Documentation

CU2608

8-port Ethernet Switch with IP67 protection class

Version: 2.0.0
Date: 2016-01-21

BECKHOFF

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1 Foreword

1.1 Notes on the documentation

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.
It is essential that the following notes and explanations are followed when installing and commissioning these components.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Disclaimer

The documentation has been prepared with care. The products described are, however, constantly under development. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics. In the event that it contains technical or editorial errors, we retain the right to make alterations at any time and without warning. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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The EtherCAT Technology is covered, including but not limited to the following patent applications and patents: EP1590927, EP1789857, DE102004044764, DE102007017835 with corresponding applications or registrations in various other countries.

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1.2 Safety instructions

Safety regulations

Please note the following safety instructions and explanations!
Product-specific safety instructions can be found on following pages or in the areas mounting, wiring, commissioning etc.

Exclusion of liability

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

Personnel qualification

This description is only intended for trained specialists in control, automation and drive engineering who are familiar with the applicable national standards.

Description of symbols

In this documentation the following symbols are used with an accompanying safety instruction or note. The safety instructions must be read carefully and followed without fail!

 **DANGER**	**Serious risk of injury!** Failure to follow the safety instructions associated with this symbol directly endangers the life and health of persons.
 **WARNING**	**Risk of injury!** Failure to follow the safety instructions associated with this symbol endangers the life and health of persons.
 **CAUTION**	**Personal injuries!** Failure to follow the safety instructions associated with this symbol can lead to injuries to persons.
 **Attention**	**Damage to the environment or devices** Failure to follow the instructions associated with this symbol can lead to damage to the environment or equipment.
 **Note**	**Tip or pointer** This symbol indicates information that contributes to better understanding.

1.3 Documentation issue status

Version	Comment
2.0.0	- Migration
1.1.0	- Pin assignment for M12 socket added to introduction
1.0.0	- First public issue (technical data updated)
0.5.0	- draft

2 Product overview

2.1 Introduction

Fig. 1: CU2608

8-port Ethernet switch in protection class IP67

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. It is installed either via two central 4 mm screws or two diagonally arranged 3 mm screws.

The CU2608 meets the special requirements of real-time capable Industrial Ethernet solutions with outstanding features:

- Compact design with IP67 plastic housing
- Eight d-coded M12 sockets
- 10/100 MBaud, half or full duplex, with automatic baud rate detection
- Cross-over detection: automatic detection and correction of crossover and straight-through Ethernet cables
- Clear, fast diagnosis, one LED per Ethernet port
- Simple mounting in the field

Socket pin assignment, 4-pin M12

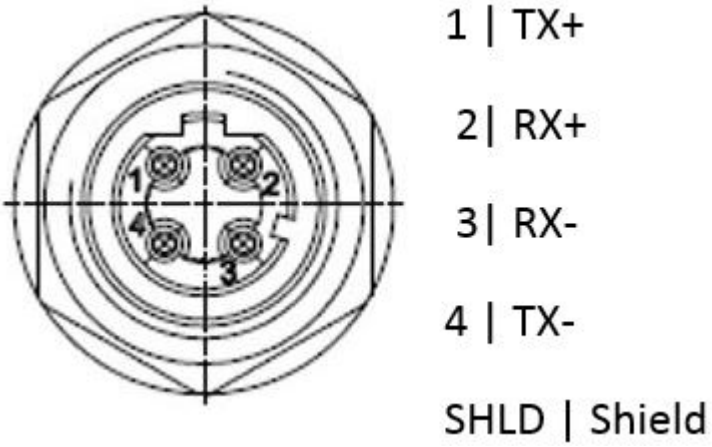

Fig. 2: Socket pin assignment, 4-pin M12

2.2 Basic function principles

Store and Forward

The switch operates according to the *store-and-forward* principle. Frames that are faulty (CRC error), too short (< 64 bytes) or too long (> 1536 bytes) are generally not passed on.

Address Memory

The switch learns the MAC addresses of the connected devices for each port. Only frames that have these addresses, broadcast/or multi-cast addresses, or which have unknown addresses are passed on to this port. Because the switch remembers more than 1000 addresses for each port, it is also suitable for connecting entire network segments. After approx. 5 minutes (Aging Time) unused addresses are removed from the memory – if required, they are re-learnt again later.

Throughput

The switch can pass through up to 148800 Ethernet frames per second (Wire Speed).

PoE - Power over Ethernet

The CU20xx, CU22xx and CU26xx switches do not support PoE according to IEEE 802.3; they do not reveal themselves as PSE (power sourcing equipment) or PD (powered devices). Any PSE connected to the switch must therefore not apply a voltage.
No provision is made in the standard for passive interconnection or distribution.

Jumbo Frames

Jumbo Frames are oversized Ethernet telegrams with a length of more than 1518 bytes. They are used in applications that require very high data throughput, for example.

The CU2208 (from hardware version 01) supports Jumbo Frames up to 9720 bytes on all ports. Please note the following:

- Jumbo Frames only supported by ports with Gbit link
- Jumbo Frames place high demands on internal data transmission. It is therefore necessary to assess the data throughput that can be achieved through the CU2208 for each individual application. Under full load no more than 2 ports can be used for Jumbo Frames at the same time.

Jumbo Frames are not subject to standardization. It is therefore necessary to verify that the frames used by the application are supported by the CU2208.

2.3 Technical data

Technical data	CU2608-0000
Bus system	Ethernet (all IEEE 802.3-based protocols) Store-and-forward switching mode, unmanaged
Number of Ethernet ports	8
Ethernet interface	10BASE-T/100BASE-TX Ethernet with M12, d-coded
Cable length	up to 100 m CAT5, switches cascadable as required
Baud rate	10/100 Mbit/s, IEEE 802.3u auto-negotiation, Half or full duplex at 10 and 100 Mbit/s possible, automatic settings
Diagnostics	1 LED per channel: link/activity, LED for power supply
Power supply	Power supply and transfer via: M8 connector, 4-pin
Supply voltage	24 V_{DC} (-15 %/+20 %)
Current consumption	typically 120 mA
Weight	approx. 350 g
Dimensions without connector (W x H x D)	approx. 126 x 60 x 26,5 mm
Mounting [▶ 11]	• Directly on mounting surface via two central 4 mm screws or two diagