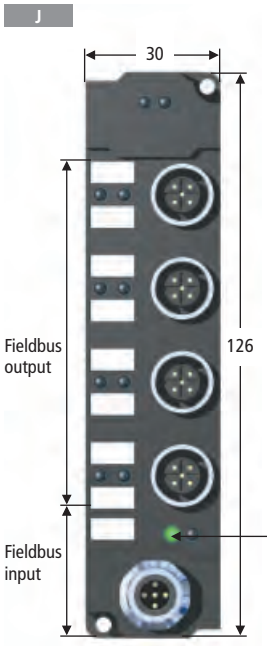
Illustrations similar

J



Technical data	
Fieldbus	CANopen or DeviceNet
Bus plug	M12 plug, 5-pin, screwed
Data transfer rates	up to 1 Mbaud (CANopen) or 500 kbaud (DeviceNet)
Protection class	IP 67
Temperature range	0…+55 °C

The following stub lines are not to be exceeded:

Baud rates	Max. stub length (multidrop)	Max. bus length with multidrop technology (without stubs)
1000 kbaud	0.3 m	25 m
500 kbaud	1.2 m	60 m
250 kbaud	2.4 m	120 m
125 kbaud	4.8 m	310 m

K

L

Interbus

Ordering information	Components for field assembly of Interbus cables
Z1003	FSMA plug with knurled nut for 1000 µm plastic fibre
ZB4100	9-pin D-sub socket for incoming remote bus
ZB4101	9-pin D-sub plug for outgoing remote bus
ZB4200	Interbus remote bus cable, certified 3 x 2 x 0.22 mm²
Z1120	Interbus plastic fibre optic, 2-core, 1000 µm
Z1121	Interbus plastic fibre optic, 2-core, 1000 µm with protective PU cladding

SERCOS interface

Ordering information	Components for field assembly of SERCOS interface cables
Z1003	FSMA plug with knurled nut for 1000 µm plastic fibre
Z1100	plastic fibre optic, core Ø 1000 µm, single core, diameter 2.2 mm
Z1101	plastic fibre optic, core Ø 1000 µm, PUR sheat Ø 5.5 mm, Kevlar strain relief, drag-chain suitable

K-bus

Ordering information	K-bus extension cable, assembled at both ends with RJ45 plug, double-shielded, red					A
ZK1090-0101-1002	0.2 m	ZK1090-0101-1010	1.0 m	ZK1090-0101-1030	3.0 m	
ZK1090-0101-1005	0.5 m	ZK1090-0101-1020	2.0 m	ZK1090-0101-1050	5.0 m	

Ordering information	Ribbon cable
ZK1010-8080-3003	ribbon cable for bus connection between two power terminals KL8001, 0.03 m, included in the scope of supply of KL8001
ZK1010-8080-3005	ribbon cable for bus connection between two power terminals KL8001 for reversing contactor connection, 0.05 m
ZK1010-8080-3010	ribbon cable for bus connection between the KL9060 and the KL8001, 0.1 m, included in scope of supply of KL9060

Ordering information	Components for K-bus extension for field assembly
ZS1090-0005	RJ45, IP 20, plug, plastic, IDC, straight, male, 8-pin, AWG26-22, Ø 5.5…8.5 mm
ZK1090-0000-1xxx	cable for K-bus extension with open ends, Ethernet cable STP, xxx = length in dm

A

We reserve the right to make technical changes.

Signal cables

Ordering information	For manual operating modules of the KL85xx series, 20 x 0.14 mm², shielded, assembled at both ends with 20-pin plug, for terminals with ribbon cable connection					A
ZK8500-8282-7030	3 m	ZK8500-8282-7040	4 m	ZK8500-8282-7050	5 m	

A

IP-Link

Ordering information	Pre-assembled cable
ZK1020-0101-0xxx	pre-assembled IP-Link cable, drag-chain suitable

Ordering information	Sold by the metre for field assembly
Z1103	plastic fibre optics, 1000 µm, PUR sheat ø 6 mm, heavy duty, drag-chain suitable
ZS5400-0001	sanding gauge for IP-Link connector
ZS5400-0010	abrasive paper P600, 10 sheets

Ordering information	Connectors for field assembly	Pict.
ZS1020-0010	plug, packaging unit = 1 piece	A
ZS1021-0010	plug, packaging unit = 10 pieces	A
ZS1022-0010	IP-Link plug, packaging unit = 10 pieces, clip type	B
ZK1020-0101-1000	IP-Link connector, for flush mounted extension modules	C
ZS1022-0000	locking device IP-Link, stainless steel	

A

B

C

Illustrations similar

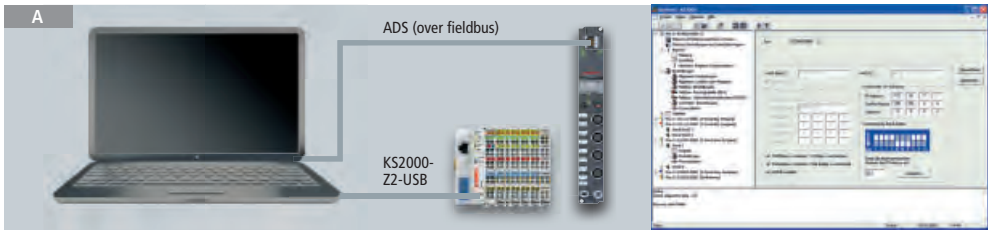
Software and programming

Configuration software KS2000

The KS2000 can be used for parametering fieldbus components, local diagnostics, forcing data, monitorig values, updating firmware and programming Beckhoff mini PLCs via TwinCAT. The connection between the fieldbus components and the PC is established via the serial or USB connection cable provided, or via the network and TCP/IP. The KS2000 configuration software for Windows NT/2000/XP/Vista or Windows 7 operating systems has a friendly user interface, making work comfortable and convenient.

Ordering information		A
KS2000(-0000)	KS2000 software for Bus Coupler/Bus Terminal Controller, RS232 interface	
KS2000-0001	KS2000 software for Fieldbus Box, RS232 interface	
KS2000-0010	KS2000 software for Bus Coupler/Bus Terminal Controller, USB interface	
KS2000-0011	KS2000 software for Fieldbus Box, USB interface	

A



USB cable for Bus Couplers or Bus Terminal Controllers at KS2000/TwinCAT

The KS2000 cable establishes a connection between the Bus Couplers or Bus Terminal Controllers and the PC. The USB cable features electrical isolation. Status LEDs indicate whether data are sent or received. On the connected PC the USB cable behaves like a COM port and can therefore be used for all Beckhoff tools using serial communication.

Ordering information	
KS2000-Z2-USB	connection cable for KS2000 or TwinCAT for serial conversion from USB for Bus Couplers or Bus Terminal Controllers of the BK, BC or LC series, 3 m

USB cable for Fieldbus Box modules at KS2000/TwinCAT

The KS2000 cable connects the Fieldbus Box modules with the PC. The USB cable features electrical isolation. Status LEDs indicate whether data are sent or received. On the connected PC the USB cable behaves like a COM port and can therefore be used for all Beckhoff tools using serial communication.

Ordering information		Pict.
KS2000-Z3-USB	connection cable for KS2000 or TwinCAT for serial conversion from USB for Fieldbus Box, 3 m	A

A

We reserve the right to make technical changes.

RS232 programming cable for BX controllers at KS2000/TwinCAT

Ordering information	
ZK1000-0030	connection cable for KS2000 or TwinCAT, RS232 for BX Controller series

EtherCAT demokit

The TC9910-B11x EtherCAT demokit offers a quick introduction into EtherCAT communication. It includes EtherCAT Terminals and a Coupler for testing simple I/O functions. The enclosed CD contains a step-by-step guide and a full version of TwinCAT 2 as programming environment for the Beckhoff EtherCAT master. EtherCAT slaves of any type can be tested with this field-proven EtherCAT master. It also includes a comprehensive help collection that facilitates familiarisation with Beckhoff ADS communication and programming according to IEC 61131-3.

The demokit consists of:
- EK1100 EtherCAT Coupler
- 2 digital input terminals 24 V DC
- 2 digital output terminals 24 V DC
- Beckhoff product folder
- Beckhoff TwinCAT CD
- "TwinCAT Quickstart" documentation
- documentation describing the EK1100
- a 25 cm section of 35 mm mounting rail for fitting the terminal system
- TwinCAT 2 PLC license (only TC9910-B110)
- EL9011 end cap
- Ethernet cable

Ordering information	A
TC9910-B110	EtherCAT demokit, with TwinCAT 2 PLC license
TC9910-B111	EtherCAT demokit, without TwinCAT 2 PLC license
TC9910-B112	EtherCAT demokit, without TwinCAT 2 PLC license (1 instead of 2 digital input terminals)

A

Spare parts

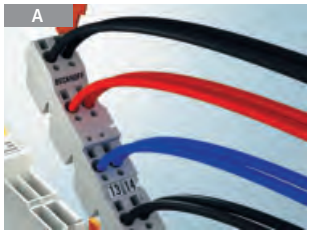
Ordering information	For power terminal KL8001
ZS1010-1610	plug for exposed bus connection of the KL8001, spare part, included in the scope of supply of KL9060

Ordering information	For terminals with plug-in wiring level	A
ZS2010	10 connectors for KS and ES series, spare part (KS/ES terminals are supplied with connector.)	

Ordering information	Female header with spring connection as IP 20 plug-in connection level, for KM or EM modules, EP2316-0003, EPP2316-0003 and IE2403		B
ZS2001-0001	1 x 10-pin, without LED	ZS2001-0004	3 x 10-pin, with LED
ZS2001-0002	1 x 10-pin, with LED	ZS2001-0005	3 x 10-pin, without LED, labelling (1…10)

Ordering information	Fuses and relays	Pict.
ZB2601	relay, 230 V AC, 16 A, coil 24 V, spare part KM2604	
ZB2602	relay, manual operation, 230 V AC, 16 A, coil 24 V, spare part KM2614	
ZB8000-0001	spare fuse, 1.25 A, 10 pieces, spare part KL3681/EL3681	C

A



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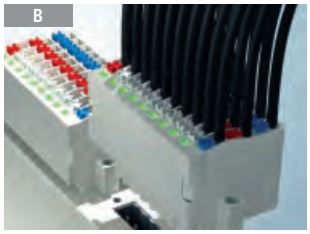


C

Marking material and coding pins

Standard contact signs

Bus and EtherCAT Terminals can be individually labelled with standard contact signs. The marking material is not included in the delivery. Further versions ▶ **labelling**

Ordering information	For contact labels, unprinted (100 pieces)		A
BZ2000	white	BZ2006	blue
BZ2002	yellow	BZ2007	orange
BZ2005	red	BZ2008	light green

Ordering information	For contact labels, printed (100 pieces)		A
BZ1100	0 V, blue	BZ1107	+, white
BZ1102	–, blue	BZ1108	PE, light green
BZ1104	24 V, red	BZ1300	ten of each: 0…7, 20 unprinted, white
BZ1106	+, red	BZ1400	two of each: 00 01…48 49, white

Ordering information	For equipment identification labels 12 x 7 mm with removable identification section (180 pieces)		
BZ3000	unprinted	BZ3010	printed according to customer specification (in Excel file)

EtherCAT Box, Fieldbus Box and EtherCAT P Box modules can be individually labelled with standard contact signs. The marking material is not included in the delivery.

Ordering information	Marking lables
ZS5100-0000	marking labels, blank, 4 stripes à 10 pieces
ZS5100-xxxx	marking labels, customised printing

Slide-in label covers

The slide-in label covers BZ3200 enable clear labelling of the individual channels or text-based functional description of the terminals. The labels are inserted in the designated slots. For connecting the individual channels the label cover can be tilted upwards.

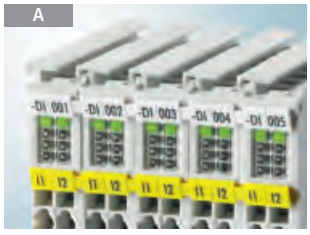
Ordering information	B
BZ3200	insertable label cover, transparent, pluggable, 11.5 mm x 104.5 mm, packing unit = 50 pieces
BZ5100	push-in strips for labels, A4 sheet, 160 pieces, pre-punched, packing unit = 10 pieces

Coding pins

The coding pins and sockets for KS/ES terminals with pluggable wiring level enable coding between terminal and plug in order to prevent incorrect plug insertion.

Ordering information	Set contains 100 sockets and 100 pins	C
ZS2010-0010	coding pins and sockets for KS and ES terminals	

A



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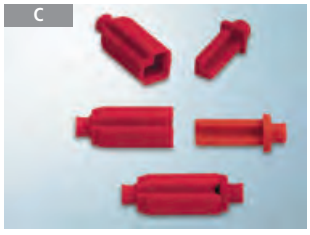

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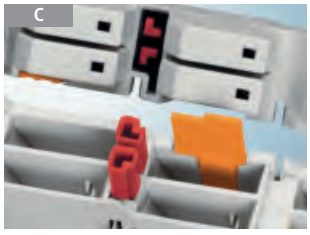


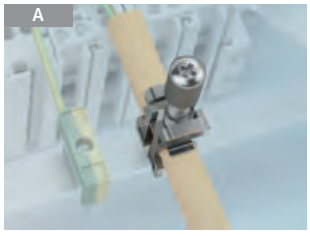
Housings and assembly

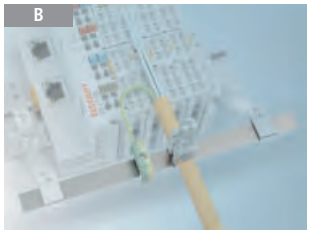
Shielding connection system

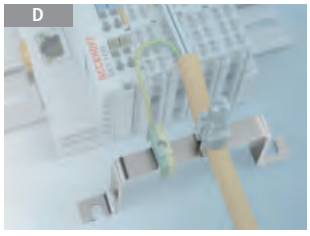
The shielding connection system enables the shielding to be located very close to the terminals of the shielded line, so that interference is reduced to a minimum. A shield busbar for attachment to a mounting rail or a bracket for separate mounting in the control cabinet are available.

Ordering information	Necessary components for mounting on a mounting rail	Pict.
ZB8500	clamp strap for shield connection with knurled screw, width 11 mm, shield diameter max. 8 mm, packing unit = 10 pieces	A
ZB8510	shield busbar 10 x 3 mm, 1000 mm galvanised Cu, packing unit = 1 piece	B
ZB8520	mounting rail holder for shield busbar (10 x 3 mm), packing unit = 2 pieces	C
ZB8530	U-clamp terminal up to 4 mm² for PE connection to the rail (10 x 3 mm), packing unit = 20 pieces	

Ordering information	Necessary components for separate mounting in a control cabinet	Pict.
ZB8500	clamp strap for shield connection with knurled screw, width 11 mm, shield diameter max. 8 mm, packing unit = 10 pieces	A
ZB8511	shield busbar clamp 10 x 3 mm for 5 Bus Terminals/EtherCAT Terminals 12 mm, packing unit = 10 pieces	D
ZB8530	U-clamp terminal up to 4 mm² for PE connection to the rail (10 x 3 mm), packing unit = 20 pieces	







Bus system housings

The BG1558 and BG1559 housings are especially suitable for the construction of compact I/O stations with a higher protection class (IP 65). The housings are supplied with mounting rails. If desired, the housings can be supplied fully fitted with couplers, terminals, flanges and PG threaded fittings. Further sizes are available on request.

Ordering information	Bus system housings with inspection window, mounting rails and holes	Pict.
BG1558	bus system housing 400 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	A
BG1559	bus system housing 600 mm x 200 mm x 120 mm (W x H x D) with mounting rails and holes	

Blanking plugs for unused ports (Fieldbus Box/EtherCAT Box)

Ordering information	Blanking plugs
ZS5000-0010	blanking plug, plastic (IP 67), for M8 socket, packaging unit = 50 pieces
ZS5000-0020	blanking plug, plastic (IP 67), for M12 socket, packaging unit = 50 pieces
ZS5000-0040	blanking plug, plastic (IP 67), for 7/8" socket, packaging unit = 10 pieces
ZS5000-0041	blanking plug, plastic (IP 67), for 7/8" plug, packaging unit = 10 pieces
ZS5000-0050	blanking plug, stainless steel (IP 69K), for M8 socket, packaging unit = 2 pieces
ZS5000-0051	blanking plug, stainless steel (IP 69K), for M12 socket, packaging unit = 4 pieces

Sets for Fieldbus Box modules

Ordering information	Fieldbus Box sets
ZS5000-0000	Fieldbus Box set M8 (contact labels, blanking plugs)
ZS5000-0001	Fieldbus Box set 8 mm (contact labels, blanking plugs)
ZS5000-0002	Fieldbus Box set M12 (contact labels, blanking plugs)

Mounting elements (Fieldbus Box/EtherCAT Box)

Ordering information	Mounting	Pict.
ZS5300-0001	mounting plate for 15 Extension Box or EtherCAT Box modules, stainless steel, 500 mm x 130 mm	A
ZS5300-0003	mounting plate for Coupler Box, zinc-coated steel sheet, 270 mm x 30 mm, thickness: 1.5 mm	
ZS5300-0011	mounting plate for 14 small or 7 wide EtherCAT Box modules, stainless steel, 500 mm	
ZS5300-0004	universal mounting bracket for a single small EtherCAT Box or Extension Box, stainless steel, 146 x 46 x 76 mm	
BG2000-0000	ATEX protective housing	

A

Tools

Ordering information	
ZB8700	slot screwdriver, assembly tool for pressing the spring force clamps on the coupler and the terminals

Ordering information	Torque wrench
ZB8800	torque wrench for M8 cables with knurl, incl. ratchet
ZB8800-0001	M12 ratchet for ZB8800
ZB8800-0002	M8 ratchet (field assembly) for ZB8800
ZB8801-0000	torque wrench for hexagonal plugs, adjustable
ZB8801-0001	torque cable key, M8/wrench size 9, for ZB8801-0000
ZB8801-0002	torque cable key, M12/wrench size 13, for ZB8801-0000
ZB8801-0003	torque cable key, M12F/wrench size 18, for ZB8801-0000

We reserve the right to make technical changes.

ZB8110 | External ballast resistor

During the acceleration phase, the motor needs energy supply, but during braking it functions as a generator and feeds energy back into the DC-Link, which raises the voltage in the DC-Link. If the voltage exceeds the adjustable threshold value, a ballast resistor is activated.

The external ZB8110 ballast resistor is available as an accessory to the EL9576 brake chopper terminal or the KL9570 buffer capacitor terminal. It regulates the DC-Link voltage as soon as more braking power is needed. It has a maximum continuous rating of 100 W. The ZB8110 is connected directly to the EL9576 or KL9570. A mounting plate is included in the scope of supply for each ballast resistor.

Technical data	ZB8110
Rated output	100 W
Cable length	1000 mm
Wire cross section	AWG16/1.5 mm²
Resistance value	10 Ω
Operating voltage	maximum: ≤ 700 V AC; ≤ 1000 V DC considering self protection ≤ 600 V AC; ≤ 850 V DC considering CSA and UL approvals
Insulation voltage	≥ 4000 V at 50 Hz/1 min
Energy consumption	4 kJ at 1.2 s (1 % ED) 8 kJ at 7.2 s (6 % ED)
Operating/storage temperature	0…+55 °C/-25…+85 °C
Dimensions (L x W x H)	110 mm x 80 mm x 15 mm
Weight	0.28 kg
Casing temperature	≤ 250 °C
Protect. class/installation pos.	IP 65/variable
Further information	ZB8110

ZB8610 | Fan cartridge for EtherCAT and Bus Terminals

The ZB8610 fan cartridge is used for forced ventilation within the terminal housing and ensures better heat dissipation from the housing. It extends the thermal operating range of EtherCAT Terminals (ELxxxx) and Bus Terminals (KLxxxx) and offers a wide range of new application options. The cartridge is installed on the underside of the terminal segment and covers a width of four standard terminals (4 x 12 mm). It consists of the fan, an installation plate, a terminal strip (24 V DC, 0 V DC, diag, mode) and a bracket for fixation on different terminal housings.

The fan can be operated in three different modes:

1. Demand-based control via an integrated temperature sensor (default, only power supply required)
2. Continuous operation at full load (In addition to the power supply a high signal is applied at the mode pin.)
3. Frequency controlled by an externally applied frequency (1…9 Hz) at the mode pin, which is converted internally in steps from 2700 rpm to max. ~5500 rpm. A digital output terminal can be used as external source. The measurement of the internal terminal temperature, which is integrated in TwinCAT, is used as reference for speed control of the fan via the frequency.

A typical application of the fan cartridge is extension of the performance range of the terminals through forced cooling. This enables the EL7201 EtherCAT servo terminal to operate with higher output current, for example (4.5 A_{RMS} instead of 2.8 A_{RMS}), so that the performance is on a par with the EL7211, with the benefit of a 50 % smaller footprint.

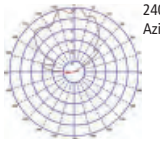
A further application is the extension of the operating temperature range of the terminals. Depending on the technical specification, the fan cartridge enables the terminals to operate at temperatures of up to 70 °C. The exact terminal-specific information for this application can be found in the documentation for the respective terminals.

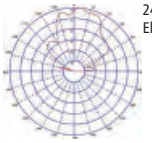
Technical data	ZB8610
Number of channels	1 fan
Nominal voltage	24 V DC (-15 %/+20 %)
Operating modes	temperature-controlled, full speed, frequency-controlled
Rotational frequency fan	adjustable in 9 steps via frequency (1…9 Hz), max. ~5500 rpm
Diagnostics	fan fault
Life span	MTBF typ. = 280,000 h @ 20 °C
Special features	increased performance and extended temperature range for various terminals
Dimensions (W x H x D)	47 mm x 22 mm x 55 mm
Weight	32 g (incl. bracket)
Operating/storage temperature	-25…+70 °C/-40…+85 °C
Relative humidity	95 %, no condensation
Protect. class/installation pos.	IP 20/see documentation
Further information	ZB8610

We reserve the right to make technical changes.

Antennas

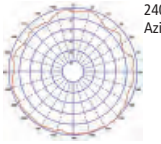
Directional antenna 9 dBi

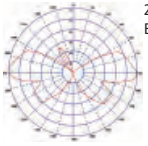




Technical data	ZS6100-0900
Frequency range	2400…2485 MHz
Gain	9 dBi
3 dB beamwidth, horizontal	65°
3 dB beamwidth, vertical	65°
Termination	SMA socket
Dimensions	93 mm x 93 mm x 25 mm (H x W x D)
Operating temperature	-40…+80 °C
Mounting	bracket mounting
Matching cables	ZK6000-0102-0020/-0040 (cable not included in the scope of supply of the antenna, only one cable per antenna possible)

Rod antenna 4 dBi

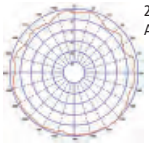


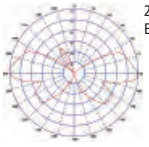


Technical data	ZS6201-0410
Frequency range	2400…2485 MHz
Gain	4 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	reverse SMA socket
Dimensions	height: 202 mm, base diameter: 35 mm
Operating temperature	-40…+80 °C
Mounting	M14 connecting nut
Matching cables	1 m cable with reverse SMA socket (included in the scope of supply of the antenna, extension not possible)

We reserve the right to make technical changes.

Rod antenna 5 dBi





Technical data	ZS6201-0500
Frequency range	2400…2485 MHz
Gain	5 dBi
3 dB beamwidth, horizontal	360°
3 dB beamwidth, vertical	70°
Termination	reverse SMA socket
Dimensions	height: 195 mm, base diameter: 12 mm
Operating temperature	-40…+80 °C
Mounting	direct connection, with angle joint
Matching cables	direct connection, reverse SMA socket (antenna cannot be combined with a cable)

Antenna cables

Ordering information	
ZK6000-0102-0020	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 200 cm
ZK6000-0102-0040	coaxial cable, 50 Ω impedance, with attached connectors (SMA plug and reverse SMA socket), black, 400 cm

For further information on the KM6551 module see page 689

Highlights

- Complete drive system with TwinCAT Motion Control
- For highly dynamic, single and multiple axis positioning tasks
- Modularity and scalable power in Compact Drive Technology
- XTS – Linear motor on an endless path

Drive Technology

The drive system for highly dynamic positioning tasks

▸ DriveTechnology

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901 **Planetary gear units**
901 High-end gear series AG2300
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933 Stepper motors AS2000
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936 Stepper motors AS1000
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940 **XTS (eXtended Transport System)**

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955 Movers AT901x
956 Software TF5850
958 Guide rails AT9xxx

Product overview Servo Drives

AX8000

AX5000

Multi-axis servo system

	AX8620 868	AX8640 868	AX81xx 869	AX82xx 869
Variant/function	power supply module	power supply module	axis module	axis module
Number of axes	side by side mounting in any order taking into account the rated output current	side by side mounting in any order taking into account the rated output current	1	2
Supply voltage	3 x 200…240 V AC 1 x 100…240 V AC	3 x 200…240 V AC 3 x 400…480 V AC	–	–
Rated output current per axis/module	20 A DC	40 A DC	8 A, 18 A	6 A
Motor feedback	–	–	OCT	OCT
Drive-specific safety functions	–	–	order options STO/SS1: AX81xx-0100 Safe Motion: AX81xx-0200	order options STO/SS1: AX82xx-0100 Safe Motion: AX82xx-0200

Digital Compact Servo Drives

	AX51xx 874	AX52xx 875
Variant/function	stand-alone	stand-alone
Number of axes	1	2
Supply voltage	wide voltage range 1 x 100…240 V AC** 3 x 100…480 V AC 3 x 400…480 V AC***	wide voltage range 1 x 100…240 V AC 3 x 100…480 V AC
Rated output current per axis/module	1.5 A, 3 A, 6 A, 12 A, 18 A, 25 A, 40 A, 60 A, 72 A, 90 A, 110 A, 143 A, 170 A	1.5 A, 3 A, 6 A
Motor feedback	multi-feedback interface*	multi-feedback interface
Drive-specific safety functions	supplementary products STO/SS1: AX5801 Safe Motion: AX5805, AX5806	supplementary products STO/SS1: AX5801 Safe Motion: AX5805

* multi-feedback interface: OCT only supported up to 40 A

** voltage range: 1-phase operation only supported up to 6 A

*** voltage range: from 60 A at least 3 x 400 V AC necessary

We reserve the right to make technical changes.

Product overview Synchronous Servomotors

AM8000, AM8500

Synchronous Servomotors, OCT

	Flange code F1 40 mm	F2 58 mm	F3 73 mm	F4 87 mm	F5 104 mm	F6 142 mm	F7 197 mm	
Standard 400 V AC		AM802x M_0 = 0.5…1.2 Nm	AM803x M_0 = 1.4…3.2 Nm	AM804x M_0 = 2.45…5.65 Nm	AM805x M_0 = 4.9…11.4 Nm	AM806x M_0 = 12.8…29 Nm	AM807x M_0 = 31.8…72.6 Nm	888
Standard 230 V AC	AM801x M_0 = 0.20…0.52 Nm							888
Standard 48 V DC	AM811x M_0 = 0.20…0.52 Nm	AM812x M_0 = 0.5…0.8 Nm	AM813x M_0 = 1.35 Nm					928
Increased inertia 400 V AC			AM853x M_0 = 1.4…3.2 Nm	AM854x M_0 = 2.45…5.65 Nm	AM855x M_0 = 4.9…11.4 Nm	AM856x M_0 = 12.8…29 Nm		895
Stainless steel 400 V AC			AM883x* M_0 = 0.9…1.85 Nm	AM884x* M_0 = 1.6…3.5 Nm	AM885x* M_0 = 3.1…6.4 Nm	AM886x* M_0 = 7.7…16.7 Nm		907

* Please note the different flange size.

Synchronous Servomotors, 2-cable standard

	Flange code F1 40 mm	F2 58 mm	F3 73 mm	F4 87 mm	F5 104 mm	F6 142 mm	F7 197 mm	F8 260 mm	
Standard 400 V AC		AM802x M_0 = 0.5…1.2 Nm	AM803x M_0 = 1.4…3.2 Nm	AM804x M_0 = 2.45…5.65 Nm	AM805x M_0 = 4.9…11.4 Nm	AM806x M_0 = 12.8…29 Nm	AM807x M_0 = 31.8…72.6 Nm		887
		AM302x M_0 = 0.84…1.41 Nm	AM303x* M_0 = 1.15…2.79 Nm	AM304x* M_0 = 1.95…5.8 Nm	AM305x* M_0 = 4.7…14.9 Nm	AM306x* M_0 = 11.9…25 Nm	AM307x* M_0 = 29.7…53 Nm	AM308x M_0 = 75…160 Nm	913
Standard 230 V AC	AM301x M_0 = 0.18…0.41 Nm	AM3021 M_0 = 0.48 Nm							913
Standard 48 V DC	AM31x* M_0 = 0.21…0.34 Nm	AM812x M_0 = 0.5…0.8 Nm	AM813x M_0 = 1.35 Nm						928
		AM3121* M_0 = 0.69 Nm							
Increased inertia 400 V AC			AM853x M_0 = 1.4…3.2 Nm	AM854x M_0 = 2.45…5.65 Nm	AM855x M_0 = 4.9…11.4 Nm	AM856x M_0 = 12.8…29 Nm			895
				AM354x* M_0 = 1.9…4.2 Nm	AM355x* M_0 = 4.1…8.6 Nm	AM356x* M_0 = 11.6…14.9 Nm			
Stainless steel 400 V AC			AM883x* M_0 = 0.9…1.85 Nm	AM884x* M_0 = 1.6…3.5 Nm	AM885x* M_0 = 3.1…6.4 Nm	AM886x* M_0 = 7.7…16.7 Nm			907

* Please note the different flange size.

We reserve the right to make technical changes.

Product overview Linear Servomotors, stepper motors

AL2000 AL2400 AL2800

AS1000 AS2000

Linear Servomotors

	AL2000 918	AL2400 920	AL2800 921
Especially suitable for	maximum power density	confined spaces	highest demands on force
Magnetic path width	80 mm	50 mm	130 mm
Cooling	air	air	air, partly water
Speed max.	7 m/s	12 m/s	6 m/s
Force max.	225…1800 N	120…480 N	1800…6750 N
Protection class	IP 64	IP 64	IP 64

Stepper motors

	AS1000 936	AS2000 933
Sizes	NEMA17, NEMA23, NEMA34	NEMA23, NEMA34
Resolution	1.8°/200 full steps	1.8°/200 full steps
Encoder	incremental, 1024 lines	incremental, 1024 lines
Standstill torque < 3 A	0.38…0.6 Nm	0.83 Nm
Standstill torque > 3 A	1.2…5.0 Nm	1.37…6.4 Nm
Protection class	IP 43, AS1060: IP 20	IP 54

We reserve the right to make technical changes.

Product overview planetary gear units

AG2300

AG2210

AG2800

AG2250

AG1000

Planetary gear units

	AG2300 901	AG2210 904	AG2800 910	AG2250 931	AG1000 939
Variant	standard (MF), high-speed (MC)	standard	stainless steel	compact drive technology: servomotors, stepper motors	compact drive technology: stepper motors
Sizes	MF: 7 sizes (060, 075, 100, 140, 180, 210, 240), MC: 6 sizes (075, 100, 140, 180, 210, 240)	5 sizes (LP050, LP070, LP090, LP120, LP155)	3 sizes (HDV015, HDV025, HDV035)	3 sizes (40, 60, 80), each also as angled variant	2 sizes (PM52, PM81)
Max. gear stages	2	2	2	size 40, 60: 2 size 80: 1	1
Gear ratios	14 gear ratios; 1-stage i = 3, 4, 5, 7, 10, 2-stage i = 16, 20, 25, 28, 35, 40, 50, 70, 100	14 gear ratios; 1-stage i = 3, 4, 5, 7, 10, 2-stage i = 9, 12, 16, 20, 25, 30, 35, 40, 50, 70, 100	14 gear ratios; 1-stage i = 3, 4, 5, 7, 10, 2-stage i = 9, 12, 16, 20, 25, 30, 35, 40, 50, 70, 100	13 gear ratios; 1-stage i = 4, 5, 7, 8, 10, 2-stage i = 12, 16, 20, 25, 32, 35, 40, 64	2 gear ratios; i = 3, 7 or 6.75
Protection class	IP 65	IP 64	IP 69K (at 30 bar, according to DIN 40050-9)	IP 54	IP 43, for AS1060: IP 20
Servomotor series	AM8000, AM8500, AM3000, AM3500	AM8000, AM8500, AM3000, AM3500	AM8800	AM8100, AM3100	
Stepper motor series				AS2000	AS1000

Product overview Compact Drive Technology

EtherCAT Terminal

EtherCAT Plug-in Module

Bus Terminal

EtherCAT Box

EtherCAT P Box

	Product group	DC motor					
		< 3 A		3…5 A		≥ 5 A	
I/O	EtherCAT Terminal IP 20	EL7332 I_{MAX} = 1.0 A, 24 V DC	441	EL7342 I_{MAX} = 3.5 A, 50 V DC, incremental encoder	441		
	EtherCAT Plug-in Module IP 20			EJ7342 I_{MAX} = 3.5 A, 50 V DC, incremental encoder	567		
	Bus Terminal IP 20	KL2532 I_{MAX} = 1 A, 24 V DC	653			KL2552 I_{MAX} = 5 A, 50 V DC, incremental encoder interface	653
	EtherCAT Box IP 67			EP7342-0002 ER7342-0002 I_{MAX} = 3.5 A, 50 V DC	504		
	EtherCAT P Box IP 67			EPP7342-0002 I_{MAX} = 3.5 A, 50 V DC	538		
Motion	Flange code F1/N1 (40 mm/NEMA17)						
	Flange code F2/N2 (58 mm/NEMA23)						
	Flange code F3 (72 mm)						
	Flange code N3 (NEMA34)						

Greyed-out variants only possible with ZB8610 fan cartridge.

We reserve the right to make technical changes.

Flange code N1

Flange code F1

Flange code N2

Flange code F2

Flange code N3

Flange code F3

Stepper motor

< 3 A

EL7037 437
I_{MAX} = 1.5 A, 24 V DC, incremental encoder, vector control

EL7031 437
I_{MAX} = 1.5 A, 24 V DC

KL2531 651
I_{MAX} = 1.5 A, 24 V DC

EP7041-1002 502
ER7041-1002
I_{MAX} = 1.5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output

EPP7041-1002 537
I_{MAX} = 1.5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output

AS1010 937
1.0 A, 48 V DC, 0.38 Nm

AS1020 937
1.0 A, 48 V DC, 0.5 Nm

AS2021 934
2.0 A, 48 V DC, 0.83 Nm

AS1030 937
1.5 A, 48 V DC, 0.60 Nm

≥ 5 A

EL7047 437
I_{MAX} = 5.0 A, 50 V DC, incremental encoder, vector control

EL7041 437
I_{MAX} = 5.0 A, 50 V DC, incremental encoder

EJ7047 567
I_{MAX} = 5.0 A, 50 V DC, incremental encoder, vector control

KL2541 651
I_{MAX} = 5 A, 50 V DC, incremental encoder interface

EP7041-3002 503
ER7041-3002
I_{MAX} = 5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output

EPP7041-3002 537
I_{MAX} = 5 A, 50 V DC, incremental encoder, 2 digital inputs, 1 digital output

AS2022 934
5.6 A, 48 V DC, 1.37 Nm

AS2023 934
5.0 A, 48 V DC, 2.30 Nm

AS1050 937
5.0 A, 48 V DC, 1.20 Nm

AS2042 934
6.0 A, 48 V DC, 6.40 Nm

AS1060 937
5.0 A, 48 V DC, 5.0 Nm

Servomotor

< 3 A

EL7201-9014 438
I_{MAX} = 2.8 A_{RMS}, 50 V DC, OCT, STO

EL7201-0010 438
I_{MAX} = 2.8 A_{RMS}, 50 V DC, OCT

EL7201 439
I_{MAX} = 2.8 A_{RMS}, 50 V DC, resolver

AM8111 928
2.85 A, 48 V DC, 0.20 Nm, 4000 min^{-1}

AM8112

AM8113

AM8121

AM8122

AM8131

3…5 A

EL7211-9014 439
I_{MAX} = 4.5 A_{RMS}, 50 V DC, OCT, STO

EL7211-0010 439
I_{MAX} = 4.5 A_{RMS}, 50 V DC, OCT

EL7211 439
I_{MAX} = 4.5 A_{RMS}, 50 V DC, resolver

EJ7211-0010 567
I_{MAX} = 4.5 A_{RMS}, 50 V DC, OCT

AM8112 928
1.36 A, 48 V DC, 0.38 Nm, 4500 min^{-1}

AM8113 928
4.8 A, 48 V DC, 0.52 Nm, 3000 min^{-1}

AM8121 928
1.36 A, 48 V DC, 0.38 Nm, 4500 min^{-1}

AM8122 928
1.36 A, 48 V DC, 0.38 Nm, 4500 min^{-1}

AM8131 928
5.0 A, 48 V DC, 1.35 Nm, 1000 min^{-1}

TC3 Motion Designer

The dimensioning of drive axes, in conjunction with the optimum selection of motor, gear unit, drive controllers and accessories, is the basis for an efficient machine design. The TC3 Motion Designer is optionally integrated in the TwinCAT automation platform, or it can be used as a stand-alone project engineering tool for mechanical construction.

Mechanics
The TC3 Motion Designer supports the designer in the configuration of typical mechanical systems such as pinion rack, spindle nut, winder, crank drive, etc.

Motion profiles
Rough estimates for simple load cases with motion profiles, e.g. based on a 1/2 or 1/3 rule or a 7-segment profile, are easy to realise with a few mouse clicks. More complex tasks and kinematic systems, perhaps in conjunction with more sophisticated motion profiles, including cam gears according to VDI 2143, are also taken account of in the TC3 Motion Designer. Export functions enable the configuration to be transferred directly to the TwinCAT System Manager, without the need for repeated inputs.

Optimisation function
An optimisation algorithm makes the selection of gear units and motors straightforward. It suggests the optimum combination based on mechanical and cost considerations, taking into account adjustable filters. The connected database provides access to all available gear units, motors and servo drives offered by Beckhoff, including the compact drive technology range with servo and stepper motor terminals. The automatic geometry matching feature checks the compatibility of motor and gear unit and prevents selection of unsuitable combinations.

Report functions
The axis configuration is documented in a report. A choice of short or detailed report is available.

With a single click the designer can call up the technical data sheet for the motor and gear unit, and with a further click the corresponding 3-D model of the drive components for integration in the design software.

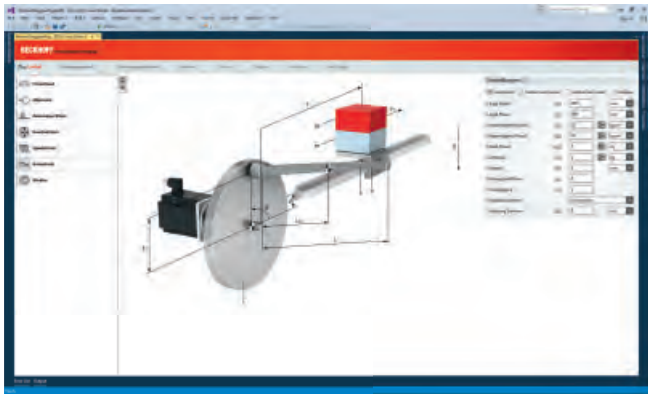
Parts list generator
The integrated parts list generator can be used directly for preparing the purchase order. Accessories such as cables, chokes and installation material are also considered.

Multi-axis design
The TC3 Motion Designer regards the machine as a holistic unit, including all drive axes: All load cycles, including their temporal dependence and their influence on the common DC-Link, are taken into account. Selection of the optimum supply module or the common brake resistor is guaranteed.

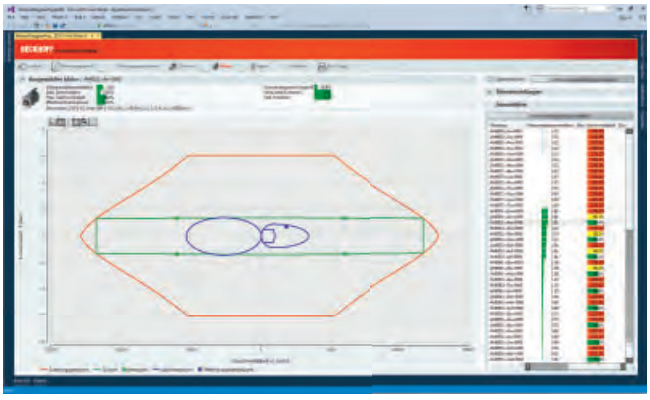
TwinCAT 3 see page 960

The optimisation algorithm suggests the economically and mechanically optimal motor/gear unit combination according to the criteria that have been set.

We reserve the right to make technical changes.

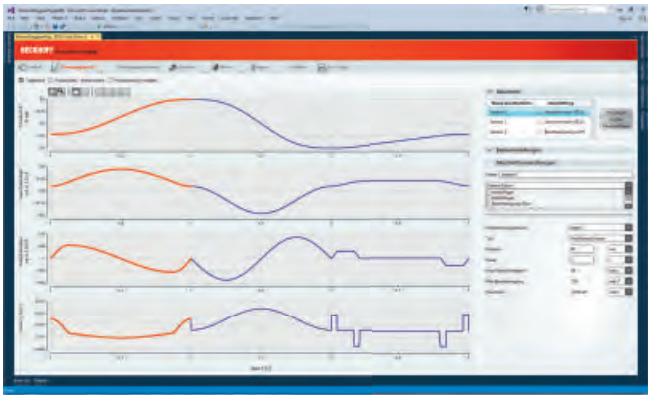


The selected mechanism is graphically displayed and can be adapted precisely to the real application through further settings.



The axis utilisation can be directly classified in the 4-quadrant view.

With the parts list editor all required components can be directly added. The complete parts list of all components can be exported in common formats, e.g. Excel.



The Motion Designer enables the direct observation of the curves of position, speed, torque and acceleration over time for each axis.

Ordering information	
TE5910	TC3 Motion Designer for drive dimensioning

▶TE5910

Beckhoff Drive Technology

Servo Drives

The AX5000 impresses with great functional variety as well as high efficiency. With current control cycle times of up to 62.5 µs, the integrated control technology supports fast and highly dynamic positioning tasks. The compact AX8000 multi-axis servo system is a fast and easy to install high-performance drive system enabling simple commissioning. At the same time, it brings high performance in a compact design to every control cabinet: with maximum control speed, integrated mains filter and 17 drive-integrated safety functions (TwinSAFE).

AX5000 see page 872
AX8000 see page 866

▶ Servo-Drives

Servomotors

The Servomotors are characterised by high dynamics as well as energy and cost efficiency. They are available with stainless steel housings (AM8800), certified according to EHEDG is this execution particularly suitable for applications in the food and beverage industries. The AM8500 series is specially designed for applications with high load moments of inertia or high synchronism demands. To further enhance their performance the AM8000 and AM8500 series can be equipped with an external fan. All motors of the AM8000, AM8500 and AM8800 series are available with OCT. The AL2000 iron-core linear motors offer high continuous forces.

Synchronous Servomotors see page 884
Linear Servomotors see page 916
Connection cables see page 878

▶ Servomotors

We reserve the right to make technical changes.

Compact Drive Technology

For the low voltage range up to 48 V, Beckhoff offers a modular system for compact servo and stepper motor drive solutions. In combination with AM8100 series motors, the EL72xx servo terminals provide a very small, highly dynamic servo axis, which is suitable for high-precision positioning applications in conjunction with OCT and multiturn absolute encoders. Optionally, the EL72xx devices enable the implementation of STO (Safe Torque Off) safety-related functions. In conjunction with the IP 20 stepper motor terminals or IP 67 EtherCAT Box modules, the AS2000 and AS1000 stepper motors can be operated as an adjustable axis, either with or without feedback. Pre-fabricated connecting cables and specially adapted planetary gear units round off the modular range of components for compact drive technology.

See page 926

▶ compact-drive-technology

eXtended Transport System

The XTS linear transport system (eXtended Transport System) from Beckhoff combines all drive technology functions in a single mechatronic system: motor movement, power electronics and displacement measurement form a technical unit which can be used to implement a wide range of complex movements. A user-friendly programming interface enables different movements to be realised simultaneously directly from TwinCAT with little effort. The modular XTS system enables fast adaptation of a transport concept to different geometries and applications.

System description see page 940
Mechanical components see page 954
Software see page 956

▶ XTS

We reserve the right to make technical changes.

Servo Drives

▶ Servo-Drives

AX5101–AX5112, AX52xx | **Digital Compact Servo Drives: 1-/2-channel up to 8.3 kW**

- 1- or 2-channel Servo Drives
- high-speed EtherCAT communication
- rated current up to 12 A or 2 x 6 A
- optimised for multi-axis applications
- variable motor output current for 2-channel Servo Drives
- TwinSAFE drive option card

See page 874

AX8000 | **Multi-axis EtherCAT drive: Compact control power with 1 µs current control update time**

- optimised, compact dimensions for control cabinet installation
- OCT integrated
- TwinSAFE integrated
- new, integrated AX-Bridge: toolless mounting
- powerful FPGA technology combined with multi-core ARM processors
- multi-channel current control technology

See page 866

We reserve the right to make technical changes.

EL7201 | **Ultra-compact servo terminal in 12 mm I/O housing up to 170 W**

- complete servo drive on 12 mm
- seamless integration into EtherCAT I/O system
- U_S 8…50 V DC, I_{MAX} 2.8 A_{RMS}
- vector control for highly dynamic positioning tasks
- tailored to AM8100

See page 439

EL7211 | **Compact servo terminal in 24 mm I/O housing up to 245 W**

- complete servo drive on 24 mm
- seamless integration into EtherCAT I/O system
- U_S 8…50 V DC, I_{MAX} 4.5 A_{RMS}
- vector control for highly dynamic positioning tasks
- tailored to AM8100

See page 439

EL72x1-9014 | **Servo terminals with STO**

- enables the realisation of the STO safety function (Safe Torque Off)
- STO corresponds to a Cat 3, PL d safety level according to DIN EN ISO 13849-1:2015
- seamless integration into EtherCAT I/O system
- U_S 8…50 V DC, I_{MAX} 4.5 A_{RMS} or I_{MAX} 2.8 A_{RMS}
- vector control for highly dynamic positioning tasks
- tailored to AM8100

See page 438

AX5118–AX5140 | **Digital Compact Servo Drives: 1-channel up to 28 kW**

- high-speed EtherCAT communication
- rated current: 18/25/40 A
- flexible motor type selection
- TwinSAFE drive option card

See page 874

AX5160–AX5193 | **Digital Compact Servo Drives: 1-channel up to 118 kW**

- high-speed EtherCAT communication
- rated current: 60/72/90/110/143/170 A
- high performance with small dimensions
- flexible motor type selection
- TwinSAFE drive option card

See page 874

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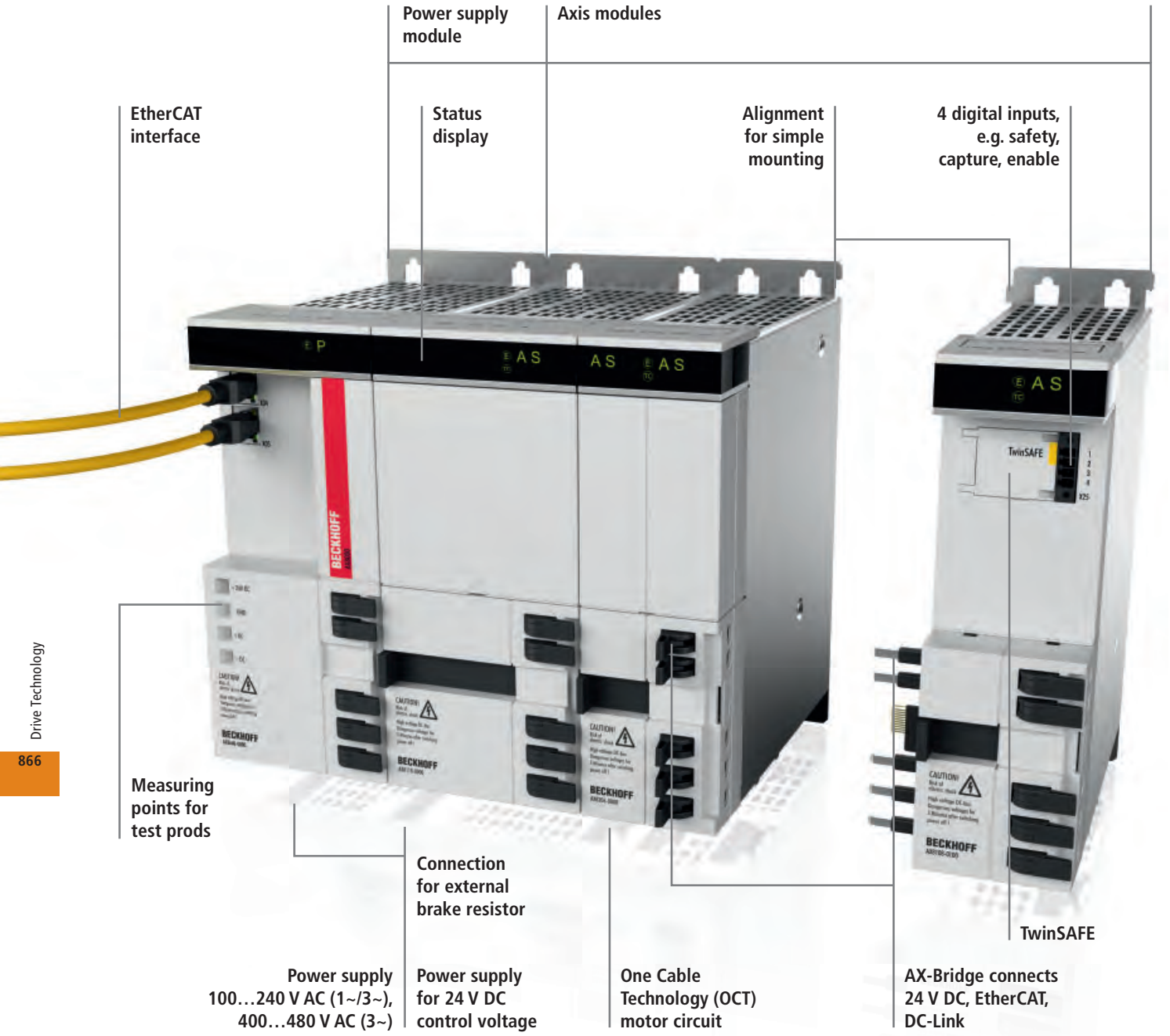
AX8000 | Multi-axis servo system

▶ AX8000



We reserve the right to make technical changes.

AX8620 | Power supply module, 20 A

AX8640 | Power supply module, 40 A

AX8108 | Axis module, 8 A

AX8118 | Axis module, 18 A

AX8206 | Double-axis module, 2 x 6 A

The AX8000 multi-axis servo system greatly simplifies the implementation of multi-channel drive solutions. The required number of 1-channel or 2-channel axis modules are attached to the central supply module. The modules are connected without screws or tools using the built-in AX-Bridge quick connection system, which is based on spring-loaded terminals. The 1-axis and 2-axis modules can optionally be equipped with STO or TwinSAFE (drive-integrated safety functions).

eXtreme Fast Control in the drive

The EtherCAT-based AX8000 multi-axis servo system combines powerful FPGA technology with multi-core ARM processors. The new multi-channel current control technology enables extremely short sampling and response times. The entirely hardware-implemented current controller combines the advantages of analog and digital control technology: reaction to a current deviation from the setpoint value is possible within 1 µs; the velocity controller cycle time is around 16 µs at a switching frequency of 32 kHz. The processing of EtherCAT process data (actual and setpoint values) is carried out without a processor almost without delay in the hardware, so that the minimum EtherCAT cycle time is only 62.5 µs.

One Cable Technology (OCT)

The AX8000 multi-axis servo system supports OCT, the One Cable Technology for power and feedback. In connection with the servomotors from the AM8000 (standard), AM8500 (increased inertia) and AM8800 (stainless steel) series, the wiring is reduced to the standard motor cable, via which the feedback signals are also transmitted. As in sensorless control, the user no longer has to use an additional feedback cable. All information required for control purposes is transmitted reliably and interference-proof via a digital interface.

Drive-integrated safety functions

The AX8000 with TwinSAFE supports the typical drive-integrated safety functions and fulfills the requirements of DIN EN ISO 13849-1:2008 (Cat. 3, Cat. 4, PL c up to e).

- stop functions (STO, SOS, SS1, SS2)
- speed functions (SLS, SSM, SSR, SMS) with up to 8 speeds
- position functions (SLP, SCA, SLI) with reference cams
- acceleration functions (SAR, SMA)
- rotating direction functions (SDIp, SDIn)
- brake function (SBC)
- safely limited torque (SLT)

Technical data	AX8000
Bus system	EtherCAT
Drive profile	CiA402 according to IEC 61800-7-201 (CoE)
Rated supply voltage	100…480 V AC, 50/60Hz
DC-Link voltage	140…875 V DC
Current control	1 µs update time, 16 µs cycle time
Design form	modular system with 60 or 90 mm wide elements
Protection class	IP 20
Operating temperature	0…+55 °C (see documentation)
Approvals	CE, cULus

We reserve the right to make technical changes.

AX8620, AX8640 | **Power supply modules**

A power supply module generates the DC-Link voltage (DC) for the supply of the axis modules and the option modules from the mains voltage. It already contains a mains filter, for which the drive is tested and certified in accordance with EN 61800-3 for Category C3 use.

Any regenerative energy produced, e.g. through strong braking of the motors, can be converted into heat either via the internal brake resistor or via the combination of built-in brake chopper and external brake resistor. Alternatively, the energy can be buffered in the AX8810 capacitor module.

AX8000 supply modules can be used on 1- and 3-phase low-voltage mains supplies.

– 1-phase mains supplies 100…240 V AC, 50/60 Hz
– 3-phase mains supplies 3 x 200…3 x 480 V AC, 50/60 Hz

A separate 24 V DC power supply is required in each case.

Technical data 100…240 V	AX8620-1000	AX8640-1000
Rated supply voltage	3 x 200…240 V AC 1 x 100…240 V AC	3 x 200…240 V AC
Rated input current at 40 °C	1~: 10.0 A AC 3~: 17.5 A AC	3~: 35 A AC
Rated output current	1~: 7 A DC 3~: 20 A DC	3~: 40.0 A DC
Rated output	1~: 2.0 kW 3~: 6.4 kW	3~: 12.8 kW
DC-Link voltage	max. 425 V DC	
DC-Link capacitance	1020 µF	1240 µF
Max. braking power (internal/external)	5.4 kW/9.8 kW	10.8 kW/22 kW
Further information	AX8620	AX8640

Technical data 400…480 V	AX8620-0000	AX8640-0000
Rated supply voltage	3 x 400…480 V AC	
Rated input current at 40 °C	3~: 17.5 A AC	3~: 35 A AC
Rated output current	3~: 20 A DC	3~: 40.0 A DC
Rated output	3~: 10.7 kW	3~: 21.4 kW
DC-Link voltage	max. 875 V DC	
DC-Link capacitance	405 µF	625 µF
Max. braking power (internal/external)	21.8 kW/21.8 kW	43.6 kW/40.1 kW
Further information	AX8620	AX8640

We reserve the right to make technical changes.

AX81xx, AX82xx | **Axis modules**

An axis module contains the DC-Link and the inverter for supplying the motor. Depending on the required number of axes, the axis modules are attached to the supply module to form the multi-axis servo system. Axis modules with different ratings can be combined in order to enable an optimised design of the individual axes. Supporting a wide supply voltage range from 100 to 480 V AC, the axis modules can be operated without limitation with any of the supply modules. This flexibility simplifies the implementation of machine configurations for any type of mains supply. The electrical connection is established without tools via the already integrated AX-Bridge: it automatically connects DC-Link, 24 V DC control voltage and communication via EtherCAT between the attached modules. The DC-Link connection enables the exchange of energy during acceleration and braking procedures, where the regenerative brake energy is primarily stored in the common DC-Link. If the energy exceeds the DC-Link capacitance, it can be destroyed via a brake resistor of the supply module.

Technical data	AX8108	AX8118	AX8206
Rated current	1 x 8 A	1 x 18 A	2 x 6 A
DC-Link voltage	max. 875 V DC		
DC-Link capacitance	135 µF	405 µF	135 µF
Number of channels	1	1	2
Min. rated channel current at full current resolution	1 A	5 A	1 A
Peak output current	20 A	40 A	14 A | 20 A
Further information	AX81xx	AX81xx	AX82xx

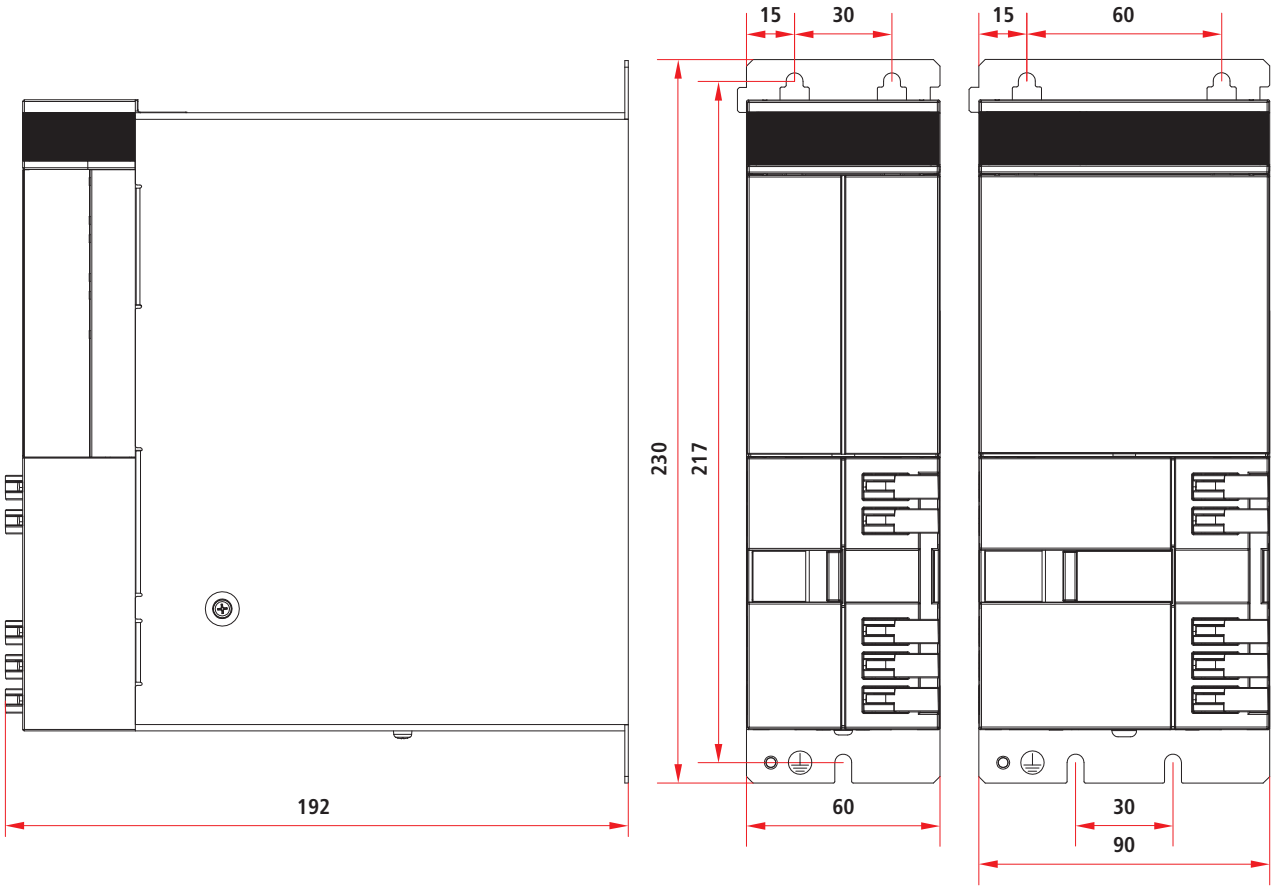
Ordering information	Axis module 1 x 8 A	Axis module 1 x 18 A	Axis module 2 x 6 A
Without TwinSAFE	AX8108-0000	AX8118-0000	AX8206-0000
With STO/SS1	AX8108-0100	AX8118-0100	AX8206-0100
Safe Motion	AX8108-0200	AX8118-0200	AX8206-0200

We reserve the right to make technical changes.

AX88xx | Option modules

An AX8810 capacitor module extends the DC-Link capacitance and is particularly suitable in combination with the AX8620-1000 single-phase supply for the support of the DC-Link. It enables energy savings: voltage peaks generated by braking motors are taken up and stored. This makes the activation of the brake resistor mostly unnecessary and helps to reduce power losses. Overall, the use of the capacitor module makes a reduction in the total connected load possible and also a smaller dimensioning of the fuse.

Technical data	AX8810-1000	AX8810-0000
Function	capacitor module/DC-Link extension module	
For power supply modules	AX86xx-1000	AX86xx-0000
DC-Link voltage	max. 425 V DC	max. 875 V DC
DC-Link capacitance	4420 µF	1755 µF
Further information	AX881x	



Dimensions	Height without connectors	Depth without connectors	Width
AX8620	230 mm	192 mm	60 mm
AX8640	230 mm	192 mm	90 mm
AX8108	230 mm	192 mm	60 mm
AX8118	230 mm	192 mm	90 mm
AX8206	230 mm	192 mm	60 mm
AX8810	230 mm	192 mm	60 mm

We reserve the right to make technical changes.

Accessories for AX8000 Servo Drives at AM8xxx

Motor cables 1 mm² with iTec plug system for AM801x, AM802x, AM803x and AM853x at AX8108 and AX8206

Ordering information	Motor cable with 1 mm² wire gauge, highly flexible for drag-chain use
ZK4800-8022-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 81 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 1 mm² + (2 x 0.75 mm²) + (2 x AWG22))
ZK4800-8022-0050	example for 5 m length
ZK4501-8022-xxxx	extension cable

Motor cables 1.5 mm² with M23 speedtec® plug for AM883x and AM8x4x up to AM8x6x (up to winding code P) at AX8108 and AX8206

Ordering information	Motor cable with 1.5 mm² wire gauge, fixed installation
ZK4800-8003-xxxx	cables for fixed installation min. bending radius = 61 mm (5 x OD), (4 x 1.5 mm² + (2 x 0.75 mm²) + (2 x AWG22))
ZK4800-8003-0050	example for 5 m length
ZK4501-8003-xxxx	extension cable
Ordering information	**Motor cable with 1.5 mm² wire gauge, highly flexible for drag-chain use**
ZK4800-8023-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 89 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 1.5 mm² + (2 x 0.75 mm²) + (2 x AWG22))
ZK4800-8023-0050	example for 5 m length
ZK4501-8023-xxxx	extension cable

Motor cables 2.5 mm² with M23 speedtec® plug for AM8x4x up to AM8x6x (up to winding code P) at AX8118

Ordering information	Motor cable with 2.5 mm² wire gauge, fixed installation
ZK4800-8004-xxxx	cables for fixed installation min. bending radius = 69 mm (5 x OD), (4 x 2.5 mm² + (2 x 1 mm²) + (2 x AWG22))
ZK4800-8004-0050	example for 5 m length
ZK4501-8004-xxxx	extension cable
Ordering information	**Motor cable with 2.5 mm² wire gauge, highly flexible for drag-chain use**
ZK4800-8024-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 97 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 2.5 mm² + (2 x 1 mm²) + (2 x AWG22))
ZK4800-8024-0050	example for 5 m length
ZK4501-8024-xxxx	extension cable

Motor cables 4 mm² with M40 speedtec® plug for AM8x6x (from winding code Q) and AM807x at AX8118

Ordering information	Motor cable with 4 mm² wire gauge, highly flexible for drag-chain use
ZK4800-8025-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 111 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 4 mm² + (2 x 1 mm²) + (2 x AWG22))
ZK4800-8025-0050	example for 5 m length
ZK4801-8025-xxxx	extension cable

Brake energy management

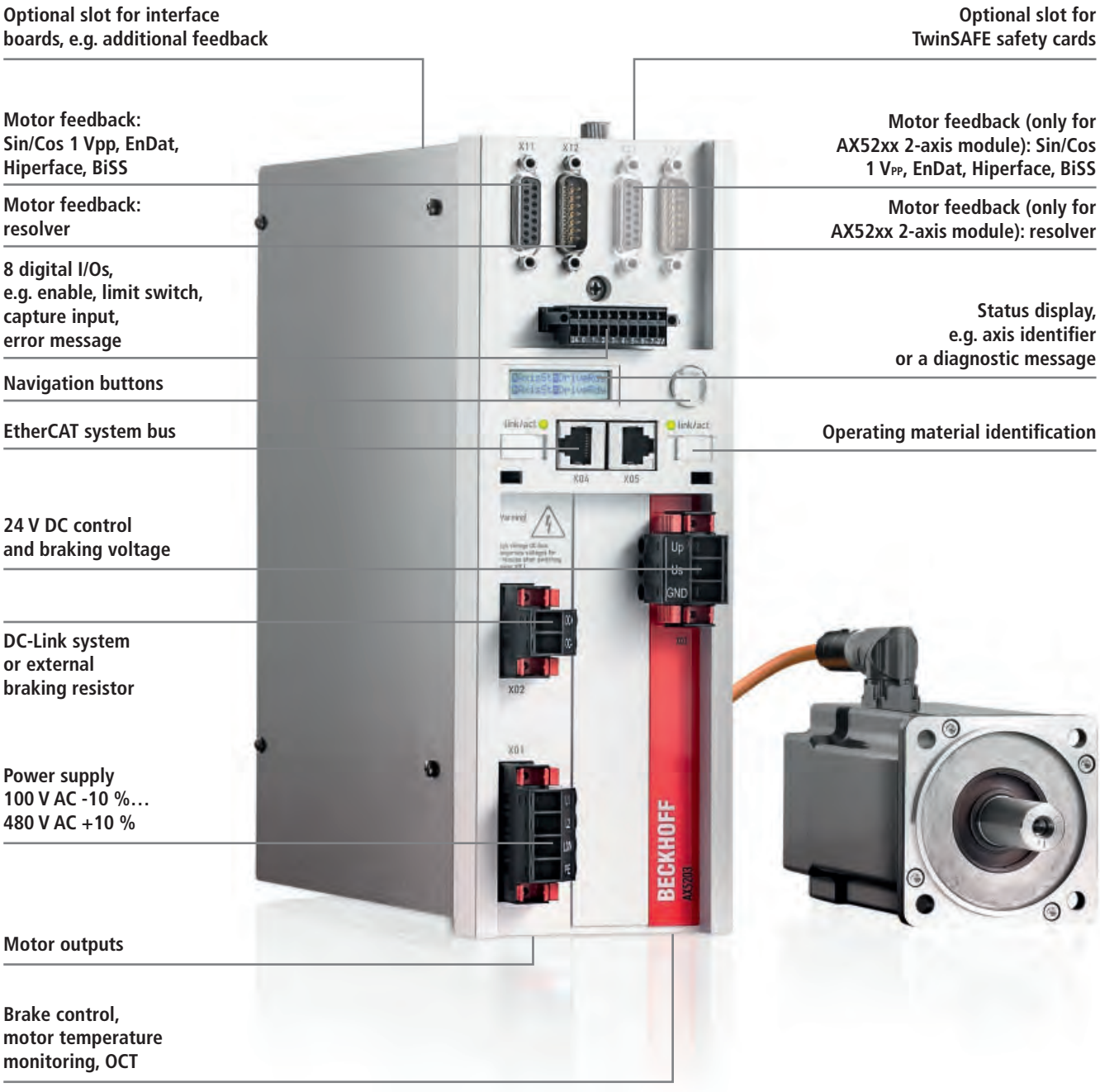
Ordering information	AX2090-BW80-xxxx | Ballast resistors
AX2090-BW80-1000	external ballast resistor for AX8620-1000 and AX8640-0000 supply modules, 1.0 kW, 18 Ω [1]
AX2090-BW80-1600	external ballast resistor for AX8620-0000 supply modules, 1.6 kW, 33 Ω [1]
AX2090-BW80-2000	external ballast resistor for AX8640-1000 supply modules, 2.0 kW, 18 Ω [2]
AX2090-BW80-3200	external ballast resistor for AX8640-0000 supply modules, 3.2 kW, 18 Ω [2]

Recommended interface cables: [1] ZK4000-2101-2xxx (1.5 mm²), [2] ZK4000-2102-2xxx (2.5 mm²)

We reserve the right to make technical changes.

AX5000 | Digital Compact Servo Drives

▶ AX5000



We reserve the right to make technical changes.

AX5101–AX5112 | 1-channel, up to 12 A

AX52xx | 2-channel, up to 2 x 6 A

AX5118–AX5140 | 1-channel, 18/25/40 A

AX5160, AX5172 | 1-channel, 60/72 A

AX5190, AX5191 | 1-channel, 90/110 A

AX5192, AX5193 | 1-channel, 143/170 A

The EtherCAT drives

The AX5000 Servo Drive product line from Beckhoff sets new standards in drive performance. The AX5000 series is available in single- or multi-channel form and is optimised for exceptional functionality and cost-effectiveness. Featuring integrated, high-speed control technology with a current control cycle of down to 62.5 µs, the AX5000 drives support fast and highly dynamic positioning tasks. The drives utilise EtherCAT as a high-performance communication system, providing an ideal interface with PC-based control technology while supporting coupling with other fieldbus systems. The 2-channel Servo Drives with variable motor output current optimise the packaging density and the cost per drive channel. The compact design and simple and safe installation through the "AX-Bridge" quick connection system significantly simplify control cabinet assembly.

Technical highlights

- **fast control algorithms**
  - current control: min. 62.5 µs
  - speed control: min. 62.5 µs
  - position control: min. 62.5 µs
- **variably adjustable current and speed filters**
- **high-speed EtherCAT system communication**
- **1- or 2-channel Servo Drive**
  - optimised for multi-axis applications
  - variable motor output current in 2-channel drives
  - active current sensing
- **active DC-Link and brake energy management via AX-Bridge**
- **variable motor interface with**
  - multi-feedback interface
  - flexible motor type selection
  - scalable, wide range motor current measurement
  - OCT (One Cable Technology)
  - electronic identification plate
- **high-speed capture inputs**
  - eight programmable digital I/Os, two with timestamp
- **mains connection**
  - wide voltage range 100…480 V AC
  - integrated mains filter
- **integration of safety functions (optional)**
  - STO, SS1
  - TwinSAFE: intelligent safety functions for Motion Control with AX58xx
- **compact design for simple control cabinet installation (300 mm depth)**
- **AX-Bridge – the quick connection system for power supply, DC-Link and control voltage**
- **variable cooling concept (fanless, forced cooling)**

Technical data	AX5000
Bus system	EtherCAT
Drive profile	SERCOS™ profile for servo drives according to IEC 61800 7 204 (SoE)
Rated supply voltage	100…480 V AC, 50/60Hz
DC-Link voltage	max. 875 V DC
Current control	62.5 µs
Design form	compact Servo Drive in 1- and 2-channel models, multi-axis systems with AX-Bridge
Protection class	IP 20
Operating temperature	AX5x01…AX5140: 0…50 °C, AX5160…AX5193: 0…40 °C
Approvals	CE, cULus

We reserve the right to make technical changes.

AX51xx | 1-channel Servo Drives up to 40 A

Technical data	AX5101-0000-0200	AX5103-0000-0200	AX5106-0000-0200	AX5112-0000-0200
Function	servo drive for one drive axis			
Rated supply voltage	3 x 100…480 V AC ±10 % 1 x 100…240 V AC ±10 %	3 x 100…480 V AC ±10 % 1 x 100…240 V AC ±10 %	3 x 100…480 V AC ±10 % 1 x 100…240 V AC ±10 %	3 x 100…480 V AC ±10 %
Rated current	1~: 1.5 A 3~: 1.5 A	1~: 3 A 3~: 3 A	1~: 4.5 A 3~: 6 A	3~: 12 A
DC-Link voltage	max. 875 V DC			
Minimum rated channel current at full current resolution	0.35 A	1 A	1 A	6 A
Peak output current	4.5 A	7.5 A	13 A	26 A
Further information	AX51xx			

Technical data	AX5118-0000-0200	AX5125-0000-0200	AX5140-0000-0200
Function	servo drive for one drive axis		
Rated supply voltage	3 x 100…480 V AC ±10 %		
Rated current	3~: 18 A	3~: 25 A	3~: 40 A
DC-Link voltage	max. 875 V DC		
Minimum rated channel current at full current resolution	12 A	12 A	18 A
Peak output current	36 A	50 A	80 A
Further information	AX51xx		

AX51xx | 1-channel Servo Drives 60…170 A

Technical data	AX5160-0000-0200	AX5172-0000-0200	AX5190-0000-0200
Function	servo drive for one drive axis		
Rated supply voltage	3 x 400…480 V AC ±10 %		
Rated current	3~: 60 A	3~: 72 A	3~: 90 A
DC-Link voltage	max. 875 V DC		
Max. braking power (internal/external)	–/52 kW	–/52 kW	–/67 kW
Peak output current	120 A	144 A	180 A
Further information	AX5160		

Technical data	AX5191-0000-0200	AX5192-0000-0200	AX5193-0000-0200
Function	servo drive for one drive axis		
Rated supply voltage	3 x 400…480 V AC ±10 %		
Rated current	3~: 110 A	3~: 143 A	3~: 170 A
DC-Link voltage	max. 875 V DC		
Max. braking power (internal/external)	–/67 kW	–/103 kW	–/103 kW
Peak output current	180 A	215 A	221 A
Further information	AX5160		

We reserve the right to make technical changes.

AX52xx | 2-channel Servo Drives

Technical data	AX5201-0000-0200	AX5203-0000-0200	AX5206-0000-0200
Function	servo drive for two drive axes with flexible distribution of the total device current		
Rated supply voltage	3 x 100…480 V AC ±10 % 1 x 100…240 V AC ±10 %		
Rated current	1~: 2 x 1.5 A 3~: 2 x 1.5 A	1~: 2 x 3 A 3~: 2 x 3 A	1~: 2 x 4.5 A 3~: 2 x 6 A
DC-Link voltage	max. 875 V DC		
Minimum rated channel current at full current resolution	0.35 A	1 A	1 A
Peak output current	2 x 5 A	2 x 10 A	2 x 13 A
Further information	AX52xx		

Dimensions	Height without connectors	Width	Depth without connectors
AX5101	274 mm	92 mm	232 mm
AX5103	274 mm	92 mm	232 mm
AX5106	274 mm	92 mm	232 mm
AX5112	274 mm	92 mm	232 mm
AX5118	274 mm	185 mm	232 mm
AX5125	274 mm	185 mm	232 mm
AX5140	274 mm	185 mm	232 mm
AX5201	274 mm	92 mm	232 mm
AX5203	274 mm	92 mm	232 mm
AX5206	274 mm	92 mm	232 mm
AX5160	345 mm	190 mm	259 mm
AX5172	345 mm	190 mm	259 mm
AX5190	540 mm	280 mm	253 mm
AX5191	540 mm	280 mm	253 mm
AX5192	540 mm	280 mm	332 mm
AX5193	540 mm	280 mm	332 mm

Typical combinations AX5000	Mains choke	Mains filter	Braking resistor (x = 3 or 6)
AX5160-0000-0200	AX2090-ND50-0060	integrated (C2 up to 10 m, C3 up to 25 m)	AX2090-BW52-x000
AX5172-0000-0200	AX2090-ND50-0072	integrated (C2 up to 10 m, C3 up to 25 m)	AX2090-BW52-x000
AX5190-0000-0200	AX2090-ND50-0090	AX2090-NF50-0100	AX2090-BW53-x000
AX5191-0000-0200	AX2090-ND50-0110	AX2090-NF50-0150	AX2090-BW53-x000
AX5192-0000-0200	AX2090-ND50-0143	AX2090-NF50-0150	AX2090-BW54-x000
AX5193-0000-0200	AX2090-ND50-0170	AX2090-NF50-0180	AX2090-BW54-x000

Braking resistor: x = power in kW

We reserve the right to make technical changes.

Options for AX5000 Servo Drives

AX57xx | Encoder option cards

The AX5000 Servo Drive series supports a large number of feedback interfaces via the multi-feedback interface:
- resolver (2-, 4-, 6- or 8-pole)
- SinCos encoder 1 V_{PP}
- single- and multi-turn encoder Hiperface 1 V_{PP}
- single- and multi-turn encoder BiSS 1 V_{PP}
- single- and multi-turn encoder 1 V_{PP}

From hardware revision 2 onwards, OCT (One Cable Technology) is also supported by the AX5000 and with it the "second encoder" function where the encoder inside the motor is used for commutation and a second high-resolution encoder is used for position control.

Encoder option cards
For the integration of further feedback systems the controllers can be equipped with encoder option cards from hardware revision 2 onwards. The option cards are inserted in the second option slot on top of the AX5000, offering the possibility to connect one or two further encoders, depending on the version.

Encoder option cards for AX51xx
- AX5701: one additional encoder input 1 V_{PP}, BiSS B, Hiperface, EnDat
- AX5721: one additional encoder input EnDat 2.2 or BiSS C

Encoder option cards for AX52xx
- AX5702: two additional encoder inputs 1 V_{PP}, BiSS B, Hiperface, EnDat
- AX5722: two additional encoder inputs EnDat 2.2 or BiSS C

Ordering information		Pict.
AX5701-0000	encoder option card for one additional encoder input 1 V_{PP}, BiSS B, Hiperface, EnDat	
AX5702-0000	encoder option card for two additional encoder inputs 1 V_{PP}, BiSS B, Hiperface, EnDat	A
AX5721-0000	encoder option card for one additional encoder input EnDat 2.2, BiSS C	
AX5722-0000	encoder option card for two additional encoder inputs EnDat 2.2, BiSS C	

AX58xx | TwinSAFE drive options cards

Significant hazards to persons arise from the dynamic movements of the electrical drive equipment of machines. With the AX58xx TwinSAFE drive option cards numerous safety functions can be easily implemented by the user. No further circuits are necessary for this, such as circuit breakers or contactors in the supply lines or special external encoder systems. Optional cards that are certified according to DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3) are available for different safety categories:

AX5801 | Personal protection against inadvertent restart of the drive axis (STO/SS1):
- Safe Torque Off (STO) according to IEC 61800-5-2
- control through safe 24 V DC outputs
- mains voltage and motor line remain connected

AX5805, AX5806 | Further drive-integrated safety functions according to IEC 61800-5-2. Control is performed via EtherCAT; no further wiring is required:
- stop functions (STO, SOS, SS1, SS2)
- speed functions (SLS, SSM, SSR, SMS) with up to 8 speeds
- position functions (SLP, SCA, SLI) with reference cams
- acceleration functions (SAR, SMA)
- rotating direction functions (SDIp, SDIn)

For further information on TwinSAFE and the TwinSAFE products see page 1044

Ordering information		Pict.
AX5801-0200	TwinSAFE drive option card for AX5000 up to 40 A, HW 2.0: STO, SS1 (1)	B
AX5805-0000	TwinSAFE drive option card for AX5000 up to 40 A, HW 2.0: STO, SS1, SS2, SOS, SLS, SDI (1)	C
AX5806-0000	TwinSAFE drive option card for AX5000 from 60 A, HW 2.0: STO, SS1, SS2, SOS, SLS, SDI (2)	

(1) AX5000 up to 40 A: AX5x01-0000-0200, AX5x03-0000-0200, AX5x06-0000-0200, AX5112-0000-0200, AX5118-0000-0200, AX5125-0000-0200, AX5140-0000-0200

(2) AX5000 from 60 A up to 170 A: AX5160-0000-0200, AX5172-0000-0200, AX519x-0000-0200

We reserve the right to make technical changes.

AX59xx | **AX-Bridge quick connection system**

For Servo Drives up to a rated current of 40 A, the AX59xx AX bridge enables the simple and fast connection of several AX5000 units to form a multi-axis system by means of plug-in supply and connection modules.

The AX590x supply module is simply snapped onto the Servo Drive. The AX591x connection module with integrated busbars is suitable for multi-axis systems and combines mains input, intermediate circuit, 24 V DC control voltage and brake voltage. In combination, the AX590x and AX591x modules enable fast installation and commissioning.

– integration of power supply, DC-Link, 24 V DC control and braking voltage
– connection module with power rail system, current carrying capacity up to 85 A
– straightforward installation and disassembly without additional wiring
– visible and safe contacting

Active DC-Link and brake energy management

With the AX-Bridge the DC-Links are automatically through-connected: This enables an economic energy balancing between axes.

– short-circuit-proof
– intelligent utilisation of all available system ballast resistors
– elimination power loss

Ordering information		Pict.
AX5901-0000	AX-Bridge power supply module for connection of supply voltage and 24 V DC for control and brake energy (pluggable), for AX5x01…AX5125, 85 A	D
AX5902-0000	AX-Bridge power supply module for connection of supply voltage and 24 V DC for control and brake energy (pluggable), for AX5140, 85 A	D
AX5911-0000	AX-Bridge power distribution module, quick connection system for power supply, DC-Link and control voltage (pluggable), for AX5x01…AX5112, 85 A	E
AX5912-0000	AX-Bridge power distribution module, quick connection system for power supply, DC-Link and control voltage (pluggable), for AX5118 and AX5125, 85 A	F

A

B

C

D

E

F

We reserve the right to make technical changes.

Motor supply cables for AX5000 Servo Drives at AM8xxx

Motor cables 1 mm² with iTec plug system for AM801x, AM802x, AM803x and AM853x at AX5000 (1.5…6 A)

Ordering information	Motor cable with 1 mm² wire gauge, highly flexible for drag-chain use
ZK4500-8022-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 81 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 1 mm² + (2 x 0.75 mm²) + (2 x AWG22))
ZK4500-8022-0050	example for 5 m length
ZK4501-8022-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**

Motor cables 1.5 mm² with M23 speedtec® plug for AM883x and AM8x4x up to AM8x6x (up to winding code P) at AX5000 (1.5…12 A)

Ordering information	Motor cable with 1.5 mm² wire gauge, fixed installation
ZK4500-8003-xxxx	cables for fixed installation, min. bending radius = 61 mm (5 x OD), (4 x 1.5 mm² + (2 x 0.75 mm²) + (2 x AWG22))
ZK4500-8003-0050	example for 5 m length
ZK4501-8003-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**

Ordering information	Motor cable with 1.5 mm² wire gauge, highly flexible for drag-chain use
ZK4500-8023-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 89 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 1.5 mm² + (2 x 0.75 mm²) + (2 x AWG22))
ZK4500-8023-0050	example for 5 m length
ZK4501-8023-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**

Motor cables 2.5 mm² with M23 speedtec® plug for AM8x4x up to AM8x6x (up to winding code P) at AX5000 (18…25 A)

Ordering information	Motor cable with 2.5 mm² wire gauge, fixed installation
ZK4500-8004-xxxx	cables for fixed installation, min. bending radius = 69 mm (5 x OD), (4 x 2.5 mm² + (2 x 1 mm²) + (2 x AWG22))
ZK4500-8004-0050	example for 5 m length
ZK4501-8004-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**

Ordering information	Motor cable with 2.5 mm² wire gauge, highly flexible for drag-chain use
ZK4500-8024-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 97 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 2.5 mm² + (2 x 1 mm²) + (2 x AWG22))
ZK4500-8024-0050	example for 5 m length
ZK4501-8024-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**

We reserve the right to make technical changes.

Motor cables 4 mm² with M40 speedtec® plug for AM8x6x (from winding code Q) and AM807x at AX5000 (12…25 A)

Ordering information	Motor cable with 4 mm² wire gauge, highly flexible for drag-chain use
ZK4500-8025-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 111 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 4 mm² + (2 x 1 mm²) + (2 x AWG22))
ZK4500-8025-0050	example for 5 m length
ZK4501-8025-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**

Motor cables 10 mm² with M40 speedtec® plug for AM8x6x (from winding code Q) and AM807x at AX5000 (40 A)

Ordering information	Motor cable with 10 mm² wire gauge, highly flexible for drag-chain use
ZK4500-8027-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 225 mm (10 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 10 mm² + (2 x 1.5 mm²) + (2 x AWG22))
ZK4500-8027-0050	example for 5 m length
ZK4501-8027-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**

Motor cables 10 mm² with M40 speedtec® plug for AM8x6x (from winding code Q) and AM807x at AX5000 (60 A)

Ordering information	Motor cable with 10 mm² wire gauge, highly flexible for drag-chain use
ZK4504-8027-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 255 mm (10 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 10 mm² + (2 x 1.5 mm²) + (2 x AWG22))
ZK4504-8027-0050	example for 5 m length
ZK4501-8027-xxxx	extension cable

For maximum cable lengths please see the current documentation ▶ **documentations**
AX5000 (60 A/72 A) does not support OCT. With each unit, a resolver cable ZK4530-8010-xxxx must be ordered separately.

Motor cables 16 mm² with M40 speedtec® plug for AM8x6x (from winding code Q) and AM807x at AX5000 (72 A)

Ordering information	Motor cable with 16 mm² wire gauge, highly flexible for drag-chain use
ZK4504-8018-xxxx	highly flexible, drag-chain suitable cable with 5 million bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 234 mm (10 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (4 x 16 mm² + (2 x 1.5 mm²) + (2 x AWG22))
ZK4504-8018-0050	example for 5 m length
ZK4501-8018-xxxx	extension cable

Feedback cables for AX5000 Servo Drives at AM8xxx

Resolver cables with iTec plug system for AM802x, AM803x, AM853x at AX5000

Ordering information	Resolver cable with 0.25 mm² wire gauge, flexible, for drag-chain use
ZK4530-8110-xxxx	flexible, drag-chain suitable cable with 5 million bending cycles, max. 120 m/min, max. 4 m/s², min. bending radius = 75 mm (10 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, 4 x 2 x 0.25 mm²
ZK4530-8110-0050	example for 5 m length
ZK4531-8110-xxxx	extension cable

We reserve the right to make technical changes.

Resolver cables with M23 speedtec® plug for AM883x, AM8x4x to AM8x6x, AM807x at AX5000

Ordering information	Resolver cable with 0.25 mm² wire gauge, flexible, for drag-chain use
ZK4530-8010-xxxx	flexible, drag-chain suitable cable with 5 million bending cycles, max. 120 m/min, max. 4 m/s², min. bending radius = 75 mm (10 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, 4 x 2 x 0.25 mm²
ZK4530-8010-0050	example for 5 m length
ZK4531-8010-xxxx	extension cable

Encoder cables with M23 speedtec® plug for AM8x6x, AM807x at AX5000

Ordering information	Encoder cable with 0.5 mm² wire gauge, highly flexible, suitable as trailing cable
ZK4510-8020-xxxx	Highly flexible, drag-chain suitable cable with 5 mio. bending cycles, max. 240 m/min, max. 30 m/s², min. bending radius = 53 mm (7 x OD), max. drag-chain length horizontal 20 m, vertical 5 m, (7 x 2 x 0.14 mm² + 2 x 0.5 mm²). The cable is UL and CSA listed.
ZK4510-8020-0050	example for 5 m length
ZK4511-8020-xxxx	extension cable

Accessories

EtherCAT patch cables

Ordering information	ZK1090-9191-0xxx | EtherCAT patch cables
ZK1090-9191-0001	EtherCAT bridge AX5x01 to AX5112, length 0.17 m
ZK1090-9191-0002	EtherCAT bridge AX5118 to AX5140, length 0.26 m
ZK1090-9191-0xxx	EtherCAT patch cable, 0xxx = length in decimetres (-0020 = 2 m), available lengths 0.5 m, 1 m, 2 m, 3 m, 5 m and 10 m

Not assembled motor cables for higher performance, from AX5000 (25 A)

Ordering information	Motor cable, flexible, drag-chain suitable with 5 million bending cycles, for Servo Drives AX5000 from 25 A
ZK4509-0016-0zzz	6 mm², for AX5125, (4 x 6 mm² + (2 x 1 mm² + 2 x 1.5 mm²)) (1)
ZK4509-0017-0zzz	10 mm², for AX5140, (4 x 10 mm² + (2 x 1 mm² + 2 x 1.5 mm²)) (1)
ZK4509-0018-0zzz	16 mm², for AX5160, (4 x 16 mm² + 2 x (2 x 1.5 mm²)) (1)
ZK4509-0019-0zzz	25 mm², for AX5172, (4 x 25 mm² + 2 x (2 x 1.5 mm²)) (1)
ZK4509-0019-1zzz	35 mm², for AX5190, (4 x 35 mm² + 2 x (2 x 1.5 mm²)) (1)
ZK4509-0019-2zzz	50 mm², for AX5191, (4 x 50 mm² + 2 x (2 x 2.5 mm²)) (1)

zzz = ordering indication of the length of material in decimetres, e.g. ZK4509-0016-0100 = 10 metres, (1) not suitable for OCT

Power supply | Mains filters for AX5000 (from 1.5 A)

Ordering information	AX2090-NF50-0xxx | Mains filters
AX2090-NF50-0014	mains filter C2 for AX5000 Servo Drives up to 14.6 A, 46.4 x 231 x 70 mm (W x H x D), 0.9 kg
AX2090-NF50-0032	mains filter C2 for AX5000 Servo Drives up to 32.8 A, 58 x 265 x 90 mm (W x H x D), 1.75 kg
AX2090-NF50-0063	mains filter C3 for AX5160* Servo Drives up to 63 A, 62 x 305 x 180 mm (W x H x D), 5 kg
AX2090-NF50-0100	mains filter C3 for AX5172*/AX5190 Servo Drives up to 100 A, 75 x 336 x 200 mm (W x H x D), 6 kg
AX2090-NF50-0150	mains filter C3 for AX5191/AX5192 Servo Drives up to 150 A, 90 x 380 x 220 mm (W x H x D), 6.8 kg
AX2090-NF50-0180	mains filter C3 for AX5193 Servo Drives up to 180 A, 200 x 410 x 120 mm (W x H x D), 7 kg

* AX5160, AX5172: mains filter already integrated. Additional mains filter for C3 only necessary if the cable lengths exceed 25 m.

We reserve the right to make technical changes.

Power supply | Mains chokes for AX5000 (from 60 A)

Ordering information	AX2090-ND50-0xxx | Mains chokes
AX2090-ND50-0060	mains choke for AX5160 Servo Drive, 60 A, 0.25 mH, U_K 2 %, 190 x 200 x 120 mm (W x H x D), 7 kg
AX2090-ND50-0072	mains choke for AX5172 Servo Drive, 72 A, 0.20 mH, U_K 2 %, 190 x 240 x 110 mm (W x H x D), 10 kg
AX2090-ND50-0090	mains choke for AX5190 Servo Drive, 90 A, 0.16 mH, U_K 2 %, 230 x 300 x 160 mm (W x H x D), 13 kg
AX2090-ND50-0110	mains choke for AX5191 Servo Drive, 110 A, 0.13 mH, U_K 2 %, 230 x 300 x 180 mm (W x H x D), 15 kg
AX2090-ND50-0143	mains choke for AX5192 Servo Drive, 143 A, 0.10 mH, U_K 2 %, 240 x 330 x 200 mm (W x H x D), 25 kg
AX2090-ND50-0170	mains choke for AX5193 Servo Drive, 170 A, 0.09 mH, U_K 2 %, 240 x 330 x 200 mm (W x H x D), 25 kg

Power supply | Transient voltage suppressor for AX5000 (1.5…25 A)

Ordering information	Transient voltage suppressor for AX5000 Servo Drives
AX2090-TS50-3000	transient voltage suppressor for AX5000 Servo Drives, required if CSA certification necessary

EMC accessories | Shroud for AX5000 (from 60 A)

Ordering information	Shroud for connecting cable screens
AX2090-SB50-0001	shroud for AX5160/AX5172
AX2090-SB50-0002	shroud for AX5190/AX5191
AX2090-SB50-0003	shroud for AX5192/AX5193

Braking energy management

Ordering information	Components for DC-Link for AX5000
AX5021-0000-0000	ballast unit with internal braking resistor (250 W) and option for connecting an external ballast resistor (up to 6 kW) as well as an additional DC link expansion capacity for storing brake energy efficiently
AX2090-BW50-0300	external ballast resistor for AX5x01 to AX5112 (stand-alone), 0.3 kW/47 Ω, 92 x 120 x 349 mm (W x H x D), 2 kg [1]
AX2090-BW50-0600	external ballast resistor for AX5x01 to AX5112 (stand-alone), 0.6 kW/47 Ω, 92 x 120 x 549 mm (W x H x D), 3 kg [1]
AX2090-BW50-1600	external ballast resistor for AX5x01 to AX5112 (stand-alone), 1.6 kW/47 Ω, 185 x 120 x 649 mm (W x H x D), 5.8 kg [1]
AX2090-BW51-1000	external ballast resistor for AX5118 to AX5140 (stand-alone) and in combination with ballast unit AX5021, 1 kW/23 Ω, 92 x 120 x 749 mm (W x H x D), 4 kg [2]
AX2090-BW51-3000	external ballast resistor for AX5118 to AX5140 (stand-alone) and in combination with ballast unit AX5021, 3 kW/23.4 Ω, 355 x 255 x 490 mm (W x H xD), 8 kg [2]
AX2090-BW51-6000	external ballast resistor for AX5118 to AX5140 (stand-alone) and in combination with ballast unit AX5021, 6 kW/23.2 Ω, 455 x 255 x 490 mm (W x H x D), 12 kg [2]
AX2090-BW52-3000	external ballast resistor for AX5160 and AX5172 (stand-alone), 3 kW/13.2 Ω, 355 x 260 x 490 mm (W x H xD), 9.5 kg [3]
AX2090-BW52-6000	external ballast resistor for AX5160 and AX5172 (stand-alone), 6 kW/13 Ω, 455 x 260 x 490 mm (W x H x D), 13 kg [3]
AX2090-BW53-3000	external ballast resistor for AX5190 and AX5191 (stand-alone), 3 kW/10.2 Ω, 355 x 255 x 490 mm (W x H xD), 9.5 kg [4]
AX2090-BW53-6000	external ballast resistor for AX5190 and AX5191 (stand-alone), 6 kW/10 Ω, 455 x 260 x 490 mm (W x H x D), 13 kg [4]
AX2090-BW54-3000	external ballast resistor for AX5192 and AX5193 (stand-alone), 3 kW/6.6 Ω, 355 x 255 x 490 mm (W x H xD), 9.5 kg [4]
AX2090-BW54-6000	external ballast resistor for AX5192 and AX5193 (stand-alone), 6 kW/6.5 Ω, 455 x 260 x 490 mm (W x H x D), 13 kg [4]

Recommended interface cables: [1] ZK4000-2101-2xxx (1.5 mm²), [2] ZK4000-2102-2xxx (2.5 mm²), [3] ZK4509-8025-xxxx (4 mm²), [4] ZK4000-2104-2xxx (6 mm²)

AX5000 motor chokes

Ordering information	AX2090-MD50-00xx | Motor chokes
AX2090-MD50-0012	motor choke for AX5000 (1.5…12 A), up to 12 A rated current, necessary for motor cable ≥ 25 m, max. 100 m, with integrated connection cable (150 mm)
AX2090-MD50-0025	motor choke for AX5000 (18…25 A), up to 25 A rated current, necessary for motor cable ≥ 25 m, max. 50 m, with integrated connection cable (150 mm)

We reserve the right to make technical changes.

Servo and Linear Motors

▶ Servomotors

Servomotors

- AM8000 for applications with highest demands on dynamics and performance, One Cable Technology (OCT) for power and feedback
- AM8500 with increased internal inertia ratio, One Cable Technology (OCT) for power and feedback
- AM8800 for use in the food, chemical and pharmaceutical industries, One Cable Technology (OCT) for power and feedback
- AM3000 for applications with highest demands on dynamics and performance

For dynamic applications in the lower power range Beckhoff offers the Compact Drive Technology series.

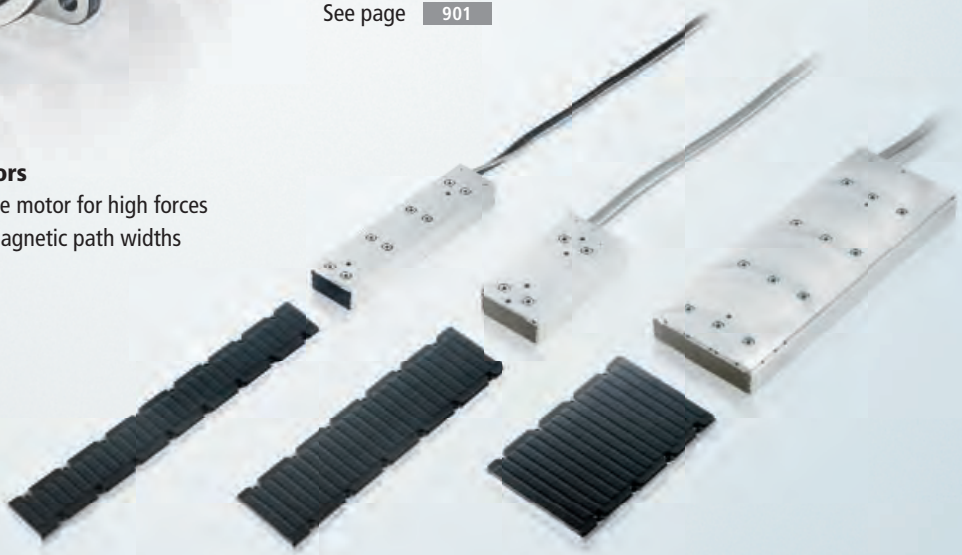
See page 884,
Compact Drive Technology see page 926

We reserve the right to make technical changes.

Planetary gear units

– AG2300: high-end gear series for AM8000/ AM8500 and AM3000 motor series, high-speed variant suited for positioning with high nominal speeds in continuous operation
– AG2210: for AM8000/AM8500 and AM3000 motor series, low backlash and high performance with up to 16 gear ratios, very low running noise coupled with maximum quality
– AG2800: stainless steel gear unit turns the AM8800 into a perfectly matched and certified Hygienic Design servo axis by dead-space-free design, smooth surfaces, a round motor adapter and high resistance to corrosion

See page 901



Linear Servomotors

– AL2xxx: iron core motor for high forces with different magnetic path widths (50/80/130 mm)

See page 916

We reserve the right to make technical changes.

AMxxxx | Synchronous Servomotors

▶ Servomotors

One Cable Technology (OCT) for power and feedback with absolute encoder

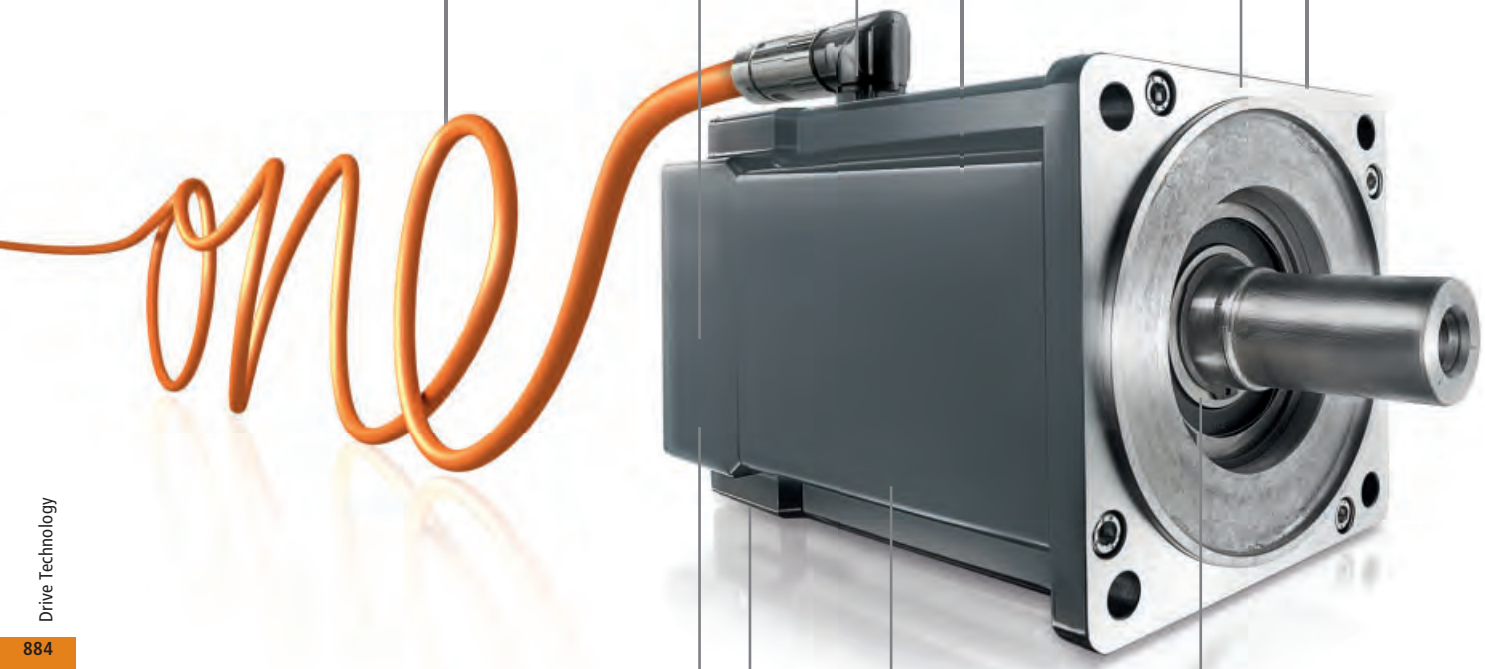
Backlash-free permanent magnet holding brake

Rotatable speedtec® plug

– Modular design
– Greatest possible variability

– Salient-pole winding technology
– Fully-encapsulated stator

Thermal sensor KTY



Powder-coated
– scratchproof
– durable
– high quality

Single- and multi-turn encoder, resolver

– Low cogging
– High performance
– High power density
– High overload capacity

High-quality radial bearing
– service life 30,000 hrs
– maximum axial and radial loadability

We reserve the right to make technical changes.

AM80xx high performance type with forced cooling

AM85xx

AM88xx

AM8000 – Dynamic power packages made in Germany

The AM8000 servomotor range stands for durable and powerful synchronous servomotors. Seven sizes, each with three overall lengths, provide seamless coverage for all areas of application. The high-performance servomotor series is characterised by an exceptional power density. Small end turns and the fully potted stator enable an optimised thermal transition from winding to motor housing.

As a result of low rotor moment of inertia coupled with an overload capability of up to 5 times, the AM8000 series is highly dynamic. The motors can be optionally equipped with the proven resolver (2-cable standard) or the innovative One Cable Technology (OCT) feedback system. With OCT, no encoder cable is required, since the feedback signals are digitally transmitted over the existing standard motor cable. Thus, the wiring costs can be reduced by up to 50 %.

Typical for all seven sizes of this motor series is the modular design. Therefore, mechanical adjustments to suit customer requirements can be made quickly and easily. With a guaranteed service life of 30,000 h for wearing parts such as ball bearings, this motor series offers high durability and robustness. Matching accessories such as gears and pre-assembled motor and encoder cables are available.

AM8500 – Synchronous servomotors with increased rotor moment of inertia

The AM8500 series extends the servomotor range by a complete series with increased rotor moment of inertia. This series covers a wide performance range with four sizes and three lengths with standstill torques ranging from 1.37 to 29 Nm. Due to the high rotor moment of inertia, the control of AM8500 servomotors is simplified in applications where a high external inertia has to be moved, because these motor types tend to vibrate less and are much easier to adjust via the servo controller.

AM8000/AM8500 – Forced Cooling

High torques even at high speeds: This is the benefit of the AM8000 and AM8500 motor series with additional forced cooling for increased performance. Equipped with a fan for axial ventilation, the standstill torques of these servomotors can be increased by about 35 %, and the rated torques at the rated speed by even up to 150 %. The external 24 V DC fan can be actuated independently of the motor.

AM8800 – Attractive hygienic design, EHEDG certified

The AM8800 stainless steel motor range is based on the AM8000 range and especially designed for use in the food, chemical and pharmaceutical industries. The motor design complies with the EHEDG requirements and the materials used with the FDA guidelines. The motors are made from AISI-316L stainless steel, making them resistant to aggressive cleaning materials. All AM8800 motors comply with protection class IP 69K and are provided with a hygienic-design cable gland. Four sizes, each with three different lengths, are available. The AM8800 range supports the One Cable Technology (OCT) as standard. The available options include a resolver, a sealing-air connection, or an AG2280 stainless steel gear unit for the implementation of a perfectly matched and standards-compliant servo axis in hygienic design.

AM3000 – High-dynamic, brushless servomotors

The low-inertia servomotors of the AM3000 series are equipped with rotors containing high-grade neodymium. The high-quality permanent magnet material highly contributes to the exceptionally dynamic behaviour of the motor series. Consequently, the AM3000 synchronous servomotors are mainly used in motion applications with highly dynamic requirements.

The AM3000 series incorporate resolvers as standard feedback unit; however, they can also be fitted with single-turn or multi-turn absolute encoders. The connection plugs can be rotated continuously. The IP 65/64 protection class of the motors can be increased to IP 65/65 by adding a sealing ring. Available accessories for these series include matching gears an pre-assembled motor and encoder cables.

We reserve the right to make technical changes.

OCT | **One Cable Technology**

The One Cable Technology (OCT) of the AM8xxx motor series reduces the motor cabling to the mandatory motor cable, which can then also be used directly for the feedback signals. As in sensorless control, the user no longer has to use an additional feedback cable. All the information required for control purposes is transferred reliably and interference-proof via a digital interface.

The symbiosis of power and feedback cable enables reliable implementation of high-precision positioning and lower velocity fluctuations. The encoder data, rotor position, multi-turn information and thermal conditions in motor are transferred via a purely digital interface. Costly analog evaluation function blocks in the drive amplifier can be avoided, while retaining extensive diagnostic options.

Since a cable and plug are omitted at both the motor and controller end, the component and commissioning costs are significantly reduced. The wiring is simplified significantly, possible error sources are eliminated. This also has positive effects on the peripheral devices, since drag-chains, cable bushings and areas reserved for cables in machines and control cabinets can now be made smaller. OCT can be used for line lengths of up to 100 m.

This results in greater degrees of freedom on the motor side: the omission of a plug connector allows the new technology to be used even in the smallest motor sizes. The AX5000 EtherCAT Servo Drives support OCT.

Features

- digital single-cable transmission via the existing motor cable
- digital transmission of sensor data
- no interference-susceptible analog signals
- support for the electronic identification plate
- Encoder cables, including expensive plugs, are dispensed with.
- reduction
  - in the costs for cable, plug and assembly
  - in warehouse costs by dispensing with a cable variant
  - in space requirements in cable carrier chains
  - in space requirements on the motor (important with small sizes)
  - in the sources of error and wear
- Remote diagnostics are possible up to the motor.
- Cable lengths of up to 100 m are possible.
- operating hours counter and error memory integrated in the motor

The AX5000 EtherCAT Servo Drives support OCT.

We reserve the right to make technical changes.

AM8000 | **Synchronous Servomotors**

The AM8000 series represents robust, durable and high-performance synchronous servomotors "Made in Germany". The seven flange codes, each with three overall lengths, cover a wide torque range.

The AM8000 motors feature a low rotor moment of inertia and a very high overload capacity. Based on these technical characteristics, the most highly dynamic applications can be realised.

The windings of the AM8000 motors are implemented using salient pole-wound technology, resulting in a high copper space factor. Due to the high slot space factor, high continuous torques can be achieved. The fully potted stator provides for an ideal thermal transition from winding to housing. Another advantage is mechanical protection of the winding wires against vibrations.

Amply sized, sealed grooved ball bearings in conjunction with a sophisticated mechanical design ensure a bearing service life of 30,000 hours. All motors feature an integrated KTY temperature sensor for exact temperature evaluation.

In the forced-cooling version, the power density of the AM8000 motor series can be further increased by means of external axial ventilation. This option is available for the AM806x to AM807x sizes.

The modular design of the AM8000 motors enables rapid implementation of mechanical adjustments. Customer-specific variants are available. The motors offer an electronic identification plate for simple commissioning.

The housing is fully powder-coated so that cutting edges are covered. The acrylic powder coating also offers high resistance against scratching and corrosion. In the basic version, AM8000 motors feature IP 54 protected housings. For harsh environmental conditions, the shaft feed-through can optionally be equipped with an FPM sealing ring (fluoropolymer rubber), so that the whole motor is IP 65 protected.

Planetary gear units
see page 901

Pre-assembled cables
see page 878

Technical data	AM80xx
Motor type	permanent magnet-excited three-phase synchronous motor
Magnet material	neodymium-iron-boron
Insulation class	thermal class F (155 °C)
Design form	flange-mounted according to IM B5, IM V1, IM V3
Protection class	IP 54, IP 65 (shaft seal)
Cooling	convection, permissible ambient temperature 40 °C, optionally: external axial ventilation
Coating/surface	dark grey powder coating, similar to RAL7016
Temperature sensor	KTY in stator winding
Connection method	round plug connector, swivelling, angled
Life span	L_{10h} = 30,000 hrs for ball bearings
Approvals	CE, UL
Feedback system	absolute encoder single-turn and multi-turn (OCT), resolver

We reserve the right to make technical changes.

AM801x | Flange code F1, motor length 1 – 3

Data for 230 V AC	AM8011-wByz	AM8012-wCyz	AM8013-wDyz
Standstill torque	0.20 Nm	0.38 Nm	0.52 Nm
Rated torque	0.18 Nm	0.33 Nm	0.45 Nm
Rated speed	8000 min^{-1}	8000 min^{-1}	8000 min^{-1}
Rated power	0.15 kW	0.28 kW	0.38 kW
Standstill current	0.76 A	1.30 A	1.65 A
Rotor moment of inertia	0.029 $kgcm^2$	0.048 $kgcm^2$	0.067 $kgcm^2$
Rotor moment of inertia (with brake)	0.052 $kgcm^2$	0.071 $kgcm^2$	0.090 $kgcm^2$

AM8021 | Flange code F2, motor length 1

Data for 400 V AC	AM8021-wByz	AM8021-wDyz
Standstill torque	0.50 Nm	0.50 Nm
Rated torque	0.50 Nm	0.50 Nm
Rated speed	8000 min^{-1}	9000 min^{-1}
Rated power	0.42 kW	0.47 kW
Standstill current	0.85 A	1.60 A
Rotor moment of inertia	0.134 $kgcm^2$	0.134 $kgcm^2$
Rotor moment of inertia (with brake)	0.156 $kgcm^2$	0.156 $kgcm^2$

AM8022 | Flange code F2, motor length 2

Data for 400 V AC	AM8022-wDyz	AM8022-wEyz
Standstill torque	0.80 Nm	0.80 Nm
Rated torque	0.70 Nm	0.65 Nm
Rated speed	8000 min^{-1}	9000 min^{-1}
Rated power	0.59 kW	0.61 kW
Standstill current	1.50 A	2.44 A
Rotor moment of inertia	0.253 $kgcm^2$	0.253 $kgcm^2$
Rotor moment of inertia (with brake)	0.276 $kgcm^2$	0.276 $kgcm^2$

AM8023 | Flange code F2, motor length 3

Data for 400 V AC	AM8023-wEyz	AM8023-wFyz
Standstill torque	1.20 Nm	1.20 Nm
Rated torque	1.00 Nm	0.90 Nm
Rated speed	8000 min^{-1}	9000 min^{-1}
Rated power	0.84 kW	0.85 kW
Standstill current	2.20 A	3.40 A
Rotor moment of inertia	0.373 $kgcm^2$	0.373 $kgcm^2$
Rotor moment of inertia (with brake)	0.396 $kgcm^2$	0.396 $kgcm^2$

AM8031 | Flange code F3, motor length 1

Data for 400 V AC	AM8031-wCyz	AM8031-wDyz	AM8031-wFyz
Standstill torque	1.37 Nm	1.38 Nm	1.40 Nm
Rated torque	1.34 Nm	1.33 Nm	1.30 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	9000 min^{-1}
Rated power	0.42 kW	0.84 kW	1.23 kW
Standstill current	1.00 A	1.95 A	3.20 A
Rotor moment of inertia	0.462 $kgcm^2$	0.462 $kgcm^2$	0.462 $kgcm^2$
Rotor moment of inertia (with brake)	0.541 $kgcm^2$	0.541 $kgcm^2$	0.541 $kgcm^2$

We reserve the right to make technical changes.

AM8032 | Flange code F3, motor length 2

Data for 400 V AC	AM8032-wDyz	AM8032-wEyz	AM8032-wHyz
Standstill torque	2.38 Nm	2.37 Nm	2.37 Nm
Rated torque	2.30 Nm	2.20 Nm	1.85 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	9000 min^{-1}
Rated power	0.72 kW	1.38 kW	1.74 kW
Standstill current	1.70 A	2.95 A	5.10 A
Rotor moment of inertia	0.842 $kgcm^2$	0.842 $kgcm^2$	0.842 $kgcm^2$
Rotor moment of inertia (with brake)	0.921 $kgcm^2$	0.921 $kgcm^2$	0.921 $kgcm^2$

AM8033 | Flange code F3, motor length 3

Data for 400 V AC	AM8033-wEyz	AM8033-wFyz	AM8033-wJyz
Standstill torque	3.20 Nm	3.22 Nm	3.22 Nm
Rated torque	2.98 Nm	2.70 Nm	2.30 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	9000 min^{-1}
Rated power	0.94 kW	1.70 kW	2.17 kW
Standstill current	2.10 A	4.10 A	6.80 A
Rotor moment of inertia	1.22 $kgcm^2$	1.22 $kgcm^2$	1.22 $kgcm^2$
Rotor moment of inertia (with brake)	1.46 $kgcm^2$	1.46 $kgcm^2$	1.46 $kgcm^2$

AM8041 | Flange code F4, motor length 1

Data for 400 V AC	AM8041-wDyz	AM8041-wEyz	AM8041-wHyz
Standstill torque	2.37 Nm	2.45 Nm	2.40 Nm
Rated torque	2.30 Nm	2.31 Nm	2.10 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	8000 min^{-1}
Rated power	0.72 kW	1.45 kW	1.76 kW
Standstill current	1.65 A	3.00 A	5.25 A
Rotor moment of inertia	1.08 $kgcm^2$	1.08 $kgcm^2$	1.08 $kgcm^2$
Rotor moment of inertia (with brake)	1.73 $kgcm^2$	1.73 $kgcm^2$	1.73 $kgcm^2$

AM8042 | Flange code F4, motor length 2

Data for 400 V AC	AM8042-wEyz	AM8042-wFyz	AM8042-wJyz
Standstill torque	4.10 Nm	4.10 Nm	4.10 Nm
Rated torque	3.90 Nm	3.70 Nm	3.10 Nm
Rated speed	2500 min^{-1}	5000 min^{-1}	8000 min^{-1}
Rated power	1.02 kW	1.94 kW	2.60 kW
Standstill current	2.15 A	4.10 A	6.90 A
Rotor moment of inertia	1.97 $kgcm^2$	1.97 $kgcm^2$	1.97 $kgcm^2$
Rotor moment of inertia (with brake)	2.62 $kgcm^2$	2.62 $kgcm^2$	2.62 $kgcm^2$

AM8043 | Flange code F4, motor length 3

Data for 400 V AC	AM8043-wEyz	AM8043-wHyz	AM8043-wKyz
Standstill torque	5.65 Nm	5.65 Nm	5.60 Nm
Rated torque	5.30 Nm	4.90 Nm	4.10 Nm
Rated speed	2500 min^{-1}	5000 min^{-1}	8000 min^{-1}
Rated power	1.39 kW	2.57 kW	3.43 kW
Standstill current	2.90 A	5.40 A	9.30 A
Rotor moment of inertia	2.87 $kgcm^2$	2.87 $kgcm^2$	2.87 $kgcm^2$
Rotor moment of inertia (with brake)	3.52 $kgcm^2$	3.52 $kgcm^2$	3.52 $kgcm^2$

We reserve the right to make technical changes.

AM8051 | Flange code F5, motor length 1

Data for 400 V AC	AM8051-wEyz	AM8051-wGyz	AM8051-wKyz
Standstill torque	4.80 Nm	4.90 Nm	4.90 Nm
Rated torque	4.60 Nm	4.40 Nm	3.90 Nm
Rated speed	2500 min^{-1}	5000 min^{-1}	8000 min^{-1}
Rated power	1.20 kW	2.30 kW	3.27 kW
Standstill current	2.70 A	4.75 A	8.50 A
Rotor moment of inertia	2.24 $kgcm^2$	2.24 $kgcm^2$	2.24 $kgcm^2$
Rotor moment of inertia (with brake)	2.90 $kgcm^2$	2.90 $kgcm^2$	2.90 $kgcm^2$

AM8051 | Flange code F5, motor length 1, high-performance type with forced cooling

Data for 400 V AC	AM8051-wFyz	AM8051-wJyz	AM8051-wLyz
Standstill torque	6.2 Nm	6.3 Nm	6.3 Nm
Rated torque	5.8 Nm	5.5 Nm	3.6 Nm
Rated speed	2500 min^{-1}	4750 min^{-1}	8000 min^{-1}
Rated power	1.52 kW	2.74 kW	3.02 kW
Standstill current	3.5 A	5.8 A	11.1 A
Rotor moment of inertia	2.24 $kgcm^2$	2.24 $kgcm^2$	2.24 $kgcm^2$
Rotor moment of inertia (with brake)	2.90 $kgcm^2$	2.90 $kgcm^2$	2.90 $kgcm^2$

AM8052 | Flange code F5, motor length 2

Data for 400 V AC	AM8052-wFyz	AM8052-wJyz	AM8052-wLyz
Standstill torque	8.20 Nm	8.20 Nm	8.20 Nm
Rated torque	7.50 Nm	6.90 Nm	5.40 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	7300 min^{-1}
Rated power	1.57 kW	2.89 kW	4.13 kW
Standstill current	3.30 A	6.30 A	11.3 A
Rotor moment of inertia	4.08 $kgcm^2$	4.08 $kgcm^2$	4.08 $kgcm^2$
Rotor moment of inertia (with brake)	4.74 $kgcm^2$	4.74 $kgcm^2$	4.74 $kgcm^2$

AM8052 | Flange code F5, motor length 2, high-performance type with forced cooling

Data for 400 V AC	AM8052-wGyz	AM8052-wKyz	AM8052-wNyz
Standstill torque	10.7 Nm	10.7 Nm	9.6 Nm
Rated torque	9.7 Nm	9.1 Nm	6.5 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	6000 min^{-1}
Rated power	2.03 kW	3.77 kW	4.08 kW
Standstill current	4.3 A	8.5 A	13.6 A
Rotor moment of inertia	4.08 $kgcm^2$	4.08 $kgcm^2$	4.08 $kgcm^2$
Rotor moment of inertia (with brake)	4.74 $kgcm^2$	4.74 $kgcm^2$	4.74 $kgcm^2$

AM8053 | Flange code F5, motor length 3

Data for 400 V AC	AM8053-wGyz	AM8053-wKyz	AM8053-wNyz
Standstill torque	11.4 Nm	11.4 Nm	11.4 Nm
Rated torque	10.0 Nm	8.35 Nm	4.50 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	7000 min^{-1}
Rated power	2.09 kW	3.50 kW	3.30 kW
Standstill current	4.70 A	8.80 A	15.6 A
Rotor moment of inertia	5.92 $kgcm^2$	5.92 $kgcm^2$	5.92 $kgcm^2$
Rotor moment of inertia (with brake)	7.04 $kgcm^2$	7.04 $kgcm^2$	7.04 $kgcm^2$

We reserve the right to make technical changes.

AM8053 | Flange code F5, motor length 3, high-performance type with forced cooling

Data for 400 V AC	AM8053-wJyz	AM8053-wLyz	AM8053-wPyz
Standstill torque	15.4 Nm	15.4 Nm	13.3 Nm
Rated torque	14.9 Nm	12.9 Nm	7.1 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	5000 min^{-1}
Rated power	3.12 kW	5.41 kW	3.72 kW
Standstill current	6.4 A	11.9 A	18.6 A
Rotor moment of inertia	5.92 $kgcm^2$	5.92 $kgcm^2$	5.92 $kgcm^2$
Rotor moment of inertia (with brake)	7.04 $kgcm^2$	7.04 $kgcm^2$	7.04 $kgcm^2$

AM8061 | Flange code F6, motor length 1

Data for 400 V AC	AM8061-wGyz	AM8061-wJyz	AM8061-wMyz
Standstill torque	12.8 Nm	12.8 Nm	12.8 Nm
Rated torque	12.1 Nm	11.0 Nm	9.00 Nm
Rated speed	1500 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	1.90 kW	3.46 kW	4.71 kW
Standstill current	4.00 A	7.80 A	13.1 A
Rotor moment of inertia	11.1 $kgcm^2$	11.1 $kgcm^2$	11.1 $kgcm^2$
Rotor moment of inertia (with brake)	13.4 $kgcm^2$	13.4 $kgcm^2$	13.4 $kgcm^2$

AM8061 | Flange code F6, motor length 1, high-performance type with forced cooling

Data for 400 V AC	AM8061-wHyz	AM8061-wLyz	AM8061-wNyz
Standstill torque	17.1 Nm	17.1 Nm	15.5 Nm
Rated torque	16.1 Nm	14.7 Nm	10.7 Nm
Rated speed	1400 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	2.36 kW	4.60 kW	5.60 kW
Standstill current	5.20 A	10.1 A	15.8 A
Rotor moment of inertia	11.1 $kgcm^2$	11.1 $kgcm^2$	11.1 $kgcm^2$
Rotor moment of inertia (with brake)	13.4 $kgcm^2$	13.4 $kgcm^2$	13.4 $kgcm^2$

AM8062 | Flange code F6, motor length 2

Data for 400 V AC	AM8062-wJyz	AM8062-wLyz	AM8062-wPyz
Standstill torque	21.1 Nm	21.1 Nm	21.1 Nm
Rated torque	18.50 Nm	15.2 Nm	6.50 Nm
Rated speed	1500 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	2.91 kW	4.78 kW	3.40 kW
Standstill current	6.20 A	12.4 A	20.3 A
Rotor moment of inertia	20.0 $kgcm^2$	20.0 $kgcm^2$	20.0 $kgcm^2$
Rotor moment of inertia (with brake)	22.3 $kgcm^2$	22.3 $kgcm^2$	22.3 $kgcm^2$

AM8062 | Flange code F6, motor length 2, high-performance type with forced cooling

Data for 400 V AC	AM8062-wKyz	AM8062-wNyz	AM8062-wRyz
Standstill torque	29.9 Nm	29.9 Nm	28.1 Nm
Rated torque	26.4 Nm	22.2 Nm	13.4 Nm
Rated speed	1400 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	3.87 kW	7.00 kW	7.00 kW
Standstill current	8.70 A	17.4 A	28.7 A
Rotor moment of inertia	20.0 $kgcm^2$	20.0 $kgcm^2$	20.0 $kgcm^2$
Rotor moment of inertia (with brake)	22.3 $kgcm^2$	22.3 $kgcm^2$	22.3 $kgcm^2$

We reserve the right to make technical changes.

AM8063 | Flange code F6, motor length 3

Data for 400 V AC	AM8063-wKyz	AM8063-wNyz	AM8063-wRyz
Standstill torque	29.0 Nm	29.0 Nm	29.0 Nm
Rated torque	22.3 Nm	13.2 Nm	6.10 Nm
Rated speed	1500 min^{-1}	3000 min^{-1}	4000 min^{-1}
Rated power	3.50 kW	4.15 kW	2.56 kW
Standstill current	8.70 A	17.2 A	29.5 A
Rotor moment of inertia	29.0 $kgcm^2$	29.0 $kgcm^2$	29.0 $kgcm^2$
Rotor moment of inertia (with brake)	34.9 $kgcm^2$	34.9 $kgcm^2$	34.9 $kgcm^2$

AM8063 | Flange code F6, motor length 3, high-performance type with forced cooling

Data for 400 V AC	AM8063-wLyz	AM8063-wQyz	AM8063-wTyz
Standstill torque	41.4 Nm	41.4 Nm	40.1 Nm
Rated torque	33.9 Nm	25.5 Nm	15.1 Nm
Rated speed	1400 min^{-1}	3000 min^{-1}	4000 min^{-1}
Rated power	4.97 kW	8.00 kW	6.30 kW
Standstill current	11.6 A	24.0 A	39.8 A
Rotor moment of inertia	29.0 $kgcm^2$	29.0 $kgcm^2$	29.0 $kgcm^2$
Rotor moment of inertia (with brake)	34.9 $kgcm^2$	34.9 $kgcm^2$	34.9 $kgcm^2$

AM8071 | Flange code F7, motor length 1

Data for 400 V AC	AM8071-wKyz	AM8071-wNyz	AM8071-wRyz
Standstill torque	31.8 Nm	31.8 Nm	29.0 Nm
Rated torque	26.5 Nm	19.5 Nm	8.00 Nm
Rated speed	1500 min^{-1}	3000 min^{-1}	4000 min^{-1}
Rated power	4.16 kW	6.13 kW	3.35 kW
Standstill current	9.60 A	17.8 A	28.2 A
Rotor moment of inertia	49.6 $kgcm^2$	49.6 $kgcm^2$	49.6 $kgcm^2$
Rotor moment of inertia (with brake)	68.3 $kgcm^2$	68.3 $kgcm^2$	68.3 $kgcm^2$

AM8071 | Flange code F7, motor length 1, high-performance type with forced cooling

Data for 400 V AC	AM8071-wMyz	AM8071-wPyz	AM8071-wTyz
Standstill torque	42.8 Nm	42.8 Nm	41.2 Nm
Rated torque	36.2 Nm	29.2 Nm	18.1 Nm
Rated speed	1500 min^{-1}	2900 min^{-1}	4000 min^{-1}
Rated power	5.70 kW	8.90 kW	7.60 kW
Standstill current	12.6 A	23.8 A	41.1 A
Rotor moment of inertia	49.6 $kgcm^2$	49.6 $kgcm^2$	49.6 $kgcm^2$
Rotor moment of inertia (with brake)	68.3 $kgcm^2$	68.3 $kgcm^2$	68.3 $kgcm^2$

AM8072 | Flange code F7, motor length 2

Data for 400 V AC	AM8072-wLyz	AM8072-wPyz	AM8072-wTyz
Standstill torque	54.6 Nm	54.6 Nm	50.0 Nm
Rated torque	48.9 Nm	38.2 Nm	13.0 Nm
Rated speed	1000 min^{-1}	2000 min^{-1}	3000 min^{-1}
Rated power	5.12 kW	8.00 kW	4.08 kW
Standstill current	11.1 A	20.6 A	39.0 A
Rotor moment of inertia	92.3 $kgcm^2$	92.3 $kgcm^2$	92.3 $kgcm^2$
Rotor moment of inertia (with brake)	110.9 $kgcm^2$	110.9 $kgcm^2$	110.9 $kgcm^2$

We reserve the right to make technical changes.

AM8072 | Flange code F7, motor length 2, high-performance type with forced cooling

Data for 400 V AC	AM8072-wNyz	AM8072-wRyz	AM8072-wUyz
Standstill torque	80.7 Nm	80.7 Nm	74.0 Nm
Rated torque	72.6 Nm	60.1 Nm	33.8 Nm
Rated speed	1000 min^{-1}	2000 min^{-1}	3000 min^{-1}
Rated power	7.6 kW	12.6 kW	10.6 kW
Standstill current	16.1 A	29.2 A	53.0 A
Rotor moment of inertia	92.2 $kgcm^2$	92.2 $kgcm^2$	92.2 $kgcm^2$
Rotor moment of inertia (with brake)	111 $kgcm^2$	111 $kgcm^2$	111 $kgcm^2$

AM8073 | Flange code F7, motor length 3

Data for 400 V AC	AM8073-wNyz	AM8073-wQyz	AM8073-wTyz
Standstill torque	72.6 Nm	72.6 Nm	70.0 Nm
Rated torque	58.5 Nm	38.8 Nm	10.8 Nm
Rated speed	1000 min^{-1}	2000 min^{-1}	3000 min^{-1}
Rated power	6.13 kW	8.13 kW	3.39 kW
Standstill current	14.7 A	27.9 A	45.6 A
Rotor moment of inertia	134.9 $kgcm^2$	134.9 $kgcm^2$	134.9 $kgcm^2$
Rotor moment of inertia (with brake)	153.6 $kgcm^2$	153.6 $kgcm^2$	153.6 $kgcm^2$

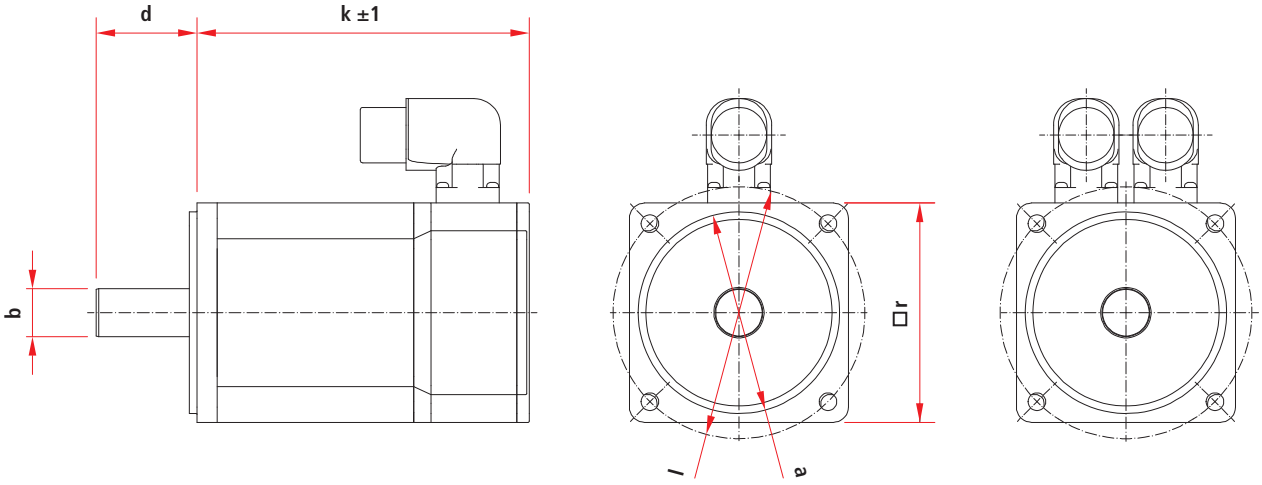
AM8073 | Flange code F7, motor length 3, high-performance type with forced cooling

Data for 400 V AC	AM8073-wPyz	AM8073-wRyz	AM8073-wUyz
Standstill torque	104 Nm	104 Nm	95.0 Nm
Rated torque	83.7 Nm	63.3 Nm	17.8 Nm
Rated speed	1000 min^{-1}	2000 min^{-1}	3000 min^{-1}
Rated power	8.8 kW	13.3 kW	5.60 kW
Standstill current	19.8 A	37.4 A	66.5 A
Rotor moment of inertia	135 $kgcm^2$	135 $kgcm^2$	135 $kgcm^2$
Rotor moment of inertia (with brake)	154 $kgcm^2$	154 $kgcm^2$	154 $kgcm^2$

Order reference	AM80uv-wxyz
u	flange code F
v	motor length
w = 0	smooth shaft
w = 1	shaft with groove and feather key according to DIN 6885
w = 2	shaft with IP 65 sealing ring and smooth shaft (not for AM801x)
w = 3	shaft with IP 65 sealing ring and shaft with groove and feather key (not for AM801x)
x	winding code A…Z
y = 0	2-cable standard: feedback resolver (not for AM801x)
y = 1	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, single-turn, absolute position within one revolution, 18 bit resolution
y = 2	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, multi-turn, absolute position within 4096 revolutions, 18 bit resolution
y = 4	2-cable standard: feedback multi-turn, absoulte encoder SKM36, 128 sincos periods (only for AM806x and AM807x)
y = A	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, single-turn, absolute position within one revolution, resolution 23 bit (only for AM803x to AM807x and AM853x to AM856x)
y = B	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, multi-turn, absolute position within 4096 revolutions, resolution 23 bit (only for AM803x to AM807x and AM853x to AM856x)
z = 0	without holding brake
z = 1	with holding brake
z = A	forced cooling, without holding brake, for AM805x, AM806x, AM807x [1]
z = B	forced cooling, with holding brake, for AM805x, AM806x, AM807x [1]

[1] The EL2022 356 or KL2022 635 digital output terminal with matching ZK4054-6400-xxxx supply cable is recommended for controlling the external 24 V DC ventilation.

We reserve the right to make technical changes.



One Cable Technology

Resolver version

Dimensions	a	b	d	l	r	k (without brake)	k (with brake)
AM8011	30 h7	8 h7	25 mm	46 mm	40 mm	97 mm	129 mm
AM8012	30 h7	8 h7	25 mm	46 mm	40 mm	117 mm	149 mm
AM8013	30 h7	8 h7	25 mm	46 mm	40 mm	137 mm	169 mm
AM8021	40 j6	9 k6	20 mm	63 mm	58 mm	111.5 mm	146 mm
AM8022	40 j6	9 k6	20 mm	63 mm	58 mm	133.5 mm	168 mm
AM8023	40 j6	9 k6	20 mm	63 mm	58 mm	155.5 mm	190 mm
AM8031	60 j6	14 k6	30 mm	75 mm	72 mm	129 mm	168 mm
AM8032	60 j6	14 k6	30 mm	75 mm	72 mm	154 mm	194 mm
AM8033	60 j6	14 k6	30 mm	75 mm	72 mm	180 mm	229 mm
AM8041	80 j6	19 k6	40 mm	100 mm	87 mm	132 mm	179.5 mm
AM8042	80 j6	19 k6	40 mm	100 mm	87 mm	162 mm	209.5 mm
AM8043	80 j6	19 k6	40 mm	100 mm	87 mm	192 mm	239.5 mm
AM8051	95 j6	24 k6	50 mm	115 mm	104 mm	136.5 mm	183.5 mm
AM8051*	95 j6	24 k6	50 mm	115 mm	104 mm	209 mm	256 mm
AM8052	95 j6	24 k6	50 mm	115 mm	104 mm	169.5 mm	216.5 mm
AM8052*	95 j6	24 k6	50 mm	115 mm	104 mm	242 mm	289 mm
AM8053	95 j6	24 k6	50 mm	115 mm	104 mm	202.5 mm	251.5 mm
AM8053*	95 j6	24 k6	50 mm	115 mm	104 mm	275 mm	324 mm
AM8061	130 j6	32 k6	58 mm	165 mm	142 mm	176 mm	228 mm
AM8061*	130 j6	32 k6	58 mm	165 mm	142 mm	259 mm	311 mm
AM8062	130 j6	32 k6	58 mm	165 mm	142 mm	216 mm	268 mm
AM8062*	130 j6	32 k6	58 mm	165 mm	142 mm	299 mm	351 mm
AM8063	130 j6	32 k6	58 mm	165 mm	142 mm	256 mm	315 mm
AM8063*	130 j6	32 k6	58 mm	165 mm	142 mm	339 mm	398 mm
AM8071	180 j6	38 k6	80 mm	215 mm	194 mm	212 mm	284.5 mm
AM8071*	180 j6	38 k6	80 mm	215 mm	194 mm	322.5 mm	395 mm
AM8072	180 j6	38 k6	80 mm	215 mm	194 mm	269 mm	341.5 mm
AM8072*	180 j6	38 k6	80 mm	215 mm	194 mm	379.5 mm	452 mm
AM8073	180 j6	38 k6	80 mm	215 mm	194 mm	326 mm	398.5 mm
AM8073*	180 j6	38 k6	80 mm	215 mm	194 mm	436.5 mm	509 mm

* high-performance type: oversize caused by fan, see dimension "k"

▶AM80xx

We reserve the right to make technical changes.

AM8500 | Synchronous Servomotors with higher moment of inertia

The AM8500 series extends the servomotor range by a complete series with increased rotor moment of inertia. Due to the modified rotor geometry it is increased, depending on the length, by 100 to 300 % compared to the AM8000 servomotors. The AM8500 series covers a wide performance range with four sizes and three lengths with standstill torques from 1.37 to 29 Nm. A particular highlight, as with all servomotors from the AM8000 series, is the One Cable Technology (OCT) that combines power and feedback system in the standard motor cable.

Due to the high rotor inertia, control of the AM8500 is simplified in areas in which a high external inertia has to be moved, e.g. CNC applications in machine tools and woodworking machines. The servomotors tend to vibrate less and are much easier to adjust to the application on the servo controller. Where the ratio of external to inherent inertia has previously required a gearbox, this can now be dispensed with in some cases. Typical areas of application for the AM8500 servomotors are in woodworking machines, printing machines and machine tools as well as in film winders and feeding drive units.

In the forced cooling version the power density of the AM8500 motor series is thus increased further thanks to the external axial ventilation of the servomotors: the standstill torques can be increased by about 35 %; the rated torques at the rated speed even by up to 150 %. In this version the servomotor series offers high torques even at high speeds. Cooling takes place with a 24 V DC fan, which is actuated independently of the motor.In the forced cooling version all further options are available in accordance with the order data such as OCT or backlash-free permanent magnet holding brake. The forced cooling option is available for AM855x and AM856x.

Planetary gear units
see page 901

Pre-assembled cables
see page 878

Technical data	AM85xx
Motor type	permanent magnet-excited three-phase synchronous motor
Magnet material	neodymium-iron-boron
Insulation class	thermal class F (155 °C)
Design form	flange-mounted according to IM B5, IM V1, IM V3
Protection class	IP 54, IP 65 (shaft seal)
Cooling	convection, permissible ambient temperature 40 °C, optionally: external axial ventilation
Coating/surface	dark grey powder coating, similar to RAL7016
Temperature sensor	KTY in stator winding
Connection method	round plug connector, swivelling, angled
Life span	L_{10h} = 30,000 hrs for ball bearings
Approvals	CE, UL
Feedback system	absolute encoder single-turn and multi-turn (OCT), resolver

We reserve the right to make technical changes.

AM8531 | Flange code F3, motor length 1

Data for 400 V AC	AM8531-wCyz	AM8531-wDyz	AM8531-wFyz
Standstill torque	1.37 Nm	1.38 Nm	1.40 Nm
Rated torque	1.34 Nm	1.33 Nm	1.30 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	9000 min^{-1}
Rated power	0.42 kW	0.84 kW	1.23 kW
Standstill current	1.00 A	1.95 A	3.20 A
Rotor moment of inertia	1.67 $kgcm^2$	1.67 $kgcm^2$	1.67 $kgcm^2$
Rotor moment of inertia (with brake)	1.76 $kgcm^2$	1.76 $kgcm^2$	1.76 $kgcm^2$

AM8532 | Flange code F3, motor length 2

Data for 400 V AC	AM8532-wDyz	AM8532-wEyz	AM8532-wHyz
Standstill torque	2.38 Nm	2.37 Nm	2.37 Nm
Rated torque	2.30 Nm	2.20 Nm	1.85 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	9000 min^{-1}
Rated power	0.72 kW	1.38 kW	1.74 kW
Standstill current	1.70 A	2.95 A	5.10 A
Rotor moment of inertia	2.05 $kgcm^2$	2.05 $kgcm^2$	2.05 $kgcm^2$
Rotor moment of inertia (with brake)	2.15 $kgcm^2$	2.15 $kgcm^2$	2.15 $kgcm^2$

AM8533 | Flange code F3, motor length 3

Data for 400 V AC	AM8533-wEyz	AM8533-wFyz	AM8533-wJyz
Standstill torque	3.20 Nm	3.22 Nm	3.22 Nm
Rated torque	2.98 Nm	2.70 Nm	2.30 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	9000 min^{-1}
Rated power	0.94 kW	1.70 kW	2.17 kW
Standstill current	2.10 A	4.10 A	6.80 A
Rotor moment of inertia	2.44 $kgcm^2$	2.44 $kgcm^2$	2.44 $kgcm^2$
Rotor moment of inertia (with brake)	–	–	–

AM8541 | Flange code F4, motor length 1

Data for 400 V AC	AM8541-wDyz	AM8541-wEyz	AM8541-wHyz
Standstill torque	2.37 Nm	2.45 Nm	2.40 Nm
Rated torque	2.30 Nm	2.31 Nm	2.10 Nm
Rated speed	3000 min^{-1}	6000 min^{-1}	8000 min^{-1}
Rated power	0.72 kW	1.45 kW	1.76 kW
Standstill current	1.65 A	3.00 A	5.25 A
Rotor moment of inertia	4.63 $kgcm^2$	4.63 $kgcm^2$	4.63 $kgcm^2$
Rotor moment of inertia (with brake)	5.27 $kgcm^2$	5.27 $kgcm^2$	5.27 $kgcm^2$

AM8542 | Flange code F4, motor length 2

Data for 400 V AC	AM8542-wEyz	AM8542-wFyz	AM8542-wJyz
Standstill torque	4.10 Nm	4.10 Nm	4.10 Nm
Rated torque	3.90 Nm	3.70 Nm	3.10 Nm
Rated speed	2500 min^{-1}	5000 min^{-1}	8000 min^{-1}
Rated power	1.02 kW	1.94 kW	2.60 kW
Standstill current	2.15 A	4.10 A	6.90 A
Rotor moment of inertia	5.53 $kgcm^2$	5.53 $kgcm^2$	5.53 $kgcm^2$
Rotor moment of inertia (with brake)	6.16 $kgcm^2$	6.16 $kgcm^2$	6.16 $kgcm^2$

We reserve the right to make technical changes.

AM8543 | Flange code F4, motor length 3

Data for 400 V AC	AM8543-wEyz	AM8543-wHyz	AM8543-wKyz
Standstill torque	5.65 Nm	5.65 Nm	5.60 Nm
Rated torque	5.30 Nm	4.90 Nm	4.10 Nm
Rated speed	2500 min^{-1}	5000 min^{-1}	8000 min^{-1}
Rated power	1.39 kW	2.57 kW	3.43 kW
Standstill current	2.90 A	5.40 A	9.30 A
Rotor moment of inertia	6.43 $kgcm^2$	6.43 $kgcm^2$	6.43 $kgcm^2$
Rotor moment of inertia (with brake)	–	–	–

AM8551 | Flange code F5, motor length 1

Data for 400 V AC	AM8551-wEyz	AM8551-wGyz	AM8551-wKyz
Standstill torque	4.80 Nm	4.90 Nm	4.90 Nm
Rated torque	4.60 Nm	4.40 Nm	3.90 Nm
Rated speed	2500 min^{-1}	5000 min^{-1}	8000 min^{-1}
Rated power	1.20 kW	2.30 kW	3.27 kW
Standstill current	2.70 A	4.75 A	8.50 A
Rotor moment of inertia	8.74 $kgcm^2$	8.74 $kgcm^2$	8.74 $kgcm^2$
Rotor moment of inertia (with brake)	9.40 $kgcm^2$	9.40 $kgcm^2$	9.40 $kgcm^2$

AM8551 | Flange code F5, motor length 1, high-performance type with forced cooling

Data for 400 V AC	AM8551-wFyz	AM8551-wJyz	AM8551-wLyz
Standstill torque	6.20 Nm	6.30 Nm	6.30 Nm
Rated torque	5.8 Nm	5.5 Nm	3.6 Nm
Rated speed	2500 min^{-1}	4750 min^{-1}	8000 min^{-1}
Rated power	1.52 kW	2.74 kW	3.02 kW
Standstill current	3.5 A	5.8 A	11.1 A
Rotor moment of inertia	8.74 $kgcm^2$	8.74 $kgcm^2$	8.74 $kgcm^2$
Rotor moment of inertia (with brake)	9.40 $kgcm^2$	9.40 $kgcm^2$	9.40 $kgcm^2$

AM8552 | Flange code F5, motor length 2

Data for 400 V AC	AM8552-wFyz	AM8552-wJyz	AM8552-wLyz
Standstill torque	8.20 Nm	8.20 Nm	8.20 Nm
Rated torque	7.50 Nm	6.90 Nm	5.40 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	7300 min^{-1}
Rated power	1.57 kW	2.89 kW	4.13 kW
Standstill current	3.30 A	6.30 A	11.3 A
Rotor moment of inertia	10.6 $kgcm^2$	10.6 $kgcm^2$	10.6 $kgcm^2$
Rotor moment of inertia (with brake)	11.2 $kgcm^2$	11.2 $kgcm^2$	11.2 $kgcm^2$

AM8552 | Flange code F5, motor length 2, high-performance type with forced cooling

Data for 400 V AC	AM8552-wGyz	AM8552-wKyz	AM8552-wNyz
Standstill torque	10.7 Nm	10.7 Nm	9.6 Nm
Rated torque	9.7 Nm	9.1 Nm	6.5 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	6000 min^{-1}
Rated power	2.03 kW	3.77 kW	4.08 kW
Standstill current	4.3 A	8.5 A	13.6 A
Rotor moment of inertia	10.6 $kgcm^2$	10.6 $kgcm^2$	10.6 $kgcm^2$
Rotor moment of inertia (with brake)	11.2 $kgcm^2$	11.2 $kgcm^2$	11.2 $kgcm^2$

We reserve the right to make technical changes.

AM8553 | Flange code F5, motor length 3

Data for 400 V AC	AM8553-wGyz	AM8553-wKyz	AM8553-wNyz
Standstill torque	11.4 Nm	11.4 Nm	11.4 Nm
Rated torque	10.0 Nm	8.35 Nm	4.50 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	7000 min^{-1}
Rated power	2.09 kW	3.50 kW	3.30 kW
Standstill current	4.70 A	8.80 A	15.6 A
Rotor moment of inertia	12.5 $kgcm^2$	12.5 $kgcm^2$	12.5 $kgcm^2$
Rotor moment of inertia (with brake)	–	–	–

AM8553 | Flange code F5, motor length 3, high-performance type with forced cooling

Data for 400 V AC	AM8553-wJyz	AM8553-wLyz	AM8553-wPyz
Standstill torque	15.4 Nm	15.4 Nm	13.3 Nm
Rated torque	14.9 Nm	12.9 Nm	7.1 Nm
Rated speed	2000 min^{-1}	4000 min^{-1}	5000 min^{-1}
Rated power	3.12 kW	5.41 kW	3.72 kW
Standstill current	6.4 A	11.9 A	18.6 A
Rotor moment of inertia	12.5 $kgcm^2$	12.5 $kgcm^2$	12.5 $kgcm^2$
Rotor moment of inertia (with brake)	–	–	–

AM8561 | Flange code F6, motor length 1

Data for 400 V AC	AM8561-wGyz	AM8561-wJyz	AM8561-wMyz
Standstill torque	12.8 Nm	12.8 Nm	12.8 Nm
Rated torque	12.1 Nm	11.0 Nm	9.00 Nm
Rated speed	1500 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	1.90 kW	3.46 kW	4.71 kW
Standstill current	4.00 A	7.80 A	13.1 A
Rotor moment of inertia	48.2 $kgcm^2$	48.2 $kgcm^2$	48.2 $kgcm^2$
Rotor moment of inertia (with brake)	50.6 $kgcm^2$	50.6 $kgcm^2$	50.6 $kgcm^2$

AM8561 | Flange code F6, motor length 1, high-performance type with forced cooling

Data for 400 V AC	AM8561-wHyz	AM8561-wLyz	AM8561-wNyz
Standstill torque	17.1 Nm	17.1 Nm	15.5 Nm
Rated torque	16.1 Nm	14.7 Nm	10.7 Nm
Rated speed	1400 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	2.36 kW	4.60 kW	5.60 kW
Standstill current	5.20 A	10.1 A	15.8 A
Rotor moment of inertia	48.2 $kgcm^2$	48.2 $kgcm^2$	48.2 $kgcm^2$
Rotor moment of inertia (with brake)	50.6 $kgcm^2$	50.6 $kgcm^2$	50.6 $kgcm^2$

AM8562 | Flange code F6, motor length 2

Data for 400 V AC	AM8562-wJyz	AM8562-wLyz	AM8562-wPyz
Standstill torque	21.1 Nm	21.1 Nm	21.1 Nm
Rated torque	18.5 Nm	15.2 Nm	6.50 Nm
Rated speed	1500 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	2.91 kW	4.78 kW	3.40 kW
Standstill current	6.20 A	12.4 A	20.3 A
Rotor moment of inertia	57.1 $kgcm^2$	57.1 $kgcm^2$	57.1 $kgcm^2$
Rotor moment of inertia (with brake)	59.6 $kgcm^2$	59.6 $kgcm^2$	59.6 $kgcm^2$

We reserve the right to make technical changes.

AM8562 | Flange code F6, motor length 2, high-performance type with forced cooling

Data for 400 V AC	AM8562-wKyz	AM8562-wNyz	AM8562-wRyz
Standstill torque	29.9 Nm	29.9 Nm	28.1 Nm
Rated torque	26.4 Nm	22.2 Nm	13.4 Nm
Rated speed	1400 min^{-1}	3000 min^{-1}	5000 min^{-1}
Rated power	3.87 kW	7.00 kW	7.00 kW
Standstill current	8.70 A	17.4 A	28.7 A
Rotor moment of inertia	57.1 $kgcm^2$	57.1 $kgcm^2$	57.1 $kgcm^2$
Rotor moment of inertia (with brake)	59.6 $kgcm^2$	59.6 $kgcm^2$	59.6 $kgcm^2$

AM8563 | Flange code F6, motor length 3

Data for 400 V AC	AM8563-wKyz	AM8563-wNyz	AM8563-wRyz
Standstill torque	29.0 Nm	29.0 Nm	29.0 Nm
Rated torque	22.3 Nm	13.2 Nm	6.10 Nm
Rated speed	1500 min^{-1}	3000 min^{-1}	4000 min^{-1}
Rated power	3.50 kW	4.15 kW	2.56 kW
Standstill current	8.70 A	17.2 A	29.5 A
Rotor moment of inertia	66.1 $kgcm^2$	66.1 $kgcm^2$	66.1 $kgcm^2$
Rotor moment of inertia (with brake)	–	–	–

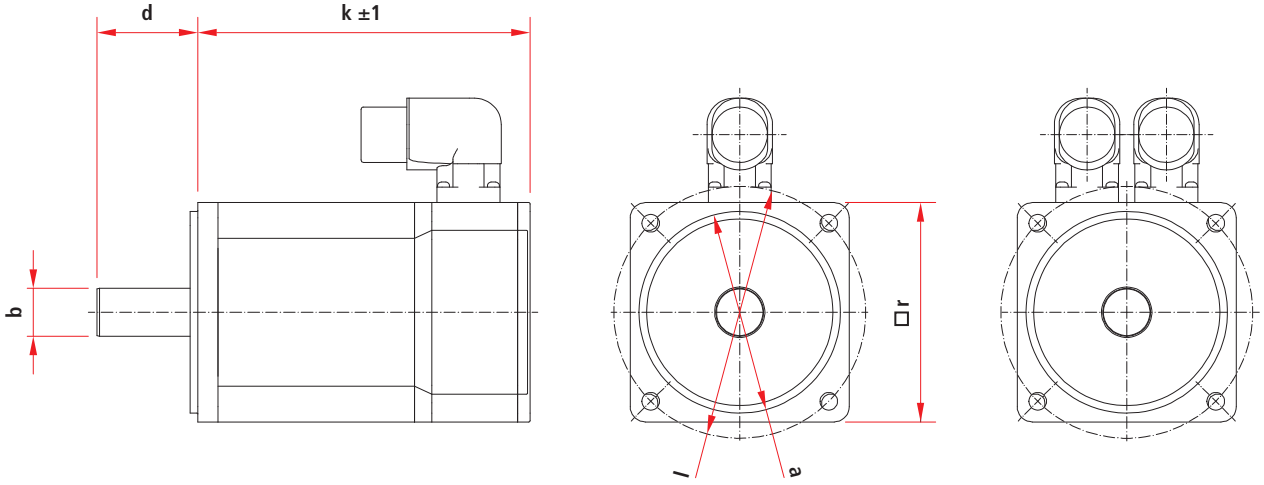
AM8563 | Flange code F6, motor length 3, high-performance type with forced cooling

Data for 400 V AC	AM8563-wLyz	AM8563-wQyz	AM8563-wTyz
Standstill torque	41.4 Nm	41.4 Nm	40.1 Nm
Rated torque	33.9 Nm	25.5 Nm	15.1 Nm
Rated speed	1400 min^{-1}	3000 min^{-1}	4000 min^{-1}
Rated power	4.97 kW	8.00 kW	6.30 kW
Standstill current	11.6 A	24.0 A	39.8 A
Rotor moment of inertia	66.1 $kgcm^2$	66.1 $kgcm^2$	66.1 $kgcm^2$
Rotor moment of inertia (with brake)	–	–	–

Order reference	AM85uv-wxyz
u	flange code F
v	motor length
w = 0	smooth shaft
w = 1	shaft with groove and feather key according to DIN 6885
w = 2	shaft with IP 65 sealing ring and smooth shaft
w = 3	shaft with IP 65 sealing ring and shaft with groove and feather key
x	winding code A…Z
y = 0	2-cable standard: feedback resolver
y = 1	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, single-turn, absolute position within one revolution, 18 bit resolution
y = 2	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, multi-turn, absolute position within 4096 revolutions, 18 bit resolution
y = 4	2-cable standard: feedback multi-turn, absoulte encoder SKM36, 128 sincos periods (only for AM856x)
y = A	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, single-turn, absolute position within one revolution, resolution 23 bit
y = B	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, multi-turn, absolute position within 4096 revolutions, resolution 23 bit
z = 0	without holding brake
z = 1	with holding brake (not available for AM8533, AM8543, AM8553 and AM8563)
z = A	forced cooling, without holding brake, for AM855x, AM856x [1]
z = B	forced cooling, with holding brake, for AM855x, AM856x (not available for AM8553 and AM8563) [1]

[1] The EL2022 356 or KL2022 635 digital output terminal with matching ZK4054-6400-xxxx supply cable is recommended for controlling the external 24 V DC ventilation.

We reserve the right to make technical changes.



One Cable Technology

Resolver version

Dimensions	a	b	d	l	r	k (without brake)	k (with brake)
AM8531	60 j6	14 k6	30 mm	75 mm	72 mm	168 mm	194 mm
AM8532	60 j6	14 k6	30 mm	75 mm	72 mm	194 mm	229 mm
AM8533	60 j6	14 k6	30 mm	75 mm	72 mm	229 mm	–
AM8541	80 j6	19 k6	40 mm	100 mm	87 mm	179.5 mm	209.5 mm
AM8542	80 j6	19 k6	40 mm	100 mm	87 mm	209.5 mm	239.5 mm
AM8543	80 j6	19 k6	40 mm	100 mm	87 mm	239.5 mm	–
AM8551	95 j6	24 k6	50 mm	115 mm	104 mm	183.5 mm	216.5 mm
AM8551*	95 j6	24 k6	50 mm	115 mm	104 mm	256 mm	289 mm
AM8552	95 j6	24 k6	50 mm	115 mm	104 mm	216.5 mm	251.5 mm
AM8552*	95 j6	24 k6	50 mm	115 mm	104 mm	289 mm	324 mm
AM8553	95 j6	24 k6	50 mm	115 mm	104 mm	251.5 mm	–
AM8553*	95 j6	24 k6	50 mm	115 mm	104 mm	324 mm	–
AM8561	130 j6	32 k6	58 mm	165 mm	142 mm	228 mm	268 mm
AM8561*	130 j6	32 k6	58 mm	165 mm	142 mm	311 mm	351 mm
AM8562	130 j6	32 k6	58 mm	165 mm	142 mm	268 mm	315 mm
AM8562*	130 j6	32 k6	58 mm	165 mm	142 mm	351 mm	398 mm
AM8563	130 j6	32 k6	58 mm	165 mm	142 mm	315 mm	–
AM8563*	130 j6	32 k6	58 mm	165 mm	142 mm	398 mm	–

* high-performance type: oversize caused by fan, see dimension "k"

▶AM85xx

We reserve the right to make technical changes.

AG2300 | High-end gear series for AM8000 and AM8500 servomotors

The low-backlash, high-performance planetary gear units of the AG2300 series offer high torque, low torsional backlash and a very low noise level in all 14 gear ratios. The high-end gear units for the AM8000 and AM8500 servomotors have a high power density and are able to absorb high radial and axial forces. The high quality and running smoothness of this helical gear unit series meet the highest control quality demands.

The MF standard variant allows high positioning accuracy and highly dynamic operating cycles (duty cycle < 60 %). The high-speed MC variant is suited for positioning with high nominal speeds in continuous operation (duty cycle > 60 %).

The gear units of the AG2300 series are perfectly matched to the AM8000 and AM8500 motor series. The inertia ratios, the required torques and the suitable motors can be conveniently calculated directly in TwinCAT with the TC Motion Designer. In addition, the tool checks in a single step whether the selected motor can be adapted to the gear unit. The planetary gear units are fitted to the respective motor in the factory and delivered as a complete motor/gear unit.

Features

- standard version MF for high positioning quality in highly dynamic operating cycles
- high-speed version MC for high speeds in continuous operation
- low-backlash planetary gear unit with output shaft
- absolutely maintenance-free, thanks to unique lubrication concept
- high axial and radial forces
- long service life (MF > 20,000 h, MC > 30,000 h)
- maximum efficiency
- maximum power density
- low running noise and smooth running thanks to helical gearing
- flexible installation position
- output shaft with feather key or smooth shaft
- available in 7 or 6 sizes
  - MF: SP060 to SP240
  - MC: SP075 to SP240
- 14 gear ratios, i = 3, 4, 5, 7, 10 (single-stage), i = 16, 20, 25, 28, 35, 40, 50, 70, 100 (two-stage)
- acceleration torques between 30 and 4500 Nm
- low torsional backlash (1…8 arcmin)

Technical data	AG2300
Type of gear	planetary gear with two variants
Variant	MF (standard), MC (high-speed)
Life span	MF > 20,000 h/MC > 30,000 h
Coating/surface	RAL7016 (grey)
Ambient temperature	-15…+40 °C
Lubrication	lubricated for life
Installation position	variable
Protection class	IP 65
Mechanically compatible with	flange code F (typical combination according to specifications)

We reserve the right to make technical changes.

AG2300 | **Size 060**

Technical data	AG2300-+SP060S-MF1-i	AG2300-+SP060S-MF2-i
Variant	standard MF	standard MF
Gear ratio	3/4/5/7/10	16/20/25/28/35/40/50/70/100
Nominal output torque	17…26 Nm	17…26 Nm
Max. acceleration torque	30…42 Nm	32…42 Nm
Max. torsion. backlash standard/reduced	≤ 4/2 arcmin	≤ 6/4 arcmin
Typ. flange code	F2, F3	F2, F3

AG2300 | **Size 075**

Technical data	AG2300-+SP075S-MF1-i	AG2300-+SP075S-MF2-i	AG2300-+SP075S-MC1-i	AG2300-+SP075S-MC2-i
Variant	standard MF	standard MF	high-speed MC	high-speed MC
Gear ratio	3/4/5/7/10	16/20/25/28/35/40/50/70/100	3/4/5/7/10	16/20/25/28/35/40/50/70/100
Nominal output torque	47…75 Nm	52…75 Nm	28…48 Nm	30…60 Nm
Max. acceleration torque	85…110 Nm	90…110 Nm	68…90 Nm	70…90 Nm
Max. torsion. backlash standard/reduced	≤ 4/2 arcmin	≤ 6/4 arcmin	≤ 6/4 arcmin	≤ 8/6 arcmin
Typ. flange code	F3, F4, F5	F3, F4	F3, F4, F5	F3, F4

AG2300 | **Size 100**

Technical data	AG2300-+SP100S-MF1-i	AG2300-+SP100S-MF2-i	AG2300-+SP100S-MC1-i	AG2300-+SP100S-MC2-i
Variant	standard MF	standard MF	high-speed MC	high-speed MC
Gear ratio	3/4/5/7/10	16/20/25/28/35/40/50/70/100	3/4/5/7/10	16/20/25/28/35/40/50/70/100
Nominal output torque	120…180 Nm	120…180 Nm	70…105 Nm	80…140 Nm
Max. acceleration torque	235…315 Nm	235…315 Nm	180…240 Nm	180…240 Nm
Max. torsion. backlash standard/reduced	≤ 3/1 arcmin	≤ 5/3 arcmin	≤ 4/2 arcmin	≤ 6/4 arcmin
Typ. flange code	F4, F5, F6	F3, F4, F5	F4, F5, F6	F3, F4, F5

AG2300 | **Size 140**

Technical data	AG2300-+SP140S-MF1-i	AG2300-+SP140S-MF2-i	AG2300-+SP140S-MC1-i	AG2300-+SP140S-MC2-i
Variant	standard MF	standard MF	high-speed MC	high-speed MC
Gear ratio	3/4/5/7/10	16/20/25/28/35/40/50/70/100	3/4/5/7/10	16/20/25/28/35/40/50/70/100
Nominal output torque	200…360 Nm	220…360 Nm	130…210 Nm	180…290 Nm
Max. acceleration torque	390…660 Nm	530…660 Nm	310…480 Nm	380…480 Nm
Max. torsion. backlash standard/reduced	≤ 3/1 arcmin	≤ 5/3 arcmin	≤ 4/2 arcmin	≤ 6/4 arcmin
Typ. flange code	F5, F6, F7	F4, F5, F6	F5, F6, F7	F4, F5, F6

AG2300 | **Size 180**

Technical data	AG2300-+SP180S-MF1-i	AG2300-+SP180S-MF2-i	AG2300-+SP180S-MC1-i	AG2300-+SP180S-MC2-i
Variant	standard MF	standard MF	high-speed MC	high-speed MC
Gear ratio	3/4/5/7/10	16/20/25/28/35/40/50/70/100	3/4/5/7/10	16/20/25/28/35/40/50/70/100
Nominal output torque	530…750 Nm	750 Nm	290…450 Nm	600 Nm
Max. acceleration torque	970…1210 Nm	970…1210 Nm	700…880 Nm	700…880 Nm
Max. torsion. backlash standard/reduced	≤ 3/1 arcmin	≤ 5/3 arcmin	≤ 4/2 arcmin	≤ 6/4 arcmin
Typ. flange code	F6, F7	F5, F6	F6, F7	F5, F6, F7

We reserve the right to make technical changes.

AG2300 | **Size 210**

Technical data	AG2300-+SP210S-MF1-i	AG2300-+SP210S-MF2-i	AG2300-+SP210S-MC1-i	AG2300-+SP210S-MC2-i
Variant	standard MF	standard MF	high-speed MC	high-speed MC
Gear ratio	3/4/5/7/10	16/20/25/28/35/ 40/50/70/100	3/4/5/7/10	16/20/25/28/35/ 40/50/70/100
Nominal output torque	1000…1500 Nm	1000…1500 Nm	800…1300 Nm	780…1000 Nm
Max. acceleration torque	1600…2500 Nm	1900…2500 Nm	1200…2000 Nm	1040…2000 Nm
Max. torsion. backlash standard/reduced	≤ 3/1 arcmin	≤ 5/3 arcmin	≤ 4/2 arcmin	≤ 5/4 arcmin
Typ. flange code	F7	F7	F7	F7

AG2300 | **Size 240**

Technical data	AG2300-+SP240S-MF1-i	AG2300-+SP240S-MF2-i	AG2300-+SP240S-MC1-i	AG2300-+SP240S-MC2-i
Variant	standard MF	standard MF	high-speed MC	high-speed MC
Gear ratio	3/4/5/7/10	16/20/25/28/35/ 40/50/70/100	3/4/5/7/10	16/20/25/28/35/ 40/50/70/100
Nominal output torque	1500…2500 Nm	1700…2500 Nm	1100…1960 Nm	1100…1930 Nm
Max. acceleration torque	2750…4500 Nm	3400…4500 Nm	1750…3600 Nm	1800…3600 Nm
Max. torsion. backlash standard/reduced	≤ 3/1 arcmin	≤ 5/3 arcmin	≤ 4/2 arcmin	≤ 5/4 arcmin
Typ. flange code	F7, AM308x	F7, AM308x	F7, AM308x	F7, AM308x

Order reference	AG2300-+SPaaaS-Mvs-i-wXy-Motorsize
aaa	series/size (060, 075, 100, 140, 180, 210, 240)
v = F	standard version for high positioning quality in highly dynamic operating cycles
v = C	high-speed version for high speeds in continuous operation
s = 1	1-stage with i = 3/4/5/7/10
s = 2	2-stage with i = 16/20/25/28/35/40/50/70/100
i	gear ratio
w = 0	smooth shaft
w = 1	shaft with groove and feather key
X	identifying letter for clamping hub diameter; not available for selection, is selected automatically based on the respective motor
y = 0	reduced torsional backlash
y = 1	standard torsional backlash
Motorsize	Specifies adapter unit between motor and gearbox. Correlates to motor flange code F or flange compatible motor type.
Motorsize = AM801x (F1)	flange code F1: AM801x; compatible with AM301x
Motorsize = AM802x (F2)	flange code F2: AM802x; compatible with AM302x
Motorsize = AM803x (F3)	flange code F3: AM803x, AM853x; compatible with AM303x
Motorsize = AM804x (F4)	flange code F4: AM804x, AM854x; compatible with AM304x
Motorsize = AM805x (F5)	flange code F5: AM805x, AM855x
Motorsize = AM305x	in combination with AM305x
Motorsize = AM806x (F6)	flange code F6: AM806x, AM856x; compatible with AM306x
Motorsize = AM807x (F7)	flange code F7: AM807x; compatible with AM307x
Motorsize = AM308x	in combination with AM308x

▶AG2300

We reserve the right to make technical changes.

AG2210 | Planetary gear units for AM8000 and AM8500 servomotors

The low-backlash, high-performance gear units of the AG2210 series offer high torques, low torsional backlash and up to 16 transmission ratios for optimised drive solutions as well as a very low running noise coupled with maximum quality.

The gear units for the AM8000/AM8500 Synchronous Servomotors are mainly used in applications where large mass inertia has to be accelerated, or where the inertia ratio between load and motor prevents dynamic motion. Gears of the AG2210 series are also suitable for use with the motor series AM3xxx. The inertia ratios, the required torques and the suitable motors can be conveniently calculated directly in TwinCAT with the TC Motion Designer. In addition, the tool checks in a single step whether the selected motor can be adapted to the gear unit. The planetary gear units are fitted to the respective motor in the factory and delivered as a complete motor/gear unit.

Features

- maximum economic efficiency
- absolutely maintenance-free, thanks to unique lubrication concept
- long service life (> 20,000 h)
- high efficiency (> 95 % at full load)
- low running noise and smooth operation through maximum production quality
- flexible mounting position
- output shaft with feather key
- 5 sizes LP050…LP155
- 16 gear ratios i = 3, 4, 5, 7, 10 (single-stage), i = 9, 12, 16, 20, 25, 30, 35, 40, 50, 70, 100 (two-stage)
- acceleration torque between 13 and 500 Nm
- low torsional backlash (≤ 8…13 arcmin)

Technical data	AG2210
New generation	successor of AG2200, identical design
Type of gear	planetary gear
Life span	> 20,000 h
Coating/surface	RAL7016 (grey)
Ambient temperature	-15…+40 °C
Lubrication	lubricated for life
Installation position	variable
Protection class	IP 64
Mechanically compatible with	flange code F (typical combination according to specifications)

We reserve the right to make technical changes.

AG2210 | **Size 050**

Technical data	AG2210-+LP050S-MF1-i	AG2210-+LP050S-MF2-i
Gear ratio	4/5/7/10	16/20/25/35/50/70/100
Nominal output torque	6…6.5 Nm	6…6.5 Nm
Max. acceleration torque	13…14 Nm	13…14 Nm
Max. torsion. backlash standard/reduced	≤ 10/– arcmin	≤ 13/– arcmin
Typ. flange code	F1, F2	F1, F2

AG2210 | **Size 070**

Technical data	AG2210-+LP070S-MF1-i	AG2210-+LP070S-MF2-i
Gear ratio	3/4/5/7/10	9/12/16/20/25/30/40/50/70/100
Nominal output torque	19…29 Nm	19…29 Nm
Max. acceleration torque	37…55 Nm	37…55 Nm
Max. torsion. backlash standard/reduced	≤ 8/– arcmin	≤ 10/– arcmin
Typ. flange code	F2, F3, F4	F2, F3, F4

AG2210 | **Size 090**

Technical data	AG2210-+LP090S-MF1-i	AG2210-+LP090S-MF2-i
Gear ratio	3/4/5/7/10	9/12/16/20/25/30/40/50/70/100
Nominal output torque	45…63 Nm	45…63 Nm
Max. acceleration torque	90…125 Nm	90…125 Nm
Max. torsion. backlash standard/reduced	≤ 8/– arcmin	≤ 10/– arcmin
Typ. flange code	F4, F5	F4, F5

AG2210 | **Size 120**

Technical data	AG2210-+LP120S-MF1-i	AG2210-+LP120S-MF2-i
Gear ratio	3/4/5/7/10	9/12/16/20/25/30/40/50/70/100
Nominal output torque	110…155 Nm	110…155 Nm
Max. acceleration torque	220…305 Nm	220…305 Nm
Max. torsion. backlash standard/reduced	≤ 8/– arcmin	≤ 10/– arcmin
Typ. flange code	F5, F6	F5, F6

We reserve the right to make technical changes.

AG2210 | **Size 155**

Technical data	AG2210-+LP155S-MF1-i	AG2210-+LP155S-MF2-i
Gear ratio	5/10	25/50/100
Nominal output torque	200…350 Nm	200…350 Nm
Max. acceleration torque	400…500 Nm	400…500 Nm
Max. torsion. backlash standard/reduced	≤ 8/– arcmin	≤ 10/– arcmin
Typ. flange code	F6, F7	F6

Order reference	AG2210-+LPaaaS-MFs-i-wX1-Motorsize
aaa	series/size (050, 070, 090, 120, 155)
s = 1	1-stage with i = 3/4/5/7/10
s = 2	2-stage with i = 9/12/16/20/25/30/35/40/50/70/100
i	gear ratio
w = 0	smooth shaft
w = 1	shaft with groove and feather key according to DIN 6885
X	identifying letter for clamping hub diameter; not available for selection, is selected automatically based on the respective motor
Motorsize	Specifies adapter unit between motor and gearbox. Correlates to motor flange code F or flange compatible motor type.
Motorsize = AM801x (F1)	flange code F1: AM801x; compatible with AM301x
Motorsize = AM802x (F2)	flange code F2: AM802x; compatible with AM302x
Motorsize = AM803x (F3)	flange code F3: AM803x, AM853x; compatible with AM303x
Motorsize = AM804x (F4)	flange code F4: AM804x, AM854x; compatible with AM304x
Motorsize = AM805x (F5)	flange code F5: AM805x, AM855x
Motorsize = AM305x	in combination with AM305x
Motorsize = AM806x (F6)	flange code F6: AM806x, AM856x; compatible with AM306x
Motorsize = AM807x (F7)	flange code F7: AM807x; compatible with AM307x

▶AG2210

We reserve the right to make technical changes.

AM8800 | Stainless steel servomotors

Based on the AM8000 technology, the AM8800 series has a stainless steel housing that is designed according to the EHEDG guidelines in Hygienic Design. The AM8800 is ideally suited for use in the food, pharmaceutical and chemical industries.

The windings of the AM8800 motors are implemented using salient pole-wound technology. This gives rise to a high copper space factor. Due to the high slot space factor, high continuous torques can be attained. The fully potted stator provides for a thermally ideal transition of the winding to the housing. A further positive consequence of this is the mechanical protection of the winding wires against vibrations.

Since the housing and motor shaft are manufactured from scratch-proof stainless steel AISI 316L, no corrosion creep or damage to the paint finish is possible. The motors are manufactured as standard with IP 69K protection, allowing the use of steam pressure cleaners. An optional sealing air connection to prevent the formation of condensation is also available. The cable gland also has a hygienic design. The lubricants used are certified food-safe (FDA).

One Cable Technology (OCT)
With the servomotors of the AM8000 series the feedback signals are sent directly along the conductor to the power supply so that the power and feedback systems are combined in a single motor connection cable. With the use of OCT, the information is sent reliably and without interference through a digital interface. Since a cable and plug are omitted at both the motor and controller end, the component and commissioning costs are significantly reduced.

For further information on OCT see page 886

Stainless steal gear units AG2800 see page 910

Pre-assembled cables see page 878

Technical data	AM88xx
Motor type	permanent magnet-excited three-phase synchronous motor
Magnet material	neodymium-iron-boron
Insulation class	thermal class F (155 °C)
Design form	flange-mounted according to IM B5, IM V1, IM V3, optionally IM B14, IM V18, IM V19
Protection class	IP 69K, PTFE double-lip shaft seal with FDA approval
Cooling	convection, permissible ambient temperature 40 °C
Materials	AISI 316L
Temperature sensor	KTY in stator winding
Connection method	direct cable outlet via cable gland with connected M23 coupling plug
Life span	L_{10h} = 30,000 hrs for ball bearings
Approvals	CE, UL, EHEDG
Feedback system	absolute encoder single-turn and multi-turn (OCT), resolver

We reserve the right to make technical changes.

AM883x | **Flange code 3**

Data for 400 V AC	AM8831-wByz	AM8832-wCyz	AM8833-wDyz
Standstill torque	0.85 Nm	1.40 Nm	1.85 Nm
Rated torque	0.70 Nm	1.00 Nm	1.35 Nm
Rated speed	3000 min^{-1}	3000 min^{-1}	3000 min^{-1}
Rated power	0.22 kW	0.31 kW	0.42 kW
Standstill current	0.65 A	1.00 A	1.25 A
Rotor moment of inertia	0.469 $kgcm^2$	0.850 $kgcm^2$	1.231 $kgcm^2$
Rotor moment of inertia (with brake)	0.548 $kgcm^2$	0.929 $kgcm^2$	1.471 $kgcm^2$

AM884x | **Flange code 4**

Data for 400 V AC	AM8841-wCyz	AM8842-wDyz	AM8843-wEyz
Standstill torque	1.60 Nm	2.60 Nm	3.50 Nm
Rated torque	1.30 Nm	1.90 Nm	2.75 Nm
Rated speed	3000 min^{-1}	2500 min^{-1}	2500 min^{-1}
Rated power	0.41 kW	0.50 kW	0.72 kW
Standstill current	1.10 A	1.60 A	1.90 A
Rotor moment of inertia	1.115 $kgcm^2$	2.006 $kgcm^2$	2.898 $kgcm^2$
Rotor moment of inertia (with brake)	1.765 $kgcm^2$	2.656 $kgcm^2$	3.548 $kgcm^2$

AM885x | **Flange code 5**

Data for 400 V AC	AM8851-wDyz	AM8852-wEyz	AM8853-wFyz
Standstill torque	3.10 Nm	4.80 Nm	6.40 Nm
Rated torque	2.70 Nm	3.70 Nm	4.30 Nm
Rated speed	2500 min^{-1}	2000 min^{-1}	2000 min^{-1}
Rated power	0.71 kW	0.77 kW	0.90 kW
Standstill current	1.80 A	2.10 A	2.80 A
Rotor moment of inertia	2.315 $kgcm^2$	4.142 $kgcm^2$	5.970 $kgcm^2$
Rotor moment of inertia (with brake)	2.975 $kgcm^2$	4.802 $kgcm^2$	7.090 $kgcm^2$

AM886x | **Flange code 6**

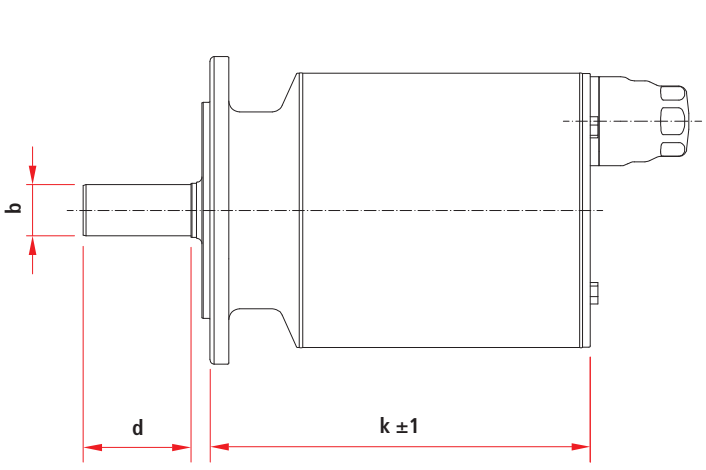
Data for 400 V AC	AM8861-wEyz	AM8862-wFyz	AM8863-wGyz
Standstill torque	7.75 Nm	12.0 Nm	16.7 Nm
Rated torque	6.20 Nm	6.00 Nm	8.00 Nm
Rated speed	1500 min^{-1}	1500 min^{-1}	1500 min^{-1}
Rated power	0.97 kW	0.94 kW	1.26 kW
Standstill current	2.53 A	3.70 A	4.90 A
Rotor moment of inertia	11.69 $kgcm^2$	20.93 $kgcm^2$	30.16 $kgcm^2$
Rotor moment of inertia (with brake)	13.94 $kgcm^2$	23.17 $kgcm^2$	32.40 $kgcm^2$

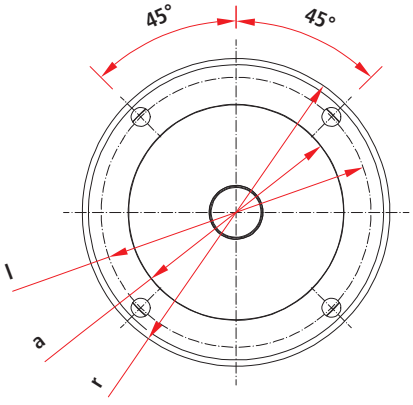
We reserve the right to make technical changes.

Order reference	AM88uv-wxyz-caaa
u	flange code
v	motor length
w = 0	smooth shaft with sealing ring IP 69K
w = 1	shaft with groove and feather key according to DIN 6885 and sealing ring IP 69K
x	winding code A…Z
y = 0	2-cable standard: feedback resolver
y = 1	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, single-turn, absolute position within one revolution, 18 bit resolution
y = 2	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, multi-turn, absolute position within 4096 revolutions, 18 bit resolution
z = 0	without holding brake
z = 2	without holding brake, with sealing air connection
z = 1	with holding brake
z = 3	with holding brake, with sealing air connection
c = 0	motor connection via M23 speedtec® plug, cable length definable via aaa [1]
c = 2	direct connection for AX5000 up to 25 A (X13+X14), cable length definable via aaa
c = 3	direct connection for AX8000 (X13), cable length definable via aaa
aaa	length of the motor cable in decimetres

[1] For motor connection via an M23 speedtec® plug, a ZK4x00-80x3-xxxx motor supply cable must also be ordered in the required length.

Motor connections see page 878





Dimensions	a	b	d	l	r	k (without brake)	k (with brake)
AM8831	60 j6	14 k6	30 mm	75 mm	89 mm	134 mm	172 mm
AM8832	60 j6	14 k6	30 mm	75 mm	89 mm	159.5 mm	197.5 mm
AM8833	60 j6	14 k6	30 mm	75 mm	89 mm	185 mm	223 mm
AM8841	80 j6	19 k6	40 mm	100 mm	114 mm	141 mm	188 mm
AM8842	80 j6	19 k6	40 mm	100 mm	114 mm	171 mm	218 mm
AM8843	80 j6	19 k6	40 mm	100 mm	114 mm	201 mm	248 mm
AM8851	95 j6	24 k6	50 mm	115 mm	134 mm	146 mm	192 mm
AM8852	95 j6	24 k6	50 mm	115 mm	134 mm	179 mm	225 mm
AM8853	95 j6	24 k6	50 mm	115 mm	134 mm	212 mm	258 mm
AM8861	130 j6	32 k6	58 mm	165 mm	189 mm	171.5 mm	221.5 mm
AM8862	130 j6	32 k6	58 mm	165 mm	189 mm	211.5 mm	261.5 mm
AM8863	130 j6	32 k6	58 mm	165 mm	189 mm	251.5 mm	301.5 mm

▶AM88xx

We reserve the right to make technical changes.

AG2800 | Planetary gear units for AM8800 stainless steel servomotors

The AM8800 stainless steel servomotors are fully compatible with the high requirements in the food, beverage and pharmaceutical industries with respect to optimum cleaning, resistance to aggressive cleaning agents, heavy mechanical loads and adverse environmental conditions. With their absolutely edge-free design these motors reduce the costs for machine manufacturers and users to a minimum.

A Hygienic Design drive axis does not always end at the stainless steel shaft of the motor; the use of a gearbox is often absolutely necessary. The same requirements apply here as to the stainless steel servomotors. All gearbox materials that come into contact with the environment exhibit high resistance to a large number of aggressive CIP (Cleaning in Place) cleaning media. The dead-space-free design, the smooth surface, the round motor adapter and the high resistance to corrosion of the gearboxes make the AM8800 a perfectly matched and certified Hygienic Design servo axis. The planetary gear units are fitted to the respective motor in the factory and delivered as a complete motor/gear unit.

Features

- corrosion-resistant implementation
- resistant to aggressive cleaning agents
- stainless steel screw plug
- food-compatible NSF-H1 lubrication
- high protection class IP 69K (at 30 bar, refering to DIN 40050-9)
- laser-etched name plate
- dead-space-free design and smooth, electro-polished surfaces

Technical data	AG2800
Type of gear	planetary gear stainless steel
Life span	> 20,000 h
Coating/surface	stainless steel 1.4404
Ambient temperature	-15…+40 °C
Installation position	variable
Protection class	IP 69K (at 30 bar, refering to DIN 40050-9)

We reserve the right to make technical changes.

AG2800 | **Size 15**

Technical data	AG2800-+HDV015Z-MF1-i	AG2800-+HDV015Z-MF2-i
Gear ratio	4/5/7/10	16/20/25/35/50/70/100
Nominal output torque	15…16 Nm	15…16 Nm
Max. acceleration torque	29…32 Nm	29…32 Nm
Max. torsion. backlash standard/reduced	≤ 10/– arcmin	≤ 15/– arcmin

AG2800 | **Size 25**

Technical data	AG2800-+HDV025Z-MF1-i	AG2800-+HDV025Z-MF2-i
Gear ratio	4/5/7/10	16/20/25/35/50/70/100
Nominal output torque	35…40 Nm	35…40 Nm
Max. acceleration torque	72…80 Nm	72…80 Nm
Max. torsion. backlash standard/reduced	≤ 10/– arcmin	≤ 15/– arcmin

AG2800 | **Size 35**

Technical data	AG2800-+HDV035Z-MF1-i	AG2800-+HDV035Z-MF2-i
Gear ratio	4/5/7/10	16/20/25/35/50/70/100
Nominal output torque	90…100 Nm	90…100 Nm
Max. acceleration torque	180…200 Nm	180…200 Nm
Max. torsion. backlash standard/reduced	≤ 10/– arcmin	≤ 15/– arcmin

Order reference	AG2800-+HDVaaaZ-MFs-i-wX1-Motorsize
aaa	series/size (015, 025, 035)
s = 1	1-stage with i = 4/5/7/10
s = 2	2-stage with i = 16/20/25/35/50/70/100
i	gear ratio
w = 0	smooth shaft
w = 1	shaft with groove and feather key according to DIN 6885
X	identifying letter for clamping hub diameter; not available for selection, is selected automatically based on the respective motor
Motorsize	Specification of the size according to flange-compatible motors. The planetary gears are delivered as a unit with the assembled motor.
Motorsize = AM883x	in combination with AM883x
Motorsize = AM884x	in combination with AM884x
Motorsize = AM885x	in combination with AM885x

▶AG2800

We reserve the right to make technical changes.

AM3000 | Synchronous Servomotors

Pole-wound motor series
For the AM3000 servomotors, the stator is not wound outside the housing but inside through a needle winder. With conventional technology, the winding is pressed into the grooved laminated core. This only achieves a copper filling ratio (which determines the maximum torque) of approx. 40 %. Furthermore, the insulation layer has to be significantly thicker in order to protect the wire from mechanical stress and prevent damage.

With pole winding, the copper wire is in close contact with the iron core. The wire insulation can be much thinner, since no pressing of the winding head is required. These measures lead to a significant increase in the proportion of "active" copper, which determines the torque value, so that the performance of the AM3000 series is approx. 25…35 % higher. An additional benefit is that the motors are significantly shorter than conventional models.

Sealed winding
The AM3000 servomotors are characterised by an extremely low moment of inertia, robust design and high overload capacity. The winding is sealed in order to eliminate air between the individual wires, since the thermal resistance of air is higher than that of epoxy resin. This further increases mechanical resilience, e.g. in case of vibrations.

Single-piece motor housing
Servomotors dissipate a large proportion of the heat generated via the mounting flange. It is therefore important to keep the heat transfer resistance as small as possible. For this reason, the housings of the AM3000 motor series are made from a single piece, since material transitions increase the thermal resistance and have a negative influence on the stability of the motor.

The AM3000 Synchronous Servomotors are available with eight different flange codes. For each size, once the flange code has been defined, there is scope for variation in the length. The motors are offered with torques between 0.18 and 180 Nm and with a wide range of nominal speeds, so that for each application and gear ratio the motor with the optimum dimensions can be selected.

Features
- Rotable plug connectors: The plug connectors for power and feedback are freely rotatable, making wiring of the whole machine easier.
- terminal box for AM308x
- tight tolerances: resulting in a highly symmetric structure inside the motor reducing cogging to an absolute minimum
- feedback option: resolver, single-turn and multi-turn absolute encoders
- The motors are available with smooth shaft or with groove and feather key.
- protection class IP 65, shaft feed through IP 54, optional IP 65/IP 65
- UL/CSA

Option
- planetary gear units in different variants

Planetary gear units
see page 904

Pre-assembled cables and more accessories
▶AM30xx

We reserve the right to make technical changes.

AM30uv-wxyz-000a	Stand-still torque	Stand-still current	Rated speed at rated supply voltage 230 V AC	400 V AC	480 V AC	Rotor moment of inertia (without brake)	(with brake)	Weight (without brake)	Weight (with brake)
AM3011-wByz-000a	0.18 Nm	1.16 A	8000 min^{-1}	–	–	0.017 kg cm²	0.020 kg cm²	0.35 kg	0.55 kg
AM3012-wCyz-000a	0.31 Nm	1.51 A	8000 min^{-1}	–	–	0.031 kg cm²	0.034 kg cm²	0.49 kg	0.69 kg
AM3013-wCyz-000a	0.41 Nm	1.48 A	8000 min^{-1}	–	–	0.045 kg cm²	0.048 kg cm²	0.63 kg	0.83 kg
AM3013-wDyz-000a	0.40 Nm	2.40 A	–	–	–	0.045 kg cm²	0.048 kg cm²	0.63 kg	0.83 kg
AM3021-wCyz-000a	0.48 Nm	1.58 A	8000 min^{-1}	–	–	0.107 kg cm²	0.118 kg cm²	0.82 kg	1.09 kg
AM3022-wCyz-000a	0.84 Nm	1.39 A	3500 min^{-1}	8000 min^{-1}	8000 min^{-1}	0.161 kg cm²	0.172 kg cm²	1.10 kg	1.37 kg
AM3022-wEyz-000a	0.87 Nm	2.73 A	8000 min^{-1}	–	–	0.161 kg cm²	0.172 kg cm²	1.10 kg	1.37 kg
AM3023-wCyz-000a	1.13 Nm	1.41 A	2500 min^{-1}	5500 min^{-1}	7000 min^{-1}	0.216 kg cm²	0.227 kg cm²	1.38 kg	1.65 kg
AM3023-wDyz-000a	1.16 Nm	2.19 A	5000 min^{-1}	8000 min^{-1}	8000 min^{-1}	0.216 kg cm²	0.227 kg cm²	1.38 kg	1.65 kg
AM3024-wCyz-000a	1.38 Nm	1.42 A	2000 min^{-1}	4500 min^{-1}	5500 min^{-1}	0.270 kg cm²	0.281 kg cm²	1.66 kg	1.93 kg
AM3024-wDyz-000a	1.41 Nm	2.21 A	4000 min^{-1}	8000 min^{-1}	8000 min^{-1}	0.270 kg cm²	0.281 kg cm²	1.66 kg	1.93 kg
AM3031-wCyz-0000	1.15 Nm	1.37 A	2500 min^{-1}	5000 min^{-1}	6000 min^{-1}	0.330 kg cm²	0.341 kg cm²	1.55 kg	1.90 kg
AM3031-wEyz-0000	1.20 Nm	2.99 A	6000 min^{-1}	–	–	0.330 kg cm²	0.341 kg cm²	1.55 kg	1.90 kg
AM3032-wCyz-0000	2.00 Nm	1.44 A	1500 min^{-1}	3000 min^{-1}	3500 min^{-1}	0.590 kg cm²	0.601 kg cm²	2.23 kg	2.58 kg
AM3032-wDyz-0000	2.04 Nm	2.23 A	2500 min^{-1}	5500 min^{-1}	6000 min^{-1}	0.590 kg cm²	0.601 kg cm²	2.23 kg	2.58 kg
AM3032-wHyz-0000	2.10 Nm	5.50 A	7000 min^{-1}	–	–	0.590 kg cm²	0.601 kg cm²	2.23 kg	2.58 kg
AM3033-wCyz-0000	2.71 Nm	1.47 A	1000 min^{-1}	2000 min^{-1}	2500 min^{-1}	0.850 kg cm²	0.861 kg cm²	2.90 kg	3.25 kg
AM3033-wEyz-0000	2.79 Nm	2.58 A	2000 min^{-1}	4500 min^{-1}	5000 min^{-1}	0.850 kg cm²	0.861 kg cm²	2.90 kg	3.25 kg
AM3041-wCyz-0000	1.95 Nm	1.46 A	1200 min^{-1}	3000 min^{-1}	3500 min^{-1}	0.810 kg cm²	0.878 kg cm²	2.44 kg	3.07 kg
AM3041-wEyz-0000	2.02 Nm	2.85 A	3000 min^{-1}	6000 min^{-1}	6000 min^{-1}	0.810 kg cm²	0.878 kg cm²	2.44 kg	3.07 kg
AM3041-wHyz-0000	2.06 Nm	5.60 A	6000 min^{-1}	6000 min^{-1}	6000 min^{-1}	0.810 kg cm²	0.878 kg cm²	2.44 kg	3.07 kg
AM3042-wCyz-0000	3.35 Nm	1.40 A	–	1500 min^{-1}	2000 min^{-1}	1.450 kg cm²	1.518 kg cm²	3.39 kg	4.02 kg
AM3042-wEyz-0000	3.42 Nm	2.74 A	1800 min^{-1}	3500 min^{-1}	4000 min^{-1}	1.450 kg cm²	1.518 kg cm²	3.39 kg	4.02 kg
AM3042-wGyz-0000	3.53 Nm	4.80 A	3500 min^{-1}	6000 min^{-1}	6000 min^{-1}	1.450 kg cm²	1.518 kg cm²	3.39 kg	4.02 kg
AM3043-wEyz-0000	4.70 Nm	2.76 A	1500 min^{-1}	2500 min^{-1}	3000 min^{-1}	2.090 kg cm²	2.158 kg cm²	4.35 kg	4.98 kg
AM3043-wGyz-0000	4.80 Nm	4.87 A	2500 min^{-1}	5000 min^{-1}	6000 min^{-1}	2.090 kg cm²	2.158 kg cm²	4.35 kg	4.98 kg
AM3043-wHyz-0000	4.82 Nm	5.40 A	3000 min^{-1}	6000 min^{-1}	–	2.090 kg cm²	2.158 kg cm²	4.35 kg	4.98 kg
AM3044-wEyz-0000	5.76 Nm	2.90 A	1200 min^{-1}	2000 min^{-1}	2500 min^{-1}	2.730 kg cm²	2.798 kg cm²	5.30 kg	5.93 kg
AM3044-wGyz-0000	5.88 Nm	5.00 A	2000 min^{-1}	4000 min^{-1}	5000 min^{-1}	2.730 kg cm²	2.798 kg cm²	5.30 kg	5.93 kg
AM3044-wHyz-0000	5.89 Nm	5.60 A	2500 min^{-1}	5000 min^{-1}	6000 min^{-1}	2.730 kg cm²	2.798 kg cm²	5.30 kg	5.93 kg
AM3044-wJyz-0000	6.00 Nm	8.80 A	4000 min^{-1}	6000 min^{-1}	6000 min^{-1}	2.730 kg cm²	2.798 kg cm²	5.30 kg	5.93 kg
AM3051-wEyz-0000	4.70 Nm	2.75 A	1200 min^{-1}	2500 min^{-1}	3000 min^{-1}	3.420 kg cm²	3.593 kg cm²	4.20 kg	5.30 kg
AM3051-wGyz-0000	4.75 Nm	4.84 A	2500 min^{-1}	5000 min^{-1}	6000 min^{-1}	3.420 kg cm²	3.593 kg cm²	4.20 kg	5.30 kg
AM3051-wHyz-0000	4.79 Nm	6.00 A	3000 min^{-1}	6000 min^{-1}	6000 min^{-1}	3.420 kg cm²	3.593 kg cm²	4.20 kg	5.30 kg
AM3052-wGyz-0000	8.43 Nm	4.72 A	1500 min^{-1}	2500 min^{-1}	3000 min^{-1}	6.220 kg cm²	6.393 kg cm²	5.80 kg	6.90 kg
AM3052-wHyz-0000	8.48 Nm	5.90 A	1800 min^{-1}	3500 min^{-1}	4000 min^{-1}	6.220 kg cm²	6.393 kg cm²	5.80 kg	6.90 kg
AM3052-wKyz-0000	8.60 Nm	9.30 A	3000 min^{-1}	5500 min^{-1}	6000 min^{-1}	6.220 kg cm²	6.393 kg cm²	5.80 kg	6.90 kg
AM3053-wGyz-0000	11.37 Nm	4.77 A	1000 min^{-1}	2000 min^{-1}	2400 min^{-1}	9.120 kg cm²	9.293 kg cm²	7.40 kg	8.50 kg
AM3053-wHyz-0000	11.51 Nm	6.60 A	–	3000 min^{-1}	3500 min^{-1}	9.120 kg cm²	9.293 kg cm²	7.40 kg	8.50 kg
AM3053-wKyz-0000	11.60 Nm	9.40 A	2000 min^{-1}	4000 min^{-1}	4500 min^{-1}	9.120 kg cm²	9.293 kg cm²	7.40 kg	8.50 kg
AM3054-wGyz-0000	14.30 Nm	5.00 A	–	1500 min^{-1}	2000 min^{-1}	11.92 kg cm²	12.093 kg cm²	9.00 kg	10.1 kg
AM3054-wHyz-0000	14.90 Nm	5.50 A	1000 min^{-1}	1800 min^{-1}	2000 min^{-1}	11.92 kg cm²	12.093 kg cm²	9.00 kg	10.1 kg
AM3054-wKyz-0000	14.40 Nm	9.70 A	1800 min^{-1}	3500 min^{-1}	4000 min^{-1}	11.92 kg cm²	12.093 kg cm²	9.00 kg	10.1 kg
AM3054-wLyz-0000	14.10 Nm	12.50 A	2500 min^{-1}	4500 min^{-1}	–	11.92 kg cm²	12.093 kg cm²	9.00 kg	10.1 kg
AM3062-wGyz-0000	11.90 Nm	4.90 A	–	1800 min^{-1}	2000 min^{-1}	16.90 kg cm²	17.51 kg cm²	8.90 kg	10.9 kg
AM3062-wHyz-0000	11.90 Nm	5.40 A	1000 min^{-1}	2000 min^{-1}	2400 min^{-1}	16.90 kg cm²	17.51 kg cm²	8.90 kg	10.9 kg
AM3062-wKyz-0000	12.20 Nm	9.60 A	2000 min^{-1}	3500 min^{-1}	4500 min^{-1}	16.90 kg cm²	17.51 kg cm²	8.90 kg	10.9 kg
AM3062-wMyz-0000	12.20 Nm	13.40 A	3000 min^{-1}	6000 min^{-1}	6000 min^{-1}	16.90 kg cm²	17.51 kg cm²	8.90 kg	10.9 kg
AM3063-wKyz-0000	16.80 Nm	9.90 A	1500 min^{-1}	3000 min^{-1}	3500 min^{-1}	24.20 kg cm²	24.81 kg cm²	11.1 kg	13.1 kg
AM3063-wMyz-0000	17.00 Nm	13.80 A	2000 min^{-1}	4000 min^{-1}	4500 min^{-1}	24.20 kg cm²	24.81 kg cm²	11.1 kg	13.1 kg
AM3063-wNyz-0000	17.00 Nm	17.40 A	3000 min^{-1}	5000 min^{-1}	6000 min^{-1}	24.20 kg cm²	24.81 kg cm²	11.1 kg	13.1 kg

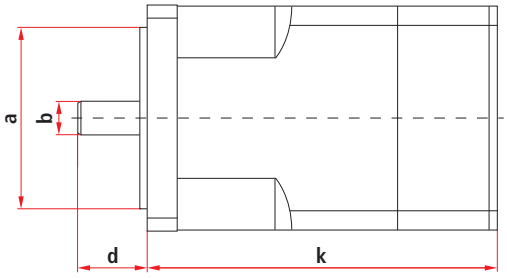
The table is continued on the next page.

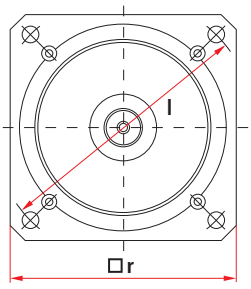
We reserve the right to make technical changes.

AM30uv-wxyz-000a	Stand-still torque	Stand-still current	Rated speed at rated supply voltage 230 V AC	400 V AC	480 V AC	Rotor moment of inertia (without brake)	(with brake)	Weight (without brake)	Weight (with brake)
AM3063-wHyz-0000	16.60 Nm	5.60 A	–	1500 min^{-1}	1800 min^{-1}	31.60 kg cm^2	32.21 kg cm^2	13.3 kg	15.3 kg
AM3064-wKyz-0000	20.80 Nm	9.20 A	1200 min^{-1}	2000 min^{-1}	2500 min^{-1}	31.60 kg cm^2	32.21 kg cm^2	13.3 kg	15.3 kg
AM3064-wLyz-0000	21.00 Nm	12.80 A	1500 min^{-1}	3000 min^{-1}	3500 min^{-1}	31.60 kg cm^2	32.21 kg cm^2	13.3 kg	15.3 kg
AM3064-wPyz-0000	20.40 Nm	18.60 A	2500 min^{-1}	4500 min^{-1}	5500 min^{-1}	31.60 kg cm^2	32.21 kg cm^2	13.3 kg	15.3 kg
AM3065-wKyz-0000	24.80 Nm	9.80 A	1000 min^{-1}	2000 min^{-1}	2200 min^{-1}	40.00 kg cm^2	40.61 kg cm^2	15.4 kg	17.4 kg
AM3065-wMyz-0000	25.00 Nm	13.60 A	1500 min^{-1}	2500 min^{-1}	3000 min^{-1}	40.00 kg cm^2	40.61 kg cm^2	15.4 kg	17.4 kg
AM3065-wNyz-0000	24.30 Nm	17.80 A	2000 min^{-1}	3500 min^{-1}	4000 min^{-1}	40.00 kg cm^2	40.61 kg cm^2	15.4 kg	17.4 kg
AM3065-wPyz-0000	24.50 Nm	19.80 A	2400 min^{-1}	4000 min^{-1}	5000 min^{-1}	40.00 kg cm^2	40.61 kg cm^2	15.4 kg	17.4 kg
AM3072-wKyz-0000	29.70 Nm	9.30 A	–	1500 min^{-1}	1800 min^{-1}	64.50 kg cm^2	66.14 kg cm^2	19.7 kg	21.8 kg
AM3072-wMyz-0000	30.00 Nm	13.00 A	–	2000 min^{-1}	2500 min^{-1}	64.50 kg cm^2	66.14 kg cm^2	19.7 kg	21.8 kg
AM3072-wPyz-0000	29.40 Nm	18.70 A	1800 min^{-1}	3000 min^{-1}	3500 min^{-1}	64.50 kg cm^2	66.14 kg cm^2	19.7 kg	21.8 kg
AM3072-wQyz-0000	29.70 Nm	20.90 A	–	3500 min^{-1}	4000 min^{-1}	64.50 kg cm^2	66.14 kg cm^2	19.7 kg	21.8 kg
AM3073-wMyz-0000	42.00 Nm	13.60 A	–	1500 min^{-1}	1800 min^{-1}	92.10 kg cm^2	93.74 kg cm^2	26.7 kg	28.8 kg
AM3073-wPyz-0000	41.60 Nm	19.50 A	1300 min^{-1}	2400 min^{-1}	2800 min^{-1}	92.10 kg cm^2	93.74 kg cm^2	26.7 kg	28.8 kg
AM3073-wQyz-0000	41.60 Nm	24.60 A	–	3000 min^{-1}	3500 min^{-1}	92.10 kg cm^2	93.74 kg cm^2	26.7 kg	28.8 kg
AM3074-wLyz-0000	53.00 Nm	12.90 A	–	1200 min^{-1}	1400 min^{-1}	119.7 kg cm^2	121.34 kg cm^2	33.6 kg	35.7 kg
AM3074-wPyz-0000	52.50 Nm	18.50 A	–	1800 min^{-1}	2000 min^{-1}	119.7 kg cm^2	121.34 kg cm^2	33.6 kg	35.7 kg
AM3074-wQyz-0000	51.90 Nm	26.20 A	–	2500 min^{-1}	3000 min^{-1}	119.7 kg cm^2	121.34 kg cm^2	33.0 kg	35.7 kg
AM3082-wTyz-0006	75.00 Nm	48.00 A	–	2500 min^{-1}	3000 min^{-1}	172.0 kg cm^2	177.00 kg cm^2	65.0 kg	73.0 kg
AM3083-wTyz-0006	130.0 Nm	62.00 A	–	2200 min^{-1}	2500 min^{-1}	334.0 kg cm^2	339.00 kg cm^2	85.0 kg	93.0 kg
AM3084-wTyz-0006	180.0 Nm	67.00 A	–	1800 min^{-1}	2000 min^{-1}	495.0 kg cm^2	500.00 kg cm^2	105 kg	113 kg

u: flange code
v: motor length

Option w = 0: smooth shaft (preferred type)
w = 1: shaft with groove and feather key according to DIN 6885
w = 2: shaft with IP 65 sealing ring and smooth shaft
w = 3: shaft with IP 65 sealing ring and shaft with groove and feather key
Option x = winding code A…T
Option y = 0: resolver, 2-pole
y = 1: single-turn absolute encoder, EnDat 2.1
absolute position within one revolution, electronic identification plate
AM302x…AM304x: 512 sine periods per revolution
AM305x…AM308x: 2048 sine periods per revolution
y = 2: multi-turn absolute encoder, EnDat 2.1
absolute position within 4096 revolutions, electronic identification plate
AM302x…AM304x: 512 sine periods per revolution
AM305x…AM308x: 2048 sine periods per revolution
y = 3: single-turn absolute encoder, BiSS
absolute position within one revolution, electronic identification plate
AM302x…AM308x: 2048 sine periods per revolution
y = 4: multi-turn absolute encoder, BiSS
absolute position within 4096 revolutions, electronic identification plate
AM302x…AM308x: 2048 sine periods per revolution
Option z = 0: without holding brake
z = 1: with holding brake
Option a = 0: rotatable angular connectors for motor and feedback cable (only for AM302x up to AM307x)
a = 1: connection cable 0.5 m with non-detachable plugs (only for AM301x/AM302x), only for resolver
a = 3: vertical connectors for motor and feedback cables (only for AM302x up to AM307x)
a = 5: yTec plug (only for AM301x)
a = 6: motor connection via terminal box (only for AM308x)
With the exception of the shaft seal, the options cannot be installed in the field.
Options such as shaft seal, holding brake, absolute encoder can lead to a reduction of the nominal rating.





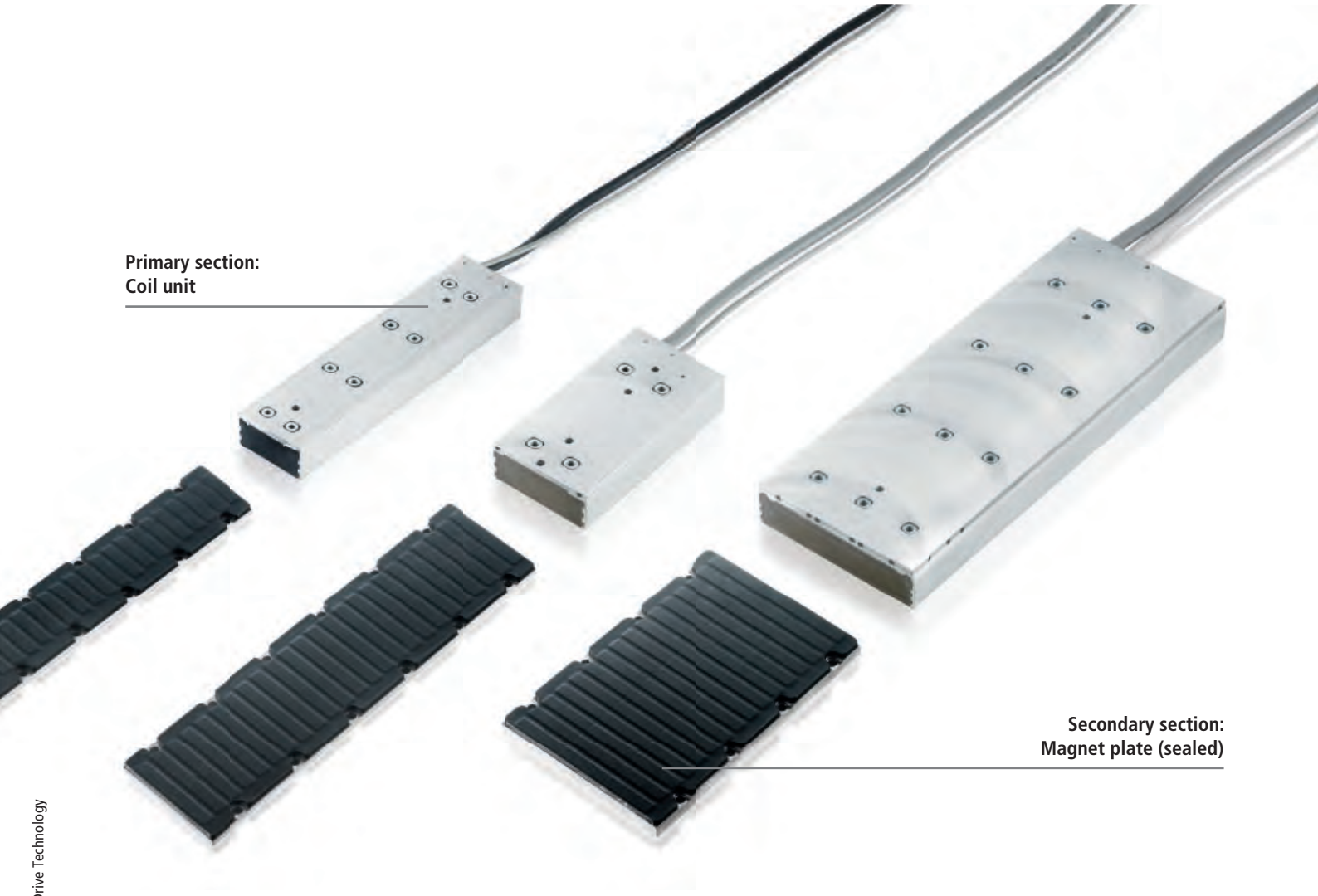
Dimensions	a	b	d	k (resolver) (without brake)	k (resolver) (with brake)	k (encoder) (without brake)	k (encoder) (with brake)	l	r
AM3011	30 mm	8 mm	25 mm	69.6 mm	106.6 mm	79.1 mm	116.1 mm	46 mm	40 mm
AM3012	30 mm	8 mm	25 mm	88.6 mm	125.6 mm	98.1 mm	135.1 mm	46 mm	40 mm
AM3013	30 mm	8 mm	25 mm	107.6 mm	144.6 mm	117.1 mm	154.1 mm	46 mm	40 mm
AM3021	40 mm	9 mm	20 mm	95.4 mm	129.5 mm	95.4 mm	129.5 mm	63 mm	58 mm
AM3022	40 mm	9 mm	20 mm	114.4 mm	148.5 mm	114.4 mm	148.5 mm	63 mm	58 mm
AM3023	40 mm	9 mm	20 mm	133.4 mm	167.5 mm	133.4 mm	167.5 mm	63 mm	58 mm
AM3024	40 mm	9 mm	20 mm	152.4 mm	186.5 mm	152.4 mm	186.5 mm	63 mm	58 mm
AM3031	60 mm	14 mm	30 mm	109.8 mm	141.3 mm	109.8 mm	141.3 mm	75 mm	70 mm
AM3032	60 mm	14 mm	30 mm	140.8 mm	172.3 mm	140.8 mm	172.3 mm	75 mm	70 mm
AM3033	60 mm	14 mm	30 mm	171.8 mm	203.3 mm	171.8 mm	203.3 mm	75 mm	70 mm
AM3041	80 mm	19 mm	40 mm	118.8 mm	152.3 mm	118.8 mm	152.3 mm	100 mm	84 mm
AM3042	80 mm	19 mm	40 mm	147.8 mm	181.3 mm	147.8 mm	181.3 mm	100 mm	84 mm
AM3043	80 mm	19 mm	40 mm	176.8 mm	210.3 mm	176.8 mm	210.3 mm	100 mm	84 mm
AM3044	80 mm	19 mm	40 mm	205.8 mm	239.3 mm	205.8 mm	239.3 mm	100 mm	84 mm
AM3051	110 mm	24 mm	50 mm	127.5 mm	172.5 mm	146.0 mm	189.0 mm	130 mm	108 mm
AM3052	110 mm	24 mm	50 mm	158.5 mm	203.5 mm	177.0 mm	220.0 mm	130 mm	108 mm
AM3053	110 mm	24 mm	50 mm	189.5 mm	234.5 mm	208.0 mm	251.0 mm	130 mm	108 mm
AM3054	110 mm	24 mm	50 mm	220.5 mm	265.5 mm	239.0 mm	282.0 mm	130 mm	108 mm
AM3062	130 mm	32 mm	58 mm	153.7 mm	200.7 mm	172.2 mm	219.7 mm	165 mm	138 mm
AM3063	130 mm	32 mm	58 mm	178.7 mm	225.7 mm	197.2 mm	244.7 mm	165 mm	138 mm
AM3064	130 mm	32 mm	58 mm	203.7 mm	250.7 mm	222.2 mm	269.7 mm	165 mm	138 mm
AM3065	130 mm	32 mm	58 mm	228.7 mm	275.7 mm	247.2 mm	294.7 mm	165 mm	138 mm
AM3072	180 mm	38 mm	80 mm	192.5 mm	234.5 mm	201.7 mm	253.7 mm	215 mm	188 mm
AM3073	180 mm	38 mm	80 mm	226.5 mm	268.5 mm	235.7 mm	287.3 mm	215 mm	188 mm
AM3074	180 mm	38 mm	80 mm	260.5 mm	302.5 mm	269.7 mm	321.3 mm	215 mm	188 mm
AM3082	250 mm	48 mm	110 mm	263.4 mm	329.4 mm	263.4 mm	329.4 mm	300 mm	260 mm
AM3083	250 mm	48 mm	110 mm	343.9 mm	410.0 mm	343.9 mm	410.0 mm	300 mm	260 mm
AM3084	250 mm	48 mm	110 mm	424.4 mm	490.4 mm	424.4 mm	490.4 mm	300 mm	260 mm

▶AM30xx

We reserve the right to make technical changes.

ALxxxx | Linear Servomotors

▶ Linear-motors



We reserve the right to make technical changes.

AL20xx | Iron core motor,
magnetic path width 80 mm

AL24xx | Iron core motor,
magnetic path width 50 mm

AL28xx | Iron core motor,
magnetic path width 130 mm

Compact power packages: Linear Servomotors AL2xxx

The AL2xxx Linear Servomotors complement the servomotors series and can be used wherever rotary design reaches mechanical limits during installation, or where special drive characteristics, in terms of dynamics, synchronism or acceleration, are required.

Linear Servomotors are easy to set up and are not subject to mechanical wear. Moreover, there are virtually no limits on travel options. With their high acceleration characteristics, Linear Servomotors can achieve positioning velocities of up to 10 m/s – with a high force constant and a very good force/mass ratio.

The pole spacing is the same for all the motors of a motor series. This has the advantage that the procedure for adjusting the drive amplifiers and the adaptation to a linear encoder is always the same, which saves time during commissioning. In principle, it is possible to operate several primary sections on one magnetic track. This significantly reduces the installation and component costs and opens up application options that would not normally be considered for linear motors.

AL2200 magnetic encoder system (MES) for linear motors

The feedback system required by linear motors for commutation and detection of speed and position normally consists of a reading head and a graduated rule installed parallel to the travel path. The hardware requirements for the complete system increase with the length of the travel path. The AL2200 in contrast detects the magnetic field of a magnetic plate and supplies the servo drive with the incremental encoder signals for commutation and position control. The MES supplies one sine oscillation per logical motor revolution. A logical motor revolution is equivalent to the distance between two homopolar magnets, i.e. between two north poles, for example. The attainable accuracy of ±0.1 mm is sufficient for simple positioning tasks and depends to a large extent on the mechanical accuracy and position of the magnets along the travel path. Since no graduated rule has to be installed, the MES is a cost-efficient feedback solution for linear motors.

Ironless AL3800 Linear Servomotors
▶AL38xx

We reserve the right to make technical changes.

AL2xxx | Linear Servomotors

The 3-phase Synchronous Linear Servomotors of the AL2xxx series consist of a primary section and a secondary section. The primary section contains a grooved, laminated core with inlaid copper windings. It is generally used as the moving part. The secondary section contains the steel plate with attached permanent magnets.

The motors of the individual series have the same width (including magnetic plate), i.e. all motors can be operated on the same magnetic plates, in any combination. The magnetic plates are fully sealed and therefore have an almost perfectly level and robust surface.

The primary sections have an IP 64 protection rating and are therefore suitable for application in harsh environments. They are equipped with a 0.5 m cable strand and optionally with pre-assembled connectors, so that they can be coupled with the servo drives either via the connector box or via plug connectors. This greatly reduces the difficulty of implementing the cabling, and makes a significant contribution to avoiding errors.

In conjunction with the AX5000 Servo Drives the linear motors of the AL2xxx series are very suitable for dynamic movements, which require high acceleration values over short distances.

Features

- accelerations up to 30 g
- no mechanical wear
- complete absence of backlash, giving stiff control response
- extremely precise positioning, high repeatability
- even, immediate force, little cogging
- very low thermal resistance, allowing high capacity utilisation
- protection from thermal overload through integrated temperature sensors
- Operation with the AX5000 is made extremely simple through default values.
- connection to the AX5000 through pre-assembled cables

AL20xx

- velocity: 3.5 m/s or 7 m/s
- peak forces: 225 N to 1800 N

AL24xx

- velocity: 12 m/s
- peak forces: 120 N to 480 N

AL28xx

- velocity: 2.5 m/s or 6 m/s
- peak forces: 1800 N to 6750 N
- operation optionally with or without water cooling

AL2200 scaleless feedback system (MES) for Linear Servomotors

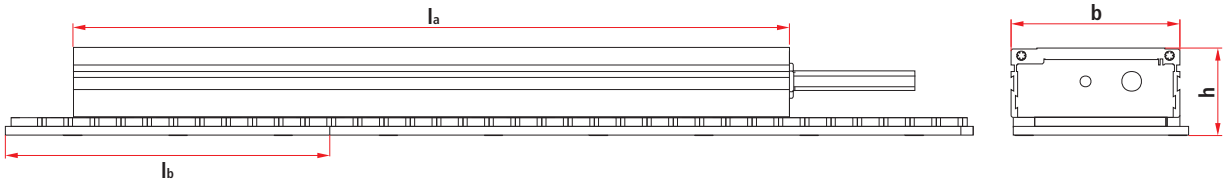
An MES system is available as an optional accessory for monitoring the magnetic field of the permanent magnets on the magnetic plate. With the aid of an integrated electronic unit, it provides incremental encoder signals for the Servo Drives of the AX5000 series for commutation, velocity and position control. The MES provides a sine wave per 24 mm pole pitch and a precision of 1/10 mm.

AL225x connector box

The AL225x connector boxes facilitate wiring between linear motor and servo drive. On one side, the motor, feedback and thermal protection cables are connected. The standard motor and encoder cables are connected on the other side of the boxes.

We reserve the right to make technical changes.

AL2000 | **Linear Servomotors**



Dimensions	b	l_a	h
AL2003	77 mm	98 mm	40 mm
AL2006	77 mm	146 mm	40 mm
AL2009	77 mm	195 mm	40 mm
AL2012	77 mm	244 mm	40 mm
AL2015	77 mm	290 mm	40 mm
AL2018	77 mm	336 mm	40 mm
AL2024	77 mm	468 mm	40 mm

Technical data	AL2003	AL2006	AL2009	AL2012	AL2015	AL2018	AL2024
Winding type	S	N | S	N | S	N | S	N | S	N | S	N | S
Speed max.	7 m/s	3.5 m/s (N), 7 m/s (S)	2.5 m/s (N), 7 m/s (S)	3.5 m/s (N), 7 m/s (S)	3.5 m/s (N), 7 m/s (S)	3.5 m/s (N), 7 m/s (S)	3.5 m/s (N), 7 m/s (S)
Motor configuration	3-phase synchronous Linear Servomotors (400…480 V AC)						
Peak force (F_P)	225 N	450 N	675 N	900 N	1125 N	1350 N	1800 N
Peak current (I_{Pa})	5 A	6.5 A (N), 13.1 A (S)	6.5 A (N), 19.6 A (S)	13.1 A (N), 26.2 A (S)	13.5 A (N), 32.7 A (S)	19.6 A (N), 41 A (S)	26.2 A (N), 52 A (S)
Continuous force with air cooling (F_{ca})	75 N	200 N	300 N	400 N	500 N	600 N	800 N
Continuous current with air cooling (I_{ca})	2.28 A	2.15 A (N), 4.3 A (S)	2.14 A (N), 6.45 A (S)	4.3 A (N), 8.6 A (S)	4.46 A (N), 10.7 A (S)	6.45 A (N), 13.38 A (S)	8.6 A (N), 17.2 A (S)
Force constant (K_f)	46 N/A	93 N/A (N), 46 N/A (S)	140 N/A (N), 46 N/A (S)	93 N/A (N), 46 N/A (S)	112 N/A (N), 46 N/A (S)	93 N/A (N), 44.9 N/A (S)	93 N/A (N), 46 N/A (S)
Motor constant (K_m)	185 N²/W	380 N²/W	570 N²/W	760 N²/W	950 N²/W	1140 N²/W	1520 N²/W
Magnet pitch	24 mm						
Magnetic attraction force (F_a)	500 N	950 N	1325 N	1700 N	2075 N	2450 N	3400 N
Weight of the coil (M_P)	0.9 kg	1.5 kg	2.0 kg	2.6 kg	3.2 kg	3.8 kg	5.2 kg
Air gap	0.5 mm						
Temperature sensor	PTC 1 kΩ						
Corresponding Servo Drive	AX5x03	AX5x03 (N), AX5x06 (S)	AX5x03 (N), AX5112 (S)	AX5x06 (N), AX5112 (S)	AX5x06 (N), AX5112 (S)	AX5112 (N), AX5118 (S)	AX5112 (N), AX5118 (S)

Ordering information	AL20xx-000x-000y coil unit
AL2003-0001-000y	Linear Servomotor, 400…480 V, F_p = 225 N, F_{ca} = 75 N
AL2006-000x-000y	Linear Servomotor, 400…480 V, F_p = 450 N, F_{ca} = 200 N
AL2009-000x-000y	Linear Servomotor, 400…480 V, F_p = 675 N, F_{ca} = 300 N
AL2012-000x-000y	Linear Servomotor, 400…480 V, F_p = 900 N, F_{ca} = 400 N
AL2015-000x-000y	Linear Servomotor, 400…480 V, F_p = 1125 N, F_{ca} = 500 N
AL2018-000x-000y	Linear Servomotor, 400…480 V, F_p = 1350 N, F_{ca} = 600 N
AL2024-000x-000y	Linear Servomotor, 400…480 V, F_p = 1800 N, F_{ca} = 800 N

Option x = 0: N type, x = 1: S type

Option y = 0: without connector plug, y = 1: with connector plugs (motor and temperature)

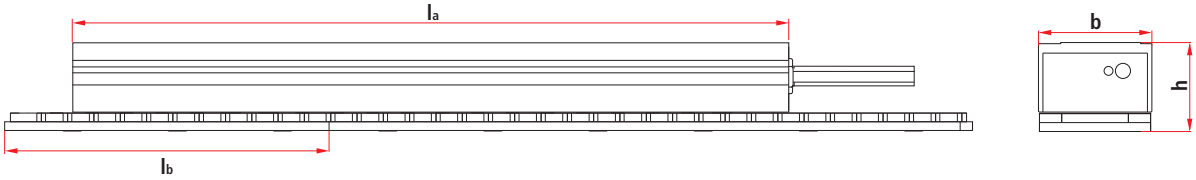
Ordering information	AL21xx-0000 magnet plate
AL2110-0000	magnetic assembly (l_b = 192 mm, weight 3.8 kg/m), for AL20xx motors
AL2120-0000	magnetic assembly (l_b = 288 mm, weight 3.8 kg/m), for AL20xx motors

Options, pre-assembled cables and accessories see page 922

▶AL20xx

We reserve the right to make technical changes.

AL2400 | **Linear Servomotors**



Dimensions	b	l_a	h
AL2403	51 mm	93 mm	40 mm
AL2406	51 mm	143 mm	40 mm
AL2412	51 mm	241 mm	40 mm

Technical data	AL2403	AL2406	AL2412
Winding type	S		
Speed max.	12 m/s		
Motor configuration	3-phase synchronous Linear Servomotors (400…480 V AC)		
Peak force (F_P)	120 N	240 N	480 N
Peak current (I_{Pa})	4.1 A	8.2 A	16.4 A
Continuous force with air cooling (F_{ca})	60 N	120 N	240 N
Continuous current with air cooling (I_{ca})	1.5 A	3.0 A	6.0 A
Force constant (K_f)	39 N/A		
Motor constant (K_m)	95 N²/W	190 N²/W	380 N²/W
Magnet pitch	24 mm		
Magnetic attraction force (F_a)	300 N	500 N	900 N
Weight of the coil (M_P)	0.6 kg	0.9 kg	1.6 kg
Air gap	0.5 mm		
Temperature sensor	PTC 1 kΩ		
Corresponding Servo Drive	AX5x03	AX5x03/AX5x06	AX5x06/AX5112

Ordering information	AL24xx-0001-000y coil unit
AL2403-0001-000y	Linear Servomotor, 400…480 V, F_p = 120 N, F_{ca} = 60 N
AL2406-0001-000y	Linear Servomotor, 400…480 V, F_p = 240 N, F_{ca} = 120 N
AL2412-0001-000y	Linear Servomotor, 400…480 V, F_p = 480 N, F_{ca} = 240 N

S type

Option y = 0: without connector plug, y = 1: with connector plugs (motor and temperature)

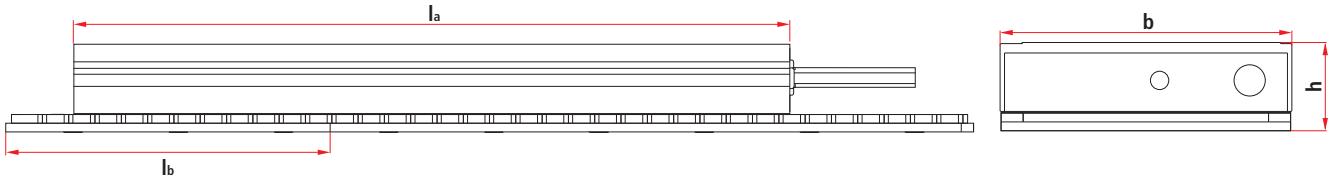
Ordering information	AL25xx-0000 magnet plate
AL2510-0000	magnetic assembly (l_b = 96 mm, weight 2.1 kg/m), for AL24xx motors
AL2520-0000	magnetic assembly (l_b = 144 mm, weight 2.1 kg/m), for AL24xx motors
AL2530-0000	magnetic assembly (l_b = 384 mm, weight 2.1 kg/m), for AL24xx motors

Options, pre-assembled cables and accessories see page 922

▶AL24xx

We reserve the right to make technical changes.

AL2800 | **Linear Servomotors**



Dimensions	b	l_a	h
AL2812	130 mm	244 mm	45 mm
AL2815	130 mm	290 mm	45 mm
AL2830	130 mm	568 mm	45 mm (1)
AL2845	130 mm	852 mm	47 mm

(1) Height h deviating for water-cooled variant: h = 47 mm

Technical data	AL2812	AL2815	AL2830	AL2845
Winding type	N | S	N | S	N | S	N | S
Speed max.	3 m/s (N), 6 m/s (S)	2.5 m/s (N), 6 m/s (S)	2.5 m/s (N), 6 m/s (S)	2.5 m/s (N), 6 m/s (S)
Motor configuration	3-phase synchronous Linear Servomotors (400…480 V AC)			
Peak force (F_P)	1800 N	2250 N	4500 N	6750 N
Peak current (I_{Pa})	13 A (N), 26 A (S)	13.5 A (N), 33 A (S)	27 A (N), 66 A (S)	41 A (N), 98 A (S)
Continuous force with water cooling (F_{cw})	–	–	2000 N	3000 N
Continuous force with air cooling (F_{ca})	760 N	950 N	1900 N	2850 N
Continuous current with water cooling (I_{cw})	–	–	8.9 A (N), 21.5 A (S)	13.4 A (N), 32.3 A (S)
Continuous current with air cooling (I_{ca})	4.1 A (N), 8.2 A (S)	4.2 A (N), 10.2 A (S)	8.5 A (N), 20.5 A (S)	12.5 A (N), 31 A (S)
Force constant (K_f)	186 N/A (N), 93 N/A (S)	225 N/A (N), 93 N/A (S)	225 N/A (N), 93 N/A (S)	225 N/A (N), 93 N/A (S)
Motor constant (K_m)	1750 N²/W	2150 N²/W	4300 N²/W	6450 N²/W
Magnet pitch	24 mm			
Magnetic attraction force (F_a)	3400 N	4150 N	8300 N	12450 N
Weight of the coil (M_P)	4.9 kg	5.9 kg	11.6 kg	18.2 kg
Air gap	0.5 mm			
Temperature sensor	PTC 1 kΩ			
Corresponding Servo Drive	AX5x06 (N), AX5112 (S)	AX5x06 (N), AX5112 (S)	AX5112 (N), AX5125 (S)	AX5118 (N), AX5140 (S)

Ordering information	AL28xx-000x-000y coil unit
AL2812-000x-000y	Linear Servomotor, 400…480 V, F_p = 1800 N, F_{ca} = 760 N
AL2815-000x-000y	Linear Servomotor, 400…480 V, F_p = 2250 N, F_{ca} = 950 N
AL2830-000x-0000	Linear Servomotor, 400…480 V, F_p = 4500 N, F_{ca} = 1900 N
AL2830-100x-0000	Linear Servomotor, 400…480 V, F_p = 4500 N, F_{ca} = 2000 N, water cooling
AL2845-100x-0000	Linear Servomotor, 400…480 V, F_p = 6750 N, F_{ca} = 2850 N, water cooling

Option x = 0: N type, x = 1: S type

Option y = 0: without connector plug, y = 1: with connector plugs (only possible with AL2812 and AL2815!)

Ordering information	AL29xx-0000 magnet plate
AL2910-0000	magnetic assembly (l_b = 192 mm, weight 10.5 kg/m), for AL28xx motors
AL2920-0000	magnetic assembly (l_b = 288 mm, weight 10.5 kg/m), for AL28xx motors

Options, pre-assembled cables and accessories see page 922

▶AL28xx

We reserve the right to make technical changes.

Accessories for Linear Motors ALxxxx

MES feedback system for Linear Servomotors

The MES supplies one sine oscillation per logical motor revolution. Since no graduated rule has to be installed, the MES is an inexpensive feedback solution for linear motors.

Ordering information	AL2200-000x | Feedback system	Pict.
AL2200-000x	magnetic encoder system (MES) for AL2000, AL2400 and AL2800 Linear Servomotors	A

Option x = 0: without connector plug, x = 1: with connector plug

Connector box for ALxxxx

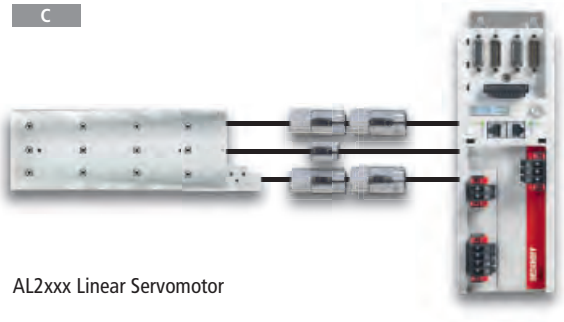
The AL225x connector boxes facilitate wiring between linear motor and the Servo Drive. They are mounted on the linear slide and move with the motor. The motor cable, the thermal protection contact cable and the encoder cable are inserted into the box through cable glands and connected to the terminal strip. The temperature contact is linked to the motor and encoder cable, so that no thermal protection contact cable is required. The standard motor and encoder cables are connected on the other side of the boxes.

Ordering information	AL225x-0001 | Connector box	Pict.
AL2250-0001	connector box for AL2003-AL2830-0001 and AL2830-1000	B
AL2255-0001	connector box for AL2830-1001 and AL2845-1000	
AL2256-0001	connector box for AL2845-1001	

Installation options Linear Servomotors/connector box

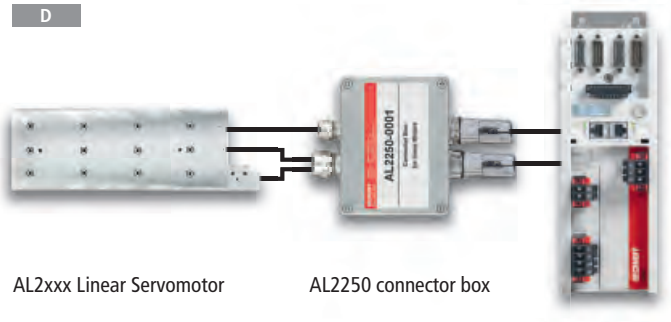
Cable	AX5000	C	AX5000 + AL2250	D
Motor cable	ZK4500-0023			
Thermal protection contact cable	ZK4540-0020		–	
Encoder cable for MES or absolute encoder	ZK4510-0020			
Encoder cable for encoder with zero pulse	ZK4520-0020			
Coil and feedback system	with connector plugs		without connector plugs	

C



AL2xxx Linear Servomotor

D



AL2xxx Linear Servomotor AL2250 connector box

A

B

We reserve the right to make technical changes.

Motor cable 1.5 mm² for ALxxxx at AX5000 (1.5 A…12 A)

Ordering information	Motor cable with 1.5 mm² wire gauge, highly flexible, for drag-chain use	Pict.
ZK4500-0023-xxxx	highly flexible, drag-chain useable cable (5 million bending cycles), max. 240 m/min, max. 30 m/s², min. bending radius = 87 mm (7 x OD), max. chain length horizontal 20 m, vertical 5 m, length < 25 m, (4 x 1.5 mm² + 2 x (2 x 0.75 mm²))	E
ZK4500-0023-0050	example for 5 m length	
ZK4502-0023-xxxx	length ≥ 25 m	
ZK4509-0023-xxxx	not assembled	
ZK4501-0023-xxxx	extension cable	F

Motor cable 2.5 mm² for ALxxxx at AX5000 (18…25 A)

Ordering information	Motor cable with 2.5 mm² wire gauge, highly flexible for drag-chain use	Pict.
ZK4500-0024-xxxx	highly flexible, drag-chain useable cable (5 million bending cycles), max. 240 m/min, max. 30 m/s², bending radius = 95 mm (7 x OD), max. chain length horizontal 20 m, vertical 5 m, length < 25 m, (4 x 2.5 mm² + 2 x (2 x 1 mm²))	E
ZK4500-0024-0050	example for 5 m length	
ZK4502-0024-xxxx	length ≥ 25 m	
ZK4509-0024-xxxx	not assembled	
ZK4501-0024-xxxx	extension cable	F

E

F

We reserve the right to make technical changes.

Encoder cable (absolute encoder) for ALxxxx and AL2250 at AX5000

Ordering information	Encoder cable with 0.14 mm² wire gauge, highly flexible for drag-chain use	Pict.
ZK4510-0020-xxxx	highly flexible, drag-chain usable cable (5 million bending cycles), max. 240 m/min, max. 30 m/s², min. bending radius = 53 mm (7 x OD), max. chain length: horizontal = 20 m, vertical = 5 m, (7 x 2 x 0.14 mm² + 2 x 0.5 mm²)	A
ZK4510-0020-0050	example for 5 m length	
ZK4511-0020-xxxx	extension cable, highly dynamic, suitable as trailing cable	B
ZK4519-0020-xxxx	not assembled	

Encoder cable (SinCos encoder with zero pulse) for ALxxxx and AL2250 at AX5000

Ordering information	Encoder cable with 0.14 mm² wire gauge, highly flexible for drag-chain use
ZK4520-0020-xxxx	highly flexible, drag-chain usable cable (5 million bending cycles), max. 240 m/min, max. 30 m/s², min. bending radius = 53 mm (7 x OD), max. chain length: horizontal = 20 m, vertical = 5 m, (7 x 2 x 0.14 mm² + 2 x 0.5 mm²)

Thermal protection cable for ALxxxx at AX5000

Ordering information	Thermal protection cable with 0.14 mm² wire gauge, highly flexible for drag-chain use	Pict.
ZK4540-0020-xxxx	highly flexible, drag-chain usable cable (5 million bending cycles), max. 240 m/min, max. 30 m/s², min. bending radius = 38 mm (7 x OD), max. chain length: horizontal = 20 m, vertical = 5 m, (2 x 2 x 0.14 mm²)	C

Note: required if no connector box is used.

We reserve the right to make technical changes.

Connectors for AMxxxx, ALxxxx servomotors and cables

Ordering information		Pict.
ZS4000-2030	EMC thermo-protective plug (female), D-sub, 9-pin, for AL2000, AL2400, AL2800 linear motors (counterpart to thermostat contact at AX5000 Servo Drive)	D
ZS4000-2040	EMC power coupling (male), M23, 8-pin, for motor cable extension ZK4501-00x3-xxxx and ZK4501-00x4-xxx (counterpart to motor cable ZK4500-00x3-xxxx and ZK4500-00x4-xxxx)	E
ZS4000-2100	metal flange for motor cable, iTec, M23 and feedback cable with iTec, to adjust the connector, including sealings	
ZS4000-2101	metal flange for feedback cable, M23, to adjust the connector, including sealings	F
ZS4000-2102	EMC power connector (female), iTec, 9-pin, for motor cable ZK4704-0411-xxxx (counterpart to motor socket AM8100)	
ZS4000-2104	EMC power connector (female), M23, 9-pin, for motor cable ZK450x-80x3-xxxx and ZK450x-80x4-xxxx (counterpart to motor socket AM8000/AM8500)	
ZS4000-2105	EMC resolver connector (female), iTec, 12-pin, for resolver cable ZK453x-8110-xxxx (counterpart to motor socket AM801x, AM802x, AM803x, AM853x)	
ZS4000-2106	EMC resolver connector (female), M23, 12-pin, for resolver cable ZK453x-8010-xxxx (counter part for motor socket AM8x4x up to AM8x7x)	
ZS4000-2107	EMC power connector (female), iTec, 9-pin, for motor cable ZK450x-8022-xxxx and ZK4704-0421-xxxx (counter part for motor socket AM80xx/AM81xx/AM85xx with iTec)	

A

B

C

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E

F

Compact Drive Technology

▶ compact-drive-technology

EL72x1, EJ7211 | **Ultra-compact servo output stages**

- seamless integration in EtherCAT I/O system
- for highly dynamic positioning tasks
- EtherCAT Terminal (EL) and EtherCAT plug-in module (EJ)
- complete servo drive with 2 feedback options (OCT, resolver)
- optionally with STO input (Safe Torque Off)
- adapted to AM8100

EL72x1 see page 438

EJ7211 see page 567

AM8100 | **Compact Synchronous Servomotor with OCT**

- 0.2 to 1.35 Nm standstill torque
- integrated 18-bit absolute encoder (multiturn or singleturn)
- dynamic servomotor from flange code 40 mm (F1)
- electronic type plate
- further ordering options for optimised axis matching
- suitable connecting cables for plug-and-play installation

See page 928

We reserve the right to make technical changes.

EL703x, EL704x, EJ7047, EP7041, EPP7041, KL2451 |
Ultra-compact stepper motor output stages

– seamless integration into the I/O system
– form factors: EtherCAT Terminal (EL), Bus Terminal (KL), EtherCAT/EtherCAT P Box (EP/EPP) and EtherCAT plug-in module (EJ)
– 1 to 5 A output current
– vector control for highly dynamic positioning tasks (EL7037/EL7047/EJ7047)
– assembled connecting cables

EPP7041 see page 537

EP7041 see page 503

KL2541 see page 651

EL703x/EL704x see page 437

EJ7047 see page 567

AS2000 | **Stepper motors in industrial design up to 6 Nm**

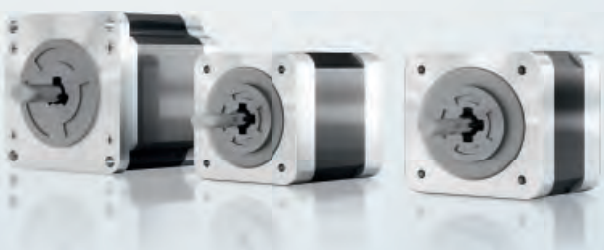
– stepper motor with 1.8°/200 full steps
– flanges: NEMA23, NEMA34
– 0.6 to 6.0 Nm standstill torque
– industrial design and high protection class (IP 54)
– optionally with torsionally rigid integrated encoder (1024 inc/rev) for vector control

See page 933

AG2250 | **Planetary gear unit for servo and stepper motors**

– straight or angled design
– low torsional backlash
– suitable for AM8100, AS2000, AS1000

See page 931



AS1000 | **Stepper motors up to 5 Nm**

– stepper motor with 1.8°/200 full steps
– flanges: NEMA17, NEMA23, NEMA34
– 0.4 to 5.0 Nm standstill torque
– ready for connection, with cable outlet
– optionally with encoder

See page 936

We reserve the right to make technical changes.

AM8100 | **Synchronous Servomotors**

The AM8100 servomotors from the AM8000 series are especially designed for operation with the EL7201 and EL7211 servo terminals. The high dynamics of the servomotors open up a multitude of possible applications: for example in industrial robots for pick-and-place applications, or in general in mechanical engineering, where a compact design and high positioning accuracy are necessary. Like all motors of the AM8xxx family they are available in One Cable Technology (OCT) versions where power and feedback are combined in a single cable.

Homing is no longer necessary thanks to the absolute value encoder integrated in the motor: the position of the drive is saved in the EEPROM, which is ideal for adjustable axes. The encoder data are transmitted entirely digitally to the EL7201-0010 or EL7211-0010 servo terminal via the motor cable. The encoder cable can be dispensed with. The full integration of the servo terminal in the Beckhoff control system facilitates the commissioning of the drive axis. All motors of the AM8xxx family use the electronic type plate, with which the engineering expenditure is additionally reduced by the simple reading of the motor parameters. The Beckhoff TwinCAT automation software enables the convenient parameterisation of the servomotors.

The AM81xx motors can optionally be equipped with a backlash-free permanent magnet holding brake, a sealing ring or a feather key groove. They are equipped with a sturdy rotary resolver encoder and for the purpose of long life have been developed with generously dimensioned bearings for general mechanical engineering. Matching gears and prefabricated connecting cables complete the ultra-compact drive axis.

Technical data	AM81xx
Motor type	permanent magnet-excited three-phase synchronous motor
Magnet material	neodymium-iron-boron
Insulation class	thermal class F (155 °C)
Design form	flange-mounted according to IM B5, IM V1, IM V3
Protection class	IP 54, IP 65 (shaft seal only for AM812x, AM813x)
Cooling	convection, permissible ambient temperature 40 °C
Coating/surface	dark grey powder coating, similar to RAL7016
Connection method	round plug connector, swivelling, angled
Life span	L_{10h} = 30,000 hrs for ball bearings
Approvals	CE, UL
Feedback system	resolver, OCT

We reserve the right to make technical changes.

AM811x | Flange code F1, motor length 1 – 3

Data for 50 V DC	AM8111-wFyz	AM8112-wFyz	AM8113-wFyz
Standstill torque	0.20 Nm	0.38 Nm	0.52 Nm
Rated torque	0.19 Nm	0.36 Nm	0.50 Nm
Rated speed	4000 min^{-1}	4500 min^{-1}	3000 min^{-1}
Rated power	0.08 kW	0.17 kW	0.16 kW
Standstill current	2.85 A	4.7 A	4.8 A
Rotor moment of inertia	0.029 $kgcm^2$	0.048 $kgcm^2$	0.067 $kgcm^2$
Rotor moment of inertia (with brake)	0.052 $kgcm^2$	0.071 $kgcm^2$	0.090 $kgcm^2$
EtherCAT Terminal	EL7201-0010	EL7211-0010	EL7211-0010
EtherCAT plug-in module	EJ7211-0010	EJ7211-0010	EJ7211-0010

AM812x | Flange code F2, motor length 1 – 2

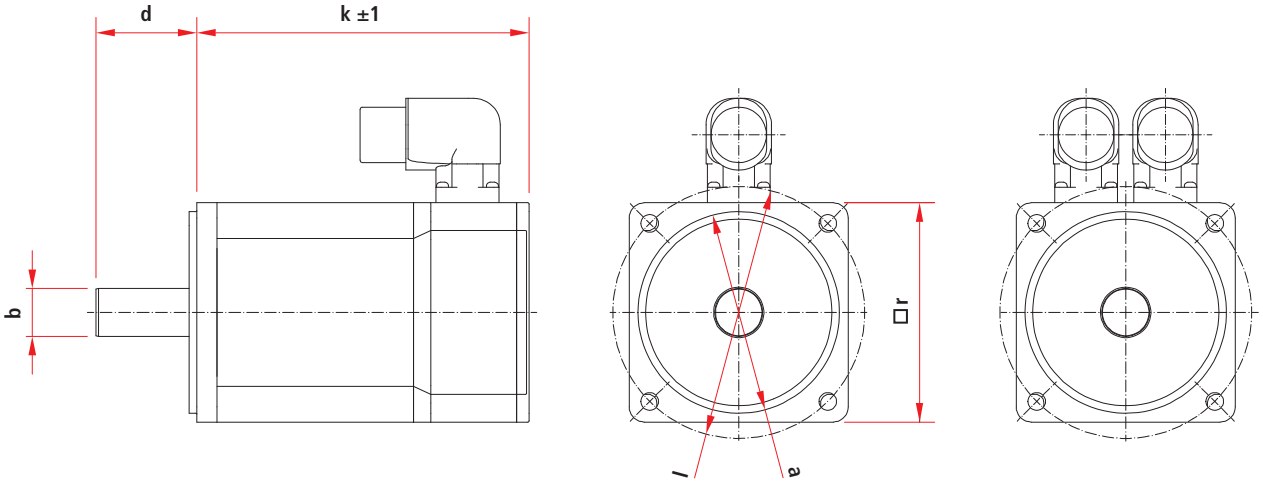
Data for 50 V DC	AM8121-wFyz	AM8122-wFyz
Standstill torque	0.50 Nm	0.80 Nm
Rated torque	0.50 Nm	0.80 Nm
Rated speed	3000 min^{-1}	2000 min^{-1}
Rated power	0.16 KW	0.17 KW
Standstill current	4.0 A	4.0 A
Rotor moment of inertia	0.134 $kgcm^2$	0.253 $kgcm^2$
Rotor moment of inertia (with brake)	0.156 $kgcm^2$	0.276 $kgcm^2$
EtherCAT Terminal	EL7211-0010	EL7211-0010
EtherCAT plug-in module	EJ7211-0010	EJ7211-0010

AM813x | Flange code F3, motor length 1

Data for 50 V DC	AM8131-wFyz
Standstill torque	1.35 Nm
Rated torque	1.35 Nm
Rated speed	1000 min^{-1}
Rated power	0.14 KW
Standstill current	5.0 A
Rotor moment of inertia	0.462 $kgcm^2$
Rotor moment of inertia (with brake)	0.541 $kgcm^2$
EtherCAT Terminal	EL7211-0010
EtherCAT plug-in module	EJ7211-0010

Order reference	AM81uv-wxyz
u	flange code
v	motor length
w = 0	smooth shaft
w = 1	shaft with groove and feather key according to DIN 6885
w = 2	shaft with IP 65 sealing ring and smooth shaft (only for AM812x, AM813x)
w = 3	shaft with IP 65 sealing ring and shaft with groove and feather key (only for AM812x, AM813x)
x	winding code F
y = 0	resolver (only for AM812x, AM813x)
y = 1	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, single-turn, absolute position within one revolution, 18 bit resolution
y = 2	One Cable Technology for power and feedback: feedback transmission via motor cable, no feedback cable necessary, electronic identification plate, multi-turn, absolute position within 4096 revolution, 18 bit resolution
z = 0	without holding brake
z = 1	with holding brake

We reserve the right to make technical changes.



One Cable Technology

Resolver version

Dimensions	a	b	d	l	r	k (without brake)	k (with brake)
AM8111	30 h7	8 h7	25 mm	46 mm	40 mm	97 mm	129 mm
AM8112	30 h7	8 h7	25 mm	46 mm	40 mm	117 mm	149 mm
AM8113	30 h7	8 h7	25 mm	46 mm	40 mm	137 mm	169 mm
AM8121	40 j6	9 k6	20 mm	63 mm	58 mm	111.5 mm	146 mm
AM8122	40 j6	9 k6	20 mm	63 mm	58 mm	133.5 mm	168 mm
AM8131	60 j6	14 k6	30 mm	75 mm	72 mm	128.7 mm	168.2 mm

▶AM81xx

Accessories for AM8100 servomotors

Supply cables for servomotor terminals with OCT and STO

Ordering information	Suitable for EL72xx-0010, EL72xx-9014
ZK4704-0421-2xxx	motor cable for OCT feedback, drag-chain suitable, (4 x 0.75 mm² + (2 x 0.34 mm²) + (2 x AWG22)), shielded [1]

[1] Max. cable length 20 m

Supply cables for servomotor terminals with resolver

Ordering information	Suitable for EL72xx-0000	Pict.
ZK4704-0411-2xxx	motor cable for resolver feedback, drag-chain suitable, (4 x 0.75 mm² + (2 x 0.5 mm²)), shielded [1]	
ZK4724-0410-2xxx	resolver cable, drag-chain suitable, (3 x 2 x 0.25 mm²), shielded [1]	A

[1] Available in lengths of 1 m, 3 m, 5 m, 10 m and 20 m (xxx = length in decimetres, e.g. -2010 = 1 m)

Technical data for drag-chain use see ▶ **compact-drive-technology**

A

We reserve the right to make technical changes.

AG2250 | Planetary gear units for Compact Drive Technology

The AG2250 planetary gears are especially matched to the AM8100 motor series and have been expanded by a two-stage version. For better design, planetary and angled planetary gears are available with the following transmission ratios: 12, 16, 20, 25, 32, 40 and 64.

The AG2250 series completes the range of small, affordable drive technology products. The gears are especially suited to applications where no particularly low torsional backlash is required. The inertia ratios, the required torques and the suitable motors can be conveniently calculated directly in TwinCAT with the TC Motion Designer. In addition, the tool checks in a single step whether the selected motor can be adapted to the gear unit. The planetary gear units are fitted to the respective motor in the factory and delivered as a complete motor/gear unit.The AG2250 series also contains angled planetary gears for space-saving installation of motors at a right-angle.

Features

- low torsional backlash
- high output torques
- high efficiency
- single-stage planetary gear, transmission ratios 3, 4, 5, 7, 8, 10
- two-stage planetary gear/angled planetary gear, transmission ratios 12, 16, 20, 25, 32, 40, 64
- single-stage angled planetary gear, transmission ratios 3, 4, 5, 7, 8, 10
- two-stage angled planetary gear, transmission ratios 12, 16, 20, 25, 32, 40, 64
- flexible installation position
- lifetime lubrication
- suitable for motors of the AM801x (230 V AC), AM8100 (48 V DC) and AS2000 (48 V DC) series

Technical data	AG2250
Type of gear	planetary gear/angled planetary gear
Life span	> 30,000 h/> 20,000 h
Lubrication	lubricated for life
Installation position	variable
Protection class	IP 54
Mechanically compatible with	flange code F, N (typical combination according to specifications)

AG2250 | **Size 40**

Technical data	AG2250-+PLE40-M01-i	AG2250-+PLE40-M02-i	AG2250-+WPLE40-M01-i	AG2250-+WPLE40-M02-i
Variant	planetary gear	planetary gear	angled planetary gear	angled planetary gear
Gear ratio	3/4/5/7/8/10	12/16/20/25/32/40/64	3/4/5/7/8/10	12/16/20/25/32/40/64
Nominal output torque	5…15 Nm	7.5…20 Nm	4.5…8.5 Nm	7.5…20 Nm
Max. acceleration torque	8…24 Nm	12…32 Nm	7…13.5 Nm	12…32 Nm
Max. torsion. backlash standard/reduced	≤ 15/– arcmin	≤ 19/– arcmin	≤ 21/– arcmin	≤ 25/– arcmin
Typ. flange code	F1	F1	F1	F1

AG2250 | **Size 60**

Technical data	AG2250-+PLE60-M01-i	AG2250-+PLE60-M02-i	AG2250-+WPLE60-M01-i	AG2250-+WPLE60-M02-i
Variant	planetary gear	planetary gear	angled planetary gear	angled planetary gear
Gear ratio	3/4/5/7/8/10	12/16/20/25/32/40/64	3/4/5/7/8/10	12/16/20/25/32/40/64
Nominal output torque	15…40 Nm	18…44 Nm	14…25 Nm	18…44 Nm
Max. acceleration torque	24…64 Nm	29…70 Nm	24…40 Nm	29…70 Nm
Max. torsion. backlash standard/reduced	≤ 10/– arcmin	≤ 12/– arcmin	≤ 16/– arcmin	≤ 18/– arcmin
Typ. flange code	F2, F3, AM312x, N2	F2, F3, AM312x	F2, F3, AM312x, N2	F2, F3, AM312x

AG2250 | **Size 80**

Technical data	AG2250-+PLE80-M01-i-wXy-AS204x	AG2250-+WPLE80-M01-i-wXy-AS204x
Variant	planetary gear	angled planetary gear
Gear ratio	3/5/7/10	3/5/7/10
Nominal output torque	38…110 Nm	38…67 Nm
Max. acceleration torque	61…176 Nm	61…107 Nm
Max. torsion. backlash standard/reduced	≤ 7/– arcmin	≤ 13/– arcmin
Typ. flange code	N3	N3

Order reference	AG2250-+PLEaa-M0s-i-wXy-Motorsize
xPLEaa	series/size (PLE40, PLE60, WPLE40, WPLE60)
s = 1	1-stage with i = 3/4/5/7/8/10
s = 2	2-stage with i = 12/16/20/25/32/40/64
i	gear ratio
w = 0	smooth shaft
w = 1	shaft with groove and feather key
X	identifying letter for clamping hub diameter; not available for selection, is selected automatically based on the respective motor
Motorsize	Specification of the size according to flange-compatible motors. The planetary gears are delivered as a unit with the assembled motor.
Motorsize = AM811x (F1)	flange code F1: AM801x, AM811x; compatible with AM301x, AM311x
Motorsize = AM812x (F2)	flange code F2: AM802x, AM812x; compatible with AM302x
Motorsize = AM312x	in combination with AM312x
Motorsize = AM813x (F3)	flange code F3: AM813x, AM803x, AM853x; compatible with AM303x
Motorsize = AS202x (N2)	flange code N2 (NEMA23): AS202x
Motorsize = AS204x (N3)	flange code N3 (NEMA34): AS204x

▶AG2250

We reserve the right to make technical changes.

AS20xx | **Stepper motors**

The new AS2000 two-phase stepper motors with a stepper angle of 1.8 degrees shrink the gap to the AM8000 high-performance servomotor. With their flange codes N2 (NEMA23) and N3 (NEMA34), the stepper motors comply with international standards. Users can select from four models ranging from 0.6 to 5 Nm.

The AS2023 with 2.3 Nm is a logical addition in the medium performance range, because the AS2000 series of stepper motors delivers significantly improved scalability.

The new design of the AS2000 series is more in line with industrial requirements. And with the higher IP 54 protection class, the motors can also be used under harsh environmental conditions. It also features easy cabling thanks to the standardised, integrated M12 high-power screwtype connector for power and the robust M12 connector for the encoder. With its torsion-proof, integrated encoder (1024 inc/rev), the motor is ideal for the Beckhoff-supported vector control of stepper motors. A non-encoder version is available as well. The vector control system minimises resonances and reduces the generation of heat and noise for servo-like operating characteristics.

All motors in the AS2000 series were designed to be used with EtherCAT stepper motor terminals EL7037 (1.5 A) and EL7047 (5 A). Commissioning them in TwinCAT is easy. To simplify the axis layout, the AS2000 stepper motors are integrated into the TC3 Motion Designer for easy dimensioning.

The motors are optionally available with a flattened shaft or with a groove and feather key (flange code N3 only). Shielded motor and encoder cables are also available. They were designed for the stepper motor terminals and come preconfigured for the terminal points. With the low-backlash planetary gear of the AG2250 series in straight or angled versions, a wide range of applications can be accommodated. A new elastic coupling connector for easy machine mounting completes the portfolio.

Technical data	AS20xx
Motor type	stepper motor
Rated supply voltage	24…50 V DC
Resolution	1.8°/200 full steps
Insulation class	thermal class B (130 °C)
Design form	flange-mounted according to IM B5, IM V1, IM V3
Protection class	IP 54
Cooling	Adequate ventilation for the motors must be assured.
Coating/surface	matt black coating RAL 9005
Connection method	M12 round plug connector
Life span	L_{10h} = 30,000 hrs for ball bearings
Approvals	CE

We reserve the right to make technical changes.

AS202x | Stepper motor 0.83…2.30 Nm (standstill torque), flange code N2

Data for 24…50 V DC	AS2021-wCy0	AS2022-wGy0	AS2023-wGy0
Flange code	N2 (NEMA23/56 mm)		
Rated supply voltage	24…50 V DC		
Rated current (per phase)	2.00 A	5.60 A	5.00 A
Standstill torque	0.83 Nm	1.37 Nm	2.30 Nm
Rotor moment of inertia	0.210 kgcm²	0.360 kgcm²	0.490 kgcm²
Bus Terminal	KL2531	KL2541	KL2541
EtherCAT Terminal	EL7037/EL7031	EL7047/EL7041	EL7047/EL7041
EtherCAT Box	EP7041-1002	EP7041-3002	EP7041-3002
EtherCAT plug-in module	EJ7047		
Gear unit	AG2250: PLE60, WPLE60		
Further information	AS2021	AS2022	AS2023

AS204x | Stepper motor 6.40 Nm (standstill torque), flange code N3

Data for 24…50 V DC	AS2042-wGy0
Flange code	N3 (NEMA34/86 mm)
Rated current (per phase)	6.00 A
Standstill torque	6.40 Nm
Rotor moment of inertia	3.000 kgcm²
Bus Terminal	KL2541
EtherCAT Terminal	EL7047/EL7041
EtherCAT Box	EP7041-3002
EtherCAT plug-in module	EJ7047
Gear unit	AG2250: PLE80, WPLE80
Further information	AS2042

Order reference	AS20uv-wxyz
u	flange code
v	motor length
w = 0	smooth shaft (only for AS202x)
w = 1	shaft with groove and feather key according to DIN 6885 (not for AS202x)
w = 8	shaft with 1 flat
x	winding code
y = 0	no encoder
y = 1	encoder 24 V DC, 1024 increments
z = 0	without holding brake

Dimensions	a	b	d	k	l	m	o	r
AS2021-wCy0	38.1 mm	6.35 mm	20.6 mm	54 mm	47.14 mm	–	–	56 mm (NEMA23)
AS2022-wGy0	38.1 mm	6.35 mm	20.6 mm	54 mm	47.14 mm	–	–	56 mm (NEMA23)
AS2023-wGy0	38.1 mm	6.35 mm	20.6 mm	54 mm	47.14 mm	–	–	56 mm (NEMA23)
AS2042-wGy0	73 mm	14 mm	30 mm	96.5 mm	69.6 mm	33 mm	24 mm	86 mm (NEMA34)

▶ AS2000

For availability status see Beckhoff website at: AS2000

We reserve the right to make technical changes.

Accessories for AS2000 stepper motors

Pre-assembled cables for IP 20

Ordering information	Motor and encoder cables for IP 20 I/Os	Pict.
ZK4000-7700-xxxx	motor cable, IP 67, PUR, 4 x 0.75 mm², shielded, drag-chain suitable, M12, plug, straight, socket, 4-pin, T-coded – open end	A
ZK4000-5100-2xxx	encoder cable, drag-chain suitable, (5 x 0.25 mm²), shielded, for EL7031/EL7037/EL7041/EL7047 or KL2531/KL2541	B

Max. cable length 10 m, available in lengths of 1 m, 3 m, 5 m and 10 m (xxx = length in decimetres, e.g. -2010 = 1 m)
Technical data for drag-chain use see ▶ **compact-drive-technology**

Pre-assembled cables for IP 67

Ordering information	Motor and encoder cables for IP 67 I/Os	Pict.
ZK4000-6877-xxxx	motor cable, IP 67, PUR, 4 x 0.75 mm², shielded,drag chain suitable, M12, plug, straight, male, 4-pin, A-coded – M12, socket, straight, female, 4-pin, T-coded	C
ZK4000-5151-xxxx	encoder cable, drag-chain suitable, (4 x 0.35 mm²), shielded, for EP7041	D

Max. cable length 10 m, available in lengths of 1 m, 3 m, 5 m and 10 m (xxx = length in decimetres, e.g. -2010 = 1 m)
Technical data for drag-chain use see ▶ **compact-drive-technology**

Coupling for AS2000

Ordering information	AG2090-+CJbb-c/d-Motorsize
AG2090-+CJ05-c/d-AS202x	jaw-type coupling for flange code N2 (AS202x), available in (drive/output) 6.35/6.00 mm, 6.35/6.35 mm, 6.35/8.00 mm
AG2090-+CJ10-c/d-AS204x	jaw-type coupling for flange code N3 (AS204x), available in (drive/output) 14.0/14.0 mm, 14.0/16.0 mm

A

B

C

D

For availability status see Beckhoff website at: AS2000

We reserve the right to make technical changes.

AS1000 | **Stepper motors**

Motion | AS1000 stepper motors
The AS1000 stepper motors with flange codes from 42 to 86 mm (NEMA17, NEMA23, NEMA34) and torques from 0.4 to 5 Nm are ideally suited for use as auxiliary axes and positioning drives. They are characterised by robustness and high holding torques. Due to the integrated micro-stepping the motors can position very well even without a feedback system and require only a motion terminal for power electronics. Stepper motors can also be operated with TwinCAT NC PTP for synchronisation functions such as cam plates or flying saws.

I/O | Stepper motor terminals
For stepper motor terminals, I/O components with different performance features are available: Bus Terminal (KL2531, KL2541), EtherCAT Terminal (EL7031/EL7041 and EL7037/EL7047) and EtherCAT Box (EP7041).

The KL2531, EL7031 and EL7037 stepper motor terminals are exclusively designed for 24 V DC power supplies. The motor current can reach up to 1.5 A. The KL2541, EL7041 and EL7047 stepper motor terminals cover a supply voltage range from 8 to 50 V DC and additionally require a 24 V DC supply via the power contacts. The motor current can be set from 1 to 5 A. The EP7041 stepper motor module allows the connection of stepper motors up to 50 V DC and 5 A.

EL7031, EL7041, EL7037, EL7074 | Stepper EtherCAT Terminals see page 437

KL2531, KL2541 | Stepper Bus Terminals see page 651

EP7041 | Stepper EtherCAT Box see page 502

EL957x | Buffer capacitor terminals see page 449

Technical data	AS10xx
Motor type	stepper motor
Rated supply voltage	24…50 V DC
Resolution	1.8°/200 full steps
Insulation class	thermal class B (130 °C)
Design form	AS1010/AS1020: flange-mounted according IM B14, IM V1, IM V3, AS1030/AS1050/AS1060: flange-mounted according IM B5, IM V1, IM V3
Protection class	IP 43, AS1060: IP 20
Cooling	Free ventilation of the motors must be ensured.
Connection method	direct cable outlet via cable gland with connected M12 coupling
Life span	L_{10h} = 30,000 hrs for ball bearings
Approvals	CE

We reserve the right to make technical changes.

AS10xx | **Rated current 1.0…1.5 A**

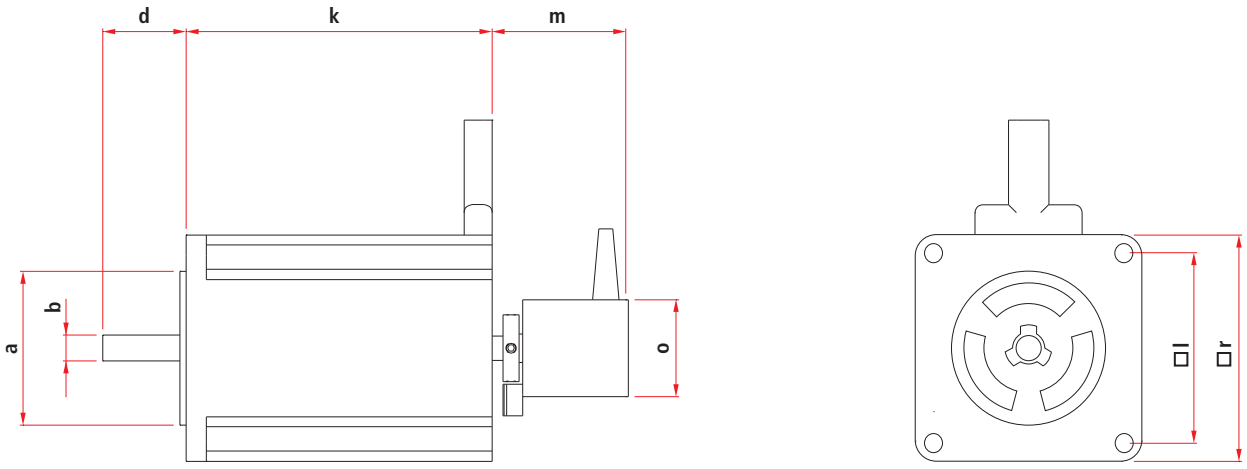
Data for 24…50 V DC	AS1010-0000	AS1020-0xyz	AS1030-0000
Flange code	42 mm (NEMA17)	42 mm (NEMA17)	56 mm (NEMA23)
Rated current (per phase)	1.00 A	1.00 A	1.50 A
Standstill torque	0.38 Nm	0.50 Nm	0.60 Nm
Rotor moment of inertia	0.056 kgcm²	0.074 kgcm²	0.210 kgcm²
Bus Terminal	KL2531	KL2531/KL2541	KL2531
EtherCAT Terminal	EL7031/EL7037	EL7031/EL7041/EL7037/EL7047	EL7031/EL7037
EtherCAT Box	EP7041-1002	EP7041-1002	EP7041-1002
Gear unit	–	–	AG1000-+PM52.i

AS10xx | **Rated current 5 A**

Data for 24…50 V DC	AS1050-0xyz	AS1060-wxyz
Flange code	56 mm (NEMA23)	86 mm (NEMA34)
Rated current (per phase)	5.00 A	5.00 A
Standstill torque	1.20 Nm	5.00 Nm
Rotor moment of inertia	0.360 kgcm²	3.000 kgcm²
Bus Terminal	KL2541	KL2541
EtherCAT Terminal	EL7041/EL7047	EL7041/EL7047
EtherCAT Box	EP7041-3002	EP7041-3002
Gear unit	AG1000-+PM52.i	AG1000-+PM81.i

Order reference	AS10u0-wxyz
u	type
w = 0	AS1010, AS1020: smooth shaft with 1 flat, AS1030, AS1050: smooth shaft, AS1060: smooth shaft with 2 flats
w = 1	shaft with groove and feather key according to DIN 6885 (only available with AS1060)
x = 0	standard motor without second shaft
x = 1	second shaft (for AS1020/AS1050/AS1060 only), necessary for encoder
y = 0	no incremental encoder
y = 2	incremental encoder, 24 V DC, 1024 lines (only available for AS1020, AS1050, AS1060), requires x = 1

We reserve the right to make technical changes.



Dimensions	a	b	d	k	l	m	o	r
AS1010	22 mm	5 mm	24 mm	39 mm	31 mm	–	–	42 mm (NEMA17)
AS1020	22 mm	5 mm	24 mm	48 mm	31 mm	33 mm	24 mm	42 mm (NEMA17)
AS1030	38.1 mm	6.35 mm	20.6 mm	54 mm	47.14 mm	–	–	56 mm (NEMA23)
AS1050	38.1 mm	6.35 mm	20.6 mm	75.8 mm	47.14 mm	33 mm	24 mm	56 mm (NEMA23)
AS1060	73 mm	14 mm	30 mm	96.5 mm	69.6 mm	33 mm	24 mm	86 mm (NEMA34)

▶AS10xx

Accessories for AS1000 stepper motors

Cables for AS1000 at Bus Terminal/EtherCAT Terminal up to 5 A

Ordering information	Cables for stepper terminals EL7031, EL7037, EL7041, EL7047 and KL2531, KL2541	Pict.
ZK4000-5100-2xxx	encoder cable for ASxxxx, IP 67, PUR, (5 x 0.25 mm²), shielded, flex, M12, plug, straight, male, 5-pin, A-coded – open end	A
ZK4000-6700-2xxx	motor cable for AS1000, assembled at both ends, (4 x 0.5 mm²), shielded, 4 million bending cycles, bending radius = 55 mm (10 x OD)	B

Available in lengths of 1 m, 3 m, 5 m and 10 m (2xxx = length in decimetres, e.g. -2010 = 1 m)
Technical data for drag-chain use see ▶ **compact-drive-technology**

A

B

We reserve the right to make technical changes.

Cables for AS1000 at EtherCAT Box up to 5 A

Ordering infomation	Cables for stepper motor EtherCAT Box EP7041	Pict.
ZK4000-5151-0xxx	encoder cable for ASxxxx, IP 67, PUR, (5 x 0.25 mm²), shielded, flex, M12, plug, straight, male, 5-pin, A-coded – M12, plug, straight, male, 5-pin, A-coded	C
ZK4000-6768-0xxx	motor cable for AS1000, assembled at both ends, (4 x 0.5 mm²), shielded, 4 million bending cycles, bending radius = (10 x OD)	D

Available in lengths of 0.5 m, 1 m, and 2 m (xxxx = length in decimetres, e.g. -0005 = 0.5 m)
Technical data for drag-chain use see ▶ **compact-drive-technology**

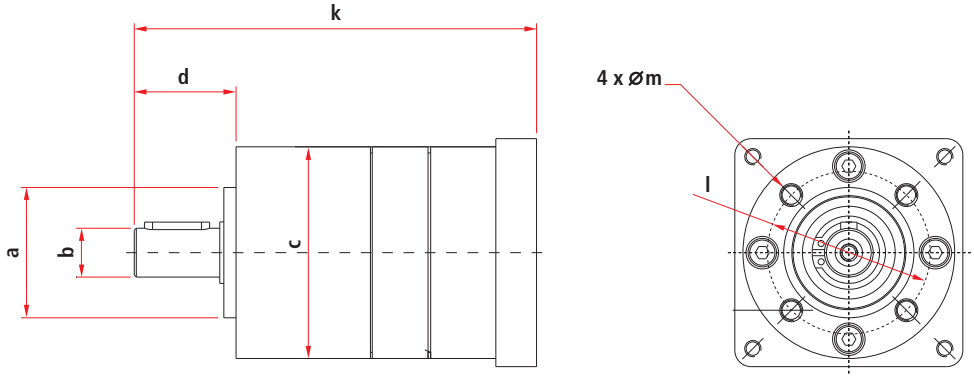
C

D

AG1000 | Planetary gear units for AS1000

Technical data	AG1000-+PM52.4	AG1000-+PM52.7	AG1000-+PM81.4	AG1000-+PM81.7
Nominal output torque	4 Nm	4 Nm	20 Nm	20 Nm
Max. acceleration torque	6 Nm	6 Nm	30 Nm	30 Nm
Gear ratio	3.7 or 63/17	6.75 or 27/4	3.7 or 63/17	6.75 or 27/4
Max. torsional backlash	≤ 0.7 °	≤ 0.7 °	≤ 0.5 °	≤ 0.5 °
Max. radial load	200 N	200 N	400 N	400 N
Efficiency	approx. 80 %			
Type of gear	planetary gear			
Weight	0.7 kg	0.7 kg	1.8 kg	1.8 kg
Combination with AS10xx	AS1030, AS1050	AS1030, AS1050	AS1060	AS1060

The planetary gears are delivered as a unit with the assembled stepper motor.

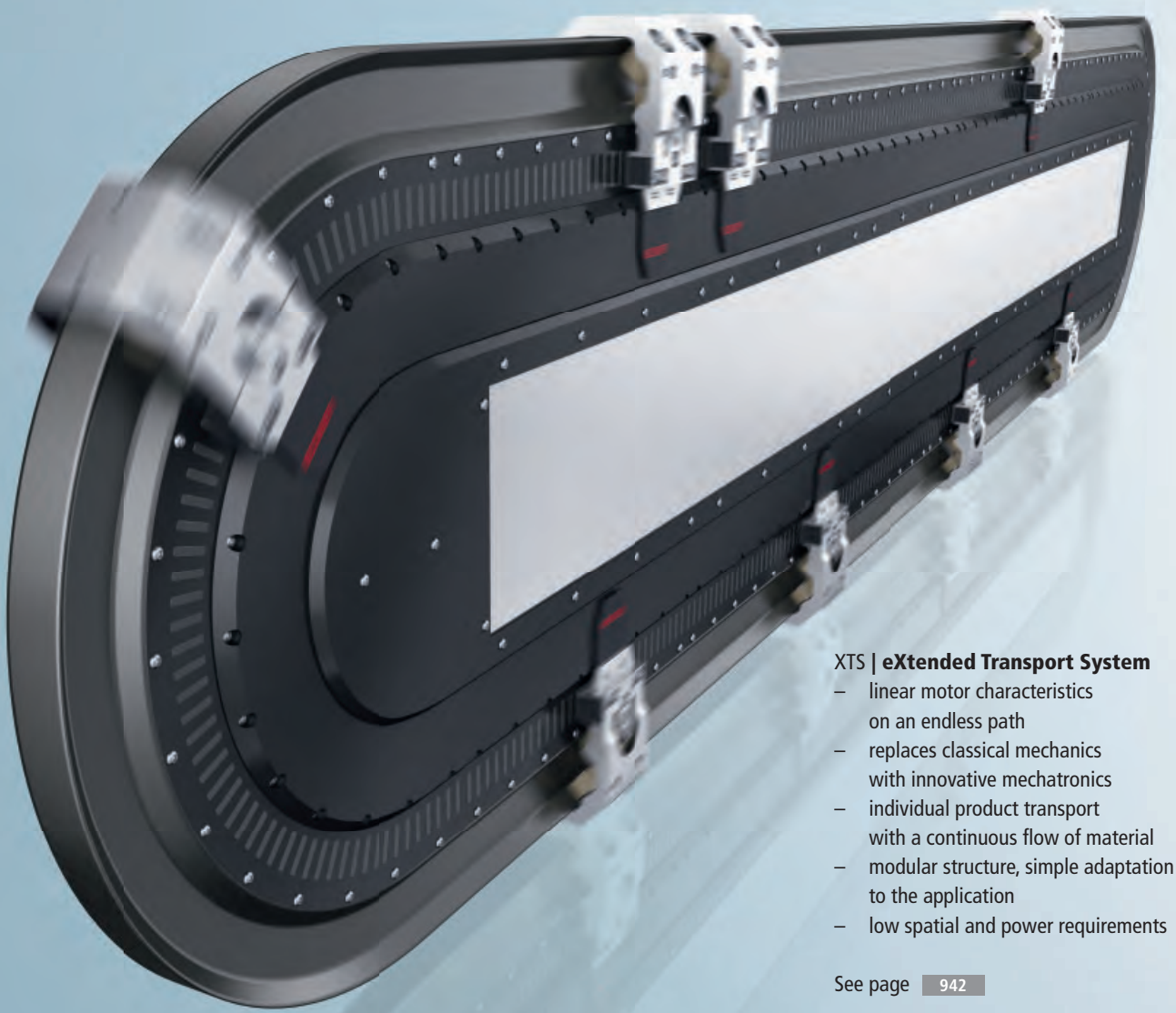


Dimensions	a	b	c	d	k	l	m
AG1000-+PM52.i	32 mm	12 mm	52 mm	25 mm	99.8 mm	40 mm	M5 x 10
AG1000-+PM81.i	50 mm	19 mm	81 mm	49 mm	151.2 mm	65 mm	M6 x 12

We reserve the right to make technical changes.

XTS | eXtended Transport System

▶ XTS



XTS | **eXtended Transport System**

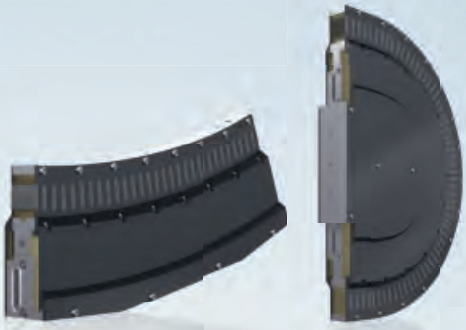
- linear motor characteristics on an endless path
- replaces classical mechanics with innovative mechatronics
- individual product transport with a continuous flow of material
- modular structure, simple adaptation to the application
- low spatial and power requirements

See page 942

We reserve the right to make technical changes.

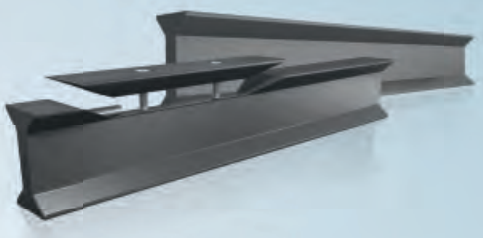
AT200x | **Straight motor module**
- highly integrated motor module with coil package, power electronics and displacement measurement
- 250 x 38 x 96 mm (L x W x H)

See page 954



AT20xx | **Curved motor modules**
- highly integrated motor modules with coil package, power electronics and displacement measurement
- +180° (clothoid, radius not constant), +45°, +22.5° or -22.5°

See page 954



AT9xxx | **Guide rails**
- straight and curved segments
- with lock for the removal of movers
- abrasion-resistant hard anodised aluminium surface
- lengths up to 2.5 m

See page 958

AT9011 | **Mover**
- wireless, mobile carrier modules
- any desired number of movers on a common path
- contains magnetic plates which, together with the coils in the motor modules, can generate propulsive forces

See page 955

TF5850 | **Software and programming**
- simple handling of the desired movements by mapping the mover as a normal servo axis in TwinCAT
- With the XTS extension in TwinCAT, all algorithms can be calculated on an IPC. Interfaces between different subsystems are not required.
- All Motion Control functions such as flying saw, electrical gears and cam plate are usable.

See page 956

We reserve the right to make technical changes.

XTS | The linear transport system

The linear transport system XTS (eXtended Transport System) unites the benefits of rotary and linear systems. XTS enables individual product transport with a continuous flow of material. Due to the low construction volume the energy efficiency can be improved and the size of a machine can be significantly reduced.

Only motor module, mover, software and Industrial PC

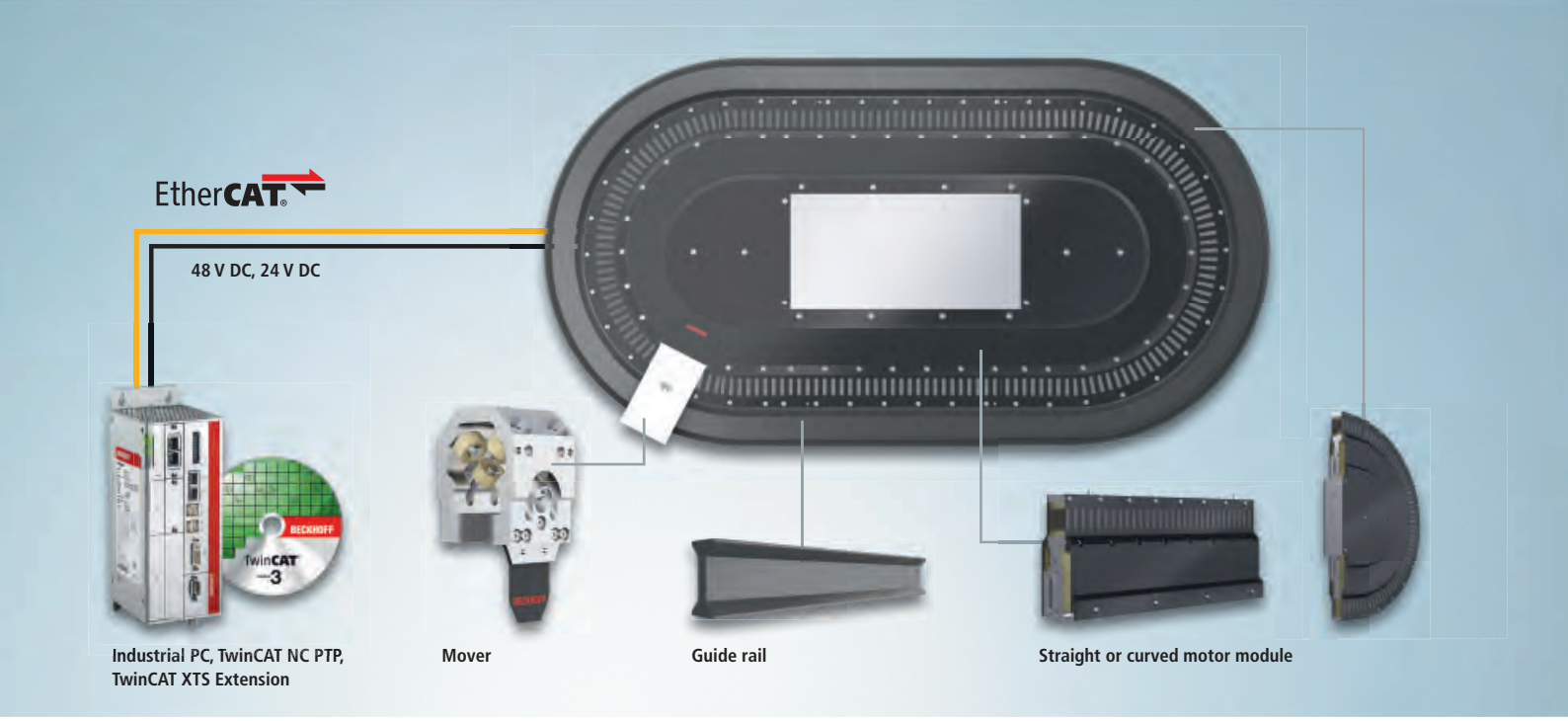
PC-based control from Beckhoff follows a principle that is equally simple and efficient: the maximum application of information technology for the simplification of mechanical processes. With XTS, Beckhoff has transferred this principle directly to the field of drive systems – and in this way has opened up new efficiency potentials in mechanical engineering, because XTS makes do with four simple components.

- Firstly: an arbitrary number of motor parts, which serve as path modules.
- Secondly: an arbitrary number of movers, which act individually or in groups.
- Thirdly: control software.
- And fourthly: an Industrial PC.

Flexible use, arbitrary functional options

There are virtually no limits to the possibilities of use of XTS: the movers can accelerate, brake, position and synchronise; they can take up absolute and positions relative to each other; they can group themselves and accumulate; they can create clamping forces in motion; they can travel through curves as fast as along straights; they can recover energy through regenerative braking and utilise both travel directions for transport purposes. And all of that with precise position control, without backlash, without material fatigue, virtually without wear – and without cost-intensive maintenance.

We reserve the right to make technical changes.

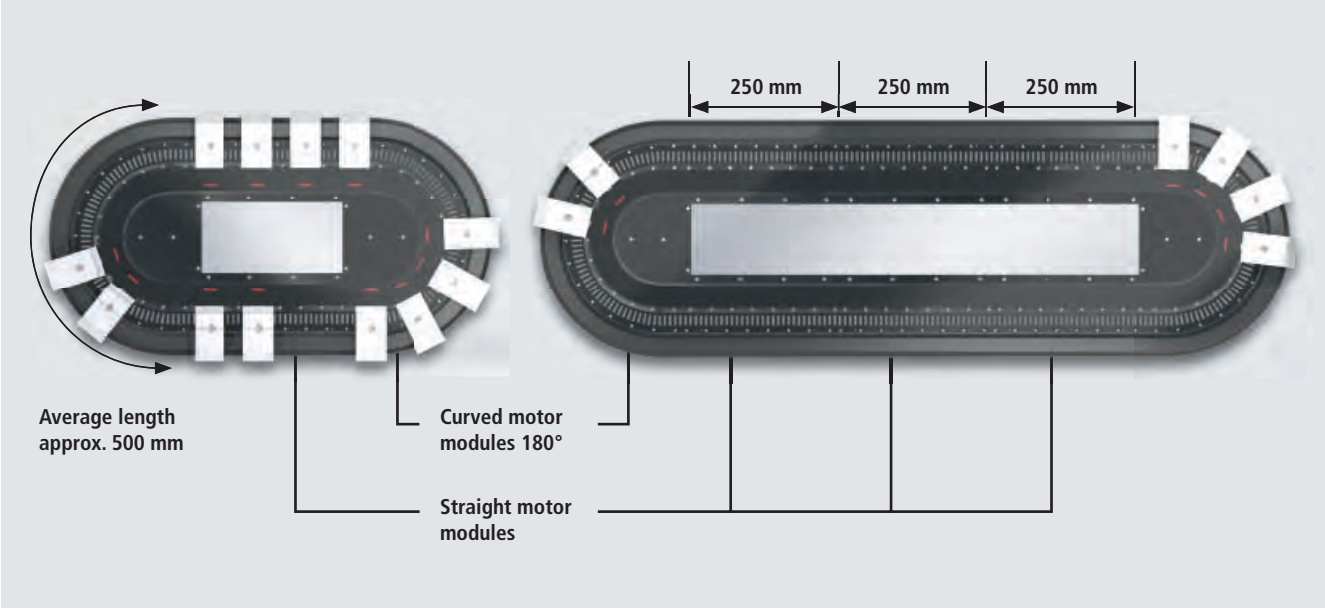


XTS | Modular and flexible

XTS is a mechatronic system containing all functions necessary for operation. A modular, fully integrated linear motor with power electronics and displacement measurement in one device. A mover as the moved part. A mechanical guide rail. The most diverse applications can be realised with these few coordinated components. The desired geometries, lengths and radii are formed by the number and choice of the components.

The XTS components for a continuous system

- curve sections
- 2 or more straight sections
- 1 or more movers
- Beckhoff Industrial PC
- TwinCAT NC PTP
- TwinCAT XTS extension
- power supply units



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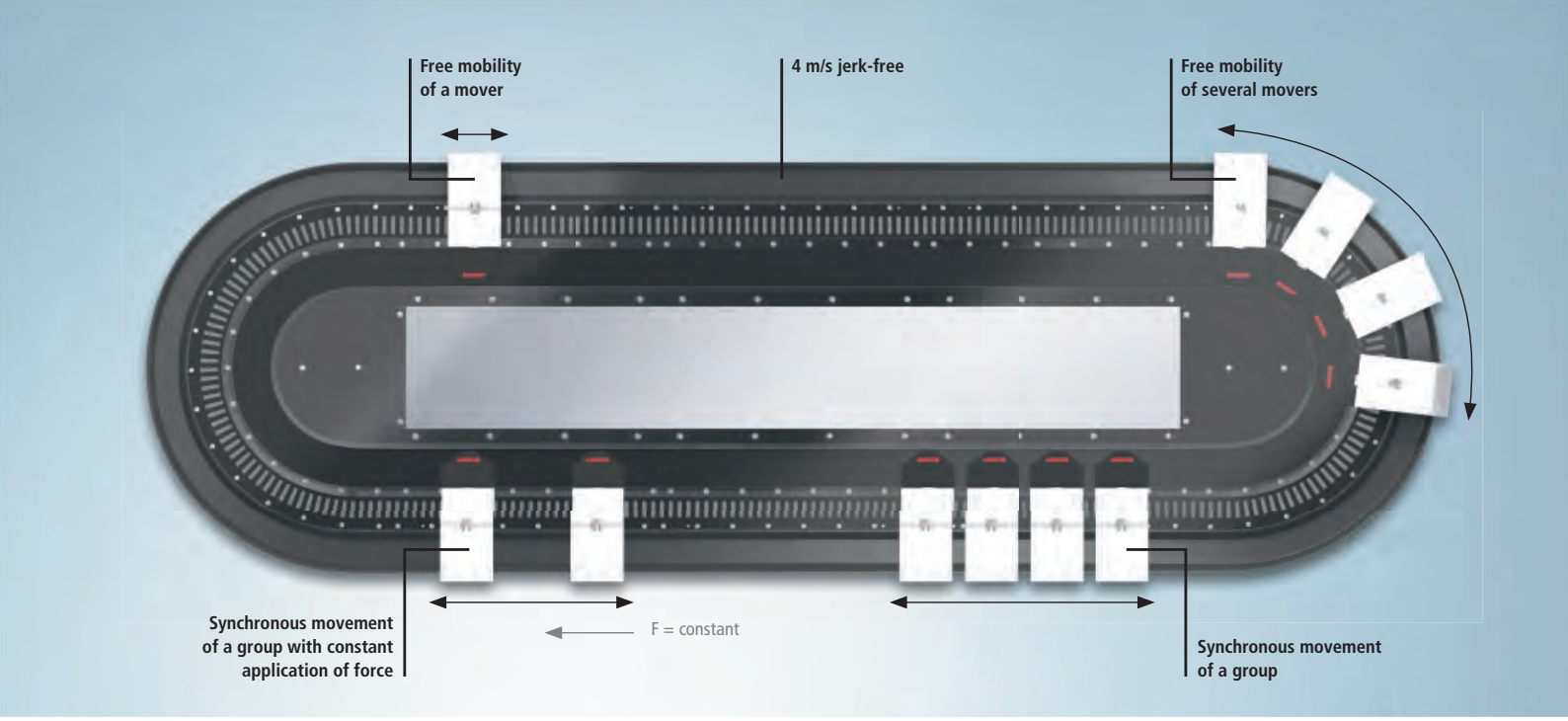


XTS | **Basic functions**

The XTS system enables a new class of functions that can be used at the same time in several places.
Completely new, particularly flexible: transport and positioning tasks are economically solvable with little effort.

The linear motor with NC and more degrees of freedom

Free mobility of an individual wireless mover
The individual mover can be moved like a linear motor along the entire path, since it makes do without cables. It can arbitrarily start, stop, brake, accelerate and drive to positions. Like a linear motor with NC, an individual mover can be synchronised to external motion profiles, thereby achieving maximum flexibility.

Production speed of up to 4 m/s over the entire path
An individual mover can be addressed sensitively – without jerking and with maximum positioning accuracy. The jerk-free acceleration profiles even allow the transport of open liquids.

Less wear, less maintenance
The use of XTS leads to less mechanical wear, since only the mover needs mechanical bearings. Gears, belts, guide rollers and clamps are no longer necessary. Due to the high positioning accuracy, the compensation of inaccuracies as required in common transport solutions is unnecessary: there is no stretching of chains due to load and wear, re-tensioning of toothed belts or mechanical backlash during load changes. Apart from the payload, only the small mass of the mover is moved.

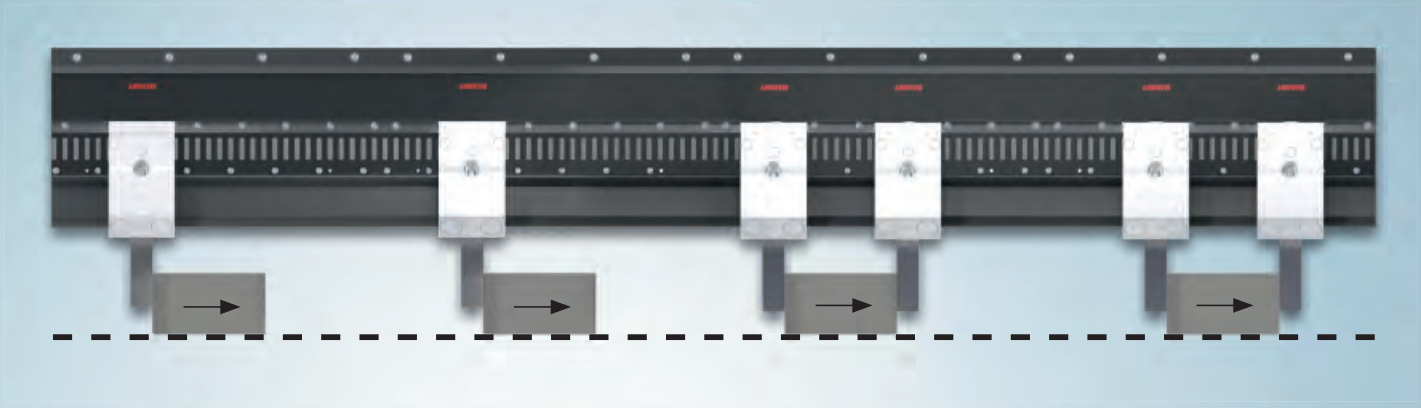
Synchronous movement in the group

Movements with constant force
A mover follows another with a defined force. It can apply a "clamping force" while at the same time following a movement, for example in order to hold a product. For other applications the force can be limited so as not to place an unnecessary load on a product under any conditions.

Synchronous movement of a group
At any place on the path during movement, groups can be formed that stop together or drive past processing stations with a specified speed profile. The size of the group (number and spacing) can be changed dynamically.

Free mobility of several movers
The movers can all be moved independently of one another. They can take up absolute positions along the entire travel distance. In addition, they can be moved relatively to each other and always avoid a collision with their neighbour.

We reserve the right to make technical changes.



Push product, adapt product spacing, reduce or increase product speed

Clamp and move product

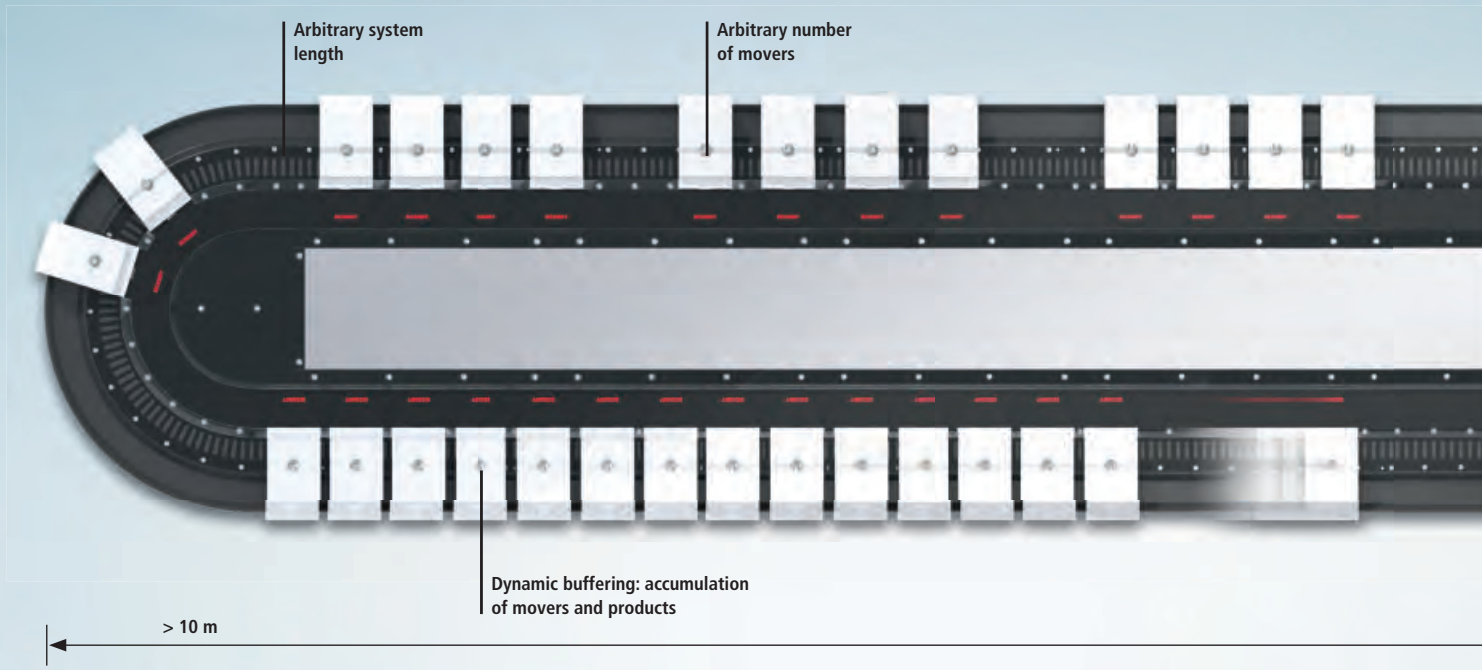
Use of the basic functions

Interruption-free production flow

From the combination of the basic functions, product flows can be kept constantly in motion with XTS. Since the movers in the XTS operate independently of each other, it is possible to stop and process individual objects without having to interrupt the entire process. Viewed from the outside the production flow is maintained.

Push product, adapt product spacing, reduce or increase product speed
The movers of the XTS system can always run with the flow of product. No return trip or return stroke is necessary. The transported material can be accumulated and grouped during the movement via the dynamic buffering.

Clamp and move product
Through the combination of the synchronous movement of a group and the application of a constant force, a product can be clamped and moved in a clamped condition. Movement is controlled at all times and at all places on the transport path.



XTS | **Complex functions**

Due to the mechatronic concept, XTS combines functions and characteristics that are required for the dynamic transport of goods of all kinds. Apart from the basic functions of the movers, the complex functions of XTS enable the gentle control of an endless product flow.

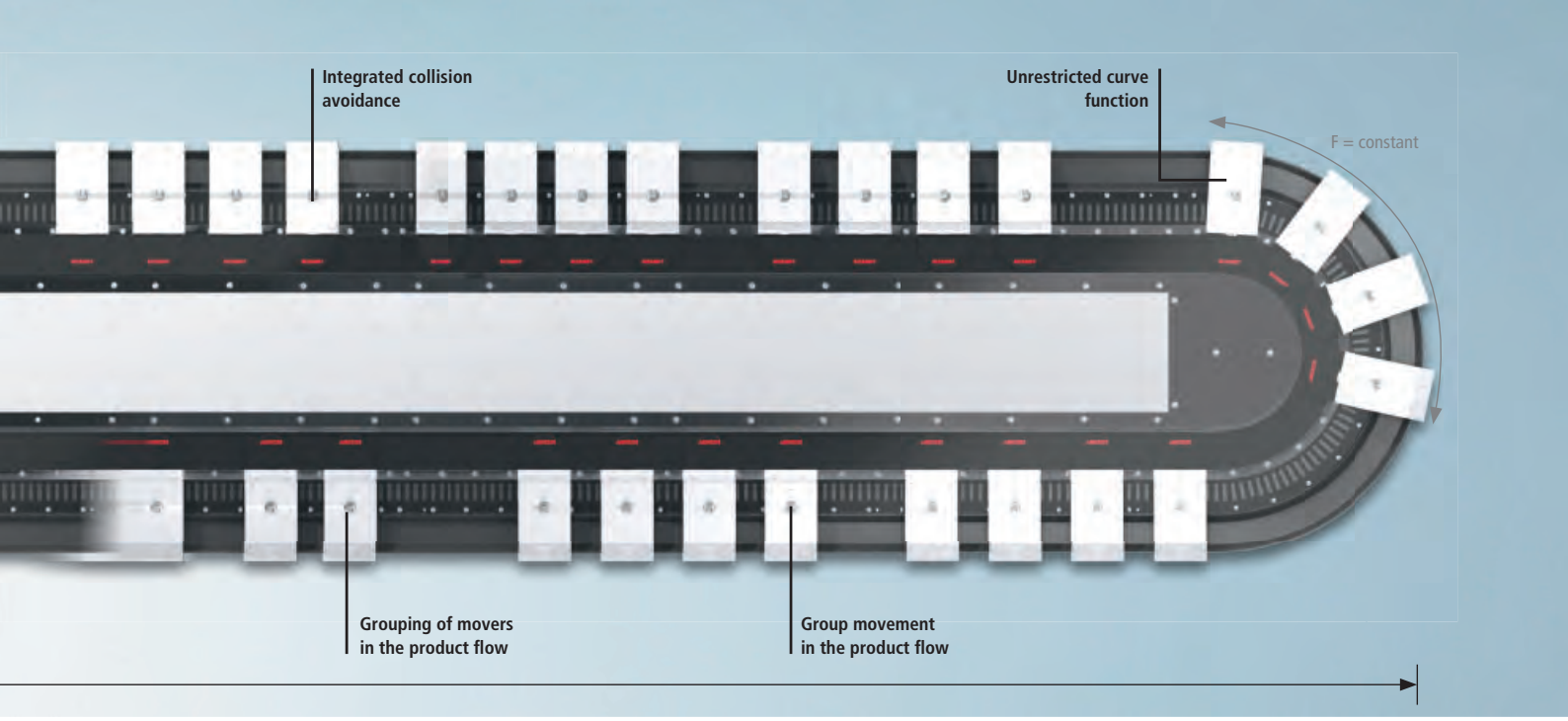
Arbitrary number of movers
There are no system limits for the number of movers; consequently the number can be optimally adapted to the application. In practice the number is limited only by the available computing power of the PC.

Unrestricted curve function
The entire travel path becomes the utilisable path, since the outward and return path and also the curve segments are available for the transport and processing of materials. This maximum utilisation of the machine volume results in very compact application solutions, which enable completely new machine concepts.

Arbitrary system length
There are no restrictions on the total length of the path, so that 10 m and much more are technically possible. The system consists of individual modules, which when combined with one another create both small, compact solutions and metre-long transport paths. Straight sections are made up of 250 mm modules which can be made endless by the use of curved segments. A motor cable has to be attached at least every three metres. The electrical connection between the modules is automatically made when assembling. The guide rail system offers lengths of up to 2.5 m.

Lower mass, increased safety
Small masses lead to a lower hazard potential, because unlike XTS, a conveyor chain is kept in motion by a central drive unit. The total acting force corresponds to the sum of all necessary individual forces over the entire length. In the case of an error, a mechanical malfunction or a manual intervention in the process, this force acts on one place. With XTS this risk can be significantly minimised and safety can be increased, since in most cases only the parameterised force of a mover acts. Hence, even in the case of a collision with an obstacle, only the mass of a mover with its payload acts.

We reserve the right to make technical changes.

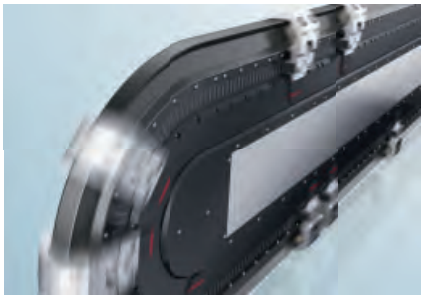


Control of a continuous product flow

High-power dynamics, but no unrestrained force
The fast signal processing and the large bandwidth of EtherCAT enable the best dynamic characteristics. Together with large peak forces, high acceleration is available to the application. Position lag monitoring avoids damage to the product in case of mechanical malfunctions. In addition, force limitation and jerk reduction allow the optimal handling of the product at all times at different points in the production. For example, the parameters can be adapted according to the filling level while moving.

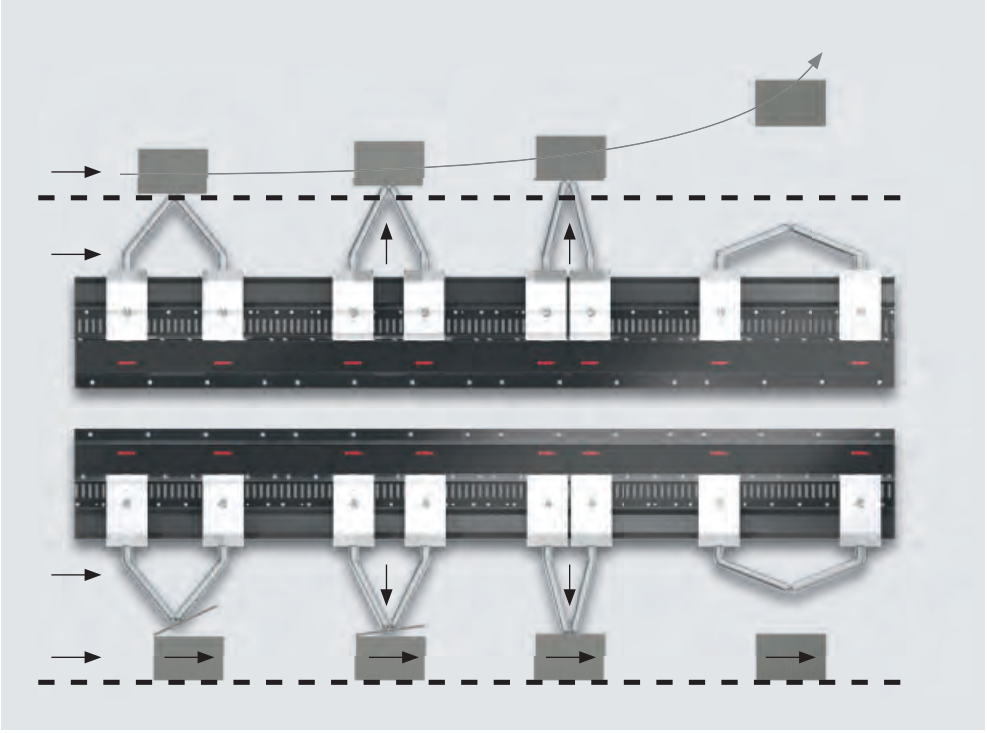
Absolutely precise configuration
The arbitrary number of movers, the modular path guidance, the individual controllability of each individual mover and the simple integrability into existing machines and plants ensure a precisely matching solution with which the production efficiency of a machine can be further optimised.

Fast, flexible format adaptation
A change of format when changing products or, for example, when the filling quantity changes can be carried out without stopping production: the modifications can be realised by changing the software parameters and empirical values can also be retrieved at any time in the form of a stored parameter set. The parameters can be exchanged between applications of the same type.



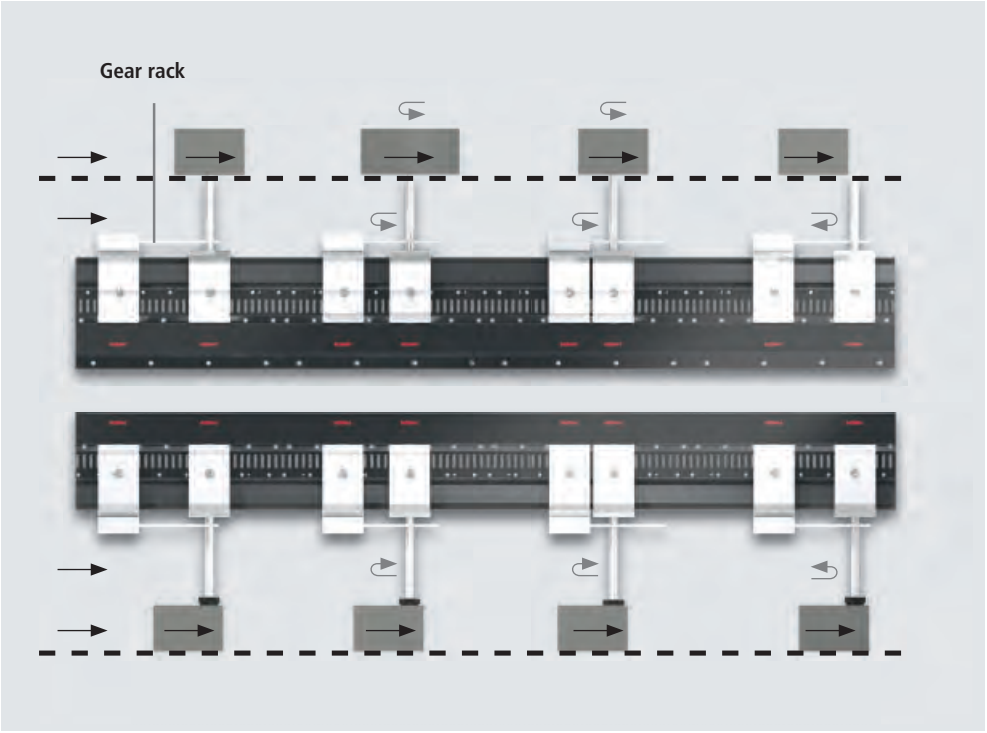
We reserve the right to make technical changes.

XTS | **Application examples**



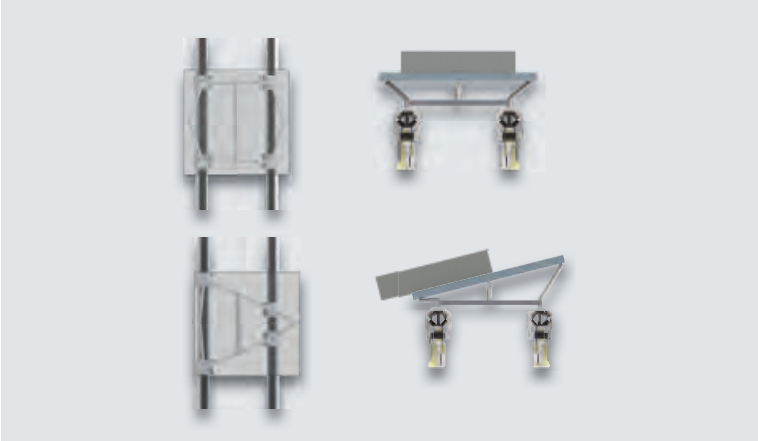
Movement kinematics in one system

Kinematics in linear motion for handling a product: lifting, sealing, etc.
A mechanical action generated by the relative movement between two movers creates an additional movement that can manipulate a product. Transported materials can be pushed upwards or to the side. A product can be closed or processed in some other way while moving.



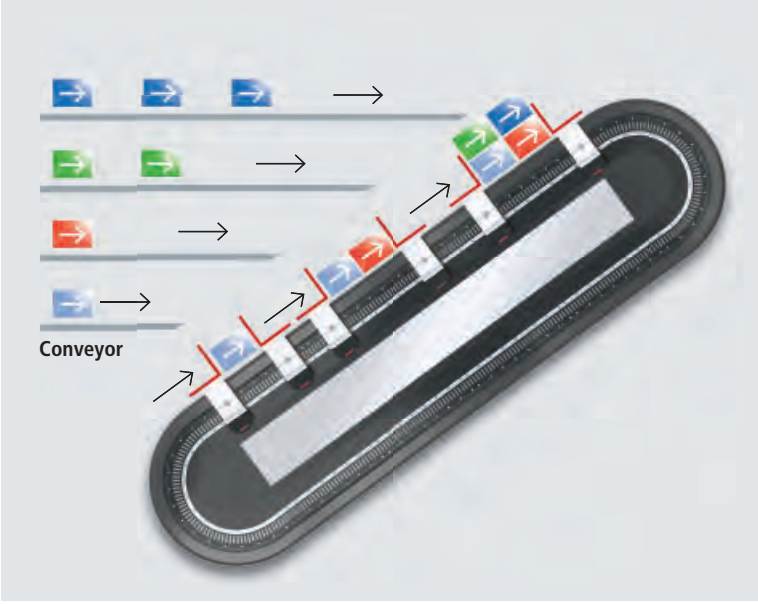
Kinematics in linear motion for handling a product: rotate, screw cap on, etc.
A rotary movement can be generated between two movers by a suitable mechanical action. This can, for example, screw a cap on or rotate the product.

We reserve the right to make technical changes.



Movement kinematics in two systems

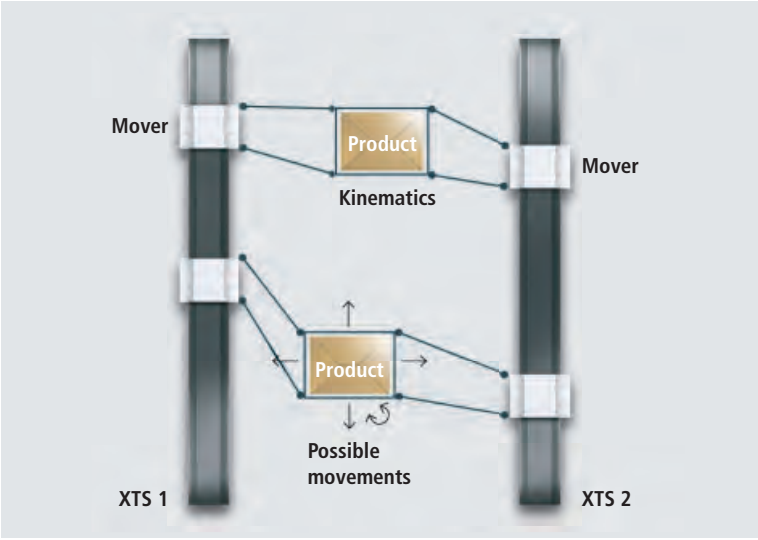
Transport and discharge product
A package or a case is transported on a surface. The package is to be deposited at a station. The surface is tilted to the side and the package slides off. Four movers on two paths move the tilting surface with the transported material. A change in the spacing of the movers with respect to each other generates a mechanical action that tilts the surface. The transported material can be prevented from sliding off when driving through curves by an inclined position and can be specifically deposited at another place while driving or after stopping.



Grouping system

Used as a grouping system, the XTS can easily combine products arriving on multiple conveyor belts into predefined and easily changed groups and move them to the next station.

The plant can adapt to the product width, stack height and number of stacks without any manual intervention. The distance between the movers and also the motion profile are changed by parameters in the software. This can even be done during operation without a standstill.



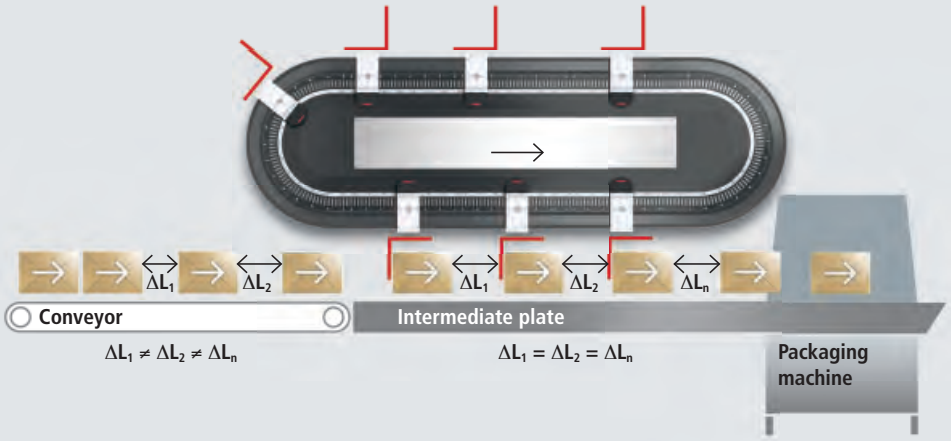
Travelling manipulator

With circulating kinematics the transported product can be influenced in X and Y directions. With two XTS systems arranged in parallel, the manipulator is synchronised to the product and shifts it on the belt at full speed. The product can even be slightly rotated by using appropriate kinematics.

We reserve the right to make technical changes.

Distribution system

Functioning as a distribution system, the XTS splits an incoming product stream into multiple streams (two in this case) inexpensively and with great flexibility.



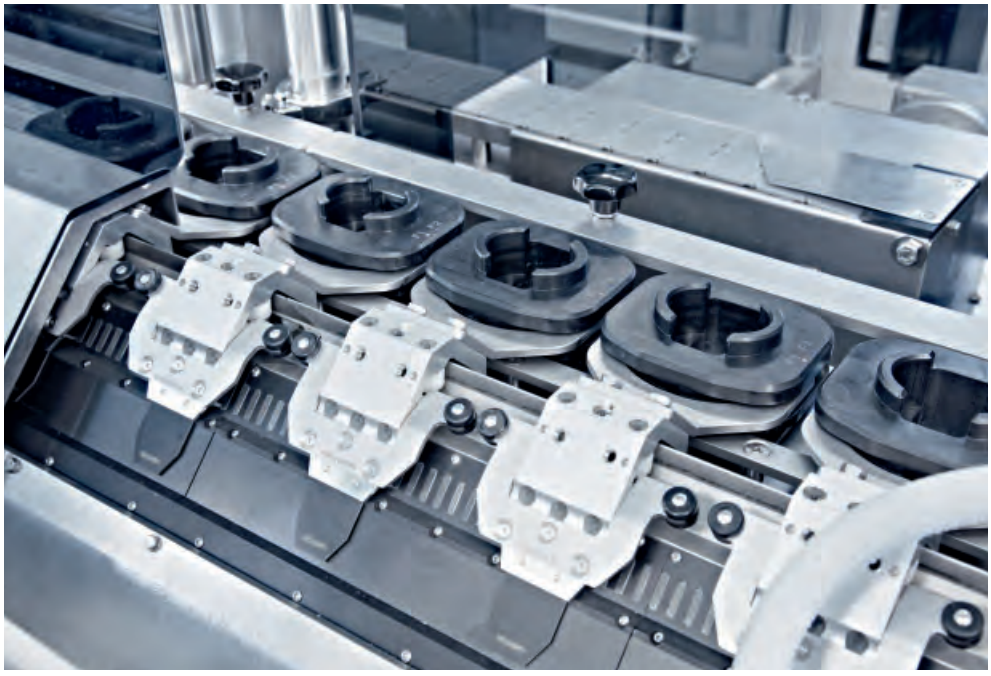
Feeder with distance adjustment

The XTS makes it easy to implement a feeder with distance adjustment that synchronises products arriving at different intervals with the downstream process.

XY axis

Two movers, defined as a virtual XY axis, and can be controlled with G-code. For example, the XTS can move the product along in a targeted manner under a fixed adhesive nozzle, in order to apply adhesive evenly along the outer contour.

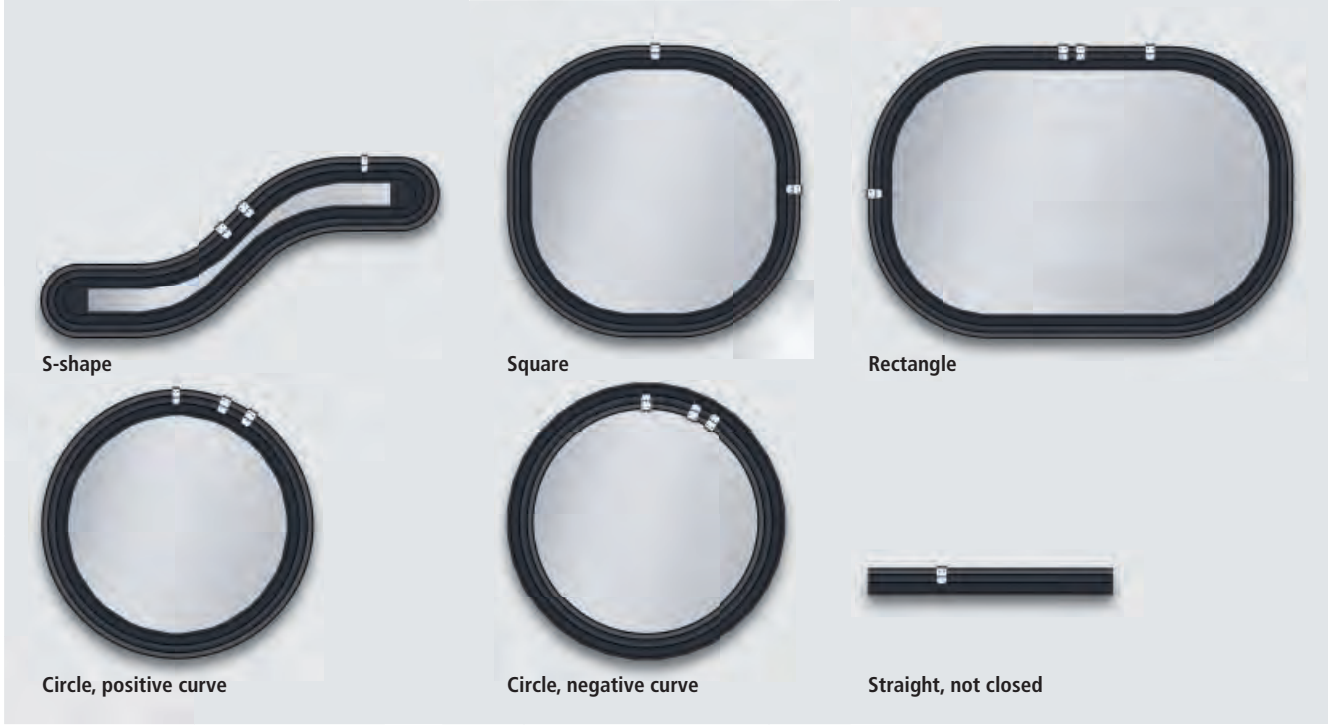
We reserve the right to make technical changes.



Synchronisation of open liquids

Every three seconds, ten open bottles are taken at a time from an intermittent filling machine to be transferred to a subsequent continuous process. To avoid spilling, the containers must be accelerated jerk-free while traversing a speed profile for the product transfer that prevents collisions with the holding clamps of the carousel.

XTS | **Trajectories**



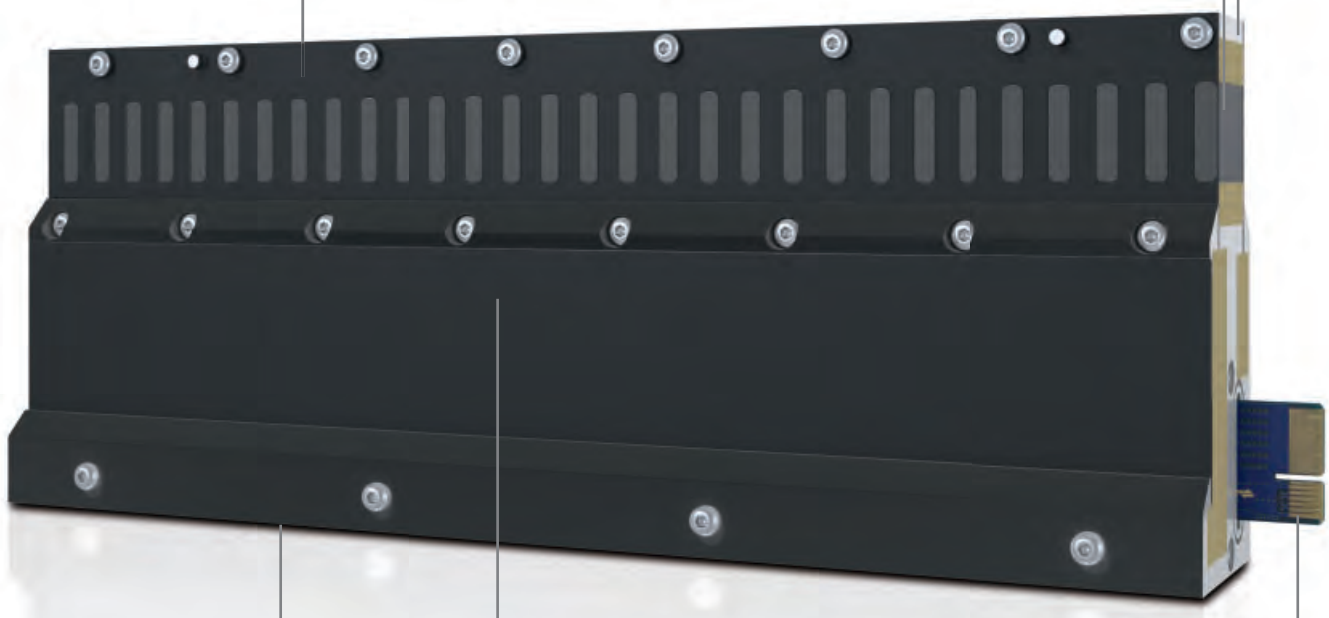
XTS | The construction kit

▶ XTS-construction-kit

To create a track the single parts with protection class IP 65 are mounted at the machine frame.

Installation area guide rail

Motor, coil package



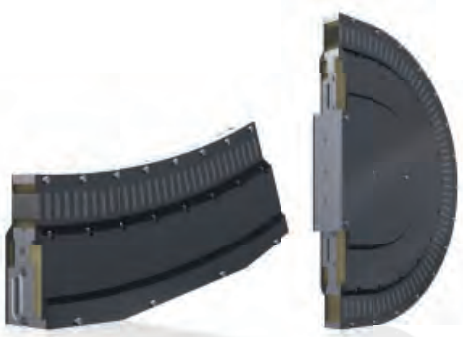
Mounting area: This surface enables mounting at the machine base.

Displacement measurement integrated in motor module
- non-contact
- absolute positions of all movers
- multi-position measurement
- resistant to dirt

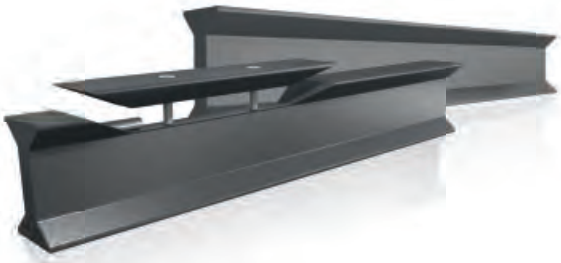
When mounting two modules, control voltage (24 V DC), power supply (48 V DC) and EtherCAT are automatically connected through.

Straight motor module

We reserve the right to make technical changes.



Curved motor modules



Guide rail system

Mover

Motor module

The motor module contains the electromagnetic coils and all other active functions necessary for the operation of the system. Only a power supply and an EtherCAT connection are required. The motor module contains no moving parts and is not subject to any wear.

– fully integrated linear motor with power electronics and displacement measurement
– Coil arrangement and mechanical structure make up a ready-to-use unit.

Guide rail system

Movers and guide rails are optimally matched to each other. The geometry of the rail and the combination of hard anodised aluminium rail surface and running surface of the mover rollers allow good running characteristics and low wear. Lubrication of the system is not necessary.

Mover

The mover contains magnetic plates which, together with the coils in the motor modules, can generate propulsive forces. It absorbs the attractive forces of the magnets on both sides and compensates them as far as possible. This allows the rollers of the mover to run at high speed in the guide rail with low wear. The rollers are equipped with a particularly wear-resistant synthetic running surface. The tensioning of the rollers prevents backlash and is at the same time designed for low wear. Consequently, the lifetime of the rollers depends on the payload. A mechanically robust encoder flag conveys the mover position to the motor module.

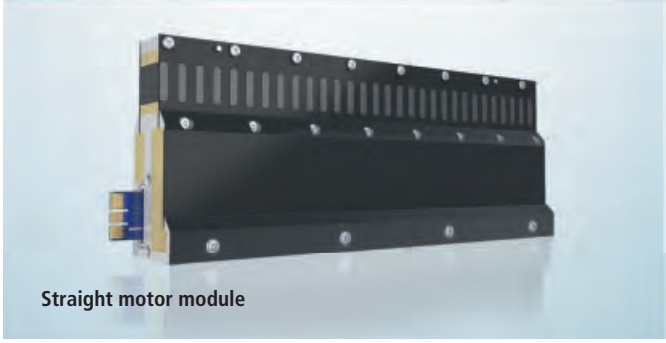
System properties	XTS
Max. force	100 N at standstill
Continuous force	30 N (at ~30 °C temperature increase in the motor compared to mounting frame)
Speed	4 m/s @ 48 V DC supply
Acceleration	> 100 m/s² (without payload)
Positioning accuracy	< ±0.15 mm @ 1.5 m/s possible within a straight module
Absolute accuracy	< ±0.25 mm possible within a straight module
Repeatability	< ±10 µm (standstill unidirectional)
Mover length	50 mm in direction of movement
Mover weight	approx. 410 g (complete mover without attachments)
Maximum system length	>> 10 m (dependent on computing power, no system limit)
Operating/storage temperature	0…+105 °C/ -25…+85 °C (for further information see documentation)
Protection class	IP 65
Approvals	CE
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4

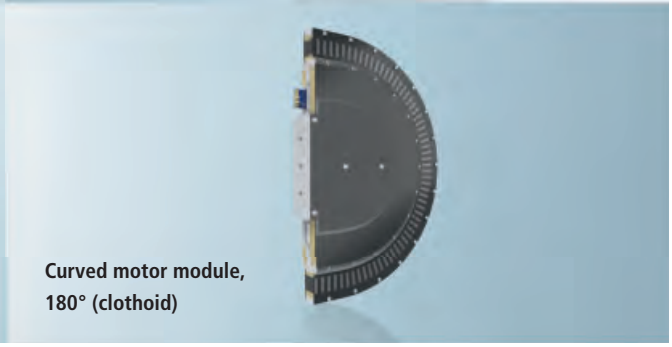
Electrical data	XTS
Supply voltage	control voltage 24 V DC, power supply 48 V DC
Current consumption	power supply: 16 A nominal current
Power consumption 24 V DC	motor modules: 30 W/m (communication, electronics, position determination)
Length per feed	max. 3 m (voltage supply, EtherCAT)
Power consumption per mover	approx. 12 W @ 4 m/s without payload

We reserve the right to make technical changes.

Curved motor module, -22.5°

Curved motor module, +22.5°


Straight motor module


Curved motor module, 180° (clothoid)

AT20xx-0xxx | XTS motor modules

The motor module, the power electronics and the displacement measurement are built into the profile. The power electronics are optimised for the requirement and reduce assembly expenditure. There is an upper mechanical interface to the guide rail and a lower one to the support structure. Straight segments and curves can be combined arbitrarily. The geometry of the motor module without edges and openings allows easy cleaning.

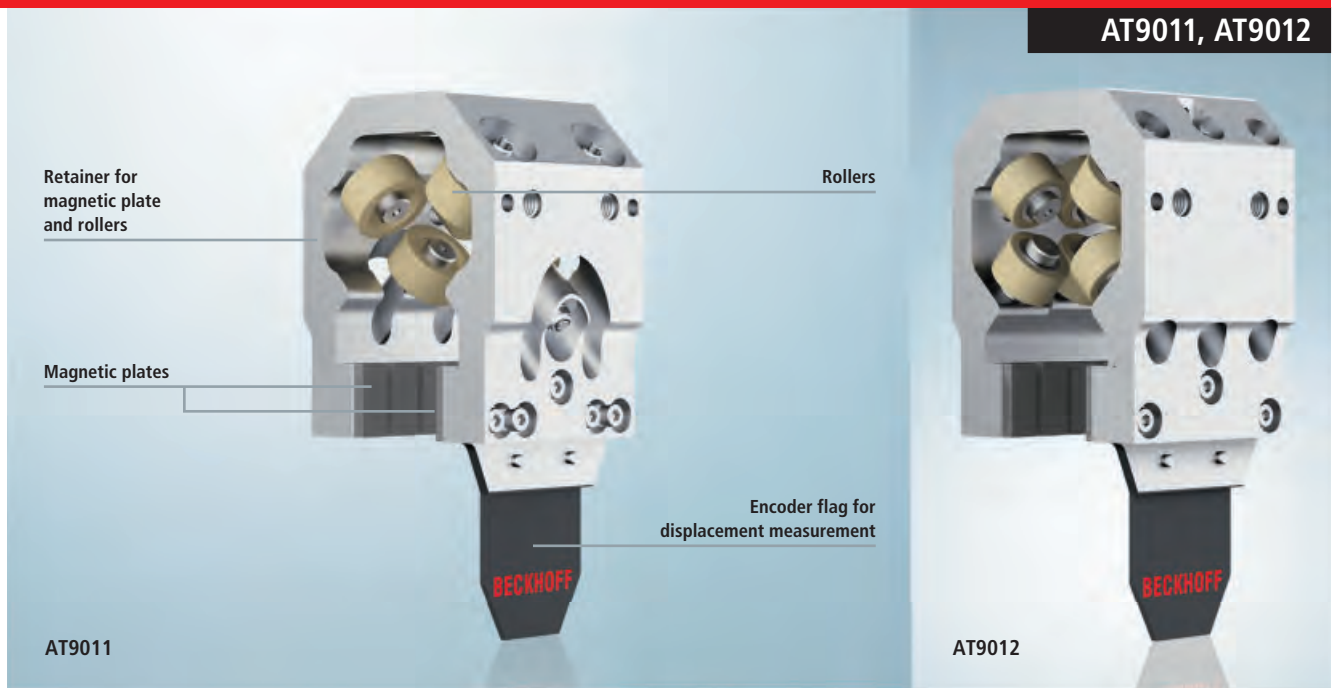
Double-air-gap motor
- double-action linear motor, hence low resulting forces on the mechanical bearing and compact total solution
- displacement measurement integrated, no additional assembly, no calibration
- Tolerances are compensated automatically.
- Attractive forces neutralise each other.
- lower force effect (wear) on the guide
- Friction losses are greatly reduced.

Output stages and coil package integrated
- no cables between coil and output stage
  - no wiring expenditure
  - exclusion of errors
  - minimum mounting space
  - Output stage and coil are optimally matched to each other.
- supply voltage 50 V DC (low voltage, low safety expenditure)
- Independent supply of each individual coil with current is possible.
- arbitrary number of travelling fields/movers possible
- temperature monitoring of the output stage
- temperature model of the coils for optimum peak load use (I^2T model)
- low temperature rise due to good thermal coupling to the machine bed

Ordering information	XTS motor modules
AT2000-0250	motor module, straight, 50 V DC/24 V DC, 250 mm x 38 mm x 96 mm (L x W x H), 2.0 kg
AT2001-0250	motor module with feed, straight, 50 V DC/24 V DC, 250 mm x 38 mm x 96 mm (L x W x H), 2.2 kg
AT2020-0250	motor module, 22.5° (positive curve, convex, radius constant), 50 V DC/24 V DC, 257.7 mm x 38 mm x 96 mm (L x W x H), 2.2 kg
AT2021-0250	motor module with feed, 22.5° (positive curve, convex, radius constant), 50 V DC/24 V DC, 257.7 mm x 38 mm x 96 mm (L x W x H), 2.2 kg
AT2025-0250	motor module, -22.5° (negative curve, concave, radius constant), 50 V DC/24 V DC, 241.9 mm x 38 mm x 96 mm (L x W x H), 2.2 kg
AT2026-0250	motor module with feed, -22.5° (negative curve, concave, radius constant), 50 V DC/24 V DC, 241.9 mm x 38 mm x 96 mm (L x W x H), 2.2 kg
AT2040-0250	motor module, 45° (positive curve, convex, radius constant), 50 V DC/24 V DC, 258.9 mm x 39.1 mm x 114.4 mm (L x W x H), 2.1 kg
AT2041-0250	motor module with feed, 45° (positive curve, convex, radius constant), 50 V DC/24 V DC, 258.9 mm x 39.1 mm x 114.4 mm (L x W x H), 2.1 kg
AT2050-0500	motor module, 180° (clothoid, radius not constant), 50 V DC/24 V DC, 307 mm x 41 mm x 195 mm (L x W x H), 4.0 kg

▶AT2000

We reserve the right to make technical changes.



AT9011, AT9012 | XTS movers

The mover is made of a light and solid aluminium alloy. Thanks to their arrangement the rollers allow backlash-free travel on the straights and in the curves. The coating of the rollers causes very little running noise and is particularly low-wear without lubrication of the guide rail. The attractive forces of the magnetic plates are largely balanced by the opposed arrangement, so that the rollers and the rail do not have to absorb the comparatively high attractive forces of the magnets.

The centre of the encoder flag supplies a position signal to the motor module. Movers can be distinguished from each other by different encoder flags. The encoder flag is made from a sturdy, lightweight glass-fibre reinforced material.

- no sliding contacts or cables to the moved part, purely passive mover
- 2 magnetic plates generate the controlled propulsive force via the motor module.
- The attractive forces largely neutralise each other in relation to the guide mechanism.
- low friction losses
- light mover (< 410…590 g)
- A light encoder flag generates the position signal.
- Short mover length allows small product spacings.
- Geometry allows driving through curves with full dynamics.
- no development of heat on and in the mover

Ordering information	XTS mover suitable for the guide rail system AT9000/AT9050
AT9011-0050-0550	mover, 6 rollers, length 50 mm with magnetic plate set AT9001-0550, 410 g, rollers: 6 x 19 mm, plastic coated
AT9011-0070-0550	mover, 6 rollers, length 70 mm with magnetic plate set AT9001-0550, 590 g, rollers: 4 x 22 mm, 2 x 26 mm, plastic coated
AT9012-0050-0550	mover, 12 rollers, length 51 mm with magnetic plate set AT9001-0550, 450 g, rollers: 12 x 16 mm, plastic coated

The magnetic plates can also be procured separately in order to be able to fit them to a self-developed mover.
Technical boundary conditions and support on enquiry.

Accessories	
AT9001-0550	magnetic plate set, 5-pin, 50 mm, encoder flag (individually orderable, components of mover AT9011-0050-0550)
AT9011-1440	encoder flag with electronic marking "Mover Standard", t = 1.4 mm, 4 absorber areas
AT9011-1441	encoder flag with electronic marking "Mover 1", t = 1.4 mm, 4 absorber areas

▶AT9011

We reserve the right to make technical changes.

TF5850 | XTS – Software and programming

The TC3 XTS Extension decouples servo algorithms from the hardware and calculates them centrally. TwinCAT maps each XTS mover as a normal servo axis, enabling simple movement handling. Each output stage/coil is supplied with a current setpoint via EtherCAT.

All Motion Control functions such as flying saw, electrical gears and cam plates are usable. Function extensions in TwinCAT take over typical XTS requirements:

- automatic accumulation
- collision avoidance
- jerk avoidance
- centrifugal force limitation

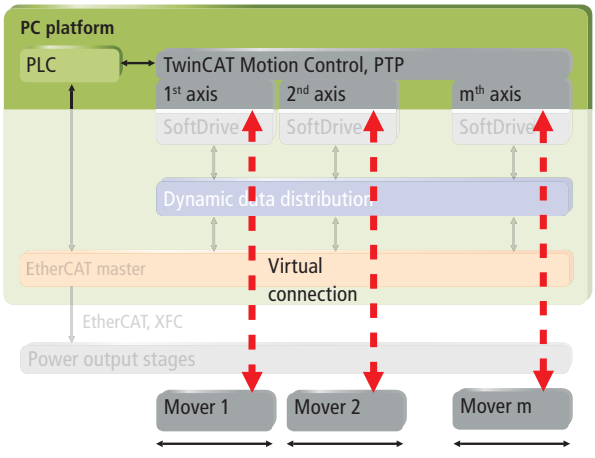
The integration of the XTS system into a production plant is easily possible thanks to support of numerous fieldbuses. All TwinCAT interfaces and functions simplify development and maintenance:

- application-specific programming in IEC 61131
- remote access over Ethernet
- synchronisation (with external application)
- setting of breakpoints
- visualisation of arbitrary variables

Distance monitoring | TF5400 TC3 Advanced Motion Pack integrated
The TF5850 contains the TwinCAT 3 function TF5400 TC3 Advanced Motion Pack with integrated distance monitoring (CA Collision Avoidance). This function is used by the mover axes for automatic monitoring of a pre-set safety distance between each other. If necessary, the axes will automatically brake the movers, taking into account the current dynamic parameters and velocity. Application programming is optimised and simplified significantly.

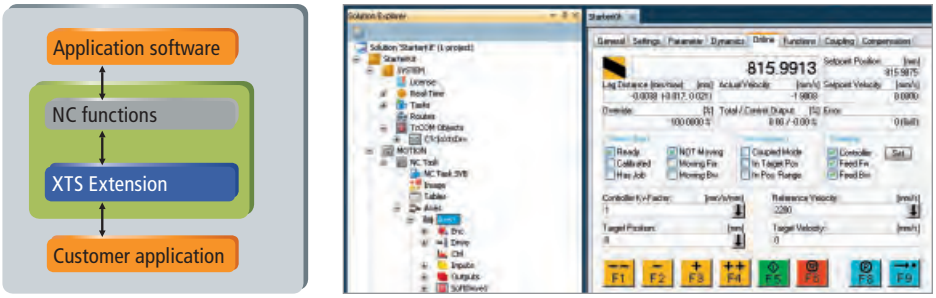
Condition Monitoring | Detection of mechanical wear and defects
The condition monitoring function integrated in the TF5850 enables online monitoring of the movers during operation. Various quality indices enable the state of the movers to be monitored. In this way, maintenance work can be planned in advance, and machine downtime reduced to a minimum.

Motion Control | Ready-to-use kinematics
The XTS Motion Control toolbox offers ready-to-use integration of complex kinematics of two or more movers. The user can define a group of several movers as a 2-D axis (XY table) or 3-D axis in TwinCAT. The software controls the mover group based on the selected kinematics. In addition, an interface for controlling the kinematics directly via CNC commands (G-code) is available.

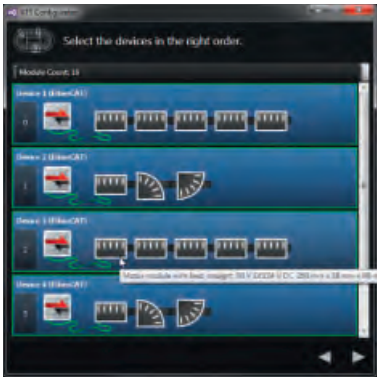


Interaction of XTS software modules

We reserve the right to make technical changes.



TC3 XTS Extension | From the point of view of application programming, a mover looks like a normal servo axis.



The XTS configurator enables largely automated system configuration.

The information from the Condition Monitoring can be reduced and simplified to a "traffic light"-style status display.

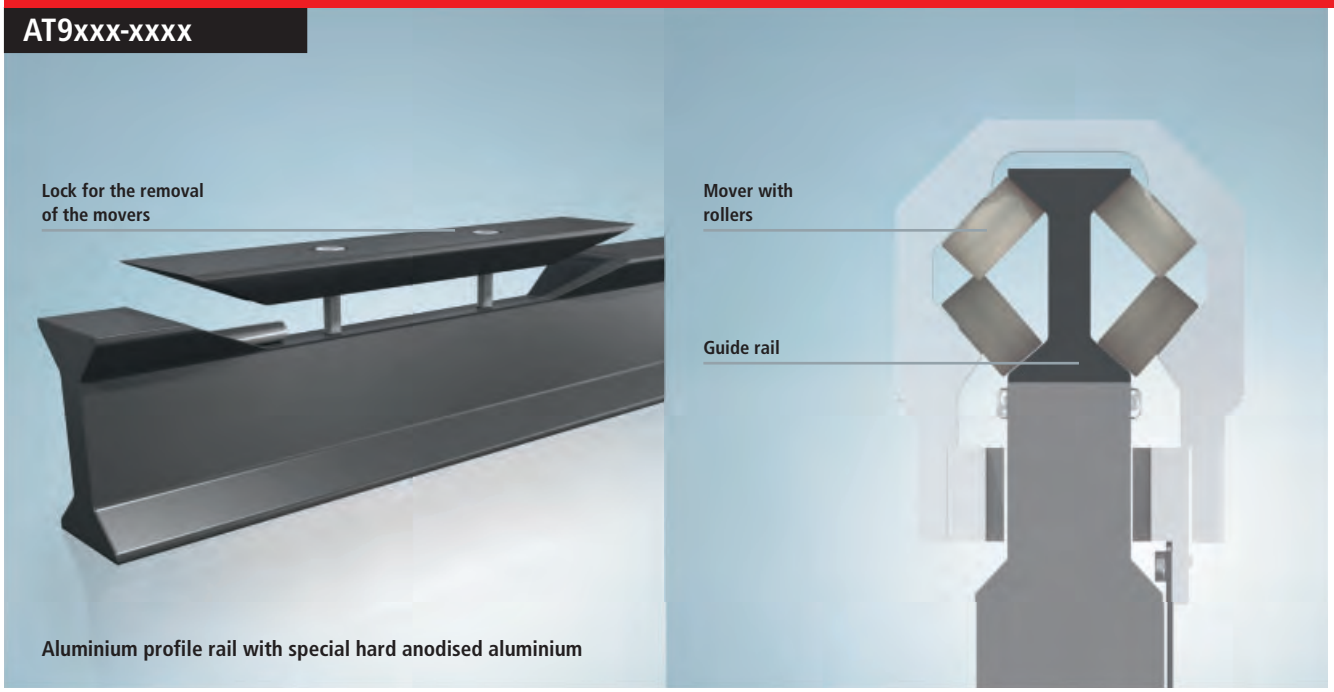
Axis and controller parameters of a mover can simply be copied within the XTS configurator.

Six movers in online monitoring: the impending failure of a ball bearing shows several days in advance.

Ordering information		
TF5000-00pp	TC3 NC PTP 10 Axes	1003
TF5850-0050	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P50 (performance plus)	
TF5850-0060	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P60 (mid performance)	
TF5850-0070	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P70 (high performance)	
TF5850-0080	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P80 (very high performance)	
TF5850-0081	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P81 (Many Core, 5-8 Cores)	
TF5850-0082	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P82 (Many Core, 9-16 Cores)	
TF5850-0083	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P83 (Many Core, 17-32 Cores)	
TF5850-0084	software license, TwinCAT 3 XTS Extension, TwinCAT 3 platform P84 (Many Core, 33-64 Cores)	

▶TwinCAT3

We reserve the right to make technical changes.



AT9xxx-xxxx | XTS guide rails

The guide rail with the matching movers makes the XTS system a ready-to-use solution. However, the motor modules can also be used together with the magnetic plate sets as a custom solution without the XTS guide rail.
The movers can be removed or inserted without tools through a lock by releasing two screws and removing part of the rail.

- optimised solution for immediate mounting on the motor module
- backlash-free due to low manufacturing tolerances and pre-tensioned rollers
- abrasion-resistant hard anodised aluminium
- high-precision mounting by means of fits
- easy maintenance through lock for the removal of the movers

Movers and guide rail are optimally matched to each other.

The geometry of the aluminium rail and the hard anodised aluminium of the surface in combination with the running surface of the mover rollers allow good running characteristics and low wear.

Ordering information	XTS guide rails available to suit the motor modules
AT9020-0500	guide rail, 22.5° curve (positive curve, convex, radius constant) and 250 mm straight, suitable for 1 x AT2020-0250 and 1 x AT2000-0250
AT9025-0500	guide rail, -22.5° curve (negative curve, concave, radius constant) and 250 mm straight, suitable for 1 x AT2025-0250 and 1 x AT2000-0250
AT9040-0500	guide rail, 45° (positive curve, convex, radius constant) and 250 mm straight, suitable for 1 x AT2040-0250 and 1 x AT2000-0250
AT9040-0750	guide rail, 2 x 45° (positive curve, convex, radius constant) and 250 mm straight, suitable for 2 x AT2040-0250 and 1 x AT2000-0250
AT9040-1250	guide rail set for 180° curve, 2 parts, suitable for 4 x AT2040-0500 and 1 x AT2000-0250
AT9042-2000	guide rail set for full circle, 4 parts, suitable for 8 x AT2040-0500, with lock
AT9050-0500	guide rail, 180° (clothoid), 390 mm x 22 mm x 233 mm (L x W x H), suitable for 1 x AT2050-0500
AT9100-0250	guide rail, straight, with lock, suitable for 1 x motor module AT200x-0250: 250 mm
AT9100-0500	guide rail, straight, with lock, suitable for 2 x motor module AT200x-0250: 500 mm
AT9100-0750	guide rail, straight, with lock, suitable for 3 x motor module AT200x-0250: 750 mm
AT9100-1000	guide rail, straight, with lock, suitable for 4 x motor module AT200x-0250: 1000 mm
AT9100-1250	guide rail, straight, with lock, suitable for 5 x motor module AT200x-0250: 1250 mm
AT9100-1500	guide rail, straight, with lock, suitable for 6 x motor module AT200x-0250: 1500 mm
AT9000-xxxx	guide rails, straight, in steps of 250 mm in length, overall length up to 2.5 m, on request
AT9000-0250	guide rail, straight, suitable for 1 x motor module AT200x-0250: 250 mm
AT9000-0500	guide rail, straight, suitable for 2 x motor module AT200x-0250: 500 mm
AT9000-0750	guide rail, straight, suitable for 3 x motor module AT200x-0250: 750 mm
AT9000-1000	guide rail, straight, suitable for 4 x motor module AT200x-0250: 1000 mm
AT9000-1250	guide rail, straight, suitable for 5 x motor module AT200x-0250: 1250 mm
AT9000-1500	guide rail, straight, suitable for 6 x motor module AT200x-0250: 1500 mm

▶AT9000

We reserve the right to make technical changes.

AT2000-xx00 | **XTS starter kit**

The starter kit facilitates fast and effective entry to the new technology. Mechanical tests and the programming of your own motion profiles are simple to accomplish. Programming experience in IEC 61131-3 and knowledge of TwinCAT NC are required for this. The XTS starter kit contains all components required for the operation of an XTS system. Depending on the required path length, a choice of three starter kits is available. The construction is fully functional and completely pre-assembled.

Basic components:
- guide rail, assembled
- stand and holder for all mechanical parts
- Industrial PC with all necessary interfaces and sufficient system performance
- TwinCAT NC PTP and XTS function package
- installed in a control cabinet, fully wired, ready for operation
- power supply units 24 V DC and 48 V DC
- 1 day instruction and programming support

Starter kit small
- 4 x straight modules
- 2 x curve modules
- 5 x mover, with rollers, magnetic plates and encoder flag

Starter kit medium
- 8 x straight modules
- 2 x curve modules
- 10 x mover, with rollers, magnetic plates and encoder flag

Starter kit large
- 12 x straight modules
- 2 x curve modules
- 10 x mover, with rollers, magnetic plates and encoder flag

Required user skills
- practical experience with TwinCAT
- basic knowledge of Motion Control

For information on the Beckhoff training offers see page 1064

Ordering information	XTS starter kit
AT2000-0500	starter kit small, 500 mm, straight length, 5 movers
AT2000-1000	starter kit medium, 1000 mm, straight length, 10 movers
AT2000-1500	starter kit large, 1500 mm, straight length, 10 movers

We reserve the right to make technical changes.

Highlights

- One software platform for engineering and runtime
- Integrated real-time support
- Software modules for PLC, NC, CNC, robotics, HMI, measurement technology, analytics, safety

TwinCAT

PLC and Motion Control on the PC

▸ TwinCAT

962 Product overviews

974 **TwinCAT 3**

976 eXtended Automation Architecture (XAA)
977 eXtended Automation Engineering (XAE)
986 eXtended Automation Runtime (XAR)

988 **TwinCAT 3 Engineering TE1xxx**

992 **TwinCAT 3 Base TC1xxx**

996 **TwinCAT 3 Functions**
996 System TF1xxx
997 HMI TF2xxx
1000 Measurement TF3xxx
1002 Controller TF4xxx
1003 Motion Control TF5xxx
1012 Connectivity TF6xxx
1019 Industry specific TF8xxx

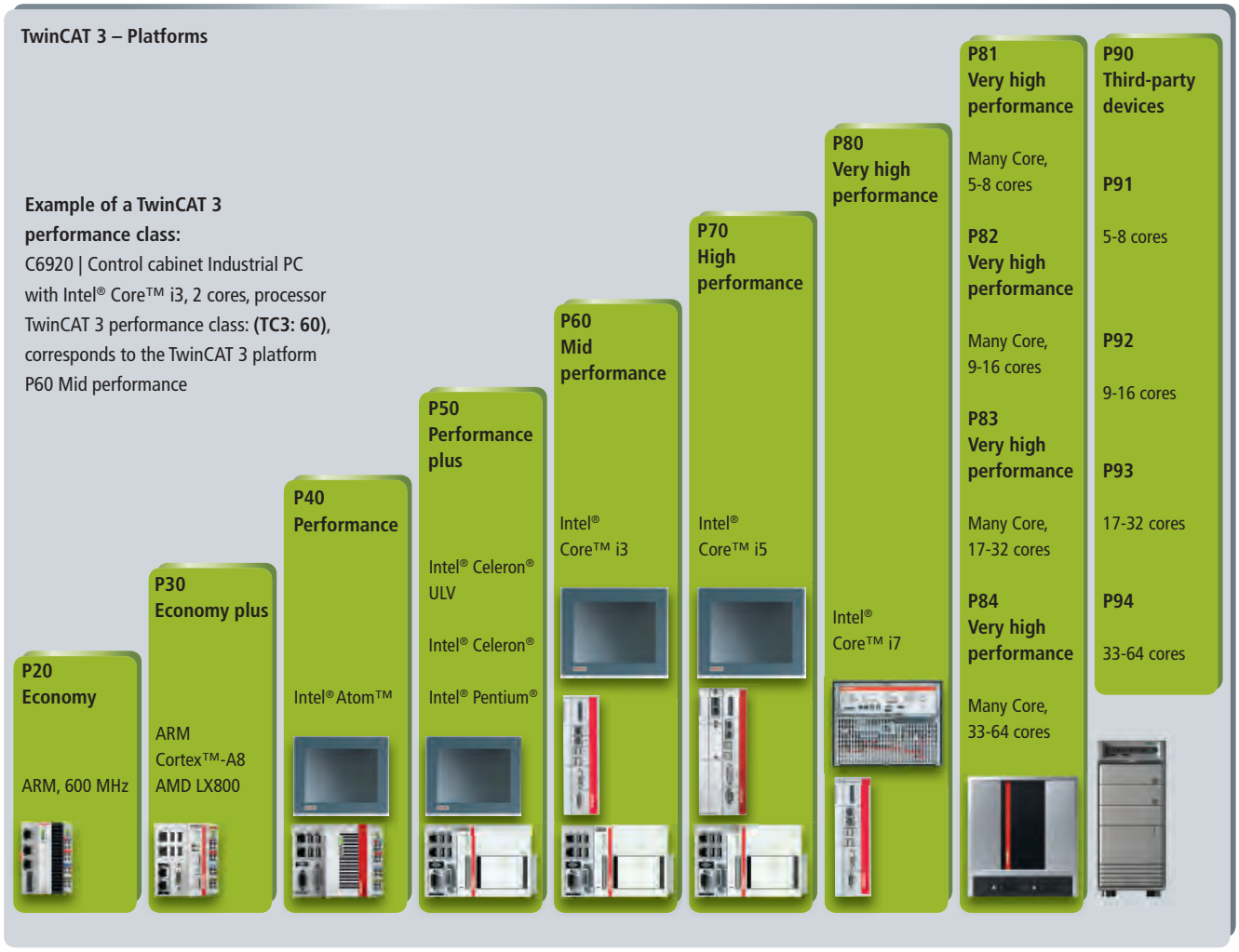
1020 **TwinCAT 2**

1022 **TwinCAT 2 PLC TX1200**
1023 **TwinCAT 2 NC PTP TX1250**
1023 **TwinCAT 2 NC I TX1260**
1024 **TwinCAT 2 CNC TX1270**
1025 **TwinCAT 2 I/O TX1100**
1025 **TwinCAT 2 CP TX1000**

1026 **TwinCAT 2 Supplements**
1026 System TSxxxx
1030 Controller TS4xxx
1031 Motion TS5xxx
1035 Communication TS6xxx
1042 Building Automation TSxxxx

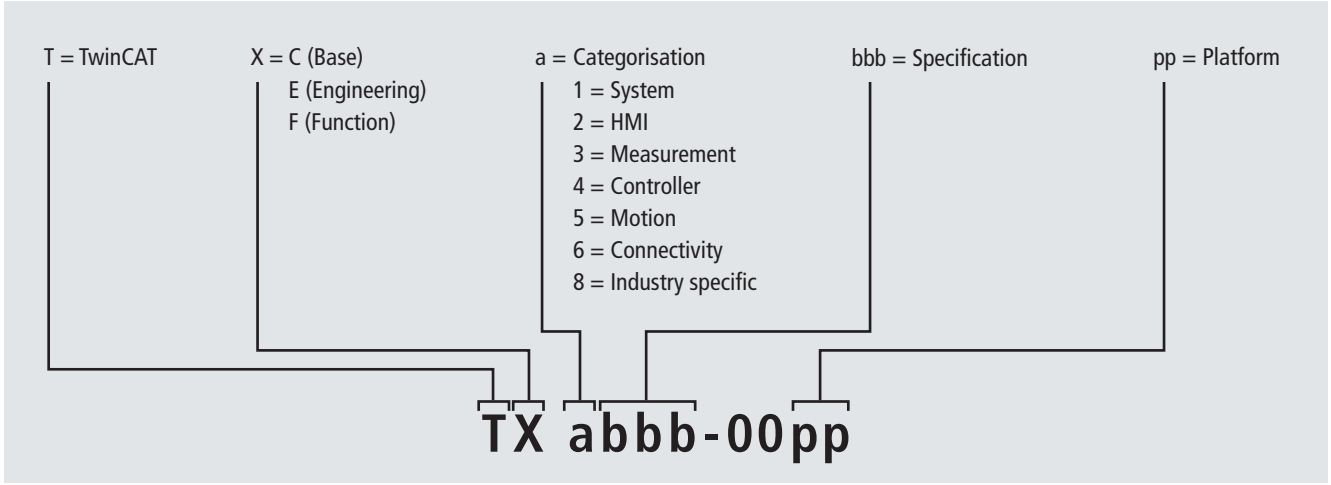
Product overview TwinCAT 3

The TwinCAT 3 runtime components are available for different platforms.

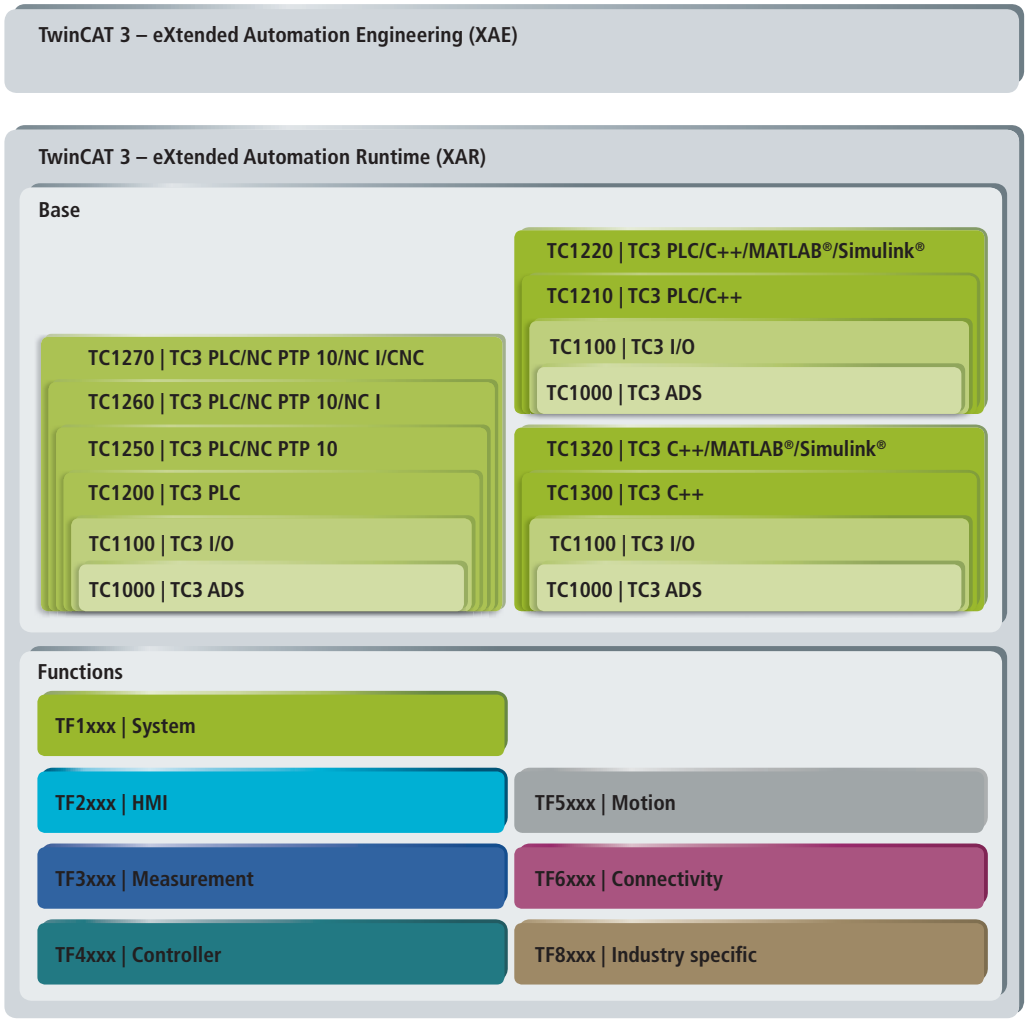


The controllers shown in the platform categorisation are only example configurations.

TwinCAT 3 designation system



We reserve the right to make technical changes.



TwinCAT 3 is divided into components. The TwinCAT 3 engineering components enable the configuration, programming and debugging of applications. The TwinCAT 3 runtime consists of further components – basic components and functions. The basic components can be extended by functions.

TwinCAT 3 | Engineering

TE1000 | **TC3 Engineering**	TwinCAT 3 engineering environment	988
TE1111 | **TC3 EtherCAT Simulation**	easy configurations of simulation environments with several EtherCAT slaves	988
TE1120 | **TC3 XCAD Interface**	transfer of existing engineering results from ECAD tools	989
TE1300 | **TC3 Scope View Professional**	software oscilloscope for the graphical display of data captured from several target systems	989
TE1400 | **TC3 MATLAB®/Simulink® Target**	TwinCAT target for MATLAB®/Simulink® for generating TwinCAT 3 modules	990
TE1410 | **TC3 Interface for MATLAB®/Simulink®**	communication interface between MATLAB®/Simulink® and the TwinCAT 3 runtime	990
TE1500 | **TC3 Valve Diagram Editor**	graphical tool for designing the characteristic curve of a hydraulic valve	990
TE1510 | **TC3 Cam Design Tool**	graphic design tool for electronic cam plates	991
TE1610 | **TC3 EAP Configurator**	a tool for visualising and configuring communication networks, in which data exchange based on the EtherCAT Automation Protocol (EAP) takes place or is to be established	991
TE2000 | **TC3 HMI**	tool for developing platform-independent user interfaces, based on current web technologies	991
TE35xx | **TC3 Analytics Workbench**	components (solutions) for online and offline analyses of one or more machines	991

TwinCAT 3 | Base

TC1000 | **TC3 ADS**	TwinCAT 3 ADS	992
TC1100 | **TC3 I/O**	TwinCAT 3 I/O	992
TC1200 | **TC3 PLC**	TwinCAT 3 PLC	993
TC1210 | **TC3 PLC/C++**	TwinCAT 3 PLC and C++	993
TC1220 | **TC3 PLC/C++/MATLAB®/Simulink®**	TwinCAT 3 PLC, C++ and modules generated in MATLAB®/Simulink®	993
TC1250 | **TC3 PLC/NC PTP 10**	TwinCAT 3 PLC and NC PTP 10	994
TC1260 | **TC3 PLC/NC PTP 10/NC I**	TwinCAT 3 PLC, NC PTP 10 and NC I	994
TC1270 | **TC3 PLC/NC PTP 10/NC I/CNC**	TwinCAT 3 PLC, NC PTP 10, NC I and CNC	995
TC1275 | **TC3 PLC/NC PTP 10/NC I/CNC E**	TwinCAT 3 PLC, NC PTP 10, NC I and CNC E	995
TC1300 | **TC3 C++**	TwinCAT 3 C++	995
TC1320 | **TC3 C++/MATLAB®/Simulink®**	TwinCAT 3 C++ and modules generated in MATLAB®/Simulink®	995

We reserve the right to make technical changes.

TwinCAT 3 | Functions		
System		
TF1800 | **TC3 PLC HMI**	stand-alone tool for displaying visualisations from the PLC development environment	996
TF1810 | **TC3 PLC HMI Web**	display of visualisations from the PLC development environment in a web browser	996
TF1910 | **TC3 UML**	UML (Unified Modeling Language) for modelling of PLC software	996
HMI		
TF2000 | **TC3 HMI Server**	modular web server, which provides an HMI either locally or remotely	997
TF2010 | **TC3 HMI Clients Pack 1**	optional package for one further (browser) connection	997
TF2020 | **TC3 HMI Clients Pack 3**	optional package for three further (browser) connections	997
TF2030 | **TC3 HMI Clients Pack 10**	optional package for ten further (browser) connections	997
TF2040 | **TC3 HMI Clients Pack 25**	optional package for 25 further (browser) connections	997
TF2050 | **TC3 HMI Targets Pack 1**	optional package for one further control system	998
TF2060 | **TC3 HMI Targets Pack 3**	optional package for three further control systems	998
TF2070 | **TC3 HMI Targets Pack 10**	optional package for ten further control systems	998
TF2080 | **TC3 HMI Targets Pack 25**	optional package for 25 further control systems	998
TF2090 | **TC3 HMI Targets Pack 100**	optional package for 100 further control systems	998
TF2100 | **TC3 HMI ADS**	server extension for access to TwinCAT 2/3 target systems via ADS	998
TF2110 | **TC3 HMI OPC UA**	server extension for access to TwinCAT target systems or other controllers via OPC UA	999
TF2200 | **TC3 HMI Extension SDK**	software development kit (C++/.NET) for programming application-specific solutions	999
TF2300 | **TC3 HMI Scope**	software oscilloscope for graphic display of time sequences	999
Measurement		
TF3300 | **TC3 Scope Server**	data preparation for visual display in the TwinCAT 3 Scope View	1000
TF3500 | **TC3 Analytics Logger**	The TwinCAT Analytics Logger enables the cyclic archiving of the process image.	1000
TF3510 | **TC3 Analytics Library**	PLC library used for online or offline analysis in the PLC runtime of the TwinCAT Analytics Workbench	1000
TF3600 | **TC3 Condition Monitoring Level 1**	Condition Monitoring Level 1	1001
TF3601 | **TC3 Condition Monitoring Level 2**	Condition Monitoring Level 2	1001
TF3900 | **TC3 Solar Position Algorithm**	precise calculation of the sun's position	1001
Controller		
TF4100 | **TC3 Controller Toolbox**	basic controllers (P, I, D), complex controllers (PI, PID), pulse width modulation, ramps, signal generators and filters	1002
TF4110 | **TC3 Temperature Controller**	temperature control for monitoring and controlling different temperature ranges	1002

TwinCAT 3 | Functions

Motion

TF5000 | **TC3 NC PTP 10 Axes**	NC PTP (point-to-point movements) for up to 10 axes	1003
TF5010 | **TC3 NC PTP Axes Pack 25**	extension of TwinCAT 3 NC PTP to up to 25 axes	1003
TF5020 | **TC3 NC PTP Axes Pack unlimited**	extension of TwinCAT 3 NC PTP to over 25 axes	1003
TF5050 | **TC3 NC Camming**	using the TwinCAT NC cam plate functionality (table coupling)	1004
TF5055 | **TC3 NC Flying Saw**	implementing flying saw functionality	1004
TF5060 | **TC3 NC FIFO Axes**	implementation of a pre-defined user setpoint generator for an NC axis	1005
TF5065 | **TC3 Motion Control XFC**	high-precision logging and switching of digital signals in relation to axis positions	1005
TF5100 | **TC3 NC I**	NC I with 3 interpolating axes and 5 additional axes	1005
TF5110 | **TC3 Kinematic Transformation L1**	realisation of different kinematic transformations Level 1	1006
TF5111 | **TC3 Kinematic Transformation L2**	realisation of different kinematic transformations Level 2	1006
TF5112 | **TC3 Kinematic Transformation L3**	realisation of different kinematic transformations Level 3	1006
TF5113 | **TC3 Kinematic Transformation L4**	realisation of different kinematic transformations Level 4	1006
TF5120 | **TC3 Robotics mxAutomation**	direct communication between the PLC and the KUKA KR C4 robot control	1007
TF5130 | **TC3 Robotics uniVAL PLC**	direct communication between the PLC and the CS8C robotics controller from Stäubli	1007
TF5200 | **TC3 CNC**	CNC path control software	1007
TF5210 | **TC3 CNC E**	CNC path control software export version	1008
TF5220 | **TC3 CNC Axes Pack**	extension to up to a total of 64 axes/controlled spindles, of which a maximum of 32 can be path axes and a maximum of 12 can be controlled spindles	1008
TF5230 | **TC3 CNC Channel Pack**	further CNC channel, extension to a maximum of 12 channels, channel synchronisation, axis transfer between channels	1008
TF5240 | **TC3 CNC Transformation**	transformation functionality (5-axis functionality)	1009
TF5250 | **TC3 CNC HSC Pack**	extending the CNC with HSC technology (high-speed cutting)	1009
TF5260 | **TC3 CNC Spline Interpolation**	path programming via splines with programmable spline type, Akima-spline, B-spline	1009
TF5270 | **TC3 CNC Virtual NCK Basis**	virtual TwinCAT CNC for simulation in a Windows environment	1009
TF5271 | **TC3 CNC Virtual NCK Options**	virtual TwinCAT CNC for simulation in a Windows environment	1010
TF5280 | **TC3 CNC Volumetric Compensation**	optional package for compensating geometric machine errors based on an ISO-standardised parametric model	1010
TF5290 | **TC3 CNC Cutting Plus**	technology package for extending the CNC functionality for cutting operations	1010
TF5410 | **TC3 Motion Collision Avoidance**	collision avoidance and controlled accumulation when operating a number of linearly and/or translationally dependent axes with TC3 NC PTP	1011
TF5420 | **TC3 Motion Pick-and-Place**	for handling tasks carried out by gantry robots and other kinematics	1011
TF5800 | **TC3 Digital Cam Server**	fast cam controller with monitoring for various fieldbuses	1011
TF5810 | **TC3 Hydraulic Positioning**	algorithms for control and positioning of hydraulic axes	1011

We reserve the right to make technical changes.

TwinCAT 3 | Functions

Connectivity

TF6000 | **TC3 ADS Communication Library**	ADS communication components	1012
TF6100 | **TC3 OPC UA**	access to TwinCAT in accordance with OPC UA with UA server (DA/HA/AC) and UA client (DA)	1012
TF6120 | **TC3 OPC DA**	access to TwinCAT variables, in accordance with OPC DA and OPC XML DA specification	1012
TF6220 | **TC3 EtherCAT Redundancy 250**	extension of the TwinCAT EtherCAT master with cable redundancy capability for up to 250 slaves	1012
TF6221 | **TC3 EtherCAT Redundancy 250+**	extension of the TwinCAT EtherCAT master with cable redundancy capability for more than 250 slaves	1013
TF6225 | **TC3 EtherCAT External Sync**	extension of the TwinCAT EtherCAT master with an option to synchronise the Beckhoff real-time communication with external signals	1013
TF6250 | **TC3 Modbus TCP**	communication with Modbus TCP devices (server and client functionality)	1013
TF6255 | **TC3 Modbus RTU**	serial communication with Modbus end devices	1013
TF6270 | **TC3 PROFINET RT Device**	communication via PROFINET (PROFINET slave)	1013
TF6271 | **TC3 PROFINET RT Controller**	communication via PROFINET (PROFINET master)	1013
TF6280 | **TC3 Ethernet/IP Slave**	communication via EtherNet/IP (EtherNet/IP slave)	1014
TF6281 | **TC3 Ethernet/IP Master**	communication via EtherNet/IP (EtherNet/IP master)	1014
TF6300 | **TC3 FTP**	easy access from TwinCAT PLC to FTP server	1014
TF6310 | **TC3 TCP/IP**	communication via generic TCP server	1014
TF6311 | **TC3 TCP/UDP Realtime**	direct access from realtime to Ethernet communication	1015
TF6340 | **TC3 Serial Communication**	communication via serial Bus Terminals or PC COM ports with the 3964R and RK512 protocol	1015
TF6350 | **TC3 SMS/SMTP**	sending SMS and e-mails from the PLC	1015
TF6360 | **TC3 Virtual Serial COM**	virtual serial COM driver for Windows platforms	1015
TF6420 | **TC3 Database Server**	accessing databases from the PLC	1015
TF6421 | **TC3 XML Server**	read and write access to XML files from the PLC	1015
TF6500 | **TC3 IEC 60870-5-10x**	communication according to IEC 60870-101, -102, -103, -104	1016
TF6510 | **TC3 IEC 61850/400-25**	communication according to IEC 61850 and IEC 61400-25	1016
TF6600 | **TC3 RFID Reader Communication**	connection of RFID readers to the TwinCAT PLC	1016
TF6610 | **TC3 S5/S7 Communication**	communication with S5/S7 controllers	1017
TF6650 | **TC3 DBC File Import for CAN**	reading of DBC file formats	1017
TF6701 | **TC3 IoT Communication (MQTT)**	provides basic publisher/subscriber-based data connectivity via MQTT	1017
TF6710 | **TC3 IoT Functions**	provides connectivity for cloud-based communication services	1017
TF6720 | **TC3 IoT Data Agent**	gateway application for data connectivity between TwinCAT runtime and IoT services	1018
TF6730 | **TC3 IoT Communicator**	sends process data and push notifications from TwinCAT to smartphones and tablets through a messaging service	1018
TF6735 | **TC3 IoT Communicator App**	smartphone and tablet app to receive and visualise live data and push notifications sent from TwinCAT	1018

Industry specific

TF8000 | **TC3 BA Connectivity Library**	libraries for programming of Bus Terminals for building automation (DALI, EnOcean, SMI, EIB, LON, M-Bus, GENIbus, MP-Bus, DMX and manual operating modules)	1019
TF8040 | **TC3 Building Automation**	software package covering all technical building automation services	1019
TF8310 | **TC3 Wind Framework**	framework for the development of operational management software for wind turbines	1019

Product overview TwinCAT 2

TX1200 | TwinCAT PLC

1022

PC hardware	standard PC/IPC hardware, no extras
Operating systems	Windows NT/2000/XP/Vista, Windows 7/10, Windows CE*
Real-time	Beckhoff real-time kernel
I/O system	EtherCAT, Lightbus, PROFIBUS DP/MC, Interbus, CANopen, DeviceNet, SERCOS, Ethernet
Runtime system	4 multi-tasking PLCs each with 4 tasks in each PLC runtime system, development and runtime systems on one PC or separately (CE: only runtime)
Memory	process image size, flags area, program size, POU size, number of variables only limited by the size of the user memory (max. 2 GB with NT/2000/XP/Vista)
Cycle time	adjustable from 50 µs
Link time	1 µs (Intel® Core™2 Duo)
Programming	IEC 61131-3: IL, FBD, LD, SFC, ST, powerful library management, convenient debugging

TX1250 | TwinCAT NC PTP

1023

TwinCAT PLC	inclusive 1022
PC hardware	standard PC/IPC hardware, no extras
Operating systems	Windows NT/2000/XP/Vista, Windows 7/10, Windows CE*
Real-time	Beckhoff real-time kernel
I/O system	EtherCAT, Lightbus, PROFIBUS DP/MC, Interbus, CANopen, DeviceNet, SERCOS, Ethernet
Programming	performed using function blocks for TwinCAT PLC according to IEC 61131-3 (standardised PLCopen Motion Control libraries), convenient axis commissioning menus in the System Manager
Runtime system	NC point-to-point including TwinCAT PLC
Number of axes	up to 255
Axis types	electrical and hydraulic servo drives, frequency converter drives, stepper motor drives, switched drives (fast/crawl axes)
Cycle time	50 µs upwards, typically 1 ms (selectable)
Axis functions	standard axis functions: start/stop/ reset/reference, speed override, special functions: master/slave cascading, cam plates, electronic gearings, online distance compensation of segments, flying saw

TX1100 | TwinCAT I/O

1025

PC hardware	standard PC/IPC hardware, no extras
Operating systems	Windows NT/2000/XP/Vista, Windows 7, NT/XP/Windows 7 Embedded, CE (only runtime)*
Real-time	Beckhoff real-time kernel

Multi-purpose I/O interface for all common fieldbus systems, PC Fieldbus Cards and interfaces with integrated real-time driver

TX1000 | TwinCAT CP

1025

PC hardware	standard PC/IPC hardware, no extras
Operating systems	Windows NT/2000/XP/Vista, Windows 7, NT/XP/Windows 7 Embedded*
Real-time	Beckhoff real-time kernel

Windows driver for Beckhoff Control Panel

* version-dependent

We reserve the right to make technical changes.

TX1260 | TwinCAT NC I

1023

TwinCAT PLC	inclusive 1022
TwinCAT NC PTP	inclusive 1023
PC hardware	standard PC/IPC hardware, no extras
Operating systems	Windows NT/2000/XP/Vista, Windows 7/10, Windows CE*
Real-time	Beckhoff real-time kernel
I/O system	EtherCAT, Lightbus, PROFIBUS DP/MC, Interbus, CANopen, DeviceNet, SERCOS, Ethernet
Programming	DIN 66025 programs for NC interpolation, access via function blocks from TwinCAT PLC according to IEC 61131-3
Runtime system	NC interpolation, including TwinCAT NC PTP and PLC
Number of axes	max. 3 axes and up to 5 auxiliary axes per group, 1 group per channel, max. 31 channels
Axis types	electrical servo axes, stepper motor drives
Interpreter functions	subroutines and jumps, programmable loops, zeroshifts, tool compensations, M and H functions
Geometries	straight lines and circular paths in 3-D space, circular paths in all main planes, helixes with base circles in all main planes linear, circular, helical interpolation in the main lanes and freely definable planes, Bezier splines, look-ahead function
Axis functions	online reconfiguration of axes in groups, path override, slave coupling to path axes, auxiliary axes, axis error and sag compensation, measuring functions
Operation	automatic operation, manual operation (jog/inching), single block operation, referencing, handwheel operation (motion/superposition)

TS511x | TwinCAT NC I Options

Options	TS511x | **TwinCAT Kinematic Transformation** 1034

TX1270 | TwinCAT CNC

1024

TwinCAT PLC	inclusive 1022
TwinCAT NC PTP	inclusive 1023
TwinCAT NC I	inclusive 1023
PC hardware	standard PC/IPC hardware, no extras
Operating systems	Windows NT/2000/XP/Vista, Windows 7, Windows NT/XP/Windows 7 Embedded*
Real-time	Beckhoff real-time kernel
I/O system	EtherCAT, Lightbus, PROFIBUS DP/MC, CANopen, DeviceNet, SERCOS, Ethernet
Programming	DIN 66025 programming language with high-level language extensions, access via function blocks from TwinCAT PLC according to IEC 61131-3
Runtime system	CNC, including TwinCAT NC I, NC PTP, PLC
Number of axes/spindles	8 path axes/controlled spindles, max. of 64 axes/controlled spindles (optional), max. 12 channels (optional)
Axis types	electrical servo-axes, analog/encoder interface via fieldbus, digital interface via fieldbus
Interpreter functions	subroutines and jumps, programmable loops, zero shifts, tool compensations, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and help functions, tool functions
Geometries	linear, circular, helical interpolation in the main planes and freely definable planes, max. 32 interpolating path axes per channel, look-ahead function
Axis functions	coupling and gantry axis function, override, axis error and sag compensation, measuring functions
Operation	automatic operation, manual operation (jog/inching), single block operation, referencing, block search, handwheel operation (motion/superposition)

TS52xx | TwinCAT CNC Options

Options	TS5220 | **TwinCAT CNC Axes Pack**
	TS5230 | **TwinCAT CNC Channel Pack**
	TS5240 | **TwinCAT CNC Transformation**
	TS5250 | **TwinCAT CNC HSC Pack**
	TS5260 | **TwinCAT CNC Spline Interpolation**

TwinCAT 2 Supplements

TwinCAT 2 Supplements | System		
TS1010 | **TwinCAT Eventlogger**	alarm and diagnostic system for logging events which occur in the TwinCAT system	1026
TS1110 | **TwinCAT Simulation Manager**	simplified preparation and configuration of a simulation environment	1027
TS1120 | **TwinCAT ECAD Import**	importing engineering results from an ECAD program	1026
TS1140 | **TwinCAT Management Server**	central administration of Beckhoff CE control systems	1029
TS1150 | **TwinCAT Backup**	backing up and restoring files, operating system and TwinCAT settings	1027
TS1600 | **TwinCAT Engineering Interface Server**	co-ordinating programming tasks via a central source code management system	1026
TS1800 | **TwinCAT PLC HMI**	displaying visualisations created in PLC Control	1028
TS1800 | **TwinCAT PLC HMI CE** -0030	displaying visualisations created in PLC Control on Windows CE platforms	1028
TS1810 | **TwinCAT PLC HMI Web**	displaying visualisations created in PLC Control in a web browser	1028
TS3300 | **TwinCAT Scope 2**	graphical analysis tool for displaying time-continuous signals	1029
TS3900 | **TwinCAT Solar Position Algorithm**	precise calculation of the sun's position	1029
TS622x | **TwinCAT EtherCAT Redundancy**	extension of the TwinCAT EtherCAT master with cable redundancy capability	1029
TS6420 | **TwinCAT Database Server**	accessing databases from the PLC	1027
TS6420 | **TwinCAT Database Server CE** -0030	accessing databases from the PLC for Windows CE platforms	1028
TS6421 | **TwinCAT XML Data Server**	reading and writing of XML-based data by the PLC	1026
TS6421 | **TwinCAT XML Data Server CE** -0030	reading and writing of XML-based data by the PLC for Windows CE platforms	1027

TwinCAT 2 Supplements | Controller		
TS4100 | **TwinCAT PLC Controller Toolbox**	modules for basic controllers (P, I, D), complex controllers (PI, PID), pulse width modulation, ramps, signal generators and filters	1030
TS4110 | **TwinCAT PLC Temperature Controller**	instanced temperature control function block for monitoring and controlling different temperature ranges	1030

TwinCAT 2 Supplements | Motion		
TS1500 | **TwinCAT Valve Diagram Editor**	graphical tool for designing the characteristic curve of a hydraulic valve	1034
TS1510 | **TwinCAT Cam Design Tool**	graphic design tool for electronic cam plates	1033
TS5050 | **TwinCAT NC Camming**	using the TwinCAT NC cam plate functionality (table coupling)	1033
TS5055 | **TwinCAT NC Flying Saw**	implementing flying saw functionality	1032
TS5060 | **TwinCAT NC FIFO Axes**	implementation of a pre-defined user setpoint generator for an NC axis	1032
TS5065 | **TwinCAT PLC Motion Control XFC**	high-precision logging and switching of digital signals in relation to axis positions	1031
TS5066 | **TwinCAT PLC Remote Synchronisation**	remote synchronisation	1032
TS511x | **TwinCAT Kinematic Transformation**	implementation of different kinematic transformations for TwinCAT PTP or TwinCAT NC I	1034
TS5800 | **TwinCAT Digital Cam Server**	software implementation of fast cam controller	1033
TS5810 | **TwinCAT PLC Hydraulic Positioning**	control and adjustment of hydraulic axes	1031

TwinCAT 2 Supplements | Communication		
TS6100 | **TwinCAT OPC UA Server**	access to TwinCAT in accordance with OPC UA with UA server (DA/HA/AC) and UA client (DA)	1038
TS6100 | **TwinCAT OPC UA Server CE** -0030	access to TwinCAT in accordance with OPC UA with UA server (DA/HA/AC) and UA client (DA) for Windows CE platforms	1038

We reserve the right to make technical changes.

TwinCAT 2 Supplements | Communication

TS6120 | **TwinCAT OPC Server**	access to TwinCAT variables in accordance with the OPC DA/OPC XML DA specification	1038
TS6250 | **TwinCAT Modbus TCP Server**	communication with Modbus TCP devices (server and client functionality)	1036
TS6250 | **TwinCAT Modbus TCP Server CE** -0030	communication with Modbus TCP devices (server and client functionality) for Windows CE platforms	1036
TS6255 | **TwinCAT PLC Modbus RTU**	serial communication with Modbus end devices	1035
TS6270 | **TwinCAT PROFINET RT Device**	TwinCAT PROFINET RT device turns every PC-based controller into a PROFINET RT device.	1040
TS6271 | **TwinCAT PROFINET RT Controller**	TwinCAT PROFINET RT controller turns every PC-based controller into a PROFINET RT controller.	1040
TS6280 | **TwinCAT EtherNet/IP Slave**	TwinCAT EtherNet/IP slave turns every PC-based controller into an EtherNet/IP slave.	1040
TS6300 | **TwinCAT FTP Client**	basic access from TwinCAT PLC to FTP server	1041
TS6310 | **TwinCAT TCP/IP Server**	communication via generic TCP servers	1039
TS6310 | **TwinCAT TCP/IP Server CE** -0030	communication via generic TCP servers for Windows CE platforms	1039
TS6340 | **TwinCAT PLC Serial Communication**	communication via serial Bus Terminals or PC COM ports	1035
TS6341 | **TwinCAT PLC Serial Communication 3964R/RK512**	communication via serial Bus Terminals or PC COM ports with the 3964R and RK512 protocol	1035
TS6350 | **TwinCAT SMS/SMTP Server**	sending SMS and e-mails from the PLC	1039
TS6350 | **TwinCAT SMS/SMTP Server CE** -0030	sending SMS and e-mails from the PLC for Windows CE platforms	1039
TS6360 | **TwinCAT Virtual Serial COM Driver**	virtual serial COM driver for Windows and Windows CE platforms	1041
TS6370 | **TwinCAT DriveCOM OPC Server**	fieldbus-independent communication connections between the engineering tool and the drive	1037
TS6371 | **TwinCAT DriveTop Server**	configuring Indramat SERCOS drives with DriveTop software on TwinCAT systems	1037
TS650x | **TwinCAT PLC IEC 60870-5-101, -102, -103, -104 Master**	implementation of IEC 60870-101, -102, -103 and -104 masters	1036
TS650x | **TwinCAT PLC IEC 60870-5-104** -0030 **Master CE**	implementation of IEC 60870-104 masters under Windows CE	1036
TS6507 | **TwinCAT PLC IEC 60870-5-101, -104 Slave**	implementation of IEC 60870-101 and -104 slaves	1036
TS6507 | **TwinCAT PLC IEC 60870-5-104** -0030 **Slave CE**	implementation of IEC 60870-104 slaves under Windows CE	1036
TS6509 | **TwinCAT PLC IEC 61400-25 Server**	IEC 61400-25 communication	1037
TS6511 | **TwinCAT PLC IEC 61850 Server**	IEC 61850 communication	1037
TS6600 | **TwinCAT PLC RFID Reader Communication**	connection of RFID readers to the TwinCAT PLC	1041
TS6610 | **TwinCAT PLC S5/S7 Communication**	communication with S5/S7 controllers	1041

TwinCAT 2 Supplements | Building Automation

TS8000 | **TwinCAT PLC HVAC**	automation of HVAC and sanitary installations	1042
TS8010 | **TwinCAT PLC Building Automation Basic**	executing basic room automation functions	1042
TS8020 | **TwinCAT BACnet/IP**	communication with the data networks of the building automation and building control systems	1042
TS8035 | **TwinCAT FIAS Server**	communication between TwinCAT PLC and a system using the FIAS standard	1043
TS8036 | **TwinCAT Crestron Server**	communication between a TwinCAT PLC and a Crestron controller	1043
TS8037 | **TwinCAT Bang & Olufsen Server**	communication between a TwinCAT PLC and a Bang & Olufsen audio/video installation	1043
TS8040 | **TwinCAT Building Automation**	software package covering all technical building automation services	1043
TS8100 | **TwinCAT Building Automation Framework**	configuration and commissioning of building automation projects	1043

TwinCAT

▶ TwinCAT

TwinCAT 3
- one engineering environment, based on Microsoft Visual Studio®
- IEC 61131, C/C++, MATLAB®/Simulink®
- integrated modules:
  - real-time
  - PLC, NC, CNC
  - HMI
  - robotics
  - measurement technology
  - Safety
- TwinCAT 3 modules: standardised programming frame for modular programming
- automatic code generation and project implementation with the TwinCAT Automation Interface

TwinCAT 3 runtime environment
- hard real-time for Windows
- one runtime for all modules
- IEC 61131, C/C++, MATLAB®/Simulink® objects in one runtime
- integrated TwinSAFE runtime
- extended real-time functionality: min. 50 µs cycle time and low jitter
- better performance: support of multi-core CPUs
- future-proof: support of 64-bit operating systems

See page 974

We reserve the right to make technical changes.

TwinCAT 2
- engineering and runtime
- IEC 61131-3 programming environment
- integrated modules:
  - real-time
  - PLC, NC, CNC
  - robotics
  - measurement technology
  - Safety

TwinCAT 2 runtime environment
- hard real-time for Windows
- real-time jitter < 5 µs
- cycle time adjustable from 50 µs
- pre-emptive multi-tasking

See page 1020

TwinCAT 3 |
eXtended Automation Technology (XAT)

▶ TwinCAT3

We reserve the right to make technical changes.

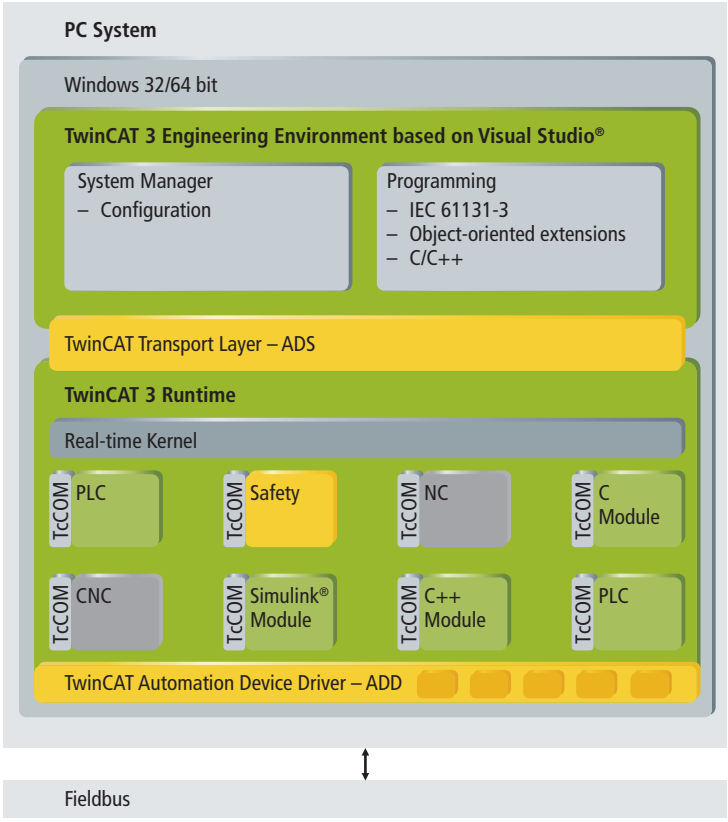
With TwinCAT 3 a PC-based control software is available which will expand the standard automation world considerably. In addition to the object-oriented IEC 61131-3 extensions, the languages of the IT world are available in C and C++. The integration of MATLAB®/Simulink® enables the application in scientific fields. And all of that in just one engineering environment. The modules run in different languages in a common runtime. The advantage of this modularity is the improved reuse of modules, once they have been written and tested. The runtime runs under harsh real-time conditions with the use of multi-core technology and the support of 32- or 64-bit operating systems.

TwinCAT 3 highlights

- only one software for programming and configuration
- Visual Studio® integration
- more freedom in selecting programming languages
- support for the object-oriented extension of IEC 61131-3
- use of C/C++ as the programming language for real-time applications
- link to MATLAB®/Simulink®
- open interfaces for expandability and adaptation to the tools landscape
- flexible runtime environment
- active support of multi-core and 64-bit systems
- migration of TwinCAT 2 projects
- automatic code generation and project implementation with the TwinCAT Automation Interface

We reserve the right to make technical changes.

TwinCAT 3 | eXtended Automation Architecture (XAA)



In addition to the possibilities of controller programming according to the 3rd edition of IEC 61131-3, the new TwinCAT 3 architecture allows the use of C and C++ as the programming language. This opens up completely new application possibilities, as well as the expansion of or integration in existing systems. The link to MATLAB®/Simulink® is just one example of this new openness.

TwinCAT 3 extends the standard automation world

eXtended Automation Architecture
- supports all main fieldbuses
- supports IEC 61131, C/C++, MATLAB®/Simulink®
- supports Motion Control: from point-to-point to CNC
- supports TwinSAFE configuration
- supports Scientific Automation: robotics, measurement technology, Condition Monitoring

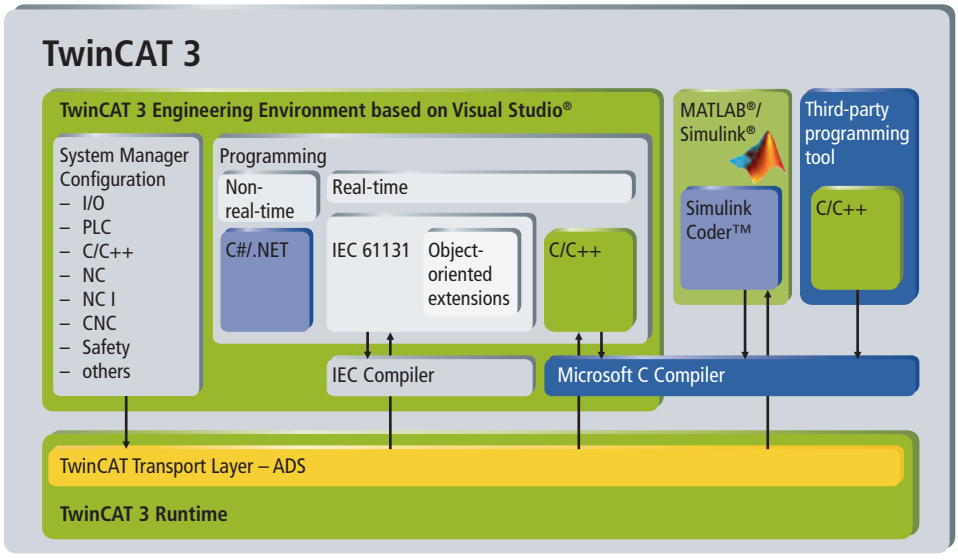
eXtended Automation Engineering
- one tool – Microsoft Visual Studio®
- integrated: IEC 61131 – worldwide standard in automation
- integrated: C/C++ – worldwide standard in IT
- integrated: TwinCAT System Manager – well-known configuration tool
- link to MATLAB®/Simulink®: worldwide standard in science
- expandable with other tools: editors, compilers
- TwinCAT 2 projects can be migrated.
- TwinCAT 3 modules: standardised programming frames
- using the .NET programming languages for non-real-time capable applications (e.g. HMI)

eXtended Automation Runtime
- IEC 61131, C/C++, MATLAB®/Simulink® objects in one runtime
- integrated TwinSAFE runtime
- extended real-time functionality: min. 50 µs cycle time and low jitter
- enhanced performance: support of multi-core CPUs
- future-proof: supports 64-bit operating systems

We reserve the right to make technical changes.

TwinCAT 3 | eXtended Automation Engineering (XAE)

Integration in Microsoft Visual Studio® makes it possible to program automation objects in parallel with the aid of the 3rd edition of IEC 61131-3 and the C or C++ languages. The objects (modules) generated can exchange data with each other and call each other independently of the language they were written in. The TwinCAT System Manager has been integrated into the development environment. This way, only one software is required to configure, parameterise, program and to diagnose automation devices.



Visual Studio® integration can be accomplished in two different ways. TwinCAT Standard only uses the basic framework of Visual Studio® with all its benefits in terms of handling, connection to source code control software, etc., while TwinCAT Integrated, as the name implies, integrates itself into Visual Studio®. In this version, the C/C++, C#, VB.NET programming languages and link to MATLAB®/Simulink® are available.

Flexible use of programming languages

C and C++ programming languages
- standardised
- widely used programming languages
- very powerful programming languages
- run under the same runtime as PLC programs
- for the implementation of drivers

Extended debugging of C++ programs
- debugging of C++ programs that run in real-time
- use of breakpoints
- use of watch lists
- use of call stacks

.NET programming languages
- used for non-real-time programming (e.g.: HMI)
- source code management in the same project

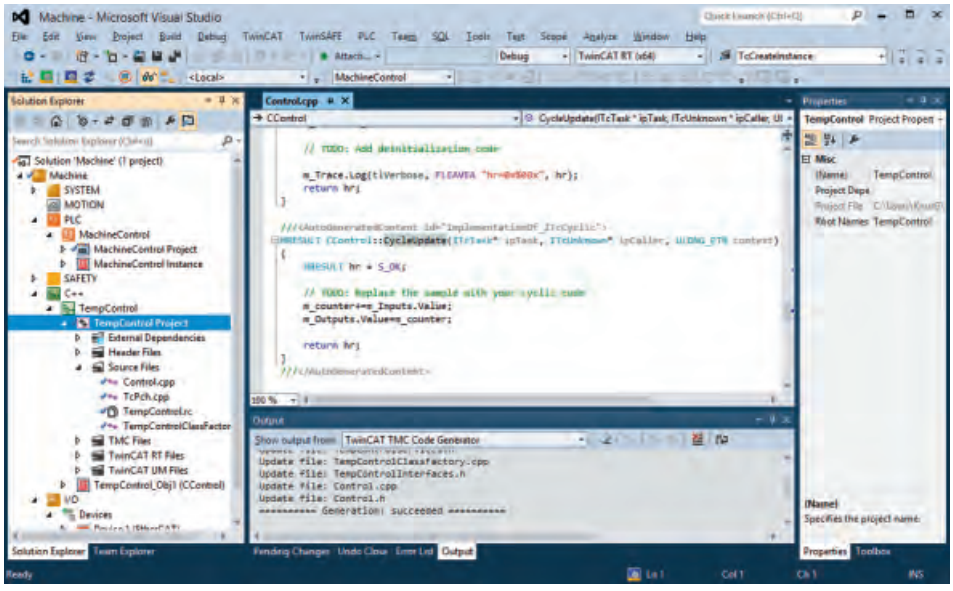
Link to MATLAB®/Simulink®
- great variety of toolboxes
- possibilities for use:
  - building of control circuits
  - in simulation
  - in optimisation
- automatic code generation
- debug interface between MATLAB®/Simulink® and TwinCAT

We reserve the right to make technical changes.

TwinCAT 3 | eXtended Automation Language Support

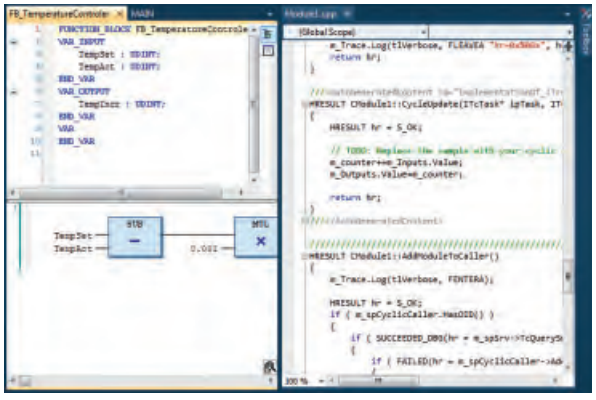
Real-time

- System Manager
- LD editor
- FBD editor
- SFC editor
- IL editor
- ST editor
- CFC editor
- Visual C/C++ editor

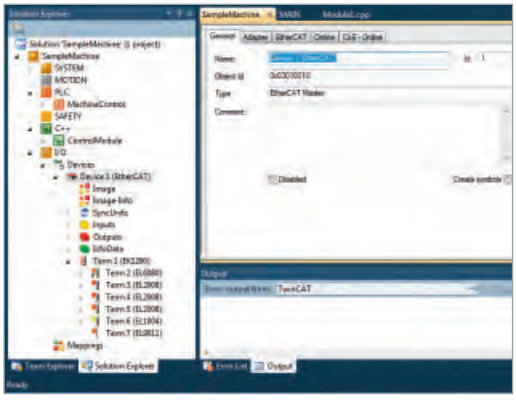


Non-real-time

- C#
- .NET
- Visual Basic
- C++
- Silverlight



Parallel use of the C++ and FBD programming languages



TwinCAT System Manager integrated into Visual Studio®

Integration of Visual Studio®

Automation devices and application programming in one environment

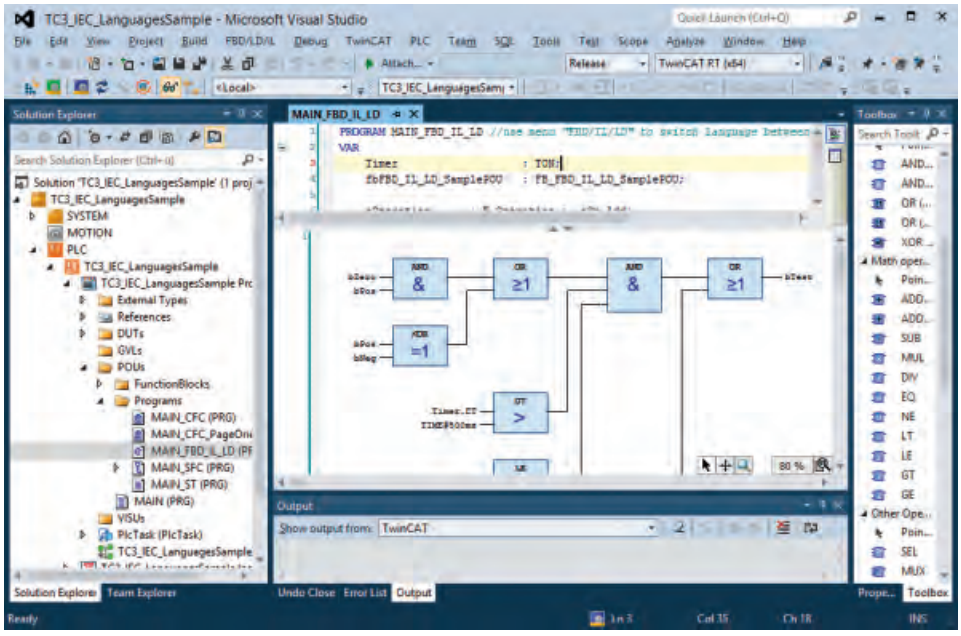
- use of the most famous and best supported development suite
- future-proof
- editing of PLC programs and complex visualisations in one environment
- multi-language support
- modern look and feel
- context-sensitive online help
- automatic syntax checking
- IntelliSense
- syntax highlighting
- use of the well-known source code control tools
- open architecture
- extendable by plug-ins

Visual Studio Microsoft Partner

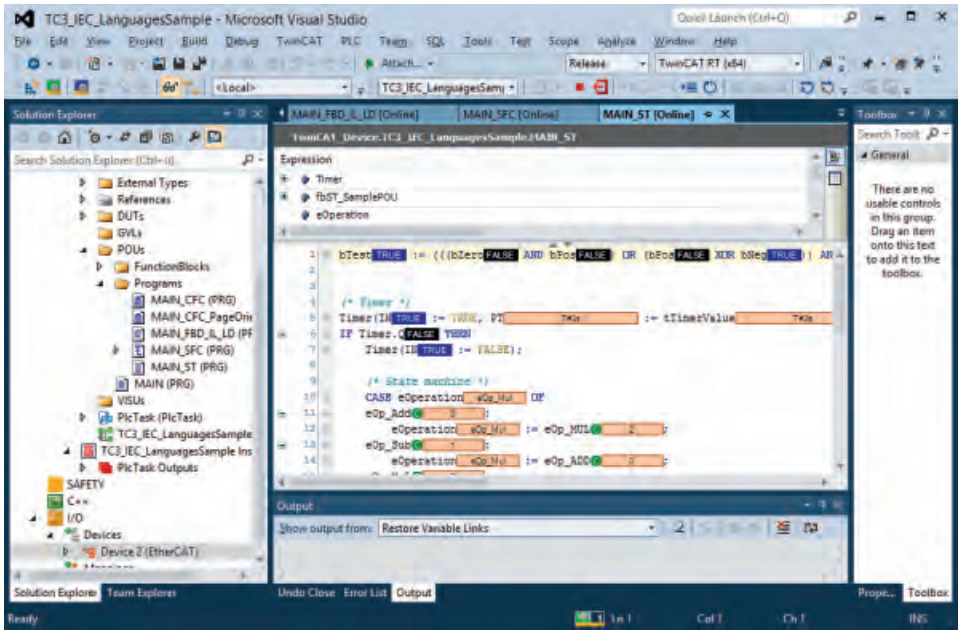
We reserve the right to make technical changes.

TwinCAT 3 | XA Language Support: IEC 61131-3

For more efficient programming of automation devices, the editors for IEC 61131-3 programming in TwinCAT have been significantly improved. The operability in particular has been optimised and the debugging options have been extended. The new options include improved inline monitoring, conditional break points and more.



In TwinCAT 3, the editors of the IEC 61131-3 have been integrated seamlessly into the Visual Studio® environment. As a result, the editors use the original Visual Studio® toolbox for the graphical languages, for example.

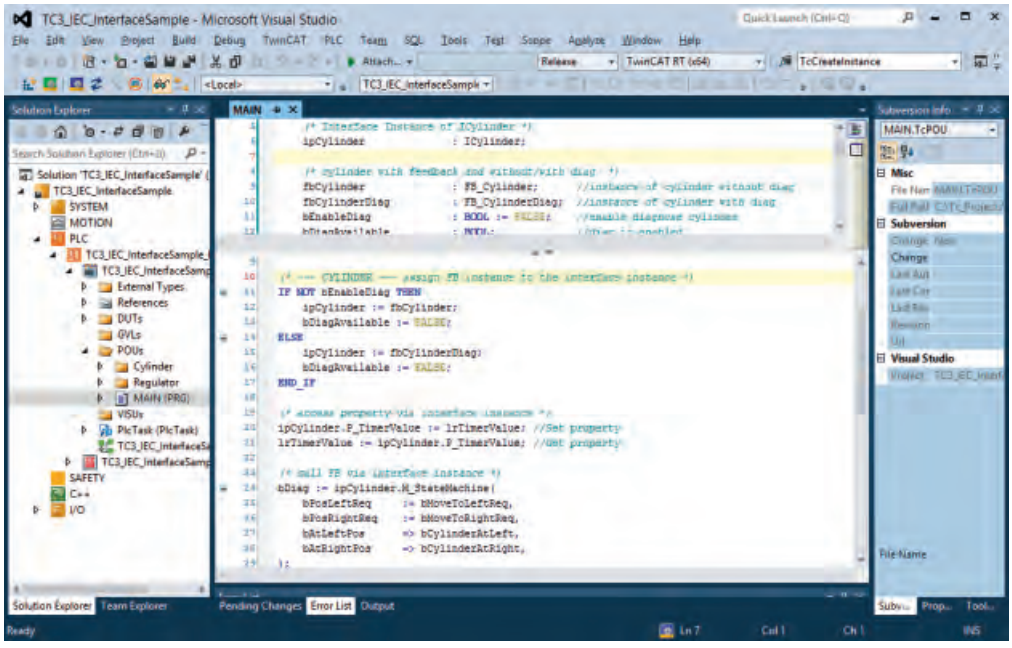


Improved inline monitoring for the Structured Text (ST) programming language

We reserve the right to make technical changes.

TwinCAT 3 | **XA Language Support: IEC 61131-3**

TwinCAT 3 completely supports the 3rd edition of the IEC 61131-3. It enables among other things the use of object-oriented techniques such as single inheritance, interfaces, methods and attributes, which significantly increase both the reusability and the quality of the control code.



Example of the use of polymorphism within an IEC 61131-3 POU (Program Organisation Unit)

IEC 61131-3 programming

- supplier-independent programming standard
- PLCopen certification
- portable, reusable software
- 5 graphic and text-based programming languages:
  - Structured Text and Instruction List
  - Function Block Diagram and Ladder Diagram
  - Sequential Function Chart
- data encapsulation by user-defined data types

Extended options in TwinCAT 3

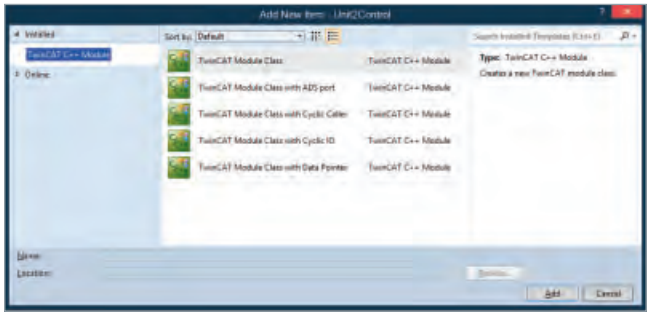
- improved usability
  - auto-complete
  - marking of associated keywords
  - collapsing of programming structures
- extended debugging
  - use of conditional break points
  - improved inline monitoring
- object-oriented extensions
  - single inheritance
  - interfaces
  - methods
  - attributes

We reserve the right to make technical changes.

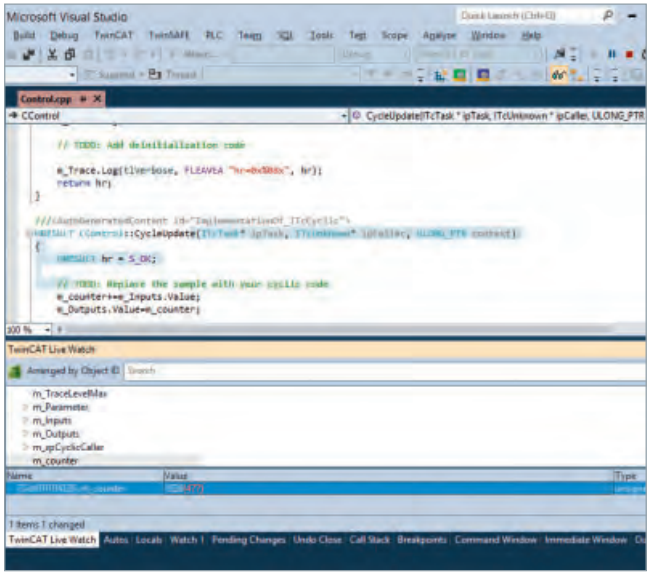
TwinCAT 3 | XA Language Support: C/C++

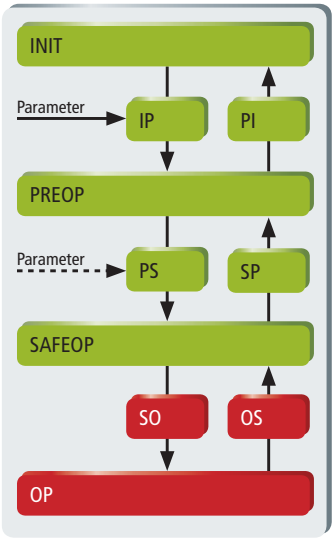
TwinCAT 3 offers the possibility to program TwinCAT runtime modules in C/C++ languages. For code generation, the C compiler integrated in Microsoft Visual Studio® 2010 is used. With TwinCAT 3 C++ libraries, functions for reading/writing files, starting threads, allocating memory or communicating with a database are provided. This corresponds to the IEC 61131-3 mechanism when using libraries.

Wizards for the creation of basic projects, classes and I/O variables make rapid engineering possible.



The routine CycleUpdate is cyclically processed. The internal variables are available for monitoring in the TwinCAT online watch window even without having to set a breakpoint.





State machine with transitions for the TwinCAT modules

C/C++ as programming languages in automation technology

C and C++ programming languages
- powerful, widely used programming languages
- standardised, object-orientated programming languages
- generation of efficient object code
- run under the same runtime as PLC programs
- for the implementation of drivers
- Beckhoff C++ Libraries for extended functionality in the real-time context

Extended debugging of C++ programs
- debugging of C++ programs that run in real-time
- monitoring, watch lists also without the use of break points

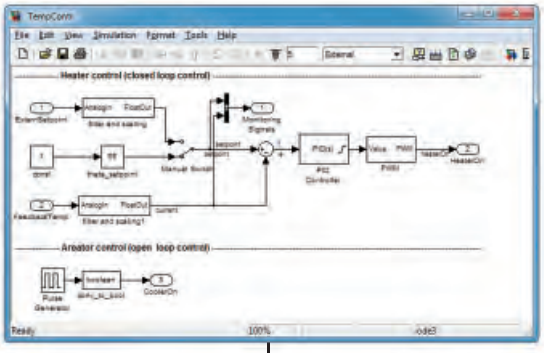
.NET programming languages
- used for non-real-time programming (e.g. HMI)
- source control in the same project

We reserve the right to make technical changes.

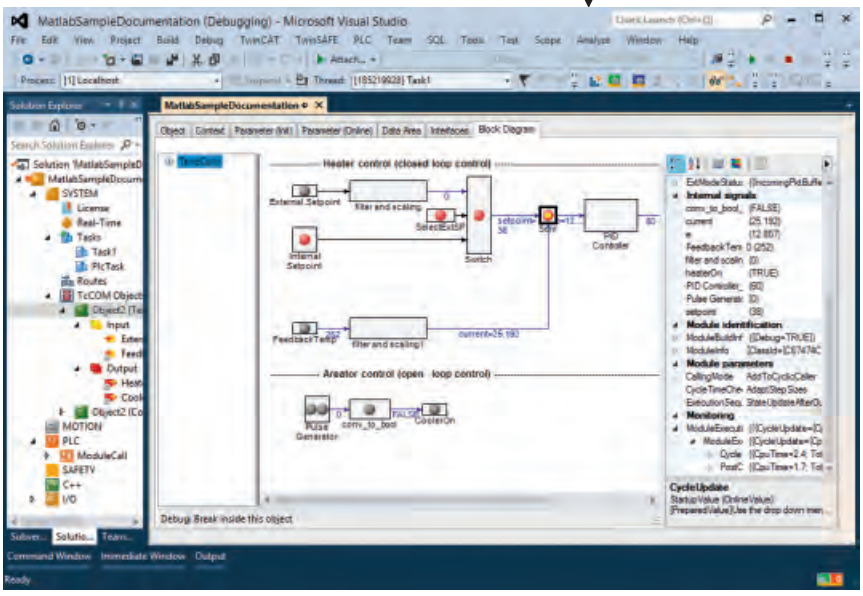
TwinCAT 3 | XA Language Support: MATLAB®/Simulink®

The integration of MATLAB®/Simulink® enables execution of TwinCAT modules that were generated as models in the Simulink® simulation environment. The chosen interfacing type displays the parameters and variables in the graphic interface of TwinCAT 3 and enables viewing and modification in the real-time environment at runtime.

MathWorks Partner



Example for temperature controller in MATLAB®/Simulink®



Parameter view of the generated module in TwinCAT

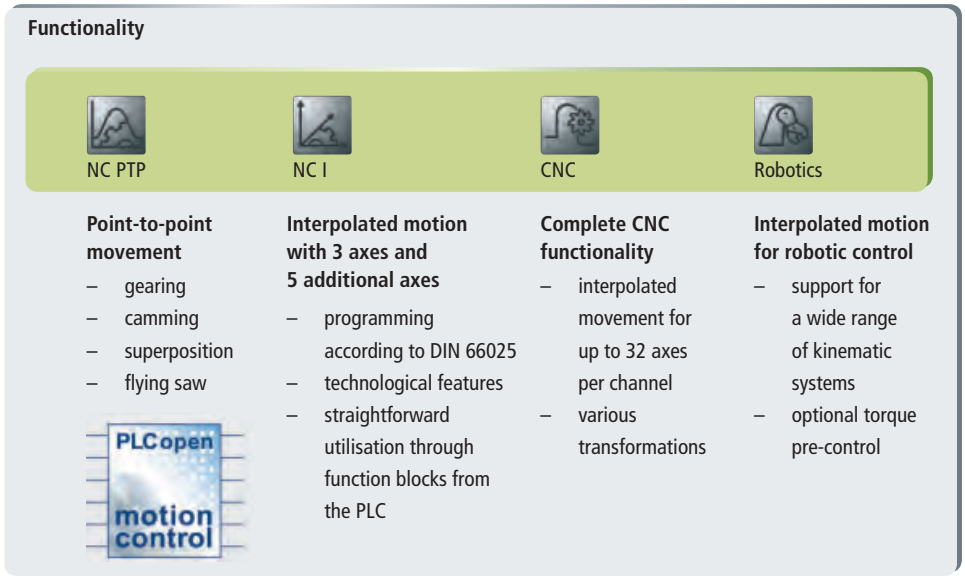
Integration with the simulation software MATLAB®/Simulink®

- standard tool in scientific and measuring applications
- wide range of toolboxes (e.g. Fuzzy Logic Toolbox)
- development, simulation and optimisation of complex control loops
- automatic code generation via Realtime Workshop
- debug interface between TwinCAT 3 and Simulink®
- parameterisation of the generated module in TwinCAT 3
- download and execution of the module in TwinCAT 3 runtime
- multiple module instantiation possible
- Modules can be used without MATLAB®/Simulink®.

We reserve the right to make technical changes.

TwinCAT 3 | eXtended Motion Control

With eXtended Motion Control, TwinCAT automation software offers an integrated and scalable solution for Motion Control applications including simple point-to-point movements, CNC and robot control.



Interpolated motion for robotic control

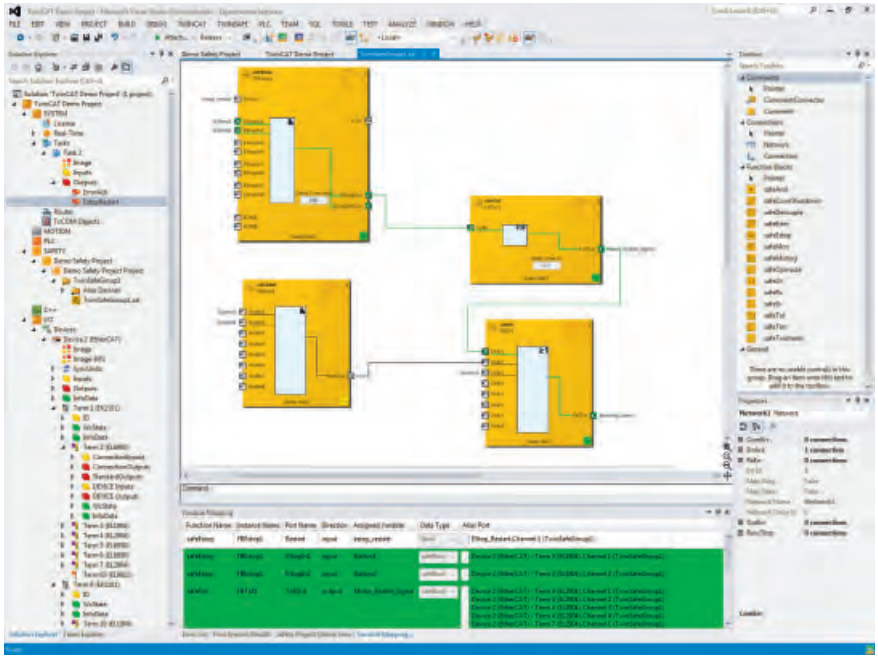
Advantages of the integration of robotic control in TwinCAT
- configuration, parameterisation, diagnostics and programming in TwinCAT
- optimum synergy between PLC, Motion Control and robot control system
- high performance and precision through direct interfaces

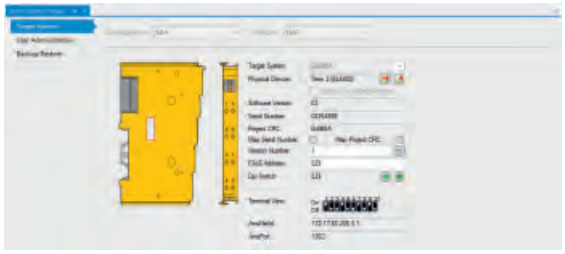
Kinematic calculation process
- forward transformation
- inverse transformation
- calculation of the dynamic model

TwinCAT 3 | **Safety Editor**

The Safety Editor integrated in TwinCAT 3 allows the creation of a safety application in a graphical environment. The user can program the desired logic directly with function blocks. The logic can initially be developed independently of the hardware configuration, leading to increased flexibility and portability. Additionally, the editor can automatically generate documentation for the application, making both the act of documenting and commissioning significantly easier.

For further information on TwinSAFE and the TwinSAFE products see page 1044





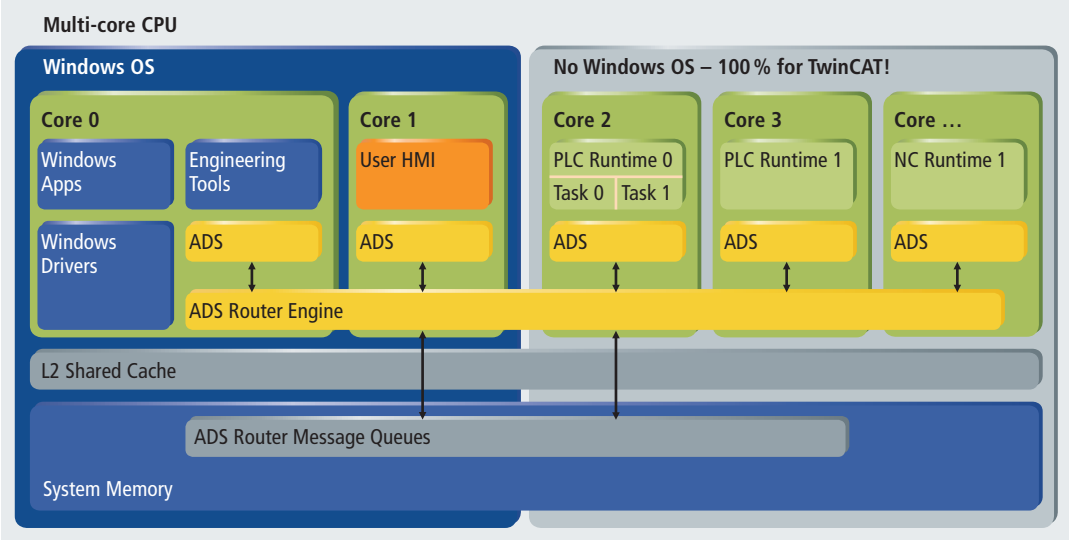
TwinCAT Safety Editor

- fully integrated in TwinCAT 3
- graphical programming
- convenient diagnostics through the direct display of online values in the graphical environment
- overview of the online state of relevant groups, connections and function blocks
- multi-level verification of the application for consistency
- automatic project download verification
- automatic generation of the documentation for acception and commissioning

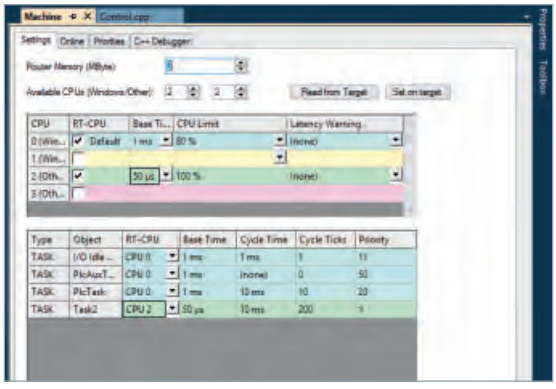
We reserve the right to make technical changes.

TwinCAT 3 | eXtended Automation Performance

Current developments in computer technology, which offer CPUs with more and more cores, enable the distribution of tasks across different cores. The TwinCAT 3 runtime environment follows this concept. It can be used to distribute functional units such as HMI, PLC runtime or MC to dedicated cores. For each of the cores used by the runtime environment the maximum load as well as the base time and therefore the possible cycle times can be set separately.



Due to the use of multi-core systems, functional units (e.g. PLC and NC runtimes, HMI) are distributed to individual processor cores.



Dialog for the distribution of tasks to processor cores: Moreover, in the so-called "core isolation" mode it is possible to make individual cores exclusively available for the use of TwinCAT. The context change between TwinCAT and the Windows operating system is thus avoided for these cores, which increases the attainable performance still further.

Multi-core and multi-tasking support

Support of multi-core systems
- distribution from applications to cores (e.g. PLC, NC and HMI can run on different cores)

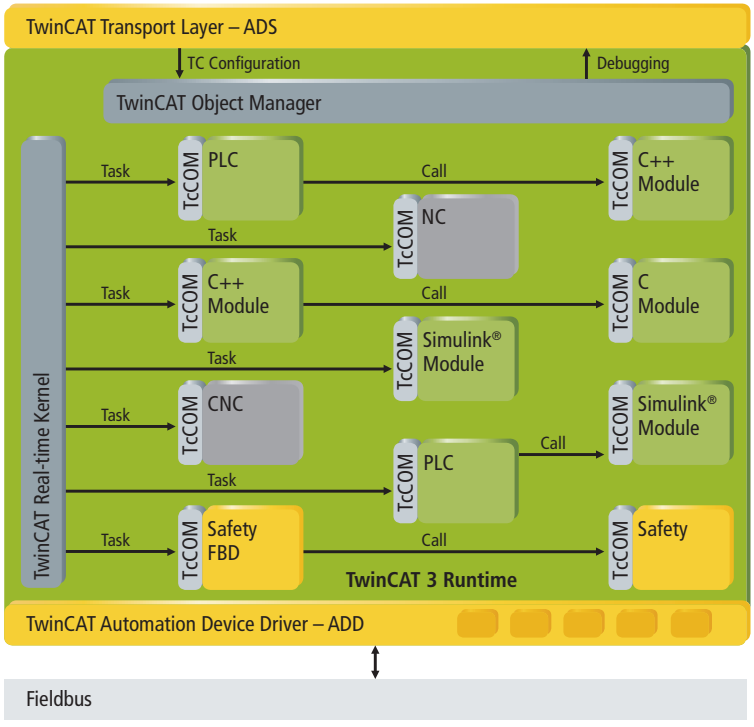
Support of multi-tasking
- preemptive multi-tasking
- parallel processing of tasks

Support of 64-bit operating systems
- usage of more resources (memory)

We reserve the right to make technical changes.

TwinCAT 3 | eXtended Automation Runtime (XAR)

Standardised modules enable open and flexible design of the TwinCAT 3 runtime. It makes an environment available in which the TwinCAT 3 modules can run. Whether the modules are PLC, NC, CNC, RC (Robotic Control) or C/C++ code-based modules (e.g. created with MATLAB®/ Simulink®) is irrelevant.



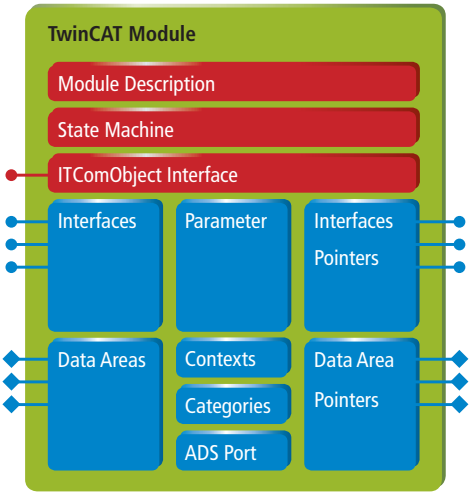
Modular TwinCAT 3 runtime

Modular design, openness, extendibility

Open runtime interface
- separation of complete functionality into modules
- use of services from system modules (e.g. real-time)
- defined interfaces
- extension of the runtime by own modules (e.g. bus drivers)
- Scalability: modules can contain simple functions; complex algorithms and real-time tasks.

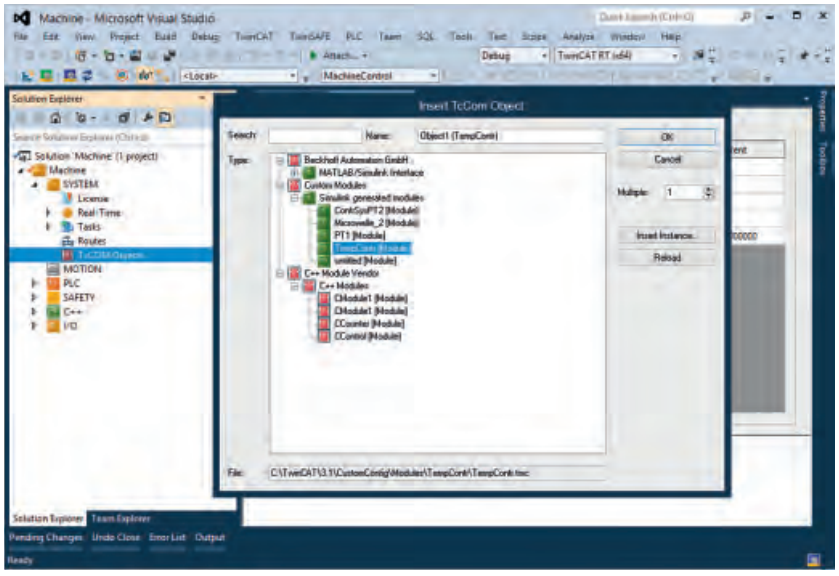
We reserve the right to make technical changes.

TwinCAT 3 modules consist of a range of formally defined attributes and interfaces. They enable general application of the modules with each other and externally. The predefined interfaces enable cyclic calling of the internal module logic, for example. Each module implements a state machine that controls the initialisation, parameterisation and linking of the respective module.



Structure of a TwinCAT 3 module

In addition to user modules, a number of system modules are already available which provide basic runtime functionality (e.g. TwinCAT real-time). These modules have fixed object IDs and are therefore accessible from each module.



Selection and parameterisation of a MATLAB®/Simulink® module

Fast communication, reusability

- Functionality of the modules is scalable.
- direct and therefore very fast communication between modules
- Modules are sealed.
- Modules can be developed, serviced and tested independent of each other.
- high reusability

TE1xxx | TwinCAT 3 Engineering

	TC3 Engineering	TC3 EtherCAT Simulation
Technical data	**TE1000**	**TE1111**
	TwinCAT Engineering contains the engineering environment of the TwinCAT 3 control software: – integration into Visual Studio® 2010/2012/2013 (if available) – support for the native Visual Studio® interfaces (e.g. connection to source code management systems) – IEC 61131-3 (IL, ST, LD, FBD, SFC) and CFC editors – IEC 61131-3 compiler – integrated system manager for the configuration of the target system – instancing and parameterisation of TwinCAT modules – integrated C++ debugger – user interface for the parameterisation of modules generated by MATLAB®/Simulink® – if integrated into Visual Studio®, instancing of .NET projects in the same solution (e.g. for HMI) – includes TwinCAT Scope and TwinCAT Bode Plot as base version	Virtual machine commissioning becomes possible if the EtherCAT cable of the machine computer can simply be plugged into a simulation computer, without the need for reconfiguration. With the TC3 EtherCAT Simulation function and a network adapter the simulation computer can simulate a number of EtherCAT slaves. For configuration purposes the EtherCAT slaves of the original machine configuration are inverted. All EtherCAT features necessary for machine simulation are modelled – including distributed clocks. Since the communication protocols CoE and SoE are implemented, acyclic commands can also be processed in the simulation environment.
Target system	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10
Further information	TE1000	TE1111

We reserve the right to make technical changes.

	TC3 XCAD Interface	TC3 Scope View Professional
	TE1120	TE1300
	TC3 XCAD Interface serves the purpose of importing already existing engineering results from an ECAD program. The TC3 XCAD Interface enables the import of information about the structure of the I/Os and their links to PLC variables, which is exported from the ECAD tool by means of XML description. On the basis of this information a system manager configuration and a basic PLC program with the I/O variables used are generated. The generation of NC and CNC axes is also possible.	TwinCAT 3 Scope View is a software oscilloscope for the graphical display of data in a YT, XY or bar chart. Scope View Professional extends the Scope View Base version which is included in TwinCAT 3 XAE by further functionalities. It can be used for tracking and monitoring processes over a longer period of time. Long-term recordings, print-out function and trigger-controlled data logging are part of the functionality. With multi-core support Scope View ensures optimised performance in the display of signals. Like TwinCAT 3 XAE, Scope View integrates itself into Microsoft Visual Studio®. It can be used as a stand-alone project or in combination with a TwinCAT project within a solution. Furthermore, Scope View Professional can be integrated into a user's .NET-based visualisation. Thus, seamless integration into an existing machine visualisation is possible.
	Windows XP, Windows 7/10	Windows XP, Windows 7/8/10
	TE1120	TE1300

We reserve the right to make technical changes.

TExxxx | TwinCAT 3 Engineering

	TC3 Target for MATLAB®/Simulink®	TC3 Interface for MATLAB®/Simulink®	TC3 Valve Diagram Editor
Technical data	**TE1400**	**TE1410**	**TE1500**

	The TwinCAT MATLAB®/Simulink® Target offers System Target Files for the use of the MATLAB®/Simulink® coder. It enables the generation of TwinCAT 3 runtime modules, which can be instanced and parameterised in the TwinCAT 3 engineering environment.	The interface for MATLAB®/Simulink® provides a communication interface between MATLAB®/Simulink® and the TwinCAT 3 runtime. It supports the acquisition and visualisation of real-time parameters. It can be used both for "software in the loop" simulation (SIL) and (in combination with TE1400) "hardware in the loop" simulation (HIL) of the controller.
		
		Features
		– data exchange between fieldbus devices and MATLAB®/Simulink®, for example for the simple realisation of control loops with low real-time requirements
		– Data exchange between the TwinCAT controller and MATLAB®/Simulink®; this enables controller testing by SIL simulation, for example.
		– acquisition and visualisation of process data via MATLAB®/Simulink®
		– configuration via graphic editor
		– various data exchange options, access via:
		  – symbol name of a variable
		  – configurable interface module
			The TwinCAT Valve Diagram Editor allows the linearisation of non-linear curves of hydraulic valves with the aid of a graphical editor. On the basis of a few base points, straight lines or 5th degree polynomials can be determined that connect the points. The characteristic linearisation curve thus determined can be loaded into the TwinCAT NC real-time and taken into account when the voltages are output in the drive.

Target system	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10
Further information	TE1400	TE1410	TE1500

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	TC3 Cam Design Tool	TC3 EAP Configurator	TC3 HMI	TC3 Analytics Workbench
	TE1510	TE1610	TE2000	TE35xx
	The TC3 Cam Design Tool allows the generation and modification of cam plates with the aid of a graphical editor. These are composed of sections of laws of motion such as modified sine waves, harmonic combinations, or of various polynomial functions. Velocity, acceleration and jerk are displayed in addition to the slave position. The generated cam plates can be transferred to the NC as tables with specified step size or as so-called motion functions.	The TwinCAT 3 EAP Configurator is a tool for visualising and configuring communication networks, in which data exchange based on the EtherCAT Automation Protocol (EAP) takes place or is to be established. EAP is used for master/master communication.	The TC3 HMI (human-machine interface) integrates itself into the well-known Visual Studio® development environment. Based on the latest web technologies (HTML5, JavaScript), it allows the user to develop platform-independent user interfaces that are "responsive", i.e. they automatically adapt to the screen resolution, size and orientation at hand. With the graphical WYSIWYG (what-you-see-is-what-you-get) editor, controls can be easily arranged via drag-and-drop and linked with real-time variables. The HMI is extensible on all levels. Mixing standard controls with custom design elements makes designing your own HMI easy. User controls can also be created and configured by modifying the standard controls to create your own toolbox. To create more complex pages, predefined designer templates can be integrated. On the client side, the HMI logic can be implemented in JavaScript or as a so-called server extension in C++ or .NET, which allows users to protect their know-how.	With the TC3 Analytics Workbench a system for online and offline analyses for one or more machines can be set up. The basic Analytics Workbench consists of: – TwinCAT PLC runtime environment – Analytics PLC library – IoT communication environment for data streaming – Analytics Configurator in Microsoft Visual Studio® – professional license for TwinCAT Scope Views. The basic package can be expanded with C/C++ and MATLAB®/Simulink® for enhancing your own Analytics application via Mathworks toolboxes for machine learning and optimisation. With the TwinCAT PLC runtime own algorithms for analysing a machine can be written. Existing code can be reused without modification. Another benefit: machine manufacturers who have implemented their machine application with TwinCAT do not need any new tools to run analyses. In addition, no special training is needed, because the programming is done in the same development environment with Visual Studio®. With the TwinCAT 3 Analytics Configurator you can comfortably sift through the data as it is cyclically acquired by the TwinCAT 3 Analytics Logger. Many different variables can be selected from a large data package in order to graphically display them, for example, with a "post-scope configuration" in Scope View Professional. The configurator also provides some algorithms from the Analytics PLC library for examining the data offline for limit values or performing a runtime analysis of machine cycles. The total running time of a machine cycle – the shortest, the longest, and the average running time – can be determined with ease. The determination and monitoring of energy requirements can be used as further analysis criteria. The results can be displayed on dashboards produced with TC3 HMI.
	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10	Windows 7/8/10	Windows 7/8/10
	TE1510	TE1610	TE2000	TE35xx

We reserve the right to make technical changes.

TC1xxx | TwinCAT 3 Base

	TC3 ADS	TC3 I/O
Technical data	**TC1000-00pp**	**TC1100-00pp**
	The Automation Device Specification (ADS) is the communication protocol of TwinCAT. It enables the data exchange and the control of TwinCAT systems. ADS is media-independent and can communicate via serial or network connections. ADS enables: – access to the process image – consistent data exchange – access to I/O tasks – detection of status changes – read-out of the PLC symbol information – access by variable name – sum commands – synchronous and asynchronous access – cyclic and event-based messages Libraries and runtime components are provided for common programming languages (including .NET, C/C++, Delphi and Java). In addition, interfaces are provided for communication with third-party software (e.g. MATLAB®, NI LabView, Office). The ADS web services enable the development of device-independent web applications (HTML5, WCF). The message router manages multiple connections and efficiently distributes the messages. The data packets can be recorded via the ADS monitor using the integrated diagnostic interface. The free TC3 ADS supplies the basic components required in order to communicate with TwinCAT systems. The setup can be integrated in your own installation routines.	Using TwinCAT I/O, cyclic data can be collected by different fieldbuses in process images. Cyclic tasks drive the corresponding fieldbuses. Various fieldbuses can be operated with different cycle times on one CPU. Applications can directly access the process image. The fieldbuses and the process images are configured in TwinCAT Engineering. – provides variable-oriented linkage of I/O devices to tasks – tasks are variable-oriented among each other – the smallest unit is one bit – upports both synchronous and asynchronous relationships – consistent exchange of data areas and process images – online display in the directory tree – online watch window – "Force and Write" for commissioning and for testing task variables and I/O devices – supported fieldbuses: – EtherCAT – Lightbus – PROFIBUS DP (master and slave) – Interbus – CANopen – SERCOS interface – DeviceNet – Ethernet – USB – SMB (System Management Bus)
Performance class (pp)	20 | 30 | 40 | 50 x | x | x | x 60 | 70 | 8x | 9x x | x | x | x	20 | 30 | 40 | 50 x | x | x | x 60 | 70 | 8x | 9x x | x | x | x
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
Further information	TC1000	TC1100

We reserve the right to make technical changes.

	TC3 PLC				TC3 PLC/C++				TC3 PLC/C++/MATLAB®/Simulink®			
	TC1200-00pp				TC1210-00pp				TC1220-00pp			
	TwinCAT PLC realises one or more PLCs with the international standard IEC 61131-3 3rd edition on one CPU. All programming languages described in the standard can be used for programming. The blocks of the type PROGRAM can be linked with real-time tasks. Various convenient debugging options facilitate fault-finding and commissioning. Program modifications can be carried out at any times and in any size online, i.e. when the PLC is running. All variables are available symbolically by ADS and can be read and written in appropriate clients. – process image size, flag range, program size, POU size and number of variables are limited only by size of RAM – cycle times from 50 µs – link time: typically 1 µs (Intel® Core™2 Duo) – IEC 61131-3: IL, FBD, LD, SFC, ST, CFC – online changes in programs and variables – remote debugging via TCP/IP – online connection with PLC runtime system worldwide via TCP/IP or fieldbus – online monitoring of variables in variable lists, watch windows, editors – online status and powerflow (accumulator contents) of programs and instances – triggering, forcing and setting variables – powerful debugging with single cycle, break points, step in, step over, display of the current call stack, watchlist shows selection of variable, trace functions – online management of all variable names and structures across the whole system – remanent and persistent data, UPS supported storage on hard disk, storage in NOVRAM as option – variable reading and writing access via ADS, OPC – certified in accordance with PLCopen base level (IL/ST) – structured programming with modular program management – source code is stored in the target system – convenient library management – powerful compiler with incremental compilation – all common data types, structures, arrays, including multi-dimensional arrays – convenient creation of programs with autoformat, autodeclare, cross-reference, search/replace, project comparison – simple linking to source code administration tools by embedding in Microsoft Visual Studio®				Extension of the TwinCAT PLC TC1200 with additional C++ functionalities: – online connection to PLC/C++ runtime system locally or worldwide via TCP/IP or via fieldbus – online monitoring of variables in variable lists, watch windows and editors without setting break points – online setting of variables				Extension of the TwinCAT PLC/C++ TC1210 by the possibility to execute modules generated in MATLAB®/Simulink®: – contains the TwinCAT 3 PLC and C++ runtime – allows the execution of modules generated in MATLAB®/Simulink® – multiple instancing of modules – parameterisation of these modules at runtime – online access to all parameters (can be deactivated) – generic modules (no hardware connection necessary within the models) – connection to the external mode of Simulink® – connection to the TwinCAT C++ debugger, with graphical representation of the blocks – modules can be called from other modules or directly by tasks			
	20	30	40	50	20	30	40	50	20	30	40	50
	x	x	x	x	–	–	x	x	–	–	x	x
	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x	x	x	x	x
	Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10				Windows XP, Windows 7/8/10			
	TC1200				TC1210				TC1220			

TC1xxx | TwinCAT 3 Base

	TC3 PLC/NC PTP 10	TC3 PLC/NC PTP 10/NC I
Technical data	**TC1250-00pp**	**TC1260-00pp**
	Extension of the TwinCAT PLC TC1200 by the possibility to realise point-to-point movements in software (TwinCAT Motion Control PTP 10). The axes are represented by axis objects and provide a cyclic interface, e.g. for the PLC. This axis object is then linked to a corresponding physical axis. In this way the most diverse axis types with the most diverse fieldbus interfaces can be connected abstractly with the axis objects, which always offer an identical configuration interface. The control of the axes can be configured in various constellations (position or velocity interface) and various controllers. The axes are configured in TwinCAT Engineering. – up to a maximum of 255 axes on one CPU – supports electrical and hydraulic Servo Drives, frequency converter drives, stepper motor drives, DC drives, switched drives (fast/slow axes), simulation axes and encoder axes – supports various encoders such as incremental encoder, absolute encoder, digital interface to the drives such as EtherCAT, SERCOS, SSI, Lightbus, PROFIBUS DP/MC, pulse train – standard axis functions such as start/stop/reset/ reference, velocity override, master/slave couplings, electronic gearbox, online distance compensation, programming is carried out via PLCopen-compliant IEC 61131-3 function blocks – convenient axis commissioning options – online monitoring of all axis state variables such as actual/set values, releases, control values – online axis tuning – forcing of axis variables – configuration of all axis parameters, such as measuring system, drive parameters and position controller – configurable controller structures: P control, PID control, PID with velocity pre-control, PID with velocity and acceleration pre-control – online master/slave and slave/master conversion – flying saw (diagonal saw [optional]) – cam plates (support by TC3 Cam Design Tool [optional]) – FIFO axes (optional) – external set value generators – multi-master coupling	Extension of the TwinCAT PLC/NC PTP 10 by the possibility to realise movements with up to three interpolating and up to five auxiliary axes. Various axis types with various fieldbus interfaces are supported. The movement is usually programmed in DIN 66025, but it can also alternatively be carried out via PLC function blocks. – max. 3 path axes and up to 5 auxiliary axes per group – 1 group per channel, max. 31 channels – supports electric servo axes, stepper motor drives – interpreter functions such as subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions – geometry functions: straight lines and circles in 3-D space, circles at all main levels, helices with base circles at all main levels, linear, circular and helical interpolation at the main levels and freely definable levels, Bezier splines, look-ahead function – online reconfiguration of axes in groups, path override, slave coupling to path axes, auxiliary axes, axis error and sag compensation, measuring functions – programming in DIN 66025 – access alternatively via function blocks according to IEC 61131-3 – operation of automatic mode, manual mode (jog/inch), single block mode, referencing, handwheel mode (movement/overlay) – convenient debugging with online monitoring of current set/actual position (position lag of all axes), NC program line currently being processed, NC program line currently being interpreted, channel status – support of kinematic transformations in combination with TF511x
Performance class (pp)	20 | 30 | 40 | 50 – | x | x | x 60 | 70 | 8x | 9x x | x | x | x	20 | 30 | 40 | 50 – | – | x | x 60 | 70 | 8x | 9x x | x | x | x
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
Further information	TC1250	TC1260

We reserve the right to make technical changes.

	TC3 PLC/NC PTP 10/NC I/CNC	TC3 PLC/NC PTP 10/NC I/CNC E	TC3 C++	TC3 C++/ MATLAB®/Simulink®
	TC1270-00pp	TC1275-00pp	TC1300-00pp	TC1320-00pp
	Extension of the TwinCAT PLC/NC PTP 10 by the possibility to realise an interpolation with up to 32 simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according DIN 66025. The axes and channels are configured in TwinCAT Engineering. – 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels (optional) – supports electric servo axes, stepper motor drives subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, zero point shifts, tool functions – geometry functions: linear, circular and helical interpolation at the main levels and freely definable levels, max. 32 interpolating path axes per channel (optional), look-ahead function – axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions – programming in DIN 66025 with high-level language extension – access via function blocks from TwinCAT PLC according to IEC 61131-3 – operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) – convenient debugging with online monitoring of all states	TwinCAT CNC export version (E version): extension of the TwinCAT PLC/NC PTP 10 by the possibility to realise an interpolation with up to 4 simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according DIN 66025. The axes and channels are configured in TwinCAT Engineering. – max. 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels (optional) – max. 4 simultaneously interpolating path axes – supports electric servo axes, stepper motor drives subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, zero point shifts, tool functions – geometry functions: linear, circular and helical interpolation at the main levels and freely definable levels, max. 4 interpolating path axes per channel (optional), look-ahead function – axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions – programming in DIN 66025 with high-level language extension – access via function blocks from TwinCAT PLC according to IEC 61131-3 – operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) – convenient debugging with online monitoring of all states	The TwinCAT 3 C++ runtime environment enables the execution of real-time modules written in C++. The following functions are supported, among others: – online connection to C++ runtime system locally or worldwide via TCP/IP or via fieldbus – online monitoring of variables in variable lists, watch windows and editors without setting break points – online setting of variables	Extension of the TC1300 by the possibility to execute modules generated by MATLAB®/Simulink®. – contains the TwinCAT 3 C++ runtime – allows the execution of modules generated in MATLAB®/Simulink® – multiple instancing of modules – parameterisation of these modules at runtime – online access to all parameters (can be deactivated) – generic modules (no hardware connection necessary within the models) – connection to the external mode of Simulink® – connection to the TwinCAT C++ debugger with graphical representation of the blocks – modules can be called from other modules or directly by tasks
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
–	–	–	x	–	–	–	x	–	–	x	x	–	–	x	x
60	70	8x	9x	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Windows XP, Windows 7/8/10			Windows XP, Windows 7/8/10				Windows XP, Windows 7/8/10				Windows XP, Windows 7/8/10			
	TC1270			TC1275				TC1300				TC1320			

We reserve the right to make technical changes.

TF1xxx | TwinCAT 3 System

	TC3 PLC HMI	TC3 PLC HMI Web	TC3 UML
Technical data	**TF1800-00pp**	**TF1810-00pp**	**TF1910-00pp**
	TC3 PLC HMI is a stand-alone tool for the presentation of visualisations which are created in the TwinCAT PLC development environment. They are shown in full-screen as soon as the system starts up.	TC3 PLC HMI Web is a web-based visualisation system. The TwinCAT PLC development environment can be used as an editor for creating web pages. The web pages are hosted by the Internet Information Server (IIS). For display of the web pages HTML5 and JavaScript is needed.	With the integration of UML (Unified Modeling Language), two additional editors for modelling of PLC software are available. The existing TwinCAT PLC programming languages are extended with the UML state and UML class diagrams. UML is a modelling language for software analysis, design and documentation. UML is particularly suitable for object-oriented implementations. The UML class diagram belongs to the group of UML structure diagrams and can be used for schematic representation of the software architecture. The UML state diagram is part of the UML behaviour diagrams and is used for dynamic software modelling. It can be used for a graphic specification of the dynamic response or the state-dependent system behaviour. The development process is supported by an online debugging option.
Performance class (pp)	20 30 40 50 x x x x 60 70 8x 9x x x x x	20 30 40 50 x x x x 60 70 8x 9x x x x x	20 30 40 50 – x x x 60 70 8x 9x x x x x
Required	TC1200	TC1200	TC1200
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
Further information	TF1800	TF1810	TF1910

We reserve the right to make technical changes.

TF2xxx | TwinCAT 3 HMI

	TC3 HMI Server	TC3 HMI Clients Pack
Technical data	TF2000-00pp	TF2010-00pp, TF2020-00pp, TF2030-00pp, TF2040-00pp
	The TC3 HMI Server is a modular web server that provides the human-machine interface (HMI). It supports all CPU classes from ARM to multi-core. The powerful architecture enables a wide range of application scenarios from local panel solutions to multi-client, multi-server and multi-runtime concepts. All that is needed to start an HMI client is an HTML5-capable browser, which is available for all major operating systems. Accordingly, clients can run on PCs as well as on mobile devices such as tablets and smartphones. Whatever the platform, security is of the utmost importance, which is why the data traveling between client and server is encrypted. The integrated user management features a configurable user rights system. The HMI server is connected to the respective controller(s) via automation protocols. For this purpose, the Automation Device Specification (ADS) interface is available. Optionally, OPC UA is available as an additional server extension. The HMI server can be modularly extended with so-called server extensions, e.g. a reporting system or recipe management. In addition, a server extension (SDK – Software Development Kit) offers the option to develop extensions in C++ or .NET. This enables users to create their own logics and implement further communication protocols.	The TC3 HMI server includes a connection to one client (browser) as standard. Optional client packages are available for establishing further connections at the same time, e.g. to a mobile device or panel. The number of supported clients is not tied to the devices employed, the HMI server only counts simultaneous (browser) connections. Optional packets are available for 1, 3, 10 or 25 clients.

Performance class (pp)	20	30	40	50	20	30	40	50
	–	x	x	x	–	x	x	x
	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x
Target system	Windows 7/8/10, Windows CE, Windows 10 IoT Core Pro				Windows 7/8/10, Windows CE, Windows 10 IoT Core Pro			
Further information	TF2000				TF2010			

For availability status see Beckhoff website at:

TF2xxx | TwinCAT 3 HMI

	TC3 HMI Targets Pack	TC3 HMI ADS
Technical data	TF2050-00pp, TF2060-00pp, TF2070-00pp, TF2080-00pp, TF2090-00pp	TF2100-00pp
	The TC3 HMI server includes a connection to one controller as standard. Optional target packages for 1, 3, 10, 25 or 100 targets are available for connecting further control systems. The HMI server only stores the number of physical targets, based on the unique addressing. The engineering process can be more flexible and modular, and the efficiency increased.	The Automation Device Specification (ADS) describes a device- and fieldbus-independent interface for controlling the internal communication in TwinCAT. The extension enables access to TwinCAT 2/3 target systems. The symbol files can be used for developing and testing the HMI offline.

Performance class (pp)	20	30	40	50	20	30	40	50
	–	x	x	x	–	x	x	x
	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x
Target system	Windows 7/8/10, Windows CE, Windows 10 IoT Core Pro				Windows 7/8/10, Windows CE, Windows 10 IoT Core Pro			
Further information	TF2050				TF2100			

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	TC3 HMI OPC UA				TC3 HMI Extension SDK				TC3 HMI Scope			
	TF2110-00pp				TF2200-00pp				TF2300-00pp			
	OPC Unified Architecture is a vendor-independent communication interface for linking TwinCAT or other controllers. The extension includes the OPC UA client, which enables integration of an OPC UA server.				The TwinCAT HMI server can be expanded modularly and flexibly via extensions. The software development kit (C++/.NET) can be used for programming application-specific solutions (e.g. business logics, proprietary protocols). In addition, user IP (intellectual property) is protected, and existing functions can be accessed by the server (e.g. ADS, logging).				The TwinCAT Scope software oscilloscope can be used to display time sequences with high resolution. The extension enables integration of the software oscilloscope into the TwinCAT HMI and provides ready-made scope control.			
	20	30	40	50	20	30	40	50	20	30	40	50
	–	x	x	x	–	x	x	x	–	x	x	x
	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x	x	x	x	x
	Windows 7/8/10, Windows CE, Windows 10 IoT Core Pro				Windows 7/8/10, Windows CE, Windows 10 IoT Core Pro				Windows 7/8/10, Windows CE, Windows 10 IoT Core Pro			
	TF2110				TF2200				TF2300			

TF3xxx | TwinCAT 3 Measurement

Technical data	TC3 Scope Server TF3300-00pp	TC3 Analytics Logger TF3500-00pp	TC3 Analytics Library TF3510-00pp
	The TwinCAT 3 Scope Server prepares data for visual display in the TwinCAT 3 Scope View. It can be used for autarkic data recordings in distributed systems within production, plant or machine networks.	The TC3 Analytics Logger cyclically collects data from the application and the process image. Since it works within the real-time context, it delivers outstanding performance. The data can be stored in a local file or sent to a message broker via an IoT communication protocol. The broker can run on your own network or in a public cloud. The Analytics Logger can be easily configured in the engineering environment of TwinCAT 3 via Microsoft Visual Studio®.	The TC3 Analytics Library is a PLC library with analytical functions for process and application data. It can be run locally on the target system or on an analytical system that is linked to the cloud. The library contains function blocks for cycle analysis with minimum, maximum and average cycle times. It also contains function blocks for threshold value monitoring and is able to document the number of threshold value violations. Other function blocks analyse signal amplitudes and store indicators like maxima and minima. The library makes it easy to analyse fault conditions as well as certain states of a state machine. In combination with the TC3 HMI, easy-to-use machine dashboards can be developed that process and display valuable information for operators and service technicians.
Performance class (pp)	20 30 40 50 – – x x 60 70 8x 9x x x x x	20 30 40 50 – x x x 60 70 8x 9x x x x x	20 30 40 50 – x x x 60 70 8x 9x x x x x
Required	TC1000	TC1000	TC1200
Target system	Windows XP, Windows 7/8/10	Windows 7/8/10	Windows 7/8/10
Further information	TF3300	TF3500	TF3510

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	TC3 Condition Monitoring Level 1				TC3 Condition Monitoring Level 2				TC3 Solar Position Algorithm			
	TF3600-00pp				i TF3601-00pp				TF3900-00pp			
	In order to implement Condition Monitoring for machines and plants, the TwinCAT Condition Monitoring library offers a modular construction kit of mathematical algorithms with which measured values can be analysed. The user can serve himself from this construction kit, depending upon the application background, thus having the option to develop a scalable solution on different platforms. The library's functions are primarily relevant to analysis, statistics and classification. In addition to spectral analysis via FFT or using, for instance, an envelope spectrum, it is possible to calculate key statistical values such as the kurtosis or the crest factor. Combining these algorithms with limit value monitoring is, for instance, ideally suited to monitoring roller bearings. Level 1 contains the following algorithms: – Power Spectrum – Magnitude Spectrum – Envelope – Envelope Spectrum – Power Cepstrum – Time-based RMS – Frequency-based RMS – Histogram – Crest Factor – Moment Coefficients – Mean, Standard Deviation, Skew, Kurtosis – Discrete Classification – Watch Upper Thresholds				In addition to the Level 1 functions, TwinCAT Condition Monitoring Level 2 contains the following algorithms: – Hilbert Transform – Analytic Signal – Instantaneous Phase – Overlap Add Synthesis – Statistics – Statistics of Frequency Spectra – Quantities and Percentiles – Homomorphic Signal Processing – Power Cepstrum – Instantaneous Frequency – Pattern Recognition/Machine Learning – Bayesian Classification				With the TwinCAT Solar Position Algorithm it is possible to determine the sun angle using the date, time, geographical longitude and latitude as well as further parameters (depending on the desired accuracy). The function block works with a maximum inaccuracy of ±0.001°.			
	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	x	x	–	–	x	x	x	x	x	x
	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x	x	x	x	x
	TC1200				TC1200				TC1200			
	Windows XP, Windows 7/8/10				Windows XP, Windows 7/8/10				Windows XP, Windows 7/8/10, Windows CE			
	TF3600				TF3601				TF3900			

TF4xxx | TwinCAT 3 Controller

	TC3 Controller Toolbox	TC3 Temperature Controller
Technical data	**TF4100-00pp**	**TF4110-00pp**
	The TwinCAT Controller Toolbox covers all essential blocks for control applications. – controllers satisfy industrial requirements such as anti-reset windup – simple basic controllers (P, I, D) – complex controllers (PI, PID, switching controllers) – filter blocks – control value generators (limiters, PWM) – ramp and signal generator blocks	Temperature controllers can be simply implemented using TwinCAT Temperature Controller. Simple commissioning through self-adjustment of the controller (auto-tuning) is included. – automatic and manual operation with shock-free set up – control value analog or pulse-width modulated signal – tolerance monitoring, absolute value monitoring – scalable reaction to sensor error and heating power faults – limitation of set and control values – optional ramping of the set value – optional start-up phase for the setpoint variables – industrial PID controller as base control algorithm inside the temperature controller

Performance class (pp)	20	30	40	50	20	30	40	50
	x	x	x	x	x	x	x	x
	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x
Required	TC1200				TC1200			
Target system	Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10, Windows CE			
Further information	TF4100				TF4110			

We reserve the right to make technical changes.

TF5xxx | TwinCAT 3 Motion Control

	TC3 NC PTP 10 Axes	TC3 NC PTP Axes Pack 25	TC3 NC PTP Axes Pack unlimited
Technical data	**TF5000-00pp**	**TF5010-00pp**	**TF5020-00pp**
	TC3 NC PTP 10 Axes implements Motion Control for point-to-point movements in software. The axes are represented by axis objects and provide a cyclic interface, e.g. for the PLC. This axis object is then linked to a corresponding physical axis. In this way, the most diverse axis types with the most diverse fieldbus interfaces can be connected abstractly with the axis objects, which always offer an identical configuration interface. The control of the axes can be configured in various conformations (position or velocity interface) and various controllers. The axes are configured in TwinCAT Engineering. – up to 10 axes, developable to a maximum of 255 axes – supports electrical and hydraulic servo drives, frequency converter drives, stepper motor drives, DC drives, switched drives (fast/slow axes), simulation axes and encoder axes – supports various encoders such as incremental encoder, absolute encoder, digital interface to the drives such as EtherCAT, SERCOS, SSI, Lightbus, PROFIBUS DP/MC, pulse train – standard axis functions such as start/stop/reset/reference, velocity override, master/slave couplings, electronic gearbox, online distance compensation – programming is carried out via PLCopen-compliant IEC 61131-3 function blocks – convenient axis commissioning options – online monitoring of all axis state variables such as actual/setpoint values, releases, control values, online axis tuning – forcing of axis variables – configuration of all axis parameters, such as measuring system, drive parameters and position controller – configurable controller structures: P control, PID control, PID with velocity pre-control, PID with velocity and acceleration pre-control – online master/slave and slave/master conversion – flying saw (diagonal saw) – cam plates (support by TC3 Cam Design Tool [optional]) – FIFO axes (optional) – external set point value generators – multi-master coupling	Extension of TF5000-00pp up to a maximum of 25 axes	Extension of TF5000-00pp up to a maximum of 255 axes
Performance class (pp)	20 | 30 | 40 | 50 – | x | x | x 60 | 70 | 8x | 9x x | x | x | x	20 | 30 | 40 | 50 – | – | x | x 60 | 70 | 8x | 9x x | x | x | x	20 | 30 | 40 | 50 – | – | x | x 60 | 70 | 8x | 9x x | x | x | x
Required	TC1200	TC1200	TC1200
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
Further information	TF5000	TF5010	TF5020

We reserve the right to make technical changes.

TF5xxx | TwinCAT 3 Motion Control

	TC3 NC Camming				TC3 NC Flying Saw			
Technical data	TF5050-00pp				TF5055-00pp			
	TwinCAT NC Camming (cam plate) is a non-linear relationship between a master and a slave axis. The camming package offers various options for the storage of cam plates. Convenient PLC blocks enable the loading, coupling and uncoupling of cam plates. It is possible to load new cam plates or to modify cam plates during operation. The TC3 CAM Design Tool offers support for the creation of the cam plates. – position tables with master interpolation points and corresponding slave positions; interpolation between the points is done linearly or by splines – motion function table describing a cam plate via motion laws according to VDI guideline 2143 – cyclic or linear processing – cam plate with offset and scale, can be modified on the master or slave side – high flexibility through online change of the motion functions				TwinCAT NC Flying Saw implements the coupling of a slave axis to a master axis in a certain synchronous position (flying saw). PLC function blocks enable coupling and uncoupling as well as parameterisation. – The master axis can be a real axis, a virtual axis, or some other external source of actual values. – synchronisation of the slave axis from any motion situation (stop, forward or reverse travel) with the master in motion – simple synchronisation with the master velocity – precise position synchronisation with the master axis (velocity and position) – synchronous velocity can be set via a coupling factor – optional return prevention as additional safety function – superimposed section compensation during the synchronous phase for dynamic position correction			
Performance class (pp)	20	30	40	50	20	30	40	50
	–	–	x	x	–	–	x	x
	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x
Required	TC1250				TC1250			
Target system	Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10, Windows CE			
Further information	TF5050				TF5055			

We reserve the right to make technical changes.

	TC3 NC FIFO Axes				TC3 Motion Control XFC				TC3 NC I			
	TF5060-00pp				TF5065-00pp				TF5100-00pp			
	Using TwinCAT NC FIFO Axes, externally generated set position values can be output to the axes in the form of a velocity pre-control. The set value generation is designed in such a way that both the set position and the set velocity are determined as the FIFO inputs are worked through in sequence. It is also possible, if necessary, to interpolate between two neighbouring FIFO inputs.				eXtreme Fast Control (XFC) is the technique that enables very fast, temporally high-precision reactions using EtherCAT, special I/O terminals and TwinCAT on the PC. Using EtherCAT Distributed Clocks (DC) and appropriate terminals, distributed latches or cam controllers can be implemented simply in this way. – function blocks for the high-precision acquisition and switching of digital signals related to axis positions – EtherCAT Distributed Clocks with the timestamp-based EtherCAT EL1252, EL2252 or EL2262 input and output terminals – blocks for the conversion of DC time to position and vice versa – convenient PLCopen-compliant TouchProbe block – digital cam controller as PLCopen-compliant block In conjunction with TwinCAT NC I, function blocks are available for high-precision switching of signals depending on the path position.				Using TwinCAT NC I, movements can be implemented with up to three interpolating and up to five auxiliary axes in the interpolation package. Various axis types with various fieldbus interfaces are supported. The movement is usually programmed in DIN 66025, but it can also alternatively be carried out via PLC function blocks. – max. 3 path axes and up to 5 auxiliary axes per group – 1 group per channel, max. 31 channels – supports electric servo axes, stepper motor drives – interpreter functions such as subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions – geometry functions: straight lines and circles in 3-D space, circles at all main levels, helices with base circles at all main levels, linear, circular and helical interpolation at the main levels and freely definable levels, Bezier splines, look-ahead function – online reconfiguration of axes in groups, path override, slave coupling to path axes, auxiliary axes, axis error and sag compensation, measuring functions – programming in DIN 66025 – access alternatively via function blocks according to IEC 61131-3 – operation of automatic mode, manual mode (jog/inch), single block mode, referencing, handwheel mode (movement/overlay) – convenient debugging with online monitoring of current setpoint/actual position (position lag of all axes), NC program line currently being processed, NC program line currently being interpreted, channel status – support of kinematic transformations in combination with TF511x			
	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	x	x	–	–	x	x	–	–	x	x
	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x	x	x	x	x
	TC1250				TC1250, TC1260				TC1250			
	Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10, Windows CE			
	TF5060				TF5065				TF5100			

TF5xxx | TwinCAT 3 Motion Control

	TC3 Kinematic Transformation L1	TC3 Kinematic Transformation L2	TC3 Kinematic Transformation L3	TC3 Kinematic Transformation L4
Technical data	**TF5110-00pp**	**TF5111-00pp**	**TF5112-00pp**	**TF5113-00pp**
	Various robot types kinematics can be realised using TwinCAT Kinematic Transformation. The programming of the robot movements takes place in Cartesian coordinates using either DIN 66025 instructions or the PLCopen-compliant blocks from the PLC. An integrated dynamic pre-control ensures high precision of the movement even at high accelerations and speeds. Configuration takes place in TwinCAT Engineering. – supports various parallel and also serial kinematics, e.g. for pick-and-place tasks – supports the programming of interpolating movements in G-code (DIN 66025) – alternatively, standard PTP and cam plate applications can be realised – simple programming in the Cartesian coordinate system – automatic calculation of the inverse kinematic for the relevant motor positions – kinematics configured in TwinCAT 3 Engineering; in addition to the type (e.g. delta), the bar lengths and offsets must also be parameterised – mass and mass inertia values can be specified for dynamic pre-control – optimised for the Beckhoff Servo Drives from the AX5000 series – basic package integrating the following kinematics: cartesian portals	Extension of the TwinCAT Kinematic Transformation L1 with additional kinematics: – 2-D parallel kinematics – shear kinematics – crane and roll kinematics	Extension of the TwinCAT Kinematic Transformation L1/L2 with additional kinematics: – 3-D Delta – SCARA	Extension of the TwinCAT Kinematic Transformation L1/L2/L3 with additional kinematics: – 5-D kinematics – serial 6-axis kinematics – Stewart platform
Performance class (pp)	20 30 40 50 – – x x 60 70 8x 9x x x x x	20 30 40 50 – – x x 60 70 8x 9x x x x x	20 30 40 50 – – x x 60 70 8x 9x x x x x	20 30 40 50 – – x x 60 70 8x 9x x x x x
Required	TC1260	TC1260	TC1260	TC1260
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
Further information	TF5110	TF5111	TF5112	TF5113

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	TC3 Robotics mxAutomation				TC3 Robotics uniVAL PLC				TC3 CNC			
	TF5120-00pp				TF5130-00pp				TF5200-00pp			
	TC3 Robotics mxAutomation allows direct communication between the PLC and the KUKA KR C4 robot control via a common interface. The robot movements can be programmed directly in the PLC, and the actual values of the robot can be synchronised in real time. TC3 Robotics mxAutomation combines PLC control and robot on a single platform and enables programming from an existing system without knowledge of a specific robot programming language. Communication takes place via EtherCAT, with the TwinCAT EtherCAT master and the KR C4 controller from KUKA exchanging data via the EL6695-1001 EtherCAT bridge terminal. In doing so, drive commands are transmitted from the controller to the robot and actual values from the robot to the controller. The robot position data are transmitted to the PLC in every cycle. In addition, the PLC programmer has access to the robot position data at all times in real-time.				The TC3 Robotics uniVAL PLC allows direct communication between the PLC and the CS8C robotics controller from Stäubli via a common interface. The robot's movements can be programmed directly in the PLC and compared with the robot's actual values in real-time. The TC3 Robotics uniVAL PLC combines PLC control and robotics on a single platform and enables programming from a single system without having to know a special robot programming language. The communication takes place via EtherCAT, with TwinCAT and the CS8C controller from Stäubli exchanging the data as master and slave, respectively. TwinCAT sends the motion commands to the robot via EtherCAT. Thanks to this efficient communication, commands can be sent from the PLC to the robot at high speed. In addition, the PLC programmer has real-time access to the robot's position data at all times. Other motion programs which are located in the robot controller's database can also be activated via this interface.				TwinCAT CNC offers the option to implement interpolation with up to 32 simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according DIN 66025. The axes and channels are configured in TwinCAT Engineering. – 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels (optional) – supports electric servo axes, stepper motor drives – subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, tool functions – geometry functions linear, circular and helical interpolation at the main levels and freely definable levels, max. 32 interpolating path axes per channel (optional), look-ahead function – axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions – programming in DIN 66025 with high-level language extension – access via function blocks from TwinCAT PLC according to IEC 61131-3 – operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) – convenient debugging with online monitoring of all states			
	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	–	x	–	–	–	x	–	–	–	x
	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x	x	x	x	x
	TC1200				TC1200				TC1260			
	Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10			
	TF5120				TF5130				TF5200			

TF5xxx | TwinCAT 3 Motion Control

	TC3 CNC E	TC3 CNC Axes Pack	TC3 CNC Channel Pack
Technical data	**TF5210-00pp**	**TF5220-00pp**	**TF5230-00pp**
	TwinCAT CNC in the export version (E version) offers the option to implement an interpolation with up to four simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according DIN 66025. The axes and channels are configured in TwinCAT Engineering. – maximum 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels – maximum 4 interpolationg path axes – supports electric servo axes, stepper motor drives – subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, tool functions – geometry functions linear, circular and helical interpolation at the main levels and freely definable levels, max. 64 path axes per channel, look-ahead function – axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions – programming in DIN 66025 with high-level language extension – access via function blocks from TwinCAT PLC according to IEC 61131-3 – operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) – convenient debugging with online monitoring of all states	Using the TwinCAT CNC Axes Pack, extension is possible up to a total of 64 axes/controlled spindles, of which a maximum of 32 can be path axes and a maximum of 12 can be controlled spindles.	Using TwinCAT CNC Channel Pack, a further CNC channel can be extended to a maximum of 12 channels. – channel synchronisation – axis transfer between channels

Performance class (pp)	20	30	40	50	20	30	40	50	20	30	40	50
	–	–	–	x	–	–	–	x	–	–	–	x
	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x	x	x	x	x
Required	TC1260				TC1270				TC1270			
Target system	Windows XP, Windows 7/8/10				Windows XP, Windows 7/8/10				Windows XP, Windows 7/8/10			
Further information	TF5210				TF5220				TF5230			

We reserve the right to make technical changes.

	TC3 CNC Transformation	TC3 CNC HSC Pack	TC3 CNC Spline Interpolation	TC3 CNC Virtual NCK Basis
	TF5240-00pp	TF5250-00pp	TF5260-00pp	TF5270-00pp
	TwinCAT CNC Transformation is an optional function for the TwinCAT CNC. – transformation functionality (5-axis functionality) – kinematics selection from the kinematics library – RTCP function – TLC function – definition of different coordinate systems, linking/transition of coordinate systems	TwinCAT CNC HSC Pack is an optional high-speed cutting solution for the TwinCAT CNC: – cross-block velocity and acceleration control for optimum utilisation of the axis dynamics and thus higher path speeds – high surface quality through smoothed dynamics and associated reduction of vibrational excitation of the machine – effective control of specified contour tolerances – path programming via splines with programmable spline type (Akima-spline, B-spline) for reduction of NC blocks for free-form surfaces	TwinCAT CNC Spline Interpolation is an optional package for the TwinCAT CNC for path programming via splines with programmable spline type, Akima-spline, B-spline.	TwinCAT CNC Virtual NCK Basis is a virtual TwinCAT CNC for simulation in a Windows environment as an option for the TwinCAT CNC.
	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50
	– – – x	– – – x	– – – x	– – – x
	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x
	x x x x	x x x x	x x x x	x x x x
	TC1270	TC1270	TC1270	TC1000
	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10
	TF5240	TF5250	TF5260	TF5270

TF5xxx | TwinCAT 3 Motion Control

	TC3 CNC Virtual NCK Options	TC3 CNC Volumetric Compensation	TC3 CNC Cutting Plus
Technical data	TF5271-00pp	i TF5280-00pp	i TF5290-00pp
	TwinCAT CNC Virtual NCK Options is a virtual TwinCAT CNC for simulation in a Windows environment as a further option package for the TwinCAT CNC and TwinCAT CNC Virtual NCK Basis.	TC3 CNC Volumetric Compensation is an optional package for compensating geometric machine errors based on an ISO-standardised parametric model. Application – very effective option for increasing the machine accuracy and therefore the manufacturing accuracy simply through control technology measures – correction of the TCP position through dynamic calculation of axis correction values – suitable for machines with 3 Cartesian and up to 3 rotary axes – any kinematic axis order (head/table kinematics) Features – several parameter files per compensation, several compensations per controller – parameter update via NC command or HMI – interpolation of parameter sets (sag compensation, etc.) – smoothing of parameter step changes during modulo transitions – diagnosis possible via ADS, Microsoft Excel file Safety – configurable limitation of the compensating values – configurable limitation of the travel-out velocity of the compensating values Supported file formats – tabular CSV format – etalon exchange format Standards – DIN ISO 230 "Test code for machine tools" – ISO/TR 16907 "Machine tools – Numerical compensation of geometric errors"	TC3 CNC Cutting Plus is a technology package and enhances the CNC functionality for cutting. Automatic lifting/lowering of an axis (lifts) – block-overlapping automatic lifting and lowering of an axis – to prevent collisions between the tool head and ridges or cut-out parts – jerk-limited profile without affecting the path speed Microsteps, fast laser switching signal – highly accurate output of an M function (1 µs) at a certain position – use of time stamps – supports various types of synchronisation – parameterisation by configuration of the M functions or programming the M functions via NC programs Tube transformation – multi-axis transformation for sheath surface processing – supports various profiles such as multi-edge pipes and profile pipes – processing of the programmed contour on the surface of the profile
Performance class (pp)	20 30 40 50 – – – x 60 70 8x 9x x x x x	20 30 40 50 – – – x 60 70 8x 9x x x x x	20 30 40 50 – – – x 60 70 8x 9x x x x x
Required	TC1000	TC1270	TC1270
Target system	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10
Further information	TF5271	TF5280	TF5290

i For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	TC3 Motion Collision Avoidance	TC3 Motion Pick-and-Place	TC3 Digital Cam Server	TC3 Hydraulic Positioning
	TF5410-00pp	TF5420-00pp	TF5800-00pp	TF5810-00pp
	TC3 Motion Collision Avoidance is an optional package that prevents collisions when operating a number of linearly and/or translationally dependent axes with TC3 NC PTP. The underlying algorithm ensures the maintenance of a minimum distance from the previous axis. In this way, TC3 Motion Collision Avoidance actively prevents collisions when a number of motors are using e.g. the same rail. As well as active collision avoidance, TF5410 can also be used to allow axes to accumulate in a controlled way, for example when carrying out linear movements such as with XTS (eXtended Transport System). Programming of the PLC's movement commands is based on the standard PTP motion library with an additional input "gap". For example, when using TC3 Motion Collision Avoidance, all the axes can be given the same target position. The algorithm then ensures that only the first axis actually moves to that position. The remaining axes automatically line up while maintaining their minimum distance. This means that no further programming effort is needed in order to implement a dynamic buffer in which products can accumulate.	TC3 Motion Pick-and-Place is an extension of TC3 NC I (TF5100) and was especially designed for handling tasks carried out by gantry robots and other kinematics. It smooths the transition of complex path segments. Special methods are used to blend movement commands, facilitating optimised cycle times when they are processed. This reduces the bumpiness of motion along the path, making it run more smoothly, which is vital for high cycle times, gentle treatment of the robot and careful handling of the products. The TF5420 is programmed using a PLC library. There is no limit on the number of axes in a pick-and-place group, the only limiting factor is the processing power of the controller. Given an appropriate level of processing power, interpolating movement commands can be processed even for complex machines with more than three or eight axes (three path plus five auxiliary axes).	The TwinCAT Digital Cam Server is a fast cam controller with monitoring for various fieldbuses. The cams are configured in TwinCAT Engineering. – high-performance fieldbus-independent cam controller with many functions – up to 320 outputs – up to 180 cams per output – path-path cams, path-time cams, brake cams – dynamic speed correction – measurement and monitoring of rotary speed	Algorithms for the control and positioning of hydraulic axes are combined in TwinCAT Hydraulic Positioning and are available as PLCopen-compliant PLC blocks. – for the positioning and control of hydraulic axes – functions for the conversion of sensor signals to actual positions and of control values to output data – point-to-point movements, alternatively with time- or displacement-controlled ramps – position control, pressure output with the correct sign, automatic repositioning – optimisation and monitoring of the behaviour with further functions (e.g. dead time compensation, limit value monitoring)
	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50
	– – x x	– – x x	– – x x	– – x x
	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x
	x x x x	x x x x	x x x x	x x x x
	TC1250	TC1260	TC1200	TC1200
	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10	Windows XP, Windows 7/10, Windows CE	Windows XP, Windows 7/10, Windows CE
	TF5410	TF5420	TF5800	TF5810

TF6xxx | TwinCAT 3 Connectivity

	TC3 ADS Communication	TC3 OPC UA	TC3 OPC DA	TC3 EtherCAT Redundancy 250
Technical data	**TF6000-00pp**	**TF6100-00pp**	**TF6120-00pp**	**TF6220-00pp**
	The Automation Device Specification (ADS) is the communication protocol of TwinCAT. It enables the data exchange and the control of TwinCAT systems. ADS is media-independent and can communicate via serial or network connections. ADS enables: – access to the process image – consistent data exchange – access to I/O tasks – detection of status changes – read-out of the PLC symbol information – access by variable name – sum commands – synchronous and asynchronous access – cyclic and event-based messages Libraries and runtime components are provided for common programming languages (including .NET, C/C++, Delphi and Java). In addition, interfaces are provided for communication with third-party software (e.g. MATLAB®, NI LabView, Office). The ADS web services enable the development of device-independent web applications (HTML5, WCF).	OPC Unified Architecture offers secure, reliable and manufacturer-neutral transport of raw data and pre-processed information from the manufacturing level into the production planning or ERP system. With OPC UA, all desired information is available to every authorised application and every authorised person at any time and in any place. TwinCAT OPC UA Server – certified in the OPC Laboratory, Europe – functions: DataAccess/HistoricalAccess/Alarm&Condition – PLC blocks for diagnosis and restart – intermediate storage of data on the server: interruption of the communication connection does not lead to loss of data – configurator for simple handling and diagnostics of local/remote OPC UA servers TwinCAT OPC UA Gateway – wrapper technology for an OPC DA (Data Access) interface according to OPC UA – high-performance OPC DA access – aggregation of TwinCAT OPC UA servers TwinCAT OPC UA Client – PLCopen PLC function blocks for OPC UA Data Access – Demo OPC UA client for diagnostic purposes	OPC is the standard for supplier-independent communication in automation technology. OPC DA (Data Access) is based on the Microsoft COM/DCOM standard. TwinCAT OPC DA Server – specifications OPC-DA2x and OPC-XML-DA – configurator for the set-up – demo DA client for diagnostic purposes and the loading of recipes The TF6120 product can be replaced by the new software component TwinCAT OPC UA Gateway of the TF6100 product.	TwinCAT EtherCAT Redundancy 250 extends the TwinCAT EtherCAT Master by the possibility to implement cable redundancy for up to 250 EtherCAT devices: from the last logical device a cable is returned back to the master. Configuration and diagnostics take place in the TwinCAT 3 engineering environment.
Performance class (pp)	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50
	x x x x	x x x x	– x x x	– – x x
	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x
	x x x x	x x x x	x x x x	x x x x
Required	TC1000	TC1000	TC1000	TC1100
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10	Windows XP, Windows 7/8/10, Windows CE
Further information	TF6000	TF6100	TF6120	TF6220

We reserve the right to make technical changes.

	TC3 EtherCAT Redundancy 250+	TC3 EtherCAT External Sync	TC3 Modbus TCP	TC3 Modbus RTU	TC3 PROFINET RT Device	TC3 PROFINET RT Controller
	TF6221-00pp	TF6225-00pp	TF6250-00pp	TF6255-00pp	TF6270-00pp	TF6271-00pp
	TwinCAT EtherCAT Redundancy 250+ extends the TwinCAT EtherCAT Master by the possibility to implement cable redundancy for more than 250 EtherCAT devices: from the last logical device a cable is returned back to the master. Configuration and diagnosis take place in the TwinCAT 3 engineering environment.	TC3 EtherCAT External Sync extends the TwinCAT EtherCAT master with an option to synchronise the Beckhoff real-time communication with external digital signals. The digital signals are read via terminals supporting timestamping, such as the EL1252 EtherCAT Terminal.	TwinCAT Modbus acts as gateway between Modbus TCP devices and TwinCAT runtime systems. It provides both server and client functionalities. In server mode the memory areas of several TwinCAT runtime systems can be mapped directly to the Modbus memory areas. A PLC library is provided for implementing a Modbus TCP client, so that the memory areas of a Modbus TCP device can be accessed.	TwinCAT Modbus RTU implements Modbus RTU communication via a serial RS232, RS422 or RS485 interface and is thus suitable both for the PC/CX interfaces and for operation with the KL6xxx serial Bus Terminals. It contains function blocks for master and slave operating mode with simple configuration.	The TwinCAT PROFINET RT Device (slave) is a supplement that turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into a PROFINET RT device. By installing the function, a standard Ethernet interface becomes a PROFINET slave.	The TwinCAT PROFINET RT Controller (master) is a supplement that turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into a PROFINET RT controller. By installing the function, a standard Ethernet interface becomes a PROFINET master.
	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50
	– – x x	x x x x	x x x x	x x x x	– – x x	– – x x
	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x
	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
	TC1100	TC1100	TC1200	TC1200	TC1100	TC1100
	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
	TF6221	TF6225	TF6250	TF6255	TF6270	TF6271

TF6xxx | TwinCAT 3 Connectivity

	TC3 EtherNet/IP Slave	TC3 EtherNet/IP Master	TC3 FTP Client	TC3 TCP/IP
Technical data	**TF6280-00pp**	**TF6281-00pp**	**TF6300-00pp**	**TF6310-00pp**
	The TwinCAT EtherNet/IP Slave is a supplement that turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into an EtherNet/IP slave. Through this supplement the Ethernet interface becomes an EtherNet/IP slave. The product can be used on all PC controllers and Embedded PC controllers with an Intel® chipset. A further feature of the supplements is that it enables up to eight slaves to be parameterised using a single physical interface. For this purpose, a virtual MAC address is created in order to be able to operate a total of up to eight EtherNet/IP slaves on one PC via a single Ethernet interface. This feature can be used, for example, to exchange larger amounts of data using one EtherNet/IP master or to establish a connection to several EtherNet/IP masters in different subnets.	The TwinCAT EtherNet/IP Master is a supplement that turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into an EtherNet/IP master. Through this supplement, the Ethernet interface becomes an EtherNet/IP master. The product can be used on all PC controllers and Embedded PC controllers with an Intel® chipset. The process data is configured using TwinCAT 3 allowing various process data and various sizes. The supplement supports both multicast and unicast connections. Up to 16 simple EtherNet/IP slave devices can be connected via one generic node.	TwinCAT FTP enables easy access from the PLC to one or several FTP servers with the aid of various function blocks. Files can be loaded to or from a server after the establishment of a connection (optional with authentication). Additional function blocks allow files or directories to be searched for, created, deleted and renamed.	TwinCAT TCP/IP enables the implementation and realisation of one or several TCP/IP servers and/or TCP/IP clients within the TwinCAT 3 PLC. Corresponding blocks exist for the establishment/ disconnection of communication as well as for the pure exchange of data (send and receive). The function blocks also support the use of multicast addresses.
Performance class (pp)	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50
	– – x x	– – x x	x x x x	x x x x
	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x
	x x x x	x x x x	x x x x	x x x x
Required	TC1200	TC1200	TC1200	TC1200
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
Further information	TF6280	TF6281	TF6300	TF6310

For availability status see Beckhoff website at: TF6281

We reserve the right to make technical changes.

	TC3 TCP/UDP Realtime	TC3 Serial Communication	TC3 SMS/SMTP	TC3 Virtual Serial COM	TC3 Database Server	TC3 XML Server
	TF6311-00pp	TF6340-00pp	TF6350-00pp	TF6360-00pp	TF6420-00pp	TF6421-00pp
	In contrast to TF6310, TC3 TCP/UDP Realtime (TF6311) enables fast and convenient access from the real-time directly to the network card. The TwinCAT 3 network card driver handles the access via a dedicated stack. The implementation facilitates cooperative use of the network card by the operating system. TF6311 provides both server and client functionality, so that the TCP/IP, UDP/IP and Ping/ARP protocols can be implemented.	TwinCAT Serial Communication implements communication with serial devices such as printers, bar code scanners, etc. The serial interface of the PC and the serial Beckhoff EL6xxx EtherCAT Terminals and and KL6xxx Bus Terminals are supported. Via the network-based fieldbus system from Beckhoff the serial terminals can be accessed over a distance of up to 100 m. In addition, it is possible to address virtual COM interfaces of the operating system from the PLC.	TwinCAT SMS/SMTP enables the transmission of SMS messages or e-mails using PLC function blocks. The latter also allows the transmission of file attachments, HTML texts and the setting of message priorities. Support for STARTTLS/SSL enables encrypted e-mail communication to be configured.	TwinCAT Virtual Serial COM enables serial EtherCAT terminals to be accessed from a Windows system. One virtual COMPort per serial connection can be generated locally or on a remote system. This enables serial communication independent of the range. Via the Windows API (e.g. .NET/ C++) you can develop your own applications that can communicate with the connected devices of the terminal.	TwinCAT Database Server enables the exchange of data between databases and the TwinCAT system. PLC variables or direct values of the EtherCAT I/Os can be logged cyclically when changes occur or event-controlled by means of PLC function blocks. – Microsoft SQL – Microsoft SQL Compact – Windows Azure SQL – MySQL – Oracle – PostgreSQL – Firebird – DB2 – InterBase – IBM AS400 iSeries – ASCII files (e.g. .csv, .txt) – Microsoft Excel – Microsoft Access – XML files	The TwinCAT XML Server provides a PLC library enabling write/read access for XML data. The user-friendly XML Server facilitates e.g. the loading of initialisation data, which is often required at machine startup.
	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50
	x x x x	x x x x	x x x x	– x x x	x x x x	x x x x
	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x
	x x x x	x x x x	x x x x	x x x x	x x x x	x x x x
	TC1200 or TC1300	TC1200	TC1200	TC1100	TC1200	TC1200
	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
	TF6311	TF6340	TF6350	TF6360	TF6420	TF6421

We reserve the right to make technical changes.

TF6xxx | TwinCAT 3 Connectivity

	TC3 IEC 60870-5-10x	TC3 IEC 61850/IEC 61400-25	TC3 RFID Reader Communication
Technical data	**TF6500-00pp**	**TF6510-00pp**	**TF6600-00pp**
	TwinCAT IEC 60870-5-10x enables communication according to the IEC standard 60870-5-10x from the PLC. Both server and client operating modes are possible. PLC library for the realisation of masters for – IEC 60870-5-101 – IEC 60870-5-102 – IEC 60870-5-103 – IEC 60870-5-104 PLC library for the realisation of slaves for – IEC 60870-5-101 – IEC 60870-5-104	For the standard-compliant communication between client and server, corresponding servers can be realised directly in the TwinCAT PLC with IEC 61850/IEC 61400-25 Telecontrol in TwinCAT 3. IEC 61850 provides data models for substation communication. IEC 61400-25 is based on IEC 61850 and offers specific extensions of the data model for wind farm communication. The respective server is configured using the TwinCAT telecontrol configurator. This decouples the configuration work from the programming work in the PLC and generates the corresponding PLC code. The PLC code can be imported into new or existing PLC projects.	RFID Reader Communication allows various RFID readers to be addressed via a serial interface. The new TwinCAT RFID reader library offers a general abstract interface that can be used for all readers. The configuration can easily be adapted to a specific reader.
Performance class (pp)	20 30 40 50 x x x x 60 70 8x 9x x x x x	20 30 40 50 x x x x 60 70 8x 9x x x x x	20 30 40 50 x x x x 60 70 8x 9x x x x x
Required	TC1200	TC1200	TC1200
Target system	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE
Further information	TF6500	TF6510	TF6600

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	TC3 S5/S7 Communication	TC3 DBC File Import for CAN	TC3 IoT Communication (MQTT)	TC3 IoT Functions
	TF6610-00pp	TF6650-00pp	i TF6701-00pp	i TF6710-00pp
	TwinCAT S5/S7 Communication allows the simple connection of TwinCAT to an S5 or S7 controller. The data blocks, flags, inputs, outputs, counters and timers of an S5 or S7 controller can be accessed using function blocks. The communication takes place using TCP/IP.	The TwinCAT 3 Function enables the reading of DBC file formats (.dbc). The DBC data format is a CAN network description and allows the definition of attributes as well as the assignment of these attributes to the elements of a network. DBC files are text files that contain e.g. scaling information for CAN data and signal definitions. The TF6650 Function can be used for data import and preprocessing according to the parameters that are stored in the DBC file. As an additional function, network nodes can also be simulated according to the DBC files. The function uses the EL6751 CANopen master terminal as hardware interface.	TC3 IoT Communication provides basic functionalities for sending and receiving data via the so-called MQ Telemetry Transport (MQTT) protocol in the form of PLC libraries. By enabling the transmission and receipt of publisher/subscriber-based MQTT messages directly from the controller, this function makes easy data communication between diverse devices possible. MQTT is an open, standardised communication protocol that is becoming increasingly popular for fast and efficient data transmission applications due to its low overhead. Many IT providers, but particularly those in the cloud computing field, provide access to their services via this protocol.	The TwinCAT 3 Function can be used to establish connectivity for cloud-based communication services. The focus is not on the protocol implementation itself (such as with the TF6701, for example), but on targeted communication with a cloud-based system, e.g. the Microsoft Azure IoT hub or Amazon AWS IoT. Several PLC function blocks are available for sending process data from the TwinCAT runtime to such cloud-based communication services or receiving data from such services.
	20 30 40 50	20 30 40 50	20 30 40 50	20 30 40 50
	x x x x	x x x x	– – x x	– – x x
	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x	60 70 8x 9x
	x x x x	x x x x	x x x x	x x x x
	TC1200	TC1100 and EL6751	TC1200	TC1200
	Windows XP, Windows 7/8/10, Windows CE	Windows XP, Windows 7/8/10, Windows CE	Windows 7/8/10	Windows 7/8/10
	TF6610	TF6650	TF6701	TF6710

TF6xxx | TwinCAT 3 Connectivity

Technical data	TC3 IoT Data Agent i TF6720-00pp	TC3 IoT Communicator i TF6730-00pp	TC3 IoT Communicator App i TF6735
	The TC3 IoT Data Agent provides IoT communication functions in the form of a gateway application that can be configured and operated independently from the TwinCAT real-time environment. The data agent picks up configured process data and transmits it to a specific communication or data service in the Microsoft Azure or Amazon Web Services™ (AWS) cloud, or it sends the process data to an MQTT or AMQP message broker. To pick up the process data, both TwinCAT ADS and the OPC UA IEC standard with their security mechanisms are available. This ensures data protection down to the controller or the respective end device. To reduce the amount of traffic and associated costs, the data agent supports advanced sampling mechanisms, such as on-data-change transmissions. If the connection is broken, buffering algorithms are available to prevent the loss of data. The entire parameterisation of the data agent can be done via an XML-based file that is supported by a graphical editor in Visual Studio®. This makes it easy to use and reduces set-up times when commissioning the system.	The TC3 IoT Communicator makes it possible to easily transmit process data to multiple end devices, monitor status changes, and send information back to the machine. The TC3 IoT Communicator connects the TwinCAT controller to a messaging service, making it easy to set it up within the TwinCAT engineering environment to send and receive push messages and process data between the PLC and mobile operating systems. Since each end device is registered with a unique ID, messages can be transmitted to specific people and/or controllers. A flag within the message indicates whether messages and status data is buffered in the messaging service and available on demand. Since the TC3 IoT Communicator is based on the publish-subscribe pattern, it does not require any special firewall settings but can be easily integrated into an existing IT network. To receive, send and display such messages, apps can be downloaded from the app stores free of charge.	The TC3 IoT Communicator App provides a simple solution for monitoring and analysing TwinCAT process data on mobile end devices. It communicates with the TwinCAT controller via a freely selectable cloud-based messaging service. To receive, send and display selected TwinCAT messages, apps can be downloaded from the app stores free of charge. The TC3 IoT Communicator App communicates with the TwinCAT controller via a messaging service in the cloud or in a local network. Various mechanisms are available for authentication and encryption.

Performance class (pp)	20	30	40	50	20	30	40	50	–
	–	–	x	x	–	–	x	x	
	60	70	8x	9x	60	70	8x	9x	
	x	x	x	x	x	x	x	x	
Required	–				TC1200				TF6730
Target system	Windows 7/8/10				Windows 7/8/10				–
Further information	TF6720				TF6730				TF6735

i For availability status see Beckhoff website at:

We reserve the right to make technical changes.

TF8xxx | TwinCAT 3 Industry specific

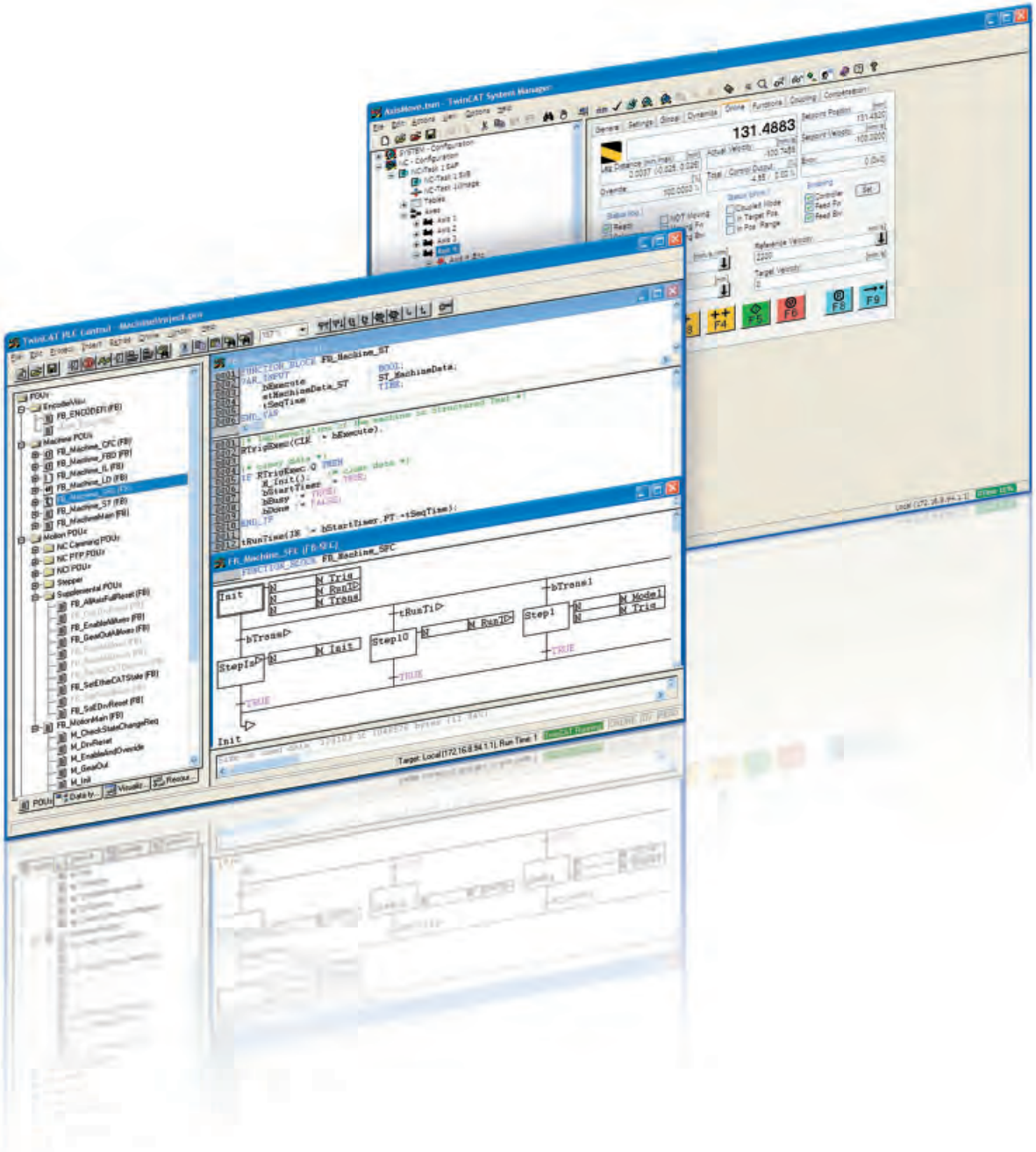
	TC3 BA Connectivity Library	TC3 Building Automation	TC3 Wind Framework
Technical data	**TF8000-00pp**	**TF8040-00pp**	**TF8310-00pp**
	The TwinCAT BA Connectivity Library simplifies the programming of Bus Terminals for building automation. It contains all libraries for communication with the following fieldbus systems: – DALI: KL6811 – DMX: EL6851, EL6851-0010 – EnOcean: KL6021-0023, KL6023 and KL6581, KL6583 – EIB: KL6301 – LON: KL6401 – M-Bus: KL6781 – MP-Bus: KL6771 – SMI: KL6831, KL6841 – GENIbus: KL6041, EL6021 – manual operating modules: KL8519, KL8524, KL8528, KL8548	TC3 Building Automation is a software package that covers all technical building automation services. It contains PLC libraries for control, signal processing, special mathematical functions, alarm processing and general system functions. In addition to modules for conventional HVAC applications it also covers room automation including lighting, air-conditioning and shading.	The TwinCAT 3 Wind Framework is based on the modular architecture of TwinCAT 3 and provides control technology and industry expertise in the form of encapsulated modules and an application template. TcCOM modules provide higher-level system services. The status module enables the monitoring of all components and includes error detection, event management, error handling and reporting. The parameter and command modules provide services for configuration and interaction with the system. The acquisition of signals and their statistical analysis is supported by the capture and statistic module. The user module checks, manages and logs all interactions by the user. The recording of all events and signals as well as the saving and loading of the entire configuration are enabled by the database module, which is based on an SQL database. The programming of the operational management using these services is simplified by a PLC library and a complete sample application. When using the TC3 Wind Framework, each subsystem of the wind turbine system (such as converters, pitch, etc.) is representing an individual module. Each subsystem module comes with a specific set of information and settings. These properties integrate themselves via specific objects from the framework into the higher-level services and operational management. When replacing a subsystem module, the associated objects are automatically integrated into the services. In this way a group of objects is created that represent the complete system and enable the monitoring and parametrisation of the turbine. Nevertheless, these subsystem modules are self-contained and reusable in another operational management or test environment.

Performance class (pp)	20	30	40	50	20	30	40	50	20	30	40	50
	x	x	x	x	x	x	x	x	–	–	x	x
	60	70	8x	9x	60	70	8x	9x	60	70	8x	9x
	x	x	x	x	x	x	x	x	x	x	x	–
Required	TC1200				TC1200				TC1000			
Target system	Windows XP, Windows 7/8/10, Windows CE				Windows XP, Windows 7/8/10, Windows CE				Windows 7/8/10			
Further information	TF8000				TF8040				TF8310			

We reserve the right to make technical changes.

TwinCAT 2

▶ TwinCAT2



We reserve the right to make technical changes.

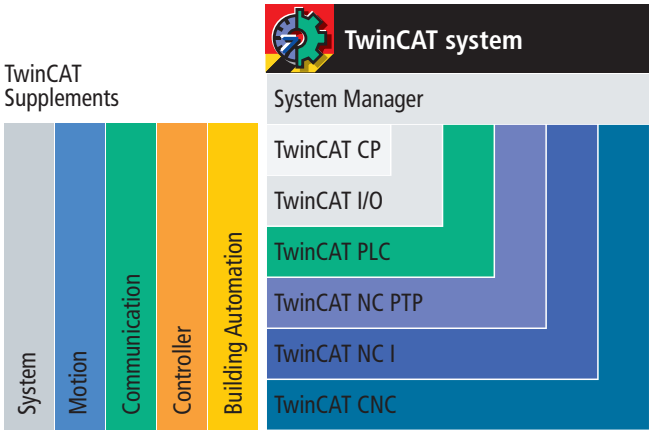
The Windows Control and Automation Technology

The Beckhoff TwinCAT software system transforms almost any compatible PC into a real-time controller with multi-PLC system, NC axis control, programming environment and operating station. At the same time, TwinCAT integrates the programming environment for all Beckhoff controllers: from high-end Industrial PC control to embedded controller.

TwinCAT architecture

TwinCAT consists of runtime systems for real-time execution of control programs and development environments for programming, configuration and diagnostics:

- TwinCAT I/O: versatile I/O interface for all common fieldbuses
- TwinCAT PLC: enables programming of up to four PLC runtimes on a single PC. The PLC program can optionally be written in one or several IEC 61131-3 languages (IL, LD, FBD, SFC, ST) or CFC.
- TwinCAT NC: enables simultaneous positioning of many axes. The levels NC PTP (point-to-point positioning), NC I (linear and circular interpolating movements of axis groups with up to eight drives) and CNC (extension of NC I with conventional CNC features for up to 32 interpolating axes per channel) are available for this purpose.



TX12xx | TwinCAT 2

TwinCAT PLC

Technical data	TX1200

TwinCAT PLC realises one or more PLCs with the international standard IEC 61131-3 on one CPU. All programming languages described in the standard can be used for programming. The blocks of the type PROGRAM can be linked with real-time tasks. Various convenient debugging options facilitate fault-finding and commissioning. Program modifications can be carried out at any times and in any size online, i.e. when the PLC is running. All variables are available symbolically by ADS and can be read and written in appropriate clients.

- process image size, flag range, program size, POU size and number of variables are limited only by size of RAM
- cycle times from 50 µs
- link time: typically 1 µs (Intel® Core™2 Duo)
- IEC 61131-3: IL, FBD, LD, SFC, ST, CFC
- online changes in programs and variables
- remote debugging via TCP/IP
- online connection with PLC runtime system worldwide via TCP/IP or fieldbus
- online monitoring of variables in variable lists, watch windows, editors
- online status and powerflow (accumulator contents) of programs and instances
- triggering, forcing and setting variables
- powerful debugging with single cycle, break points, step in, step over, display of the current call stack, watchlist shows selection of variable, trace functions
- online management of all variable names and structures across the whole system
- remanent and persistent data, UPS supported storage on hard disk, storage in NOVRAM as option
- variable reading and writing access via ADS, OPC
- certified in accordance with PLCopen base level (IL/ST)
- source code is stored in the target system
- convenient library management
- powerful compiler with incremental compilation
- all common data types, structures, arrays, including multi-dimensional arrays
- convenient creation of programs with autoformat, autodeclare, cross-reference, search/replace, project comparison

Target system	version-dependent: Windows NT/2000/XP/Vista, Windows 7/10, Windows CE
Further information	TX1200

We reserve the right to make technical changes.

	TwinCAT NC PTP	TwinCAT NC I
	TX1250	TX1260
	TwinCAT NC PTP implements Motion Control for point-to-point movements in software. The axes are represented by axis objects and provide a cyclic interface, e.g. for the PLC. This axis object is then linked to a corresponding physical axis. In this way, the most diverse axis types with the most diverse fieldbus interfaces can be connected abstractly with the axis objects, which always offer an identical configuration interface. The control of the axes can be configured in various conformations (position or velocity interface) and various controllers. The axes are configured in TwinCAT Engineering. – max. 255 axes – supports electrical and hydraulic servo drives, frequency converter drives, stepper motor drives, DC drives, switched drives (fast/slow axes), simulation axes and encoder axes – supports various encoders such as incremental encoder, absolute encoder, digital interface to the drives such as EtherCAT, SERCOS, SSI, Lightbus, PROFIBUS DP/MC, pulse train – standard axis functions such as start/stop/reset/reference, velocity override, master/slave couplings, electronic gearbox, online distance compensation – programming is carried out via PLCopen-compliant IEC 61131-3 function blocks – convenient axis commissioning options – online monitoring of all axis state variables such as actual/setpoint values, releases, control values, online axis tuning – forcing of axis variables – configuration of all axis parameters, such as measuring system, drive parameters and position controller – configurable controller structures: P control, PID control, PID with velocity pre-control, PID with velocity and acceleration pre-control – online master/slave and slave/master conversion – flying saw (diagonal saw [optional]) – cam plates (support by TwinCAT Cam Design Tool [optional]) – FIFO axes – external set point value generators – multi-master coupling	Using TwinCAT NC I, movements can be implemented with up to three interpolating and up to five auxiliary axes in the interpolation package. Various axis types with various fieldbus interfaces are supported. The movement is usually programmed in DIN 66025, but it can also alternatively be carried out via PLC function blocks. – max. 3 path axes and up to 5 auxiliary axes per group – 1 group per channel, max. 31 channels – supports electric servo axes, stepper motor drives – interpreter functions such as subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions – geometry functions: straight lines and circles in 3-D space, circles at all main levels, helices with base circles at all main levels, linear, circular and helical interpolation at the main levels and freely definable levels, Bezier splines, look-ahead function – online reconfiguration of axes in groups, path override, slave coupling to path axes, auxiliary axes, axis error and sag compensation, measuring functions – programming in DIN 66025 – access alternatively via function blocks according to IEC 61131-3 – operation of automatic mode, manual mode (jog/inch), single block mode, referencing, handwheel mode (movement/overlay) – convenient debugging with online monitoring of current setpoint/actual position (position lag of all axes), NC program line currently being processed, NC program line currently being interpreted, channel status
	version-dependent: Windows NT/2000/XP/Vista, Windows 7/10, Windows CE	version-dependent: Windows NT/2000/XP/Vista, Windows 7/10, Windows CE
	TX1250	TX1260

TX1xxx | TwinCAT 2

TwinCAT CNC

Technical data	TX1270
	TwinCAT CNC offers the option to implement interpolation with up to 32 simultaneously interpolating axes. The number of axes and/or the number of channels can be adapted to the requirements of the application via the option packages. Various transformations can be supplemented via option packages. Programming takes place according DIN 66025. The axes and channels are configured in TwinCAT Engineering. – 8 path axes/controlled spindles, max. 64 axes/controlled spindles (optional), max. 12 channels (optional) – supports electric servo axes, stepper motor drives – subroutine and jump technology, programmable loops, zero point shifts, tool corrections, M and H functions, mathematical functions, programming of parameters/variables, user macros, spindle and auxiliary functions, tool functions – geometry functions linear, circular and helical interpolation at the main levels and freely definable levels, max. 32 interpolating path axes per channel (optional), look-ahead function – axis functions, coupling and gantry axis function, override, axis error and sag compensation, measuring functions – programming in DIN 66025 with high-level language extension – access via function blocks from TwinCAT PLC according to IEC 61131-3 – operation with automatic mode, manual mode (jog/inch), single block mode, referencing, block advance, handwheel mode (movement/overlay) – convenient debugging with online monitoring of all states
Target system	version-dependent: Windows NT/2000/XP, Windows 7, Windows Embedded NT/XP/WES2009/WES7
Further information	TX1270

We reserve the right to make technical changes.

	TwinCAT I/O	TwinCAT CP
	TX1100	**TX1000**

	Using TwinCAT I/O, cyclic data can be collected by different fieldbuses in process images. Cyclic tasks drive the corresponding fieldbuses. Various fieldbuses can be operated with different cycle times on one CPU. Applications can directly access the process image. The fieldbuses and the process images are configured in TwinCAT Engineering.
	– provides variable-oriented linkage of I/O devices to tasks
	– tasks are variable-oriented among each other
	– the smallest unit is one bit
	– supports both synchronous and asynchronous relationships
	– consistent exchange of data areas and process images
	– online display in the directory tree
	– online watch window
	– "Force and Write" for commissioning and for testing task variables and I/O devices
	– supported fieldbuses:
	  – EtherCAT
	  – Lightbus
	  – PROFIBUS DP (master and slave)
	  – Interbus
	  – CANopen
	  – SERCOS interface
	  – DeviceNet
	  – Ethernet
	  – USB
	– SMB (System Management Bus)
		TwinCAT CP is a driver for the Beckhoff Control Panels C6xxx and C7xxx, the industrial operating and display devices.
		Control Panels are optimised for use as a human-machine interface. Operating and display elements create an independent unit, separated from the PC by a simple cable link.
		TwinCAT CP creates the driver connection between general Windows programs and the operating and display elements on the Beckhoff Control Panel:
		– direct switches for fast machine functions
		– switch feedback by LEDs
		– UPS support
		The driver permits variable-oriented operation of the Control Panel's functions by the Windows programs.

	version-dependent: Windows NT/2000/XP, Windows 7, Windows Embedded NT/XP/WES2009/WES7, Windows CE (only runtime)	version-dependent: Windows NT/2000/XP, Windows 7, Windows Embedded NT/XP/WES2009/WES7
	TX1100	TX1000

We reserve the right to make technical changes.

TSxxxx | TwinCAT 2 Supplements, System

	TwinCAT ECAD Import	TwinCAT Engineering Interface Server	TwinCAT Eventlogger	TwinCAT XML Data Server
Technical data	**TS1120**	**TS1600**	**TS1010**	**TS6421**
	TwinCAT ECAD Import serves the purpose of importing already existing engineering results from an ECAD program. It enables the import of information about the structure of the I/Os and their links to PLC variables, which is exported from the ECAD tool by means of XML description. On the basis of this information a system manager configuration and a basic PLC program with the I/O variables used are generated. The generation of NC devices is also possible.	With the TwinCAT Engineering Interface (ENI) server it is possible for the work of a number of programmers to be coordinated via a central source code management system. The TwinCAT ENI server offers interfaces with Microsoft Visual Source Safe and a driver for Subversion (SVN). A user and rights management is as much part of the product as a database-independent diagnostic tool, which gives an overview of all current tasks of the various users.	The TwinCAT Eventlogger is an alarm and diagnostic system for TwinCAT-based controllers. The TwinCAT Eventlogger has the task of managing all messages (events) appearing in the TwinCAT system; to forward them and where necessary to write them into the TwinCAT log file. In this context "events" are understood to comprise alarms, warnings, notes or instructions. Messages can be acknowledged. The Message Formatter produces the connection between the actual event and its message text. This is stored in an external database. By integration of the TcEventViewer type library it is possible, to create your own message display. Configuration of the message text is done by the TcEvent configurator. The event logger is included in the main TwinCAT delivery.	The TwinCAT XML Data Server permits direct access to an XML file from the PLC. The values of variables can be read by the PLC or written to the XML file. Access to structures in the PLC is also possible.
Target system	Windows NT/2000/XP, Windows 7	Windows NT/2000/XP	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7
Min. TwinCAT level	TwinCAT PLC/TwinCAT NC PTP (for NC devices)	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
Further information	TS1120	TS1600	TS1010	TS6421

We reserve the right to make technical changes.

	TwinCAT XML Data Server CE	TwinCAT Backup	TwinCAT Simulation Manager	TwinCAT Database Server
	TS6421-0030	**TS1150**	**TS1110**	**TS6420**
	The TwinCAT XML Data Server CE permits direct access to an XML file from the PLC. The values of variables can be read by the PLC or written to the XML file. Access to structures in the PLC is also possible.	Files, directories, OS-specific information, settings and TwinCAT configurations can be backed up and restored using the TwinCAT Backup Server. This can be carried out on all connected media and also via the network.	The TwinCAT Simulation Manager is a tool for simplified configuration of a simulation environment, which integrates into the TwinCAT system environment. It supports the creation of a "virtual machine", which corresponds to a real one in its runtime performance.	TwinCAT Database Server enables the exchange of data between databases and the TwinCAT system. PLC variables or direct values of the EtherCAT I/Os can be logged cyclically when changes occur or event-controlled by means of PLC function blocks.
	Windows CE	Windows NT/2000/XP	Windows NT/2000/XP, Windows 7	Windows NT/2000/XP, Windows 7
	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
	TS6421-0030	TS1150	TS1110	TS6420

We reserve the right to make technical changes.

TSxxxx | TwinCAT 2 Supplements, System

	TwinCAT Database Server CE	TwinCAT PLC HMI	TwinCAT PLC HMI CE	TwinCAT PLC HMI Web
Technical data	**TS6420-0030**	**TS1800**	**TS1800-0030**	**TS1810**
	The TwinCAT Database Server CE has the same functional attributes as the version which runs on non-CE operating systems. The only difference is the range of supported databases: MS SQL, MS SQL Compact and ASCII files.	TwinCAT PLC HMI is a stand-alone tool for the presentation of visualisations which are created in TwinCAT PLC Control. They are shown in full-screen as soon as the system starts up.	TwinCAT PLC HMI CE is a stand-alone tool for the presentation of visualisations which are created in TwinCAT PLC Control. They are shown in full-screen as soon as the system starts up.	TwinCAT PLC HMI Web is a web-based visualisation system. The TwinCAT PLC Control acts as an editor for the generation of web pages. Activation is carried out simply by setting an option in the TwinCAT PLC Control. The web pages are hosted by the Internet Information Server (IIS). For display of the web pages a Java VM is needed.
Target system	Windows CE	Windows NT/2000/XP, Windows 7	Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
Min. TwinCAT level	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
Further information	TS6420-0030	TS1800	TS1800-0030	TS1810

We reserve the right to make technical changes.

	TwinCAT Management Server	TwinCAT Scope 2	TwinCAT EtherCAT Redundancy	TwinCAT Solar Position Algorithm
	TS1140	**TS3300**	**TS622x**	**TS3900**
	The TwinCAT Management Server enables the central administration of Beckhoff CE controllers. Software updates, for example, can thus be loaded onto controllers in the network from a central location. In addition to operating system updates, device-specific components (PLC boot projects) can also be loaded. By the option of separating known network devices into groups, individual actions can be defined for each group.	With the TwinCAT Scope 2 Beckhoff offers a graphical tool for signal analysis and data collection. Due to the separation of the data logger and viewer it is possible to show the signal processes of multiple systems in the field in a central Scope 2 view. Depending on the system it is possible to browse, for example in the PLC, NC or directly in the connected EtherCAT I/Os, in order to select the corresponding values. Alongside the possibility of long-term recording, various trigger functionalities and cursors are available in the TwinCAT Scope 2.	With TwinCAT EtherCAT Redundancy the TwinCAT EtherCAT master offers the possibility of implementing cable redundancy. From the last logical device a cable is returned back to the master. The TwinCAT System Manager is used for configuration and diagnostics.	With the TwinCAT Solar Position Algorithm it is possible to determine the sun angle using the date, time, geographical longitude and latitude as well as further parameters (depending on the desired accuracy). The function block works with a maximum inaccuracy of ±0.001°.
	Windows NT/2000/XP, Windows 7	Windows XP, Windows 7	Windows NT/2000/XP, Windows 7, Windows NT/XP Embedded, Windows CE	Windows XP, Windows CE
	TwinCAT I/O	TwinCAT I/O	TwinCAT I/O	TwinCAT PLC
	TS1140	TS3300	TS622x	TS3900

TS4xxx | TwinCAT 2 Supplements, Controller

	TwinCAT PLC Controller Toolbox	TwinCAT PLC Temperature Controller
Technical data	**TS4100**	**TS4110**
	The TwinCAT Controller Toolbox covers all essential blocks for control applications. – controllers satisfy industrial requirements such as anti-reset windup – simple basic controllers (P, I, D) – complex controllers (PI, PID, switching controllers) – filter blocks – control value generators (limiters, PWM) – ramp and signal generator blocks	Temperature controllers can be simply implemented using TwinCAT Temperature Controller. Simple commissioning through self-adjustment of the controller (auto-tuning) is included. – automatic and manual operation with shock-free set up – control value analog or pulse-width modulated signal – tolerance monitoring, absolute value monitoring – scalable reaction to sensor error and heating power faults – limitation of set and control values – optional ramping of the set value – optional start-up phase for the setpoint variables – industrial PID controller as base control algorithm inside the temperature controller
Target system	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
Min. TwinCAT level	TwinCAT PLC	TwinCAT PLC
Further information	TS4100	TS4110

We reserve the right to make technical changes.

TS5xxx | TwinCAT 2 Supplements, Motion

	TwinCAT PLC Motion Control XFC	TwinCAT PLC Hydraulic Positioning
Technical data	**TS5065**	**TS5810**

	eXtreme Fast Control (XFC) is the technique that enables very fast, temporally high-precision reactions using EtherCAT, special I/O terminals and TwinCAT on the PC. Using EtherCAT Distributed Clocks (DC) and appropriate terminals, distributed latches or cam controllers can be implemented simply in this way.
	– function blocks for the high-precision acquisition and switching of digital signals related to axis positions
	– EtherCAT Distributed Clocks with the timestamp-based EtherCAT EL1252, EL2252 or EL2262 input and output terminals
	– blocks for the conversion of DC time to position and vice versa
	– convenient PLCopen-compliant TouchProbe block
	– digital cam controller as PLCopen-compliant block
		Algorithms for the control and positioning of hydraulic axes are combined in TwinCAT Hydraulic Positioning and are available as PLCopen-compliant PLC blocks.
		– programming via certified PLCopen motion blocks
		– set value generators especially for hydraulic applications
		– coupling of the set value generators to NC PTP/NC I/CNC possible
		– free profile design through connection of customer-specific set value generators
		– support of non-linear gears
		– multiple-segmented movements (blending)
		– support of all necessary interfaces via Beckhoff I/O system
		– support of all common fieldbus systems
		– all process values in physical units, determination of force true to surface
		– support of standardised and application-specific controllers for position, force/pressure
		– bumpless transfer of force and position control
		– automatic identification of valve characteristics and axis properties
		– linearisation of characteristic curves
		– maintenance and commissioning tool for
		  – axis parameterisation
		  – valve parameterisation incl. characteristic curves
		  – controller parameterisation
		  – triggering of test commands
		  – display of actual values

Target system	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
Min. TwinCAT level	TwinCAT NC PTP	TwinCAT PLC
Further information	TS5065	TS5810

TSxxxx | TwinCAT 2 Supplements, Motion

	TwinCAT NC FIFO Axes	TwinCAT NC Flying Saw	TwinCAT PLC Remote Synchronisation
Technical data	**TS5060**	**TS5055**	**TS5066**
	Using TwinCAT NC FIFO Axes, externally generated set position values can be output to the axes in the form of a velocity pre-control. The set value generation is designed in such a way that both the set position and the set velocity are determined as the FIFO inputs are worked through in sequence. It is also possible, if necessary, to interpolate between two neighbouring FIFO inputs.	TwinCAT NC Flying Saw implements the coupling of a slave axis to a master axis in a certain synchronous position (flying saw). PLC function blocks enable coupling and uncoupling as well as parameterisation. – The master axis can be a real axis, a virtual axis, or some other external source of actual values. – synchronisation of the slave axis from any motion situation (stop, forward or reverse travel) with the master in motion – simple synchronisation with the master velocity – precise position synchronisation with the master axis (velocity and position) – synchronous velocity can be set via a coupling factor – optional return prevention as additional safety function – superimposed section compensation during the synchronous phase for dynamic position correction	Due to the increasing use of decentralised controllers, time synchronisation of different systems is becoming an increasingly important issue. The implementation of cyclically-sent information on systems without identical timebase leads to a beat effect. These manifest themselves for example as periodic operational faults in the synchronisation of drives, whose axis information is transferred via network. The TwinCAT PLC Remote Synchronisation library offers options for general time synchronisation of information with distributed systems as well as special techniques for synchronising NC axes ("distributed axes").
Target system	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
Min. TwinCAT level	TwinCAT NC PTP	TwinCAT NC PTP	TwinCAT PLC
Further information	TS5060	TS5055	TS5066

We reserve the right to make technical changes.

	TwinCAT NC Camming	TwinCAT Cam Design Tool	TwinCAT Digital Cam Server
	TS5050	**TS1510**	**TS5800**
	TwinCAT NC Camming (cam plate) is a non-linear relationship between a master and a slave axis. The camming package offers various options for the storage of cam plates. Convenient PLC blocks enable the loading, coupling and uncoupling of cam plates. It is possible to load new cam plates or to modify cam plates during operation. The TwinCAT Cam Design Tool offers support for the creation of the cam plates. – position tables with master interpolation points and corresponding slave positions; interpolation between the points is done linearly or by splines – motion function table describing a cam plate via motion laws according to VDI guideline 2143 – cyclic or linear processing – cam plate with offset and scale, can be modified on the master or slave side – high flexibility through online change of the motion functions	The TwinCAT CAM Design Tool allows the generation and modification of cam plates with the aid of a graphical editor. These are composed of sections of laws of motion such as modified sine waves, harmonic combinations, or of various polynomial functions. Velocity, acceleration and jerk are displayed in addition to the slave position. The generated cam plates can be transferred to the NC as tables with specified step size or as so-called motion functions.	The TwinCAT Digital Cam Server is a fast cam controller with monitoring for various fieldbuses. The cams are configured in TwinCAT Engineering. – high-performance fieldbus-independent cam controller with many functions – up to 320 outputs – up to 180 cams per output – path-path cams, path-time cams, brake cams – dynamic speed correction – measurement and monitoring of rotary speed
	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7	Windows NT/2000/XP, Windows 7, Windows CE
	TwinCAT NC PTP	TwinCAT NC PTP	TwinCAT NC PTP
	TS5050	TS1510	TS5800

We reserve the right to make technical changes.

TSxxxx | TwinCAT 2 Supplements, Motion

	TwinCAT Valve Diagram Editor	TwinCAT Kinematic Transformation
Technical data	**TS1500**	**TS511x**

	The TwinCAT Valve Diagram Editor allows the linearisation of non-linear curves of hydraulic valves with the aid of a graphical editor. On the basis of a few base points, straight lines or 5th degree polynomials can be determined that connect the points. The characteristic linearisation curve thus determined can be loaded into the TwinCAT NC real-time and taken into account when the voltages are output in the drive.	Various robot types kinematics can be realised using TwinCAT Kinematic Transformation. The programming of the robot movements takes place in Cartesian coordinates using either DIN 66025 instructions or the PLCopen-compliant blocks from the PLC. An integrated dynamic pre-control ensures high precision of the movement even at high accelerations and speeds. Configuration takes place in the TwinCAT Engineering Interface Server.
		– supports various parallel and also serial kinematics, e.g. for pick-and-place tasks
		– supports the programming of interpolating movements in G-code (DIN 66025)
		– alternatively, standard PTP and cam plate applications can be realised
		– simple programming in the Cartesian coordinate system
		– automatic calculation of the inverse kinematic for the relevant motor positions
		– kinematics configured in the TwinCAT Engineering Interface Server; in addition to the type (e.g. delta), the bar lengths and offsets must also be parameterised
		– mass and mass inertia values can be specified for dynamic pre-control
		– tracking with the aid of flying saw and cam plates for synchronisation (e.g. to conveyor belts)
		– optimised for the Beckhoff Servo Drives from the AX5000 series
		– The following kinematics are integrated:
		  – cartesian portals
		  – 2-D parallel kinematics
		  – shear kinematics
		  – crane and roll kinematics
		  – 3-D Delta
		  – SCARA
		– separated in different product levels, depending on the complexity of the kinematics

Target system	Windows NT/2000/XP, Windows 7	Windows NT/2000/XP, Windows 7, Windows CE
Min. TwinCAT level	TwinCAT NC PTP	TwinCAT NC I
Further information	TS1500	TS511x

We reserve the right to make technical changes.

TS6xxx | TwinCAT 2 Supplements, Communication

	TwinCAT PLC Serial Communication	TwinCAT PLC Serial Communication 3964R/RK512	TwinCAT PLC Modbus RTU
Technical data	**TS6340**	**TS6341**	**TS6255**
	TwinCAT Serial Communication implements communication with serial devices such as printers, bar code scanners, etc. The serial interface of the PC and the serial Beckhoff EL6xxx EtherCAT Terminals and and KL6xxx Bus Terminals are supported. Via the network-based fieldbus system from Beckhoff the serial terminals can be accessed over a distance of up to 100 m. In addition, it is possible to address virtual COM interfaces of the operating system from the PLC.	Serial communication via the 3964R or the RK512 protocols is implemented via the TwinCAT PLC Serial Communication 3964R/RK512 software library. The PCs serial interface and the Beckhoff KL6xxx serial Bus Terminals are supported. The library also contains the TwinCAT PLC Serial Communication library. The TwinCAT Serial Communication RK512 PLC library supports transmission and reception of PLC variables of any type. Data up to 128 bytes long is transferred transparently in the form of data blocks. To ensure secure data transmission, the 3964R protocol is used underneath the RK512 protocol.	TwinCAT Modbus RTU implements Modbus RTU communication via a serial RS232, RS422 or RS485 interface and is thus suitable both for the PC/CX interfaces and for operation with the KL6xxx serial Bus Terminals. It contains function blocks for master and slave operating mode with simple configuration.
Target system	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
Min. TwinCAT level	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
Further information	TS6340	TS6341	TS6255

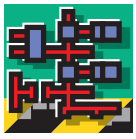
TS6xxx | TwinCAT 2 Supplements, Communication

	TwinCAT Modbus TCP Server	TwinCAT Modbus TCP Server CE	TwinCAT PLC IEC 60870-5-10x	TwinCAT PLC IEC 60870-5-104 CE
Technical data	**TS6250**	**TS6250-0030**	**TS650x**	**TS650x-0030**
	TwinCAT Modbus TCP Server acts as gateway between Modbus TCP devices and TwinCAT runtime systems. It provides both server and client functionalities. In server mode the memory areas of several TwinCAT runtime systems can be mapped directly to the Modbus memory areas. A PLC library is provided for implementing a Modbus TCP client, so that the memory areas of a Modbus TCP device can be accessed.	TwinCAT Modbus TCP Server CE acts as gateway between Modbus TCP devices and TwinCAT runtime systems. It provides both server and client functionalities. In server mode the memory areas of several TwinCAT runtime systems can be mapped directly to the Modbus memory areas. A PLC library is provided for implementing a Modbus TCP client, so that the memory areas of a Modbus TCP device can be accessed.	The TS650x enable IEC 60870-5-10x-compliant communication from the TwinCAT PLC. Both master and slave libraries are available. PLC library for the realisation of masters for – IEC 60870-5-101 – IEC 60870-5-102 – IEC 60870-5-103 – IEC 60870-5-104 PLC library for the realisation of slaves for – IEC 60870-5-101 – IEC 60870-5-104	The TS650x-0030 enable IEC 60870-5-10x-compliant communication from the TwinCAT PLC. Both master and slave libraries are available for applications under Windows CE. PLC library for the realisation of masters for – IEC 60870-5-104 PLC library for the realisation of slaves for – IEC 60870-5-104
Target system	Windows NT/2000/XP, Windows 7	Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows CE
Min. TwinCAT level	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
Further information	TS6250	TS6250-0030	TS650x	TS650x-0030

We reserve the right to make technical changes.

	TwinCAT PLC IEC 61850 Server	TwinCAT PLC IEC 61400-25 Server	TwinCAT DriveTop Server	TwinCAT DriveCOM OPC Server
	TS6511	TS6509	TS6371	TS6370
	IEC 61850 defines a communication protocol which is used particularly in electrical switchgears. Such standardised communication can be implemented using the PLC library TwinCAT IEC 61850 Server. The communication stack developed by Beckhoff is based on the MMS protocol and as well as the basic IEC 61850 standard also supports the related specialisations. For easy configuration the TwinCAT Telecontrol Configurator can be used, which is delivered with the PLC library. Thanks to the created configuration a PLC code export can be carried out, which can be integrated into existing PLC projects.	IEC 61400-25 is a specialisation of IEC 61850 for wind turbines. The data model is especially extended for objects, such as, for example wind turbine generators. The TwinCAT Telecontrol Configurator can also be used here. Beside PLC codes it can also generate TwinCAT Scope 2 configurations.	The TwinCAT DriveTop Server is a communication server for linking the Indramat DriveTop Tools to TwinCAT. This means that the DriveTop tool can be used for configuration and commissioning of Indramat drives. Configuration with a number of SERCOS rings is also supported.	The DriveCOM user organisation has set itself the aim of facilitating uniform, standardised communication between configuration, commissioning and diagnostic tools from different drive manufacturers, independent of the fieldbus. The TwinCAT DriveCOM OPC Server offers precisely this type of communication connection. It enables data flow from the engineering tool to the drive, independent of the fieldbus. Based on the network-capable ADS TwinCAT communication system, distributed drives can be configured and diagnosed from a central point. The TwinCAT DriveCOM OPC server requires a subordinate TwinCAT system with an FCxxxx-type Beckhoff fieldbus card. The TwinCAT DriveCOM configurator finds supported drives in the TwinCAT configuration and makes this information available for the engineering tool. The configurator features an automation interface and can therefore be operated remotely by other tools.
	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7	Windows NT/2000/XP, Windows 7
	TwinCAT PLC	TwinCAT PLC	TwinCAT NC PTP	TwinCAT NC PTP
	TS6511	TS6509	TS6371	TS6370

TS6xxx | TwinCAT 2 Supplements, Communication



	TwinCAT OPC Server	TwinCAT OPC UA Server	TwinCAT OPC UA Server CE
Technical data	**TS6120**	**TS6100**	**TS6100-0030**
	The TwinCAT OPC Server is a standardised data exchange interface. It supports the DataAccess (DA) and XML DA specifications. DataAccess is based on the Microsoft COM technology and provides data for the client. The OPC XML DA specification enables data exchange through XML via HTTP. Configuration of the server is carried out in a configuration tool or via XML.	OPC Unified Architecture (IEC 62541) is the newest technology generation of the OPC Foundation for the secure, reliable and manufacturer-neutral transport of raw data and pre-processed information from the manufacturing level into the production planning or ERP system. With OPC UA, all desired information is available to every authorised application and every authorised person at any time and in any place. TwinCAT OPC UA Server – certified in the OPC Laboratory, Europe – functions: DataAccess/ HistoricalAccess/Alarm&Condition – PLC blocks for diagnosis and restart – intermediate storage of data on the server: interruption of the communication connection does not lead to loss of data TwinCAT OPC UA Client – PLC function blocks for UA DataAccess – Demo UA client for diagnostic purposes	OPC Unified Architecture (IEC 62541) is the newest technology generation of the OPC Foundation for the secure, reliable and manufacturer-neutral transport of raw data and pre-processed information from the manufacturing level into the production planning or ERP system. With OPC UA, all desired information is available to every authorised application and every authorised person at any time and in any place. TwinCAT OPC UA Server CE – certified in the OPC Laboratory, Europe – functions: DataAccess/ HistoricalAccess/Alarm&Condition – PLC blocks for diagnosis and restart – intermediate storage of data on the server: interruption of the communication connection does not lead to loss of data TwinCAT OPC UA Client CE – PLC function blocks for UA DataAccess – Demo UA client for diagnostic purposes
Target system	Windows NT/2000/XP, Windows 7	Windows NT/2000/XP, Windows 7	Windows CE
Min. TwinCAT level	TwinCAT I/O	TwinCAT I/O	TwinCAT I/O
Further information	TS6120	TS6100	TS6100-0030

We reserve the right to make technical changes.

	TwinCAT SMS/SMTP Server	TwinCAT SMS/SMTP Server CE	TwinCAT TCP/IP Server	TwinCAT TCP/IP Server CE
	TS6350	TS6350-0030	TS6310	TS6310-0030
	TwinCAT SMS/SMTP Server enables the transmission of SMS messages or e-mails using PLC function blocks. The latter also allows the transmission of file attachments, HTML texts and the setting of message priorities. Support for STARTTLS/SSL enables encrypted e-mail communication to be configured.	TwinCAT SMS/SMTP Server CE enables the transmission of SMS messages or e-mails using PLC function blocks. The latter also allows the transmission of file attachments, HTML texts and the setting of message priorities. Support for START-TLS/SSL enables encrypted e-mail communication to be configured.	TwinCAT TCP/IP Server enables the implementation and realisation of one or several TCP/IP servers and/or clients within the TwinCAT PLC. Corresponding blocks exist for the establishment/disconnection of communication as well as for the pure exchange of data (send and receive). The SNMP library provided enables messages to be sent (traps) and queries to be answered (get) for monitoring TwinCAT runtimes.	TwinCAT TCP/IP Server CE enables the implementation and realisation of one or several TCP/IP servers and/or clients within the TwinCAT PLC. Corresponding blocks exist for the establishment/disconnection of communication as well as for the pure exchange of data (send and receive). The SNMP library provided enables messages to be sent (traps) and queries to be answered (get) for monitoring TwinCAT runtimes.
	Windows NT/2000/XP, Windows 7	Windows CE	Windows NT/2000/XP, Windows 7	Windows CE
	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
	TS6350	TS6350-0030	TS6310	TS6310-0030

We reserve the right to make technical changes.

TS6xxx | TwinCAT 2 Supplements, Communication

	TwinCAT PROFINET RT Controller	TwinCAT PROFINET RT Device	TwinCAT EtherNet/IP Slave	TwinCAT EtherNet/IP Slave CE
Technical data	**TS6271**	**TS6270**	**TS6280**	**TS6280-0030**
	The TwinCAT PROFINET RT Controller (master) is a supplement that turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into a PROFINET RT controller. An Ethernet interface becomes a PROFINET controller by enabling a key. The PROFINET supplement is part of the TwinCAT installation and can be operated without key in Config mode. It runs on PCs and Embedded PCs and can be used from TwinCAT 2.11 R3. In conjunction with the EL6631 PROFINET terminal for the EtherCAT I/O system, PROFINET can also be tunnelled via EtherCAT. In this case the supplement is not required. In this way, any EtherCAT network can exchange data with PROFINET RT devices.	The TwinCAT PROFINET RT Device (slave) is a supplement that turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into a PROFINET RT device. By installing the supplement, an Ethernet interface becomes a PROFINET slave. The supplement can be used on PCs and Embedded PCs. PROFINET can also be tunnelled via EtherCAT in conjunction with the EL6631-0010 PROFINET terminal for the EtherCAT I/O system. In this way, any EtherCAT network can exchange data with PROFINET IO controllers. If the EL6631-0010 is used, the TwinCAT PROFINET RT controller supplement is not required.	The TwinCAT EtherNet/IP Slave is a supplement turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into an EtherNet/IP slave. By installing the supplement, the Ethernet interface becomes an EtherNet/IP slave. This product can be used on all PC controllers and Embedded PC controllers running Windows XP and Windows CE.	The TwinCAT EtherNet/IP Slave is a supplement turns any PC-based controller with an Intel® chipset and the real-time Ethernet driver developed by Beckhoff into an EtherNet/IP slave. By installing the supplement, the Ethernet interface becomes an EtherNet/IP slave. This product can be used on all PC controllers and Embedded PC controllers running Windows CE.
Target system	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows CE
Min. TwinCAT level	TwinCAT I/O	TwinCAT I/O	TwinCAT I/O	TwinCAT I/O
Further information	TS6271	TS6270	TS6280	TS6280-0030

We reserve the right to make technical changes.

	TwinCAT Virtual Serial COM Driver	TwinCAT FTP Client	TwinCAT PLC RFID Reader Communication	TwinCAT PLC S5/S7 Communication
	TS6360	TS6300	TS6600	TS6610
	TwinCAT Virtual Serial COM Driver allows the EL60xx EtherCAT Terminals or EP6002 EtherCAT Box modules to be integrated into Windows CE or Windows as normal serial interfaces. The computer on which a serial interface is to be generated for it is defined individually for each EL60xx/EP6002. Access to the device connected to the terminal takes place via Windows API for serial interfaces.	TwinCAT FTP Client enables simple access from the PLC to several FTP servers with the aid of various function blocks. This way, files can be loaded to or from a server after the establishment of a connection (optional with authentication). Additional function blocks allow files or directories to be searched for, created, deleted and renamed.	TwinCAT PLC RFID Reader Communication allows various RFID readers to be addressed via a serial interface. The new TwinCAT RFID reader library offers a general abstract interface that can be used for all readers. The configuration can easily be adapted to a specific reader.	TwinCAT PLC S5/S7 Communication allows the simple connection of TwinCAT to an S5 or S7 controller. The data blocks, flags, inputs, outputs, counters and timers of an S5 or S7 controller can be accessed using function blocks. The communication takes place using TCP/IP.
	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
	TwinCAT I/O	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
	TS6360	TS6300	TS6600	TS6610

We reserve the right to make technical changes.

TS8xxx | TwinCAT 2 Supplements, Building Automation

	TwinCAT PLC HVAC	TwinCAT PLC Building Automation Basic	TwinCAT BACnet/IP
Technical data	**TS8000**	**TS8010**	**TS8020**
	TwinCAT PLC HVAC is an extensive TwinCAT PLC library with function blocks for automating all building services. In addition to conventional HVAC functions relating to energy generation and distribution, it also includes room automation functions for lighting, shading and air-conditioning.	The TwinCAT PLC Building Automation Basic software library allows the implementation of all functions which are important for room automation. Among these are lighting (constant light control, light dimmer, …), facade control, scaling functions, filter blocks, timer functions and peak load limiter for energy optimisation.	BACnet (Building Automation Control Network) is a standardised, manufacturer-independent communication protocol for building automation. Areas of application include HVAC, lighting control, safety and fire alarm technology. Implementation of this protocol is carried out as server as well as client and can be run on all Beckhoff Industrial PCs and Embedded PCs. All services of a BBC (BACnet Building Controller) are supported such as for example, common data use (DS), alarm and event processing (AE), time-tabling (SCHED), trend recording (T) as well as device and network management (DM). **BACnet revision 12** Embedded PCs corresponding to the ISO 16484-5:2012 standard: **Ordering information CX8091 and CX9020 with BACnet/IP image (license key included)** – ordering number of the CX8091 (no further ordering option necessary) (see page 203) – ordering number of the CX9020-xxxx (see page 214) + CX1800-1052 **Ordering information CX5010/CX5020 (see page 224)** – CX50x0 with Windows CE | Ordering number of the CX + CX1800-1052 (BACnet/IP image, license key included) – CX50x0 with Windows XPe | Ordering number of the CX + supplement TwinCAT BACnet/IP (TS8020, license key necessary), TwinCAT 2.11 R3 **BACnet revision 6** Embedded PCs corresponding to the ISO 16484-5:2010 standard: **Ordering information CX9001/CX9010 with BACnet/IP image (license key included) (see page 208)** – ordering number of the CX9001-xxxx + CX1800-1044 – ordering number of the CX9010-xxxx + CX1800-1044 **Ordering information CX5010/CX5020 (see page 224)** – CX50x0 with Windows CE | Ordering number of the CX + CX1800-1044 (BACnet/IP image, license key included) – CX50x0 with Windows XPe | Ordering number of the CX + Supplement TwinCAT BACnet/IP (TS8020, license key necessary), TwinCAT 2.11 R3
Target system	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
Min. TwinCAT level	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
Further information	TS8000	TS8010	TS8020

We reserve the right to make technical changes.

	TwinCAT FIAS Server	TwinCAT Crestron Server	TwinCAT Bang & Olufsen Server	TwinCAT Building Automation	TwinCAT Building Automation Framework
	TS8035	**TS8036**	**TS8037**	**TS8040**	**TS8100**
	The FIAS (Fidelio Interface and Application Specification) interface is a world-leader in hotel management software. The TwinCAT FIAS Server is a software package for communication between TwinCAT PLC and a system with a FIAS standard interface. The communication takes place using TCP/IP. The connection of hotel management software and automation system helps to optimise the energy consumption: e.g. the climate control is automatically adjusted for an unoccupied room; if there is strong sunlight the shading is automatically activated.	Crestron is one of the leading manufacturers of AV control systems. The TwinCAT Crestron Server enables communication between a TwinCAT PLC and a Crestron control. Both systems are connected by Ethernet. SIMPL user macros are available for programming the Crestron controller. The required function blocks are included in the TwinCAT PLC library. Read and write access to the other device is available from the Crestron controller and the TwinCAT PLC.	Bang & Olufsen is recognised all over the world for its unmistakable range of high-quality audio, video and multimedia products. The TwinCAT Bang & Olufsen server enables communication between a TwinCAT PLC and a Bang & Olufsen audio/video installation. For the TwinCAT PLC a corresponding PLC library is available, which enables access to the Bang & Olufsen Masterlink gateway. The data exchange is bidirectional via Ethernet.	TwinCAT Building Automation is a software package that covers all technical building automation services. In addition to modules for conventional HVAC applications it also covers room automation including lighting, air-conditioning and shading. Essentially, the software package consists of three components: **TwinCAT BA PLC Libraries** The TwinCAT BA PLC libraries contain basic functions for control, signal processing, special mathematical functions, alarm processing and general system functions. **TwinCAT BA PLC Templates** TwinCAT BA PLC templates consist of ready-made TwinCAT program blocks for sensors, actuators, complete modules for system components and for entire heating, ventilation and air-conditioning system installations/plants. **TwinCAT BA Project Builder** The TwinCAT BA Project Builder is a configuration program for defining system components and assigning them to individual templates. Based on this information, the project files for TwinCAT PLC Control functions and the TwinCAT System Manager can be generated for each controller.	The TwinCAT Building Automation Framework includes a configuration program (TwinCAT Building Automation Manager) and a PLC library. The PLC library is configured such that a complete application program with the main room automation functions is available, including lighting, shading, climate control, time switching functions, scene management, weather stations and energy consumption monitoring. All actuators and sensors are registered in the TwinCAT Building Automation Manager, grouped together and linked with the Bus Terminals. The logical ordering of sensors to actuators is also done in the TwinCAT Building Automation Manager. From this information the configuration program generates and activates the I/O links for all devices entered in the system and writes all necessary parameters in the controller.
	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE	Windows NT/2000/XP, Windows 7, Windows CE
	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC	TwinCAT PLC
	TS8035	TS8036	TS8037	TS8040	TS8100

Highlights

- Integrated safety system from I/Os to drives
- Compact safety PLC
- Certified up to IEC 61508 SIL 3 and DIN EN ISO 13849-1:2008 PL e
- Safety engineering integrated into TwinCAT 3

TwinSAFE

Open and scalable safety technology

▸ TwinSAFE

1046 Technology
1047 Safety over EtherCAT
1048 Scalability
1049 Solution variety
1050 TwinCAT 3 and Safety

1052 Controller, Coupler

1052 Compact Controller EK1960
1054 EtherCAT Coupler EK1914

1055 Logic

1055 EtherCAT Terminals EL69xx
1055 EtherCAT plug-in module EJ6910
1060 Bus Terminal KL6904

1056 Safe inputs

1054 EtherCAT Coupler EK1914
1056 EtherCAT Terminal EL1904
1056 EtherCAT Box EP1908
1057 EtherCAT plug-in modules EJ19xx
1061 Bus Terminal KL1904

1058 Safe outputs

1054 EtherCAT Coupler EK1914
1058 EtherCAT Terminals EL290x
1059 EtherCAT plug-in modules EJ29xx
1060 Bus Terminal KL6904
1061 Bus Terminal KL2904

1062 Safe drives

1062 Option cards AX58xx
872 Servo Drives AX5000

TwinSAFE | Open and scalable safety technology

The TwinSAFE integrated safety solution represents the consistent continuation of the open and PC-based control philosophy from Beckhoff. Due to their modularity and versatility, the TwinSAFE terminals fit seamlessly into the Beckhoff control system. Thanks to the fieldbus-neutral safety protocol (TwinSAFE/Safety over EtherCAT), the TwinSAFE devices can be integrated into any desired fieldbus system. To this end, the IP 20 TwinSAFE Bus Terminals are integrated into existing stations with K-bus or EtherCAT or used directly in the machine as IP 67 modules. These safety I/Os form the interfaces to the safety-relevant sensors and actuators.

The possibility to transmit the safety-relevant signals over a standard bus system gives rise to substantial advantages in terms of planning, installation, operation, maintenance, diagnostics and costs.

The safety application is configured or programmed in TwinCAT software. This application is then loaded over the bus to a TwinSAFE Logic terminal of type KL6904 or EL69xx. These Logic terminals form the heart of the TwinSAFE system. All safety devices in the plant communicate with this Logic terminal. Due to the enormous flexibility of the system, however, several TwinSAFE Logic terminals can be operated simultaneously in one network.

Communication via independent safety circuits

Communication between distributed TwinSAFE Logic terminals is very simple to implement with TwinCAT software. This applies not only to terminals in a network, but also to devices on different controllers. Safety-relevant data and signals can also be exchanged as soon as the controllers have established a communication connection with the help of a fieldbus or via network variables. Of course, the reaction times and capabilities of the systems employed need to be considered.

For this, TwinCAT software assumes the task of distributing the data. This central distribution of the data has two significant advantages:

– All safety-relevant data are fed via the functional controller and are available to it for diagnostic purposes. The generation of diagnostic data on the safety controller is not necessary. That saves programming effort as well as computer performance and thus costs.
– All fieldbus systems operable from TwinCAT software are also accessible to the safety equipment. The TwinSAFE/Safety over EtherCAT protocol is so safe that even the mixing of fieldbus systems as well as the safety-relevant exchange of data between modules on different fieldbus systems are not a problem.

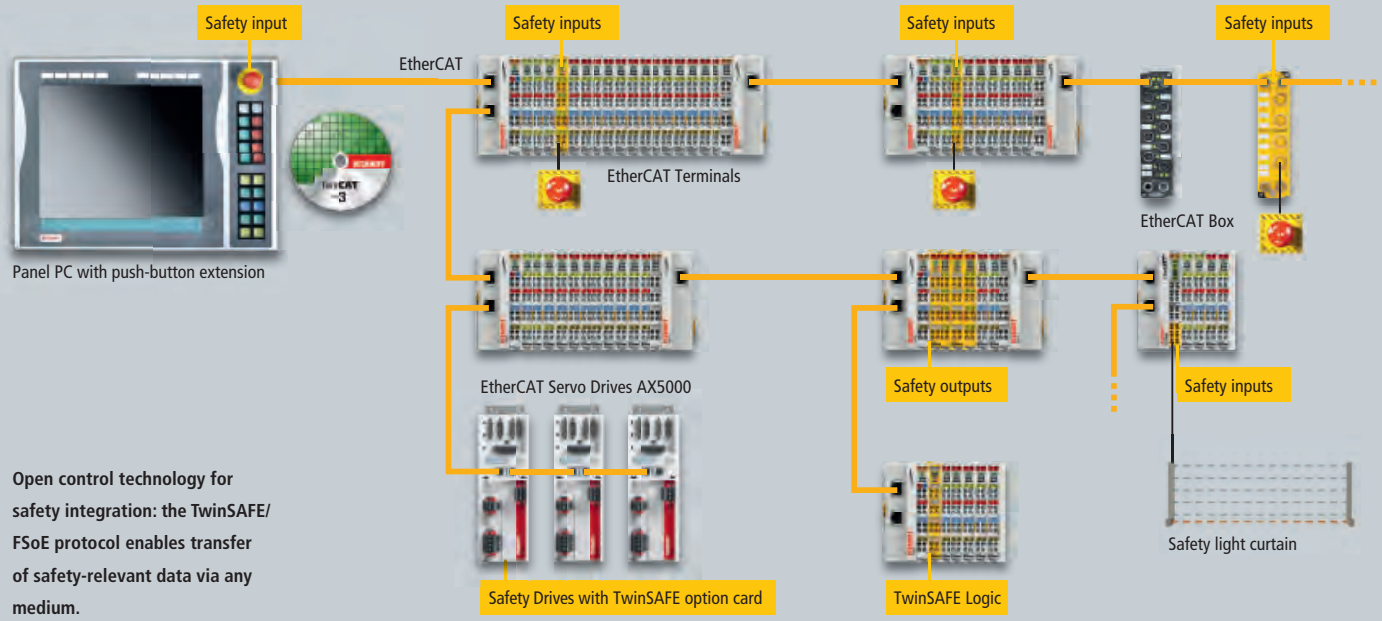
Certified safety function blocks facilitate configuration

The certified safety function blocks of the TwinSAFE Logic terminals allow the simple, error-free and inexpensive implementation of all safety tasks: from the simple monitoring of a safety door to complex muting functions and the safe control of networked and linked plants. The shutting down of individual "safety groups" or "communication shutdowns" enable the targeted shutdown of parts of the plant during the operation of a machine. These are essential functions that are required in order to be able to operate networked safety systems. Without them, the commissioning, maintenance and partial operation of linked machines are not possible.

With the EL69xx TwinSAFE Logic, all diagnostic data and statuses of the function blocks can be merged into the cyclic EtherCAT telegram. Extensive diagnosis is thus easy to implement without additional application expenditure.

A backup and restore mechanism facilitates exchange in the event of a fault

Since all parameters and settings as well as the application software are stored on the EL69xx TwinSAFE Logic, the safety controller, which is just 12 mm wide, can be programmed either in the plant over the bus or



Open control technology for safety integration: the TwinSAFE/ FSoE protocol enables transfer of safety-relevant data via any medium.

at the workstation and then simply plugged into the system.

The EL69xx has a special backup and restore mechanism. Therefore, no additional exchangeable storage medium is required as in other systems. The user can activate this function in TwinCAT software or by the application.

If the original terminal has been exchanged, e.g. due to a defect, the system automatically recognises a new TwinSAFE Logic and the valid TwinSAFE application is loaded automatically to the new terminal. The safety check takes place fully automatically and requires no intervention by the user.

The maintenance staff only needs to exchange the Bus Terminal, everything else is accomplished reliably and securely by the TwinSAFE system.

Safety over EtherCAT – Open safety protocol according to IEC 61784-3

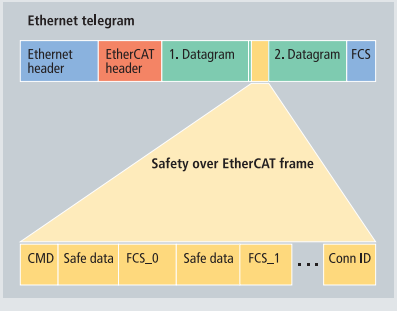
The open Safety over EtherCAT protocol (FSoE for short: "Failsafe over EtherCAT") defines a safety-related communication layer for EtherCAT. It meets the requirements of IEC 61508 SIL 3 and enables the transmission of secure and standard information on the same communication system without restrictions regarding transmission rates and cycle time.

Thanks to this openness any transmission media and transmission path can be used with Safety over EtherCAT. FSoE is focused on EtherCAT, the high-performance Ethernet fieldbus, and the transmission of safety-related process data is based on the Black Channel principle.

Thus, Safety over EtherCAT is also supported by other fieldbus systems and protocols such as PROFIBUS, CANopen or Ethernet. Copper or optical fibre cables, radio links or transmission technologies such as data light barriers can be used as transmission path. The telegram is arranged in such a way that a minimal container length of 6 bytes is sufficient for the transmission of all safety information including one byte of safe process data.

Safe data are cyclically exchanged between a Safety over EtherCAT master and a Safety over EtherCAT slave. This mechanism is called a connection (TwinSAFE connection). A master can establish and monitor several connections to different slaves.

Further information see page 311



We reserve the right to make technical changes.

Scalable safety technology

Irrespective of the complexity of the safety application, TwinSAFE is equally suited to small, local or central projects and to the decentralised networking of safety-related signals across different areas, plant parts and modules. Using TwinSAFE all safety functions can be programmed or configured on the uniform TwinCAT engineering platform.

TwinSAFE seamlessly integrates safe functions into the standard control platform from the PLC to the I/Os to the drive technology. TwinSAFE can be used both as a stand-alone system and as a decentralised controller:

Local | The TwinSAFE Compact Controller

The all-in-one solution for local safety applications is the EK1960 TwinSAFE Compact Controller. It integrates a complete safety controller including I/O level with 20 safe digital inputs and 10 safe digital outputs. The EK1960 can manage up to 32 TwinSAFE connections. For flexible adaptation to different safety tasks, the EK1960 can be extended by further TwinSAFE I/Os and drive components via the TwinSAFE protocol.

Local | Synthesis of safe and standard I/Os

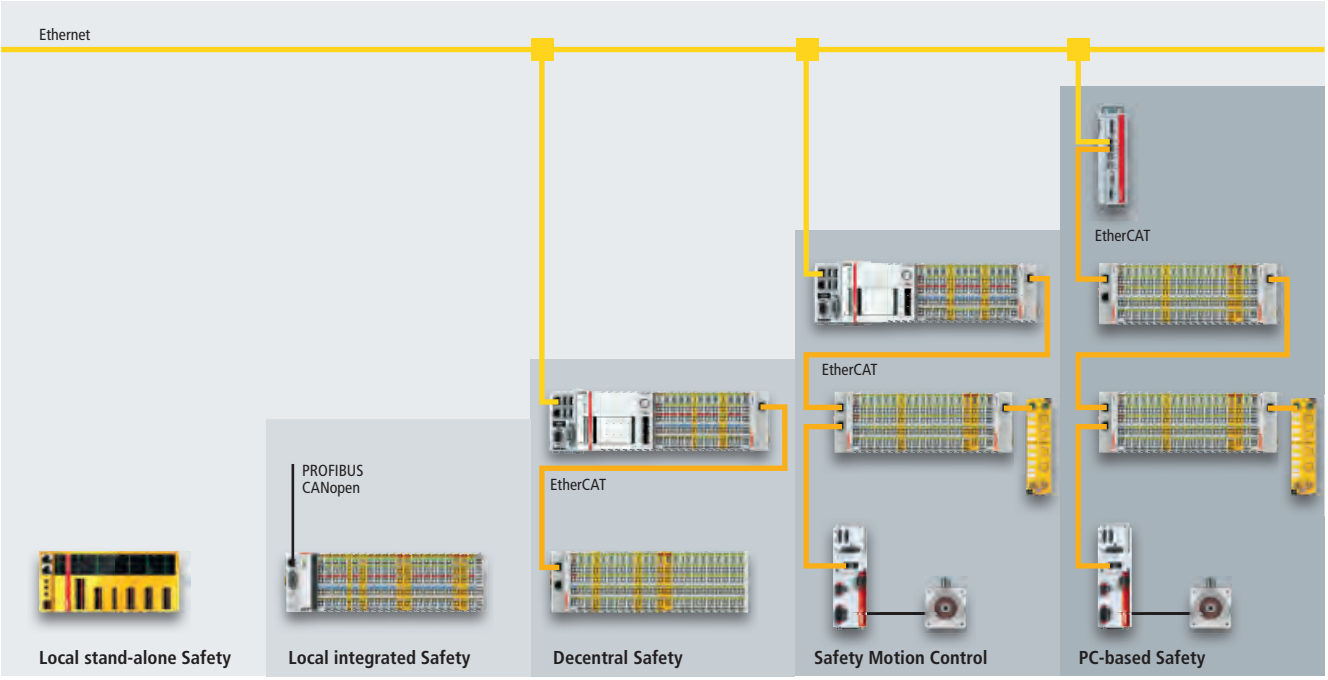
Safe signals and standard signals in automation technology can be mixed in a single system with the CX8000, CX5000 and CX9000 Embedded PCs as well as the small controllers from the BX series. The KL6904 safe logic and combinations of KL1904 safe inputs and KL2904 safe outputs can be placed anywhere in the Bus Terminal segment. According to the same principle a larger selection of components is available in the EtherCAT terminal system.

Decentralised | Safety beyond EtherCAT

The safe EtherCAT terminals are suitable for more complex topologies with a decentralised layout, since TwinSAFE fully leverages the performance capacity of EtherCAT. The safe logic is mapped by the EL6900 TwinSAFE Logic, which links the EL190x digital inputs and the EL290x digital outputs. In a decentralised safety solution, the terminals can be distributed throughout the entire network and, through the EtherCAT Box EP1908-0002, even into IP 67 areas.

Motion Control | EtherCAT Servo Drives with integrated safety

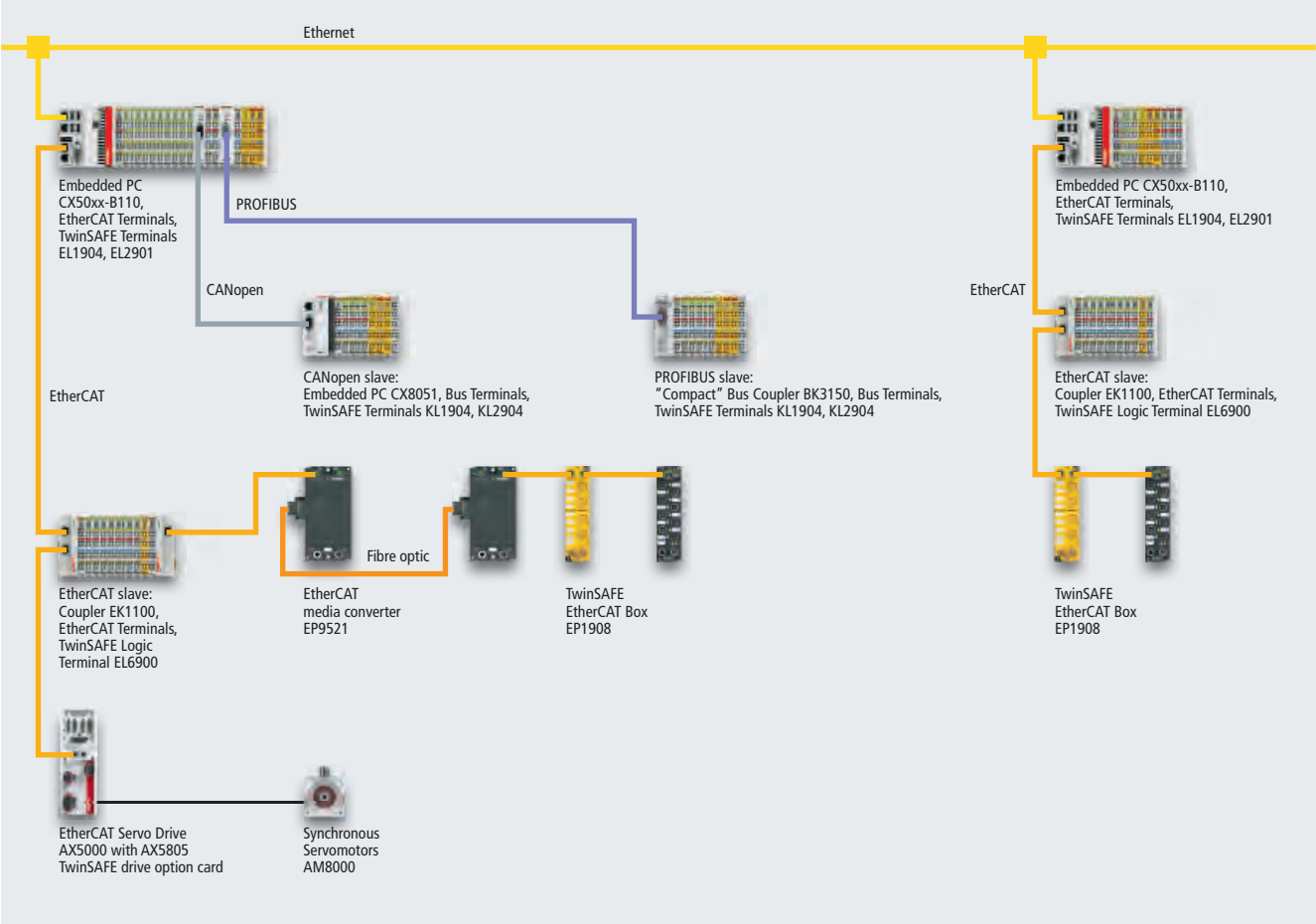
With TwinSAFE, safe drive functions can be easily implemented using the AX58xx TwinSAFE drive option cards for the AX5000 EtherCAT Servo Drive. The AX5801 option card covers the functions STO and SS1. It is controlled via a safe output and is wired separately. The AX5805 option card is capable of switching the motor torque-free or monitoring speed, position and direction of rotation (in accordance with DIN EN ISO 13849-1:2008 up to PL e). No further circuits are necessary for this, such as circuit breakers or contactors in supply lines, or special external encoder systems. Therefore there is no further wiring. The safety option card communicates directly through the AX5000 with the TwinSAFE terminals existing in the network.



We reserve the right to make technical changes.

Great variety of decentralised safety solutions

TwinSAFE represents the systematic continuation of the open, PC-based control philosophy from Beckhoff. Thanks to the fieldbus-neutral safety protocol, TwinSAFE devices can be integrated into any desired fieldbus system. With the TwinSAFE I/O modules the safety technology can be seamlessly integrated into the terminal strand, where the safe signals can be mixed with standard signals as required. The encapsulation and decoupling of individual production or manufacturing cells is considerably facilitated by the TwinSAFE system because safety products can be placed precisely at the points where safety functions are required. This reduces the expenditure for project engineering, installation and material, and maintenance is also simplified by faster diagnostics and fewer replacement parts. System extensions or changeovers can be implemented quickly and without additional wiring. Thanks to the openness and fieldbus neutrality, any transmission media and transmission path can be used with Safety over EtherCAT: in addition to different fieldbuses, media converters between copper and optical fibre physics and between copper and radio can be used as well as transmission technologies such as data light barriers.



The following environmental and operating conditions apply to all TwinSAFE products unless stated otherwise:

Technical data	EKx9xx/ELx9xx/KLx9xx	EPx9xx	EJx9xx
Nominal voltage	24 V DC (-15 %/+20 %)		
Climate class EN 60721-3-3	3K3	–	3K3
Permitted degree of contamination	2	–	2
Installation position	horizontal	variable	horizontal
EMC immunity/emission	conforms to EN 61000-6-2/EN 61000-6-4		
Vibration/shock resistance	conforms to EN 60068-2-6/EN 60068-2-27		
Protection class	IP 20	IP 65/66/67	IP 20

We reserve the right to make technical changes.

With a safety development environment and a safety runtime, the next step in the field of safety solutions is completed with TwinCAT 3.

TwinCAT 3 and Safety | Simplified engineering

The introduction of TwinCAT 3 as a universal development tool creates further possibilities for safety-relevant fields of application. Firstly, TwinCAT 3 offers additional functionality for creating and managing safety-relevant applications with the safety editor. Secondly, a standard Industrial PC can be used as a safety controller for the first time. This is possible due to the new safety runtime.

Safety editor

The safety editor integrated in TwinCAT 3 allows the creation of a safety application in a graphical environment. The desired logic is programmed with the help of function blocks. The application can be organised in networks for increased clarity. The familiar function blocks from the KL6904 and EL69xx logic terminals can be used as logical elements. Furthermore, additional function blocks are provided as part of the safety runtime. The function blocks can be freely arranged and connected within the diagram.

The safety editor offers increased flexibility and portability. This is achieved by initially programming independently of the actual hardware used. To this end, both the target system and all input and output devices are made available as so-called alias devices. At this level, all safety-relevant settings can be made in advance. Before the project is finally transferred to the executing hardware, these alias devices must be mapped to the actually installed physical devices.

In addition to using the pre-specified function blocks, there is also the possibility to create custom function blocks. These can be created by combining existing – pre-certified – function blocks or by using Safety C (this can be done only for the safety runtime). Safety C is an almost unrestricted derivative of standard C. This allows well-known control structures such as IF-THEN-ELSE, SWITCH CASE and the data types usual in C to be used for safety applications.

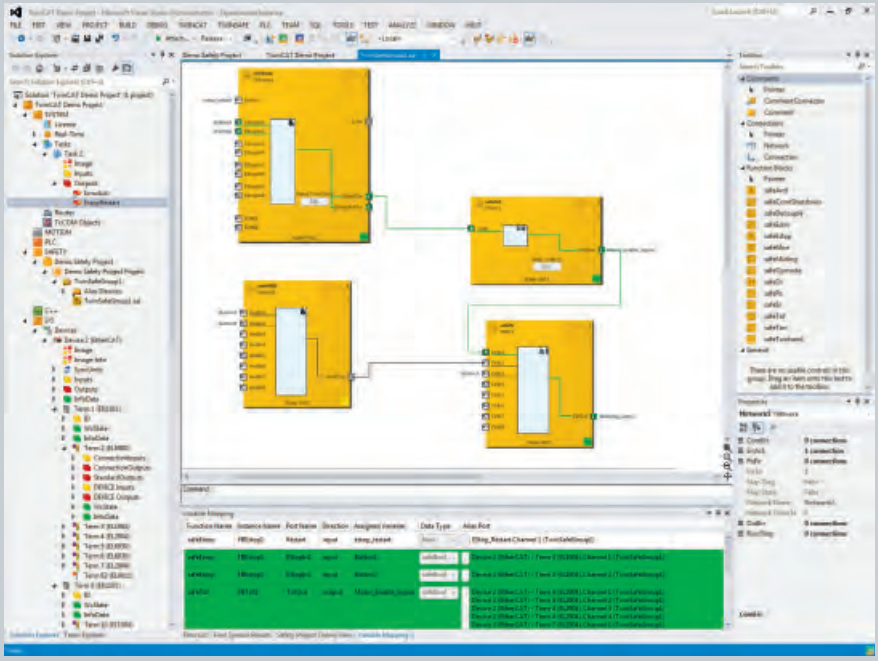
An important novelty in the programming of safety-relevant applications in TwinCAT 3 is the extended user management. In the so-called basic mode, the user can create an application exclusively from pre-specified – and thus certified – function blocks. These also include function blocks that the user has created on the basis of pre-certified function blocks. In expert mode, it is possible to create function blocks in Safety C and thus creating custom libraries. Before loading into the safety controller, a check is made as to whether the programmed logic consists of already certified function blocks or whether the created application requires renewed examination.

In addition to programming, improved tools optimally support debugging and test phase. Programs can be debugged in the usual Visual Studio® environment: the online values of variables and states of the function blocks are displayed directly in the graphical environment, enabling fast and simple debugging of the application. Furthermore, the project can be simulated offline in order to considerably speed up and simplify commissioning.

The editor is equipped with an automatic verification mechanism which automatically checks whether the saved project corresponds to the one created in the editor. The previously familiar manual comparison by uploading the project back to the safety controller is no longer necessary.

In addition, the safety editor automatically generates documentation containing a detailed view of all relevant project data. From the illustration of the hardware terminals with their safety-relevant settings through to an exact listing of the function blocks used and their interconnections, this documentation contains all important data required to facilitate the wiring of the plant, fault finding and maintenance.

We reserve the right to make technical changes.



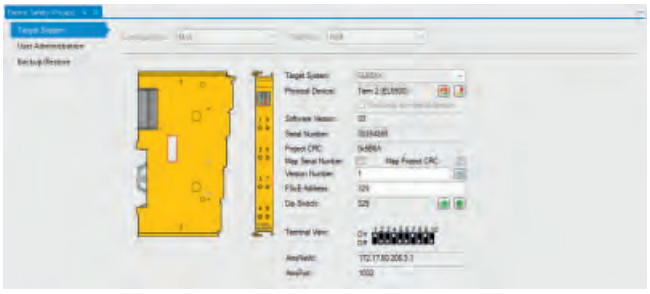
View of the graphical editor in TwinCAT 3

Safety runtime

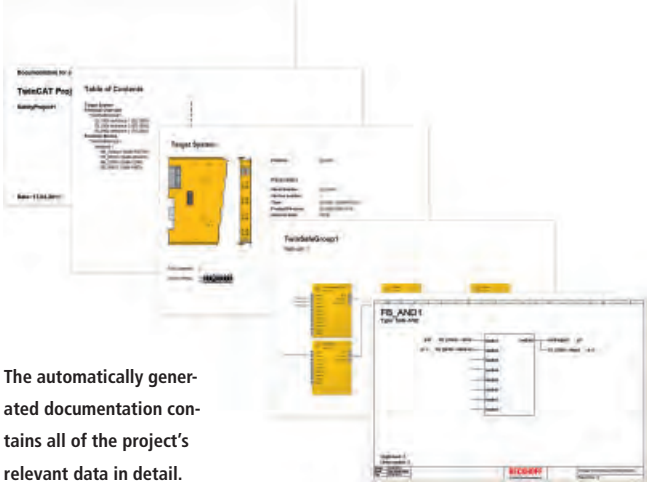
The enormous development in the field of Industrial PCs and the associated increase in reliability and quality allow a standard PC to be used as a safety controller. This is made possible by a strict mathematical basis, so that the proof of safety does not need to make reference to the respective processor and its environment. The independence from the hardware basis that this creates enables the use of standard components up to SIL 3 according to IEC 61508. The certifiability of the solution in accordance with this standard has been confirmed in a report by the TÜV SÜD.

Mathematical coding is used for this that creates a diverse redundancy on the basis of which the correct execution of operations within the safety application can be checked and a safe reaction initiated in the case of an error. In addition to pre-specified function blocks, the use of Safety C allows custom function blocks to be created and saved in a library for later use.

Further information on TwinCAT 3 on page 974 or at ▶TwinCAT3



Configuring the target system



The automatically generated documentation contains all of the project's relevant data in detail.

For availability status see Beckhoff website at: TwinSAFE

We reserve the right to make technical changes.

TwinSAFE | **Compact Controller**

The EK1960 TwinSAFE Compact Controller extends the application range of the integrated TwinSAFE safety solution. Thanks to its compact design, with 20 safe digital inputs and 24 safe digital outputs, it covers the safety requirements in particular for compact machines. The EK1960 can be operated in stand-alone mode or it can be networked with other controllers over the EtherCAT connectors. Like every EtherCAT Coupler the EK1960 can be extended by all EL/ES terminals.

The TwinSAFE Compact Controller is programmed via the TwinCAT Safety Editor in the same way as other TwinSAFE components. A TwinSAFE project is created and loaded over EtherCAT into the EK1960. The EK1960 supports the establishment of 212 TwinSAFE connections. For flexible adaptation to different safety functions, the TwinSAFE Compact Controller can be combined with TwinSAFE I/O components in IP 20 and IP 67 protection and the TwinSAFE drive option card via the Safety over EtherCAT protocol.

The fieldbus-neutral safety protocol Safety over EtherCAT enables the integration of TwinSAFE devices into arbitrary fieldbus systems. The safety I/Os form the interfaces to the safety-relevant sensors and actuators. The possibility to transmit the safety-relevant signals over a standard bus system gives rise to substantial advantages in terms of planning, installation, operation, maintenance, diagnostics and costs.

In addition to the Safety over EtherCAT protocol, the EK1960 also supports the TwinSAFE SC technology. This enables the secure transmission of data from TwinSAFE SC terminals to the EK1960 TwinSAFE Compact Controller.

The EK1960 also supports the processing of analog signals (16/32-bit, signed and unsigned). These signals can be transferred to the logic as standard, TwinSAFE SC or Safety over EtherCAT signals. Analog signals can thus be checked for plausibility within the logic. The entire calculation and scaling process is carried out at the SIL 3/PL e safety level in the safety-related EK1960 TwinSAFE Compact Controller.

Certified function blocks such as ADD, SUB, MUL, DIV and also more complex ones such as Counter, Limit or Compare are available for the processing of analog signals.

We reserve the right to make technical changes.

TwinSAFE Compact Controller,
20 safe digital inputs (24 V DC),
24 safe digital outputs (24 V DC)

Technical data	EK1960
Task within EtherCAT system	– stand-alone TwinSAFE Compact Controller (without EtherCAT network) – TwinSAFE Compact Controller with integration into an EtherCAT network for communication and diagnostics (extendable with safe and standard EtherCAT Terminals) – TwinSAFE I/O module without use of the logic function
Number of EtherCAT Terminals	up to 65,534
Data transfer rates	100 Mbaud
Safety standard	DIN EN ISO 13849-1:2008 (up to Cat 4, PL e) and IEC 61508:2010 (up to SIL 3)
Bus interface	2 x RJ45 or 2 x M8
Type/number of peripheral signals	max. 4.2 GB addressable I/O points
Data transfer medium	Ethernet/EtherCAT cable (min. Cat.5), shielded
Distance between stations	100 m (100BASE-TX)
Delay	approx. 1 µs
Number of communication partners	max. 212
Protocol	EtherCAT
Safety protocol	TwinSAFE/Safety over EtherCAT
Function blocks	max. 512
Response time	dependent on application (< 15 ms)
Fault response time	≤ watchdog time (parameterisable)
Number of inputs	20
Number of outputs	24
Max. output current	2 A (simultaneity factor 50 % at 2 A)
Current supply E-bus	500 mA
Operating/storage temperature	-25…+55 °C/-40…+70 °C
Approvals	in preparation
Further information	EK1960

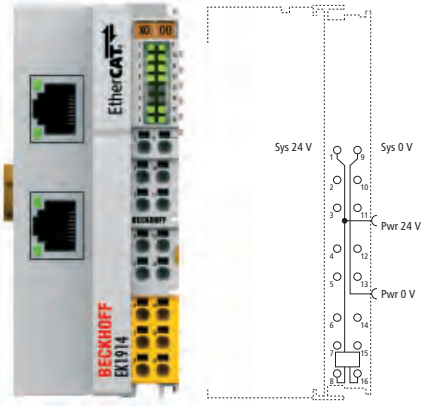
For availability status see Beckhoff website at: EK1960

We reserve the right to make technical changes.

TwinSAFE | **Coupler**

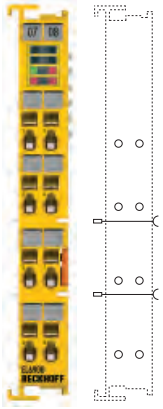
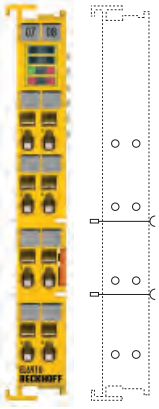
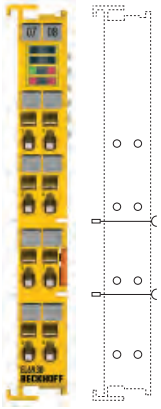
The EK1914 EtherCAT Coupler combines the functionalities of the EK1100 EtherCAT Coupler with standard and safe digital I/Os. This results in a compact design that is especially suitable for applications with a low number of I/Os. The EK1914 can be extended by all EL/ES terminals.

The EK1914 has four digital inputs and four digital outputs as well as two fail-safe inputs and two fail-safe outputs. The safe outputs switch 24 V DC actuators with up to 0.5 A current per channel. The EK1914 meets the requirements of DIN EN ISO 13849-1:2008 (Cat 4, PL e).

	EtherCAT Coupler with 4 inputs and 4 outputs as well as 2 safe inputs and 2 safe outputs
Technical data	**EK1914**
Task within EtherCAT system	coupling of EtherCAT Terminals (ELxxxx) to 100BASE-TX EtherCAT networks
Number of EtherCAT Terminals	up to 65,534
Data transfer rates	100 Mbaud
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e)
	
Protocol	EtherCAT
Bus interface	2 x RJ45
Data transfer medium	Ethernet/EtherCAT cable (min. Cat.5), shielded
Nominal voltage	24 V DC (-15 %/+20 %) (PELV)
Current consumption	typ. 72 mA (excluding current consumption of the sensors/ actuators and further terminals on the E-bus)
Distance between stations	max. 100 m (100BASE-TX)
Delay	approx. 1 µs
Safety protocol	TwinSAFE/Safety over EtherCAT
Response time	typ. 4 ms (read input/write to E-bus) max. see fault response time
Fault response time	≤ watchdog time
Number of inputs	6 digital inputs, 2 of which are fail-safe inputs
Number of outputs	6 digital outputs, 2 of which are fail-safe outputs
Current supply E-bus	max. 500 mA (for higher current consumption use EL9410 power supply terminal)
Operating/storage temperature	0…+55 °C/-25…+70 °C
Approvals	CE, UL, TÜV SÜD
Weight	approx. 123 g
Further information	EK1914

We reserve the right to make technical changes.

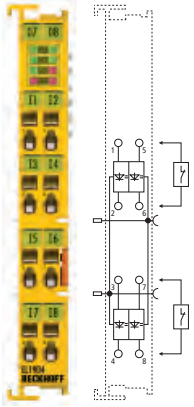
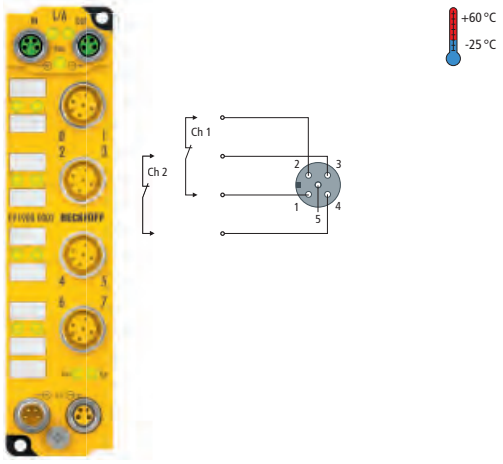
TwinSAFE | **Logic**

	TwinSAFE Logic, EtherCAT Terminal	TwinSAFE Logic, EtherCAT Terminal	TwinSAFE/PROFIsafe logic and gateway terminal, EtherCAT Terminal	TwinSAFE Logic, EtherCAT plug-in module
Technical data	**EL6900**	**EL6910**	**EL6930**	**EJ6910**
Technology	TwinSAFE Logic		TwinSAFE/PROFIsafe logic and gateway terminal	TwinSAFE Logic
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)			DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
				
	The TwinSAFE Logic can establish 128 connections to other TwinSAFE devices.	The TwinSAFE Logic can establish 212 connections to other TwinSAFE devices.	The EL6930 logic terminal can establish 127 connections to other TwinSAFE/ Safety over EtherCAT devices and one PROFIsafe slave connection to a PROFIsafe master.	The TwinSAFE Logic can establish 212 connections to other TwinSAFE devices.
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT, PROFIsafe	TwinSAFE/Safety over EtherCAT
Current consumption power contacts	–	–	–	–
Current consumption E-bus	approx. 188 mA	approx. 160 mA	approx. 188 mA	approx. 222 mA
Cycle time	500 µs…~25 ms	500 µs…~10 ms	500 µs…~25 ms	500 µs…~10 ms
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Special features	backup restore	backup restore	1 PROFIsafe slave connection	backup restore
Operating/storage temperature	-25…+55 °C/-40…+70 °C	-25…+55 °C/-40…+70 °C	-25…+55 °C/-40…+70 °C	0…+55 °C/-25…+85 °C
Approvals	CE, UL, Ex, TÜV SÜD	CE, UL	CE, TÜV SÜD	CE, TÜV SÜD
Weight	approx. 50 g	approx. 50 g	approx. 50 g	approx. 27 g
Further information	EL6900	EL6910	EL6930	EJ6910

For availability status see Beckhoff website at: EL6910

We reserve the right to make technical changes.

TwinSAFE | EtherCAT I/O – Digital input

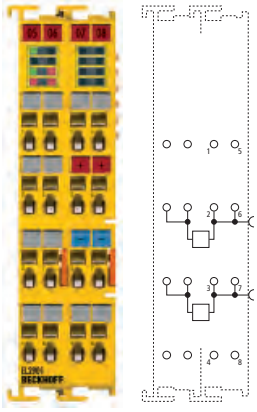
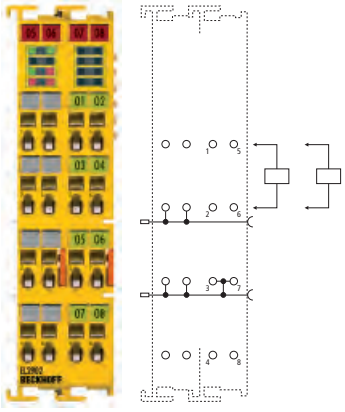
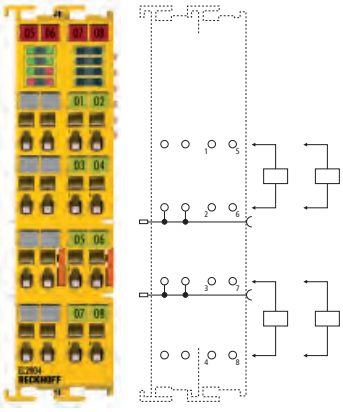
	4-channel digital input terminal, TwinSAFE, 24 V DC, EtherCAT Terminal	8-channel digital input module, TwinSAFE, 24 V DC, EtherCAT Box
Technical data	**EL1904**	**EP1908-0002**
Connection technology	1-/2-wire	M12, screw type
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Max. output current	–	–
Number of inputs	4	8
Number of outputs	–	–
		
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT
Current consumption power contacts	see documentation	–
Current consumption E-bus	approx. 200 mA	–
Current consumption from U_S/U_P	–	80 mA/40 mA
Response time	typ. 4 ms (read input/write to E-bus)	typ. 4 ms (read input/write to bus)
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Special features	4 safe inputs	8 safe inputs
Operating/storage temperature	-25…+55 °C/-40…+70 °C	-25…+60 °C/-40…+85 °C
Approvals	CE, UL, Ex, TÜV SÜD	CE, UL, TÜV SÜD
Weight	approx. 50 g	approx. 165 g
Further information	EL1904	EP1908

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

	4-channel digital input, TwinSAFE, 24 V DC, EtherCAT plug-in module	8-channel digital input, TwinSAFE, 24 V DC, EtherCAT plug-in module	8-channel digital input, 4-channel digital output, TwinSAFE, 24 V DC, EtherCAT plug-in module
	EJ1914	**EJ1918**	**EJ1957**
	distribution board		
	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
	–	–	500 mA, ∑ 2 A
	4	8	8
	–	–	4
	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT
	–	–	–
	approx. 200 mA	approx. 200 mA	approx. 200 mA
	–	–	–
	typ. 4 ms (read input/write to E-bus)	typ. 4 ms (read input/write to E-bus)	typ. 4 ms (read input/write to E-bus)
	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
	4 safe inputs	8 safe inputs	8 safe inputs, 4 safe outputs
	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C
	in preparation	in preparation	in preparation
	approx. 64 g	approx. 64 g	approx. 64 g
	EJ1914	EJ1918	EJ1957

TwinSAFE | EtherCAT I/O – Digital output

	Potential power supply terminal, TwinSAFE, 24 V DC, 10 A, EtherCAT Terminal	2-channel digital output terminal, TwinSAFE, 24 V DC, EtherCAT Terminal	4-channel digital output terminal, TwinSAFE, 24 V DC, EtherCAT Terminal
Technical data	**EL2901**	**EL2902**	**EL2904**
Connection technology	1-/2-wire and/or via power contacts	1-wire	1-/2-wire
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
Max. output current	10 A	2.3 A (per channel)	0.5 A (per channel), min. 20 mA (with active current measurement)
Number of inputs	–	–	–
Number of outputs	1	2	4
			
Protocol	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT
Current consumption power contacts	load-dependent	load-dependent	load-dependent
Current consumption E-bus	approx. 221 mA	approx. 221 mA	approx. 221 mA
Response time	–	–	–
Fault response time	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
Special features	safe power supply	2 safe outputs	4 safe outputs
Operating/storage temperature	0…+55 °C/-40…+70 °C	0…+55 °C/-40…+70 °C	-25…+55 °C/-40…+70 °C
Approvals	in preparation	CE, UL	CE, UL, Ex, TÜV SÜD
Weight	approx. 90 g	approx. 90 g	approx. 90 g
Further information	EL2901	EL2902	EL2904

For availability status see Beckhoff website at:

We reserve the right to make technical changes.

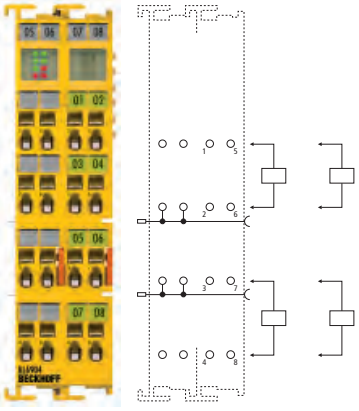
	8-channel digital input, 4-channel digital output, TwinSAFE, 24 V DC, EtherCAT plug-in module	4-channel digital output, TwinSAFE, 24 V DC, EtherCAT plug-in module	8-channel digital output, TwinSAFE, 24 V DC, EtherCAT plug-in module
	EJ1957	EJ2914	EJ2918
	distribution board		
	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)		
	500 mA, ∑ 2 A	500 mA	500 mA
	8	–	–
	4	4	8
	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT	TwinSAFE/Safety over EtherCAT
	–	–	–
	approx. 200 mA	approx. 221 mA	approx. 221 mA
	typ. 4 ms (read input/write to E-bus)	–	–
	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)	≤ watchdog time (parameterisable)
	8 safe inputs, 4 safe outputs	4 safe outputs	8 safe outputs
	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C	0…+55 °C/-25…+85 °C
	in preparation	in preparation	in preparation
	approx. 64 g	approx. 64 g	approx. 64 g
	EJ1957	EJ2914	EJ2918

We reserve the right to make technical changes.

TwinSAFE | Logic Bus Terminal

TwinSAFE enables networks with up to 1024 TwinSAFE devices. The KL6904 Bus Terminal features certified safety function blocks, which are configured according to the application to be realised. Functions such as emergency stop, safety door monitoring etc. can thus easily be selected and linked. All blocks can be freely connected among each other and are complemented by operators such as AND, OR, etc. The necessary functions are configured using the TwinCAT System Manager and loaded into the terminal via the fieldbus.

	TwinSAFE Logic Bus Terminal, 4 safe outputs
Technical data	**KL6904**
Technology	TwinSAFE Logic
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Number of outputs	4



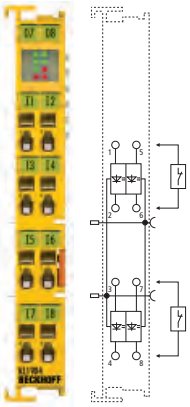
The KL6904 can establish up to 15 connections (TwinSAFE connections). The TwinSAFE Logic Terminal has four safe, local outputs, so that safety applications can be realised with only two components (KL1904 and KL6904).

Protocol	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	load-dependent
Current consumption K-bus	250 mA
Cycle time	4…100 ms
Fault response time	≤ watchdog time (parameterisable)
Output current	0.5 A max./20 mA min. (per channel)
Special features	4 safe outputs
Operating/storage temperature	0…+55 °C/-25…+70 °C
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 90 g
Further information	KL6904
Special terminals	**KL6904-0001**
Distinguishing features	pre-configured ex factory to 15 TwinSAFE connections

We reserve the right to make technical changes.

TwinSAFE | **Bus Terminal I/O**

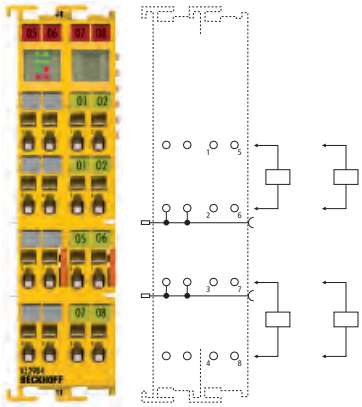
	4-channel digital input terminal, TwinSAFE, 24 V DC, Bus Terminal
Technical data	**KL1904**
Connection technology	2-wire
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Number of inputs	4
Number of outputs	–



The KL1904 Safety Bus Terminal has four fail-safe inputs.

Protocol	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	–
Current consumption K-bus	48 mA
Response time	typ. 4 ms (read input/write to K-bus)
Fault response time	≤ watchdog time (parameterisable)
Special features	4 safe inputs
Operating/storage temperature	0…+55 °C/-25…+70 °C
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 50 g
Further information	KL1904

	4-channel digital output terminal, TwinSAFE, 24 V DC, Bus Terminal
Technical data	**KL2904**
Connection technology	2-wire
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
Max. output current	0.5 A/20 mA min. (per channel)
Number of outputs	4



The KL2904 Safety Bus Terminal has four outputs.

Protocol	TwinSAFE/Safety over EtherCAT
Nominal voltage	24 V DC (-15 %/+20 %)
Current consumption power contacts	load-dependent
Current consumption K-bus	250 mA
Fault response time	≤ watchdog time (parameterisable)
Special features	4 safe outputs
Operating/storage temperature	0…+55 °C/-25…+70 °C
Approvals	CE, UL, Ex, TÜV SÜD
Weight	approx. 100 g
Further information	KL2904

We reserve the right to make technical changes.

TwinSAFE | Option cards for AX5000 Servo Drives

Significant hazards to persons arise from the dynamic movements of electrical drive equipment of machines. With the AX58xx TwinSAFE drive option cards numerous safety functions can be easily implemented by the user. Safe stop functions, safe motion functions and safe brake functions can be realised.

AX5801 | Personal protection against inadvertent restart of the drive axis (STO/SS1):

- Safe Torque Off (STO) according to IEC 61800-5-2
- control through safe 24 V DC outputs
- mains voltage and motor line remain connected

AX5805, AX5806 | Further drive-integrated safety functions according to IEC 61800-5-2. Control is performed via EtherCAT; no further wiring is required:

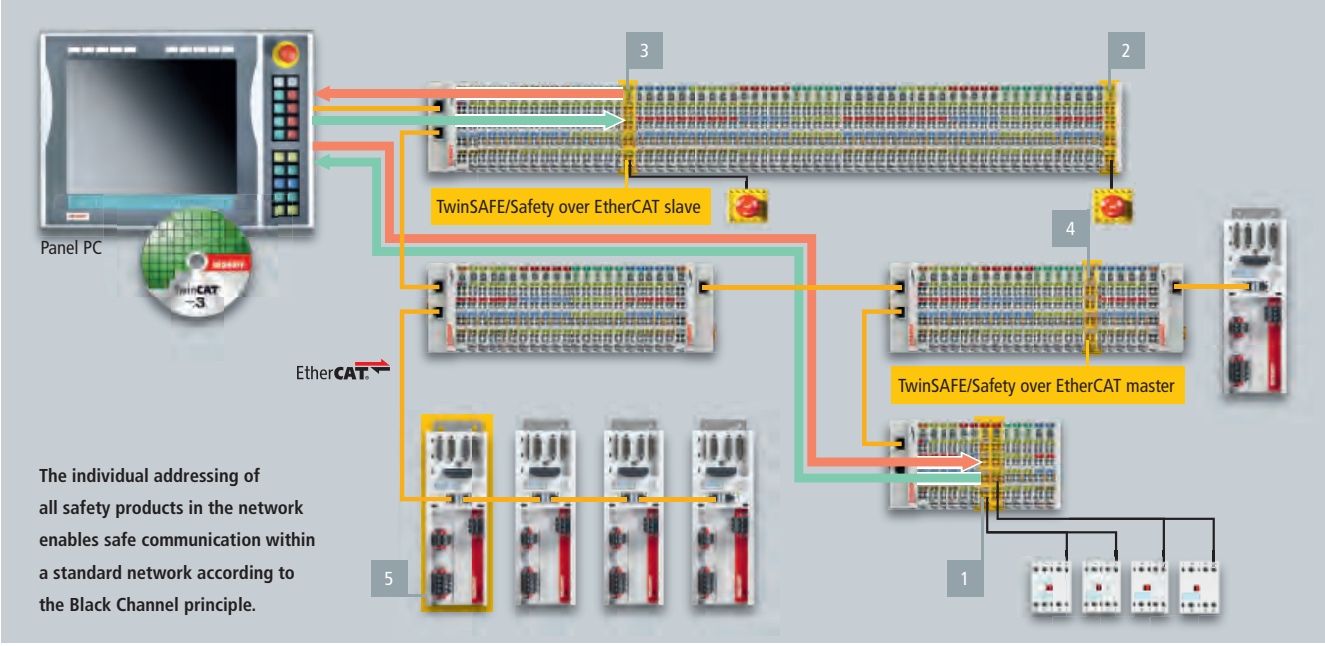
- stop functions (STO, SOS, SS1, SS2)
- speed functions (SLS, SSM, SSR, SMS) with up to 8 speeds
- position functions (SLP, SCA, SLI) with reference cams
- acceleration functions (SAR, SMA)
- rotating direction functions (SDIp, SDIn)

The AX5805/AX5806 option cards are capable of switching the motor torque-free or monitoring speed, position and direction of rotation (in accordance with DIN EN ISO 13849-1:2008 (Cat 4, PL e)). No further circuits are necessary for this, such as circuit breakers or contactors in supply lines, or special external encoder systems.

This enables a very lean installation and helps to lower costs and control cabinet space. No special encoder system is required in order to implement the SDI (Safe Direction) or SLS (Safety Limited Speed) functions; all Beckhoff standard motors can be used without modifications and without additional encoder systems for these functions. Even safe position monitoring or position range monitoring is simple to implement by means of the AX5805/AX5806 module. No additional wiring is required, since EtherCAT communication is used in the AX5000 Servo Drives. The safety option card communicates directly through the AX5000 with the TwinSAFE logic terminal present in the network.

Like the programming or configuration of the safety application, the entire parameterisation of the AX5805/AX5806 option cards takes place in TwinCAT. All system-specific settings are stored together with the application in the TwinSAFE logic terminal. For this reason, the AX5805/AX5806 TwinSAFE drive option card can be exchanged at any time without software. The card receives all necessary parameters at the next power-on or boot-up.

With the AX58xx TwinSAFE drive option card, the AX5000 servo drive is easily converted into a safe drive solution that offers the user numerous safety functions.



The individual addressing of all safety products in the network enables safe communication within a standard network according to the Black Channel principle.

We reserve the right to make technical changes.

	TwinSAFE drive option card
Technical data	**AX5801-0200**
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
	Drive-integrated safety functions: – stop functions (STO, SS1)
Operating voltage of the relays	24 V DC (-15 %/+20 %)
Operating voltage of the feedback contacts	24 V DC (-15 %/+20 %)
Max. switching current of the feedback contacts	0.35 A
Cross-section of the connections (use of ferrules is recommended)	0.2…1.5 mm²
Stripping length of the wires	10 mm
Current consumption (total for both relays)	50 mA
Weight	approx. 85 g
Operating temperature	0…+55 °C
Storage temperature	-25…+70 °C
Permissible humidity	5…95 %, non-condensing
Further environmental and operating conditions	see AX5000, page 872
Approvals	CE, UL, TÜV SÜD
Further information	AX5801

	TwinSAFE drive option card
Technical data	**AX5805-0000, AX5806-0000**
Safety standard	DIN EN ISO 13849-1:2008 (Cat 4, PL e) and IEC 61508:2010 (SIL 3)
	Drive-integrated safety functions: – stop functions (STO, SS1, SOS, SS2) – speed functions (SLS, SSM, SSR, SMS) with up to 8 speeds – position functions (SLP, SCA, SLI) with reference cams – acceleration functions (SAR, SMA) – rotating direction functions (SDIp, SDIn)
Protocol	TwinSAFE/Safety over EtherCAT
Fault response time	≤ watchdog time (parameterisable)
Weight	approx. 75 g
Environmental and operating conditions	see AX5000, page 872
Approvals	CE, UL, TÜV SÜD
Further information	AX5805

We reserve the right to make technical changes.

- Comprehensive technical assistance in the application of individual Beckhoff products or with wide-ranging services
- Support in all matters of after-sales service
- Worldwide training for Beckhoff system components

Support, Service, Training

▸ support ▸ training

1066 Support & Service
1067 Training

1068 **TwinCAT 2 Training**

Basics
1068 Compact programming TR1000
1068 Programming for those switching from PLCs TR1020
1068 Maintenance, repairs and service TR1010, TR1012

Motion Control
1069 NC Point-to-Point TR2020
1069 NC Point-to-Point and NC Interpolation TR2030

Building Automation
1069 Basic course in building automation for electricians TR5010, TR5012
1070 Building automation for system integrators TR5020
1070 BACnet training: Basics of BACnet communication TR5030
1070 BACnet programming and commissioning TR5040

Advanced
1070 TwinSAFE TR8010
1071 TwinSAFE drive option card TR8011
1071 TwinSAFE: Servicing and maintenance TR8016
1071 EtherCAT TR8020

1071 **Individual**

1072 **TwinCAT 3 Training**

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1072 Maintenance, repairs and service TR3010, TR3012
1072 Basic PLC programming TR3020
1073 Programming TR3030
1073 How to switch from TC2 to TC3 TR3040

Extended
1073 C++ module creation, wizards, TMC editor TR3042
1073 Object-oriented programming with the PLC TR3044

Motion Control
1074 NC Point-to-Point TR3050
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Advanced
1075 Basic training: TwinSAFE Terminals TR3060
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1077 **EtherCAT Developer Training**

1077 EtherCAT technology basics for developers TR8110
1077 EtherCAT workshops for developers TR8100, TR8200

Support, Service

▶ support

Beckhoff and its partners around the world offer comprehensive support and service, guaranteeing fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff Support

Beckhoff offers you comprehensive technical assistance, helping you not only with the application of individual Beckhoff products, but also with wide-ranging services:

- worldwide support
- design, programming and commissioning of complex automation systems
- training program for Beckhoff system components

Beckhoff Service

The Beckhoff service center supports you in all matters of after-sales service:

- on-site service
- repair service
- spare parts service
- hotline service

Beckhoff support and service are available to you wherever you are in the world, and can be reached by telephone, fax or e-mail. The contact addresses for your country can be found in the list of Beckhoff branches and partner companies: support

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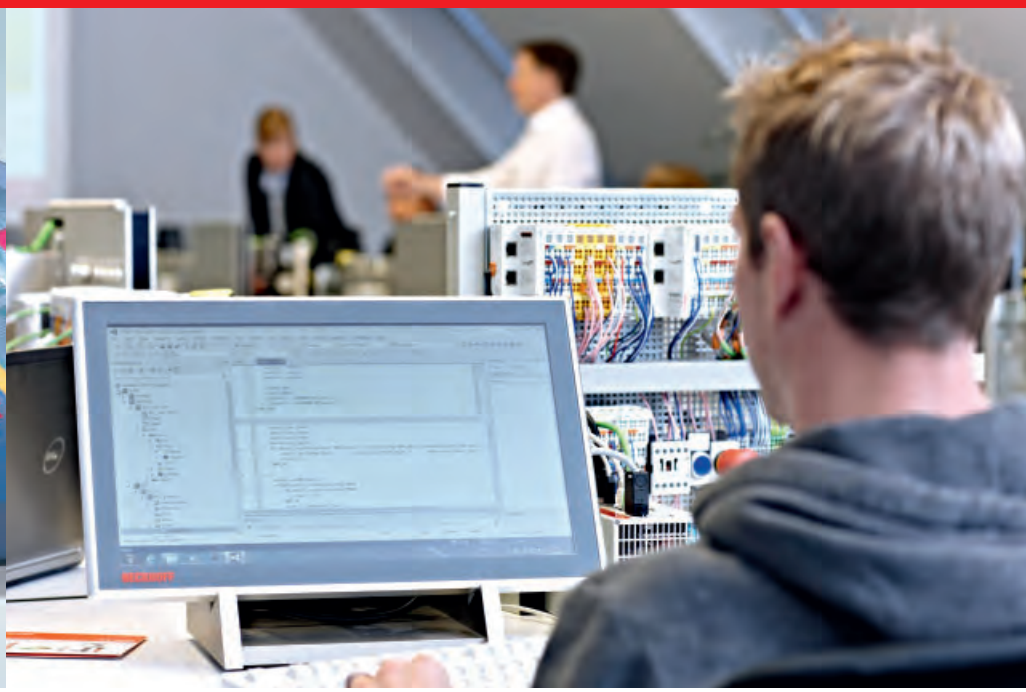
Training

▶ training

Beckhoff offers a comprehensive training program worldwide for Beckhoff system components. The training takes place at training centres at the headquarters in Germany or at the Beckhoff subsidiaries. Please contact the appropriate companies in your country with regard to training with the partner firms around the world. For addresses see page 10



TwinCAT 2 Training

TR1000 | **Compact programming**

Information	TR1000
Content	TwinCAT PLC: TwinCAT handling, IEC 61131-3 programming; TwinCAT NC PTP: basics of axis commissioning; TwinCAT ADS: communication interface, high-level language communication
Requirements	sound knowledge of Windows operating systems; experience in PLC programming; knowledge of PLC or high-level language concepts such as declaration of variables, variable classes and structures
Duration	5 days
Further information	TR1000

TR1020 | **Programming for those switching from PLCs**

Information	TR1020
Content	TwinCAT PLC: TwinCAT handling, IEC 61131-3 programming; TwinCAT NC PTP: basics of axis commissioning
Requirements	sound knowledge of Windows operating systems; experience in PLC programming
Duration	5 days
Further information	TR1020

TR1010, TR1012 | **Maintenance, repairs and service**

Information	TR1010	TR1012
Content	TwinCAT PLC: TwinCAT handling, commissioning, IEC 61131-3 programming; TwinCAT NC PTP: basics of axis commissioning; TwinCAT ScopeView for diagnostics	same as TR1010, additionally overview of Structured Text programming
Requirements	sound knowledge of Windows basic functionalities; handling of PLC systems, such as logging in and out, saving PLC programmes, etc.	
Duration	4 days	5 days
Further information	TR1010	TR1012

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TR2020 | **NC Point-to-Point**

Information	TR2020
Content	TwinCAT NC PTP: operation of TwinCAT NC feed forward, controller, functional plan; NC control with NC library blocks, cyclic interface, axis blocks; TwinCAT ScopeView: recording of the set value profiles; Motion Control (MC) blocks: standardisation of axis functions, simplifications in the use of MC blocks, advantages for programming and maintenance; programming examples; TwinCAT cam plates and MC blocks for cam plate functionality
Requirements	assured handling of TwinCAT PLC programming; solid knowledge of PLC programming; level of knowledge corresponding to courses TR1000/TR1020, or corresponding experience in IEC 61131-3 programming; programming languages: ST and Sequential Function Chart (SFC)
Duration	2 days
Further information	TR2020

TR2030 | **NC Point-to-Point and NC Interpolation**

Information	TR2030
Content	TwinCAT NC PTP: same as TR2020 without cam plates; TwinCAT NC I: creation of axis groups from single axes using function blocks from the TwinCAT libraries, creating NC programs in accordance with DIN 66025, sequential control from the System Manager, PLC libraries for creating NC channels and for controlling the interpreter, sequential control from the PLC, communication between NC program and PLC program (M functions), exchange of parameters between NC program and PLC (H, S and T), set value monitoring for the path from TwinCAT Scope
Requirements	assured handling of TwinCAT PLC programming, solid knowledge of PLC programming, level of knowledge corresponding to courses TR1000/TR1020 or corresponding experience in IEC 61131-3 programming, programming languages: ST
Duration	3 days
Further information	TR2030

TR5010, TR5012 | **Basic course in building automation for electricians**

Information	TR5010	TR5012
Content	TwinCAT PLC: TwinCAT handling, overview of IEC 61131-3; handling Embedded PC CX; building automation library	TwinCAT PLC: TwinCAT handling, overview of IEC 61131-3; handling Embedded PC CX; building automation library; overview of Structured Text programming
Requirements	sound knowledge of Windows operating systems	
Duration	3 days	4 days
Further information	TR5010	TR5012

TR5020 | **Building automation for system integrators**

Information	TR5020
Content	communication with and handling of Embedded PC CX; TwinCAT PLC: TwinCAT handling, IEC programming, overview of IEC 61131-3; TwinCAT BACnet/IP supplement; TwinCAT building automation software
Requirements	sound knowledge of Windows operating systems, experience in PLC programming
Duration	4 days
Further information	TR5020

TR5030 | **BACnet training: Basics of BACnet communication**

Information	TR5030
Content	BACnet – the idea of an open standard for building automation; BACnet network media (data link layer); BACnet objects, structure and areas of application; services for data processing; alarms in BACnet; calendar and timer functions; logging objects (trendlog, eventlog); device and network management; analysis tools, diagnostic options; planning and tendering; BACnet certificate: what are the key issues?; Common directives and customer requirements for BACnet projects: What is required?; PICS, BIBBS – How is interoperability specified?; Integration of BACnet/IP in IT infrastructures; current status of BACnet for IPv4; IPv6 outlook; BBMD – area of use and application; MS/TP – The BACnet master/slave fieldbus; outlook on future developments: Web services, new objects, CSML
Requirements	beginner's seminar; no special knowledge required
Duration	2 days
Further information	TR5030

TR5040 | **BACnet programming and commissioning**

Information	TR5040
Content	TwinCAT 2 basics; BACnet basics; simple GA application with the TCBA Project Builder; data exchange in the project; using the Excel list for project planning; adapting TCBA; BACnet advanced
Requirements	building automation basics; understanding control diagrams
Duration	5 days
Further information	TR5040

TR8010 | **TwinSAFE**

Information	TR8010
Content	integration of TwinSAFE Terminals, handling the TwinSAFE configurator, using the TwinSAFE library
Requirements	experience in handling TwinCAT software
Duration	1 day
Further information	TR8010

TR8011 | **TwinSAFE AX5805 drive option card**

Information	TR8011
Content	overview of the AX5805 option card functions, development of an example project, configuration of the option card
Requirements	experience in handling of TwinCAT software, experience in TwinCAT NC PTP, training contents of TR8010 or experience in TwinSAFE Terminals
Duration	1 day
Further information	TR8011

TR8016 | **TwinSAFE: Servicing and maintenance**

Information	TR8016
Content	introduction to the EtherCAT bus system; diagnostics and service; introduction to the TwinSAFE system; development of a TwinSAFE project; diagnostics of the TwinSAFE system; hardware exchange service case
Requirements	training contents TR1010/TR1012
Duration	2 days
Further information	TR8016

TR8020 | **EtherCAT**

Information	TR8020
Content	EtherCAT basics, configuration in the System Manager, EtherCAT diagnostics (topology view, emergency scan), oversampling terminals
Requirements	experience in handling of TwinCAT software
Duration	1 day
Further information	TR8020

TR1900 | **TwinCAT Training: Individual**

Information	TR1900
Content	agreed upon with the customer
Requirements	agreed upon with the customer
Duration	by arrangement
Further information	TR1900

TwinCAT 3 Training

TR3010, TR3012 | **Maintenance, repairs and service**

Information	TR3010	TR3012
Content	TwinCAT PLC: introduction to TwinCAT eXtended Automation Technology (XAT); TwinCAT system architecture: configuration and diagnostics, basics of IEC 61131-3 programming; TwinCAT NC PTP: basics of axis commissioning and Motion Control blocks	same as TR3010, additionally overview of Structured Text programming
Requirements	sound knowledge of basic Windows functionalities; basics of PLC systems	
Duration	4 days	5 days
Further information	TR3010	TR3012

TR3020 | **Basic PLC programming**

Information	TR3020
Content	basic PLC principles: introduction to TwinCAT eXtended Automation Technology (XAT); eXtended Automation Engineering environment (XAE), Microsoft Visual Studio® integration; hardware configuration; IEC 61131-3 programming; FBD, LD, ST and SFC editors; basic principles of ADS communication; TwinCAT NC PTP: basis of axis commissioning, motion control function blocks, TcMC2 library
Requirements	sound knowledge of PLC programming; no prior knowledge of TwinCAT 2 or IEC 61131-3 is necessary
Duration	5 days
Further information	TR3020

TR3030 | **Programming**

Information	TR3030
Content	TwinCAT PLC: introduction to TwinCAT eXtended Automation Technology (XAT), eXtended Automation Engineering environment (XAE), Microsoft Visual Studio® integration, IEC 61131-3 programming; TwinCAT NC PTP: basics of axis commissioning and motion control components; TwinCAT ADS: communication interface, high-level language link
Requirements	sound knowledge of PLC or high-level language concepts such as declaration of variables, variable classes and structures; no prior knowledge of TwinCAT 2 is necessary
Duration	5 days
Further information	TR3030

TR3040 | **How to switch from TC2 to TC3**

Information	TR3040
Content	TwinCAT PLC: introduction to TwinCAT eXtended Automation Technology (XAT), eXtended Automation Engineering environment (XAE), Microsoft Visual Studio® integration, basic differences between TC2 and TC3, principles of object-oriented programming in the PLC, integration of TcCom modules, MATLAB®/Simulink®, C/C++
Requirements	sound knowledge of TwinCAT 2 programming; basics of high-level language programming
Duration	2 days
Further information	TR3040

TR3042 | **C++ module creation, wizards, TMC editor**

Information	TR3042
Content	TwinCAT PLC: TwinCAT architecture, TwinCAT XAE (Engineering) and XAR (Runtime), opportunities and limitations of C++ programming in the TwinCAT 3 real-time environment, requirements on the development PC; TwinCAT Class Wizard: creating and debugging examples, TwinCAT TMC editor, real-time settings, task configuration multi-core support, consolidation of the above topics using practical examples
Requirements	sound knowledge of the C++ programming language
Duration	2 days
Further information	TR3042

TR3044 | **Object-oriented programming with the PLC**

Information	TR3044
Content	introduction to OOP, new: keywords of IEC 61131-3 3rd edition, implementation of a PLC example in a FB with OOP elements, inheritance, overwrite
Requirements	sound knowledge of PLC programming with TwinCAT 3, training contents of TR3030
Duration	1 day
Further information	TR3044

TR3050 | **NC Point-to-Point**

Information	TR3050
Content	operation of TwinCAT NC feed forward, controller, functional plan, NC control with NC library blocks, cyclic interface, axis blocks; TwinCAT Measurement: recording of set value profiles; Motion Control (MC) blocks: standardisation of axis functions, simplifications in the use of MC blocks, advantages for programming and maintenance, programming examples, TwinCAT cam plates and MC blocks for cam plate functionality
Requirements	assured handling of TwinCAT 3 PLC programming; solid knowledge of PLC programming; level of knowledge corresponding to courses TR3020/TR3030, or corresponding experience in IEC 61131-3 programming; programming languages: ST
Duration	2 days
Further information	TR3050

TR3052 | **NC Point-to-Point and NC Interpolation**

Information	TR3052
Content	TwinCAT NC PTP: same as TR3050 without cam plates; TwinCAT NC I: creation of axis groups from single axes using function blocks from the TwinCAT libraries, creating CNC programs, sequential control from the System Manager, PLC libraries for creating NC channels and for controlling the interpreter, sequential control from the PLC, communication between NC and PLC program (M functions), exchange of parameters between NC program and PLC (H, S and T), set value monitoring for the path from TwinCAT Scope
Requirements	assured handling of TwinCAT PLC programming; solid knowledge of PLC programming; level of knowledge corresponding to courses TR3020/TR3030, or corresponding experience in IEC 61131-3 programming; programming languages: ST
Duration	3 days
Further information	TR3052

TR3054 | **CNC**

Information	TR3054
Content	introduction to TwinCAT CNC, creating and processing CNC configurations in the System Manager, creating NC programs compliant with DIN 66025 and extensions of the CNC kernel, operating CNC interfaces via structures in the PLC, data and communication exchange between PLC and CNC using M functions and V. E. variables, recording and displaying CNC quantities using Scope View, system diagnostics facilities, operation and use of the "HLI" (high level interface), kinematic transformations, commissioning of servo drives using the CNC
Requirements	basics of programming and automation technology using TwinCAT; familiarity with TwinCAT 3 system configuration and programming; in-depth knowledge of PLC programming; contents of the courses TR3030/TR3020, or equivalent experience of IEC 61131-3 programming (we recommend advanced TwinCAT 2 users to first take the course "TR3040 | Switching from TC2 to TC3" as a basis); ST programming language
Duration	2 days
Further information	TR3054

TR3056 | **Beckhoff XTS – eXtended Transport System**

Information	TR3056
Content	presentation of the XTS system: mechanical structure, initial commissioning, module diagnostics; integration of the TcloXts TcCom module; configuration with the help of the XTS wizard; encoder system teaching procedure, error diagnostics; introduction and tuning of the TcSoftDrive, introduction to the TC3 XTS extension (automatic accumulation and collision avoidance); diagnostic options
Requirements	confidence in dealing with TwinCAT 3 NC PTP; solid knowledge of PLC programming; knowledge level of the TR3020/ TR3030 courses or appropriate experience in IEC 61131-3 programming; programming languages: ST and Sequential Function Chart
Duration	2 days
Further information	TR3056

TR3060 | **Basic training: TwinSAFE Terminals**

Information	TR3060
Content	introduction to the TwinSAFE system, integration of TwinSAFE Terminals, development of a TwinSAFE project, overview of the TwinSAFE function blocks
Requirements	experience in handling of TwinCAT 3 software experience in dealing with EtherCAT
Duration	1 day
Further information	TR3060

TR3061 | **TwinSAFE AX5805 drive option card**

Information	TR3061
Content	overview of the functions of the AX5805 option card, development of an example project, configuration of the option card
Requirements	experience in handling of TwinCAT 3 software, experience in TwinCAT NC PTP, training contents of TR3060, experience in TwinSAFE Terminals
Duration	1 day
Further information	TR3061

TR3064 | **Extended training: TwinSAFE Terminals**

Information	TR3064
Content	presentation of new analog function blocks; TwinSAFE SC; group parameterisation, replacement values and deactivation; user management
Requirements	experience in handling TwinCAT 3 software experience in dealing with EtherCAT training contents TR3060
Duration	1 day
Further information	TR3064

TR3066 | **TwinSAFE: Servicing and maintenance**

Information	TR3066
Content	introduction to the EtherCAT bus system; diagnostics and service; introduction to the TwinSAFE system; development of a TwinSAFE project; diagnostics of the TwinSAFE system; hardware exchange service case
Requirements	training contents TR1010/TR1012 or TR3010/TR3012
Duration	2 days
Further information	TR3066

TR3072 | **OPC UA**

Information	TR3072
Content	overview and benefits of OPC Unified Architecture (OPC UA); basic components of TF6100 TC3 OPC UA; operating principle of the TwinCAT OPC UA Server (architecture, configuration, symbol files, communication patterns, security, setup scenarios); operating principle of the TwinCAT OPC UA Configurator (architecture, online panel, diagnostics, certificate management); operating principle of the TwinCAT OPC UA Client (architecture, function blocks of the PLCopen_Opc_Ua library, read/write workflow, MethodCall workflow, security)
Requirements	knowledge of handling the TwinCAT system is required, such as I/O configuration, PLC handling, linking of PLC variables
Duration	1 day
Further information	TR3072

TR3076 | **EtherCAT**

Information	TR3076
Content	EtherCAT basics, diagnostics, Hot Connect, XFC, redundancy, simulation
Requirements	knowledge of handling the TwinCAT 3 software
Duration	1 day
Further information	TR3076

TR3080 | **Automation Interface**

Information	TR3080
Content	basic functions of the TwinCAT Automation Interface (combination of two technologies: Visual Studio® and TwinCAT XAE, adding TwinCAT configurations); using TwinCAT I/O functions (adding I/O devices, managing I/O templates); using TwinCAT PLC functions (adding PLC projects, adding POUs, modifying PLC program code, managing libraries, placeholders and repositories); using TwinCAT TcCOM functions (adding and parameterising TcCOM modules); using TwinCAT measurement functions (adding TwinCAT measurement projects, adding and parameterising charts, axes and channels); mapping between I/O, PLC and TcCOM modules
Requirements	knowledge of handling the TwinCAT system is required, such as I/O configuration, PLC handling, linking of PLC variables
Duration	1 day
Further information	TR3080

We reserve the right to make changes.

EtherCAT Developer Training

TR8xxx | EtherCAT seminar and workshops for developers

The workshops are aimed at developers of EtherCAT slave devices (TR8100) or EtherCAT master devices (TR8200). In addition to theoretical content these workshops also include practical exercises. It is assumed that workshop participants have access to an EL9820 evaluation kit (slave workshop) or the ET9200 Master Sample Code (master workshop). Basic EtherCAT knowledge is assumed. The workshops are held by developers in manageable groups so that individual interests can be addressed.

TR8110	EtherCAT technology basics for developers
Ordering information	training location: Verl/Nuremberg, Germany
	duration: 1 day
Further information	course contents and requirements see training

TR8100	EtherCAT evaluation kit workshop for slave developers
Ordering information	training location: Verl/Nuremberg, Germany
	duration: 1 day
Further information	course contents and requirements see training

TR8200	EtherCAT Master Sample Code workshop for master developers
Ordering information	training location: Verl/Nuremberg, Germany
	duration: 1 day
Further information	course contents and requirements see training

News

▶ news

Here you can get detailed information on new items of the Beckhoff product portfolio. Animations, videos and interactive online presentations add to the large variety of information.

Print media

▶ media

The Beckhoff catalogs and flyers are available for download on the Internet. Printed copies are available on request. Please use our online order form to specify your requirements.

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Online manual

The Beckhoff Information System provides information about Beckhoff products. Consisting of individual documentation, it includes technical information, manuals, sample codes, the knowledge base and much more.

TwinCAT

▶ TwinCAT

TwinCAT automation software can be downloaded as a full version or as a runtime version. The trial period for the runtime version is seven days.

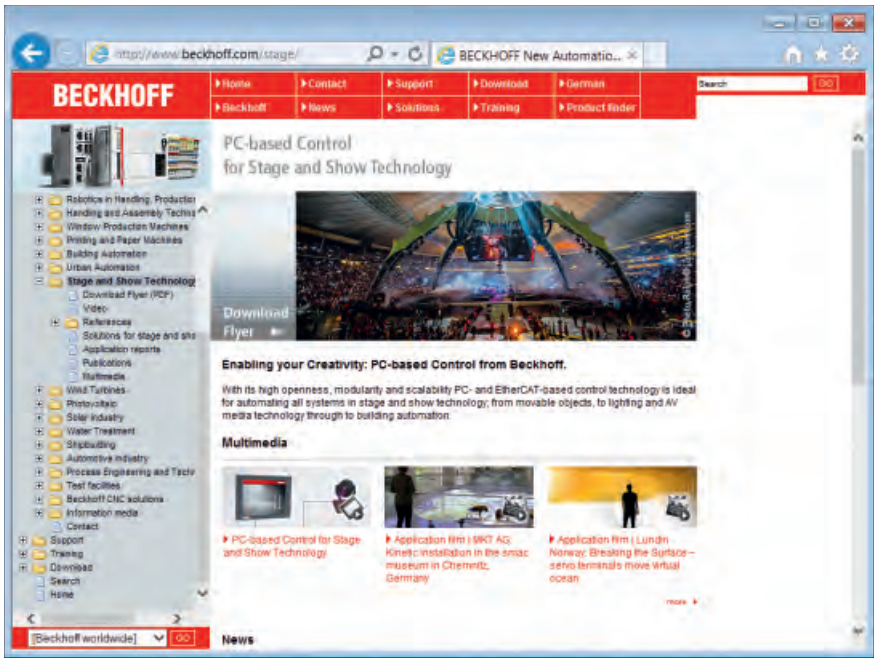
Documentations

▶ documentations

In addition to all information contained in the printed catalog, the online service offers additional information, available in PDF or CHM (Compiled HTML) file format: detailed documentation and manuals for Beckhoff products and software updates, technical drawings and configuration files for fieldbus components.

PC Control – The universal and industry-independent control solution

▶ applications



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PC Control “The New Automation Technology Magazine”

Order no. DK600x

PC Control Magazine

A further source of information is PC Control, the Beckhoff company magazine. PC Control is issued four times per year and includes general automation technology reports, particularly from the areas of IPC, I/O, Motion and Automation, and PC-based control technology. The online version of the Beckhoff company magazine can be found . All contribu-tions are available both in German and in English as web pages or as PDF fi les. The reports are supplemented with links to background or other additional information. The previous issues of PC Control are available in the archive for online viewing or for downloading.

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Print media

▶ media

Products & technologies

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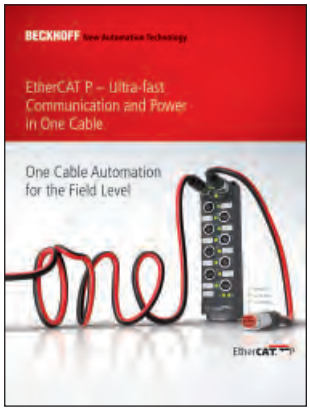
AX8000



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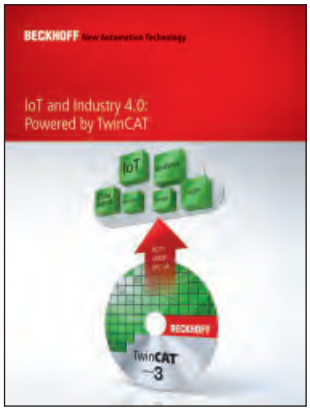
EtherCAT P



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IoT and Industrie 4.0

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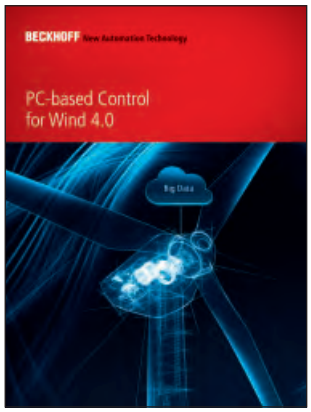
TwinCAT HMI

We reserve the right to make changes.

Applications & solutions flyers



Order no. DK357x

Wind Energy

Order no. DK365x

Shipbuilding

Order no. DK369x

Print and Paper Industry

Order no. DK364x

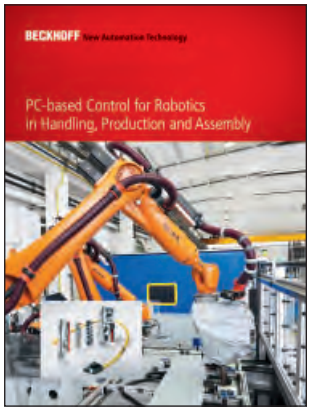
Stage and Show Technology

Order no. DK351x

Wood Industry

Order no. DK354x

Packaging Industry



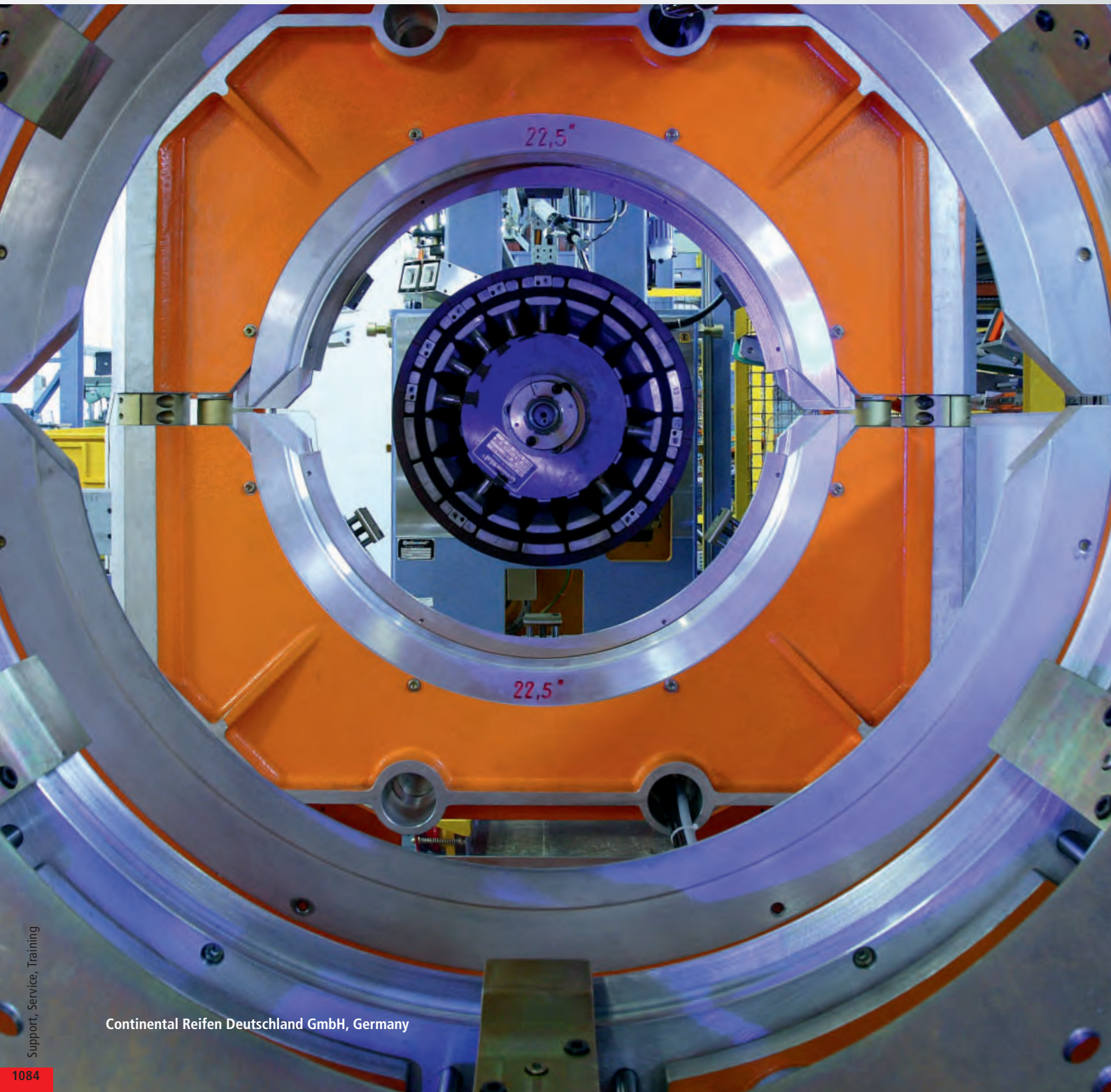
Order no. DK358x

Robotics

Order no. DK355x

Rubber and Tire Industries

In use worldwide: PC-based Control.



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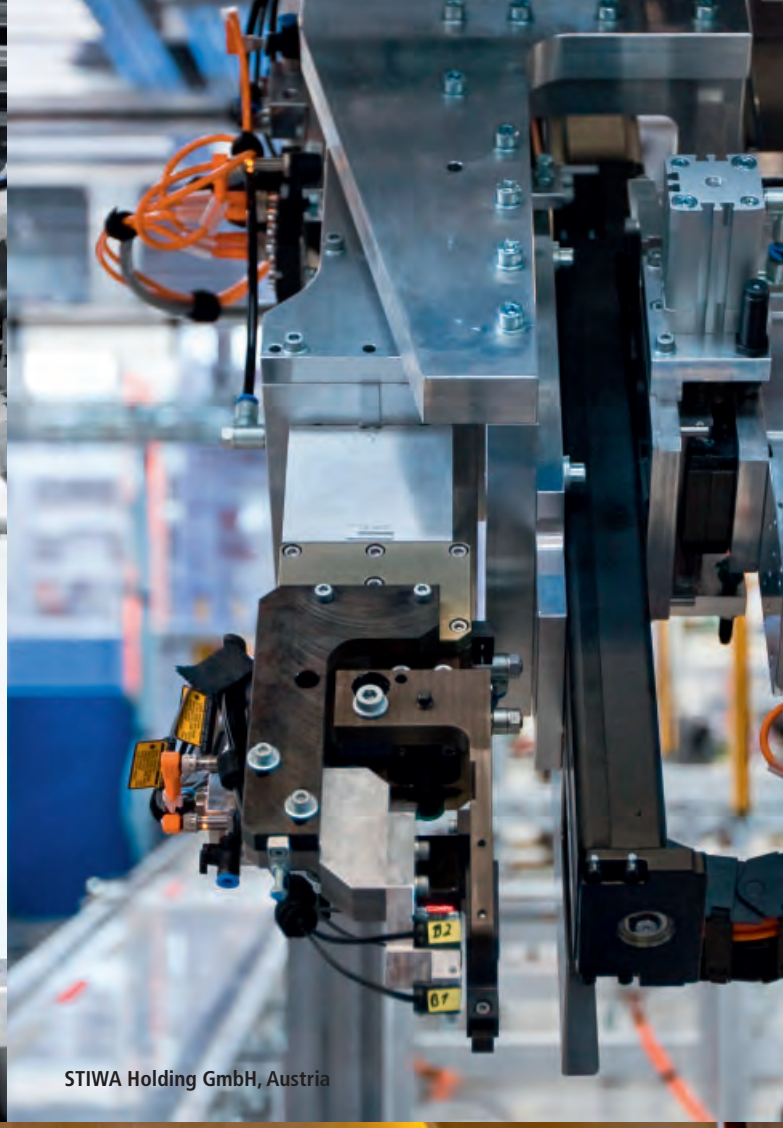

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Jilin City People's Grand Theatre, China

Eventions Products BV/Statecore
Innovative Entertainment Technology BV,
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Therme Wien GmbH & Co KG, Austria

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Microsoft Deutschland GmbH, Germany

Jet Edge Inc., USA

International units | Measures, weights and temperature

Linear measures	
1 inch (in)	25.4 mm
1 foot (ft)	30.48 cm

Square measures	
1 square inch (sq in)	6.4516 cm^2
1 square foot (sq ft)	0.09290306 m^2

Weights	
1 pound (lb)	453.59237 g
1 ounce (oz)	28.3495 g

Fahrenheit (°F)	Celsius (°C)
$t_F = 9/5 * t_C+32$	$t_C = 5/9 * (t_F-32)$

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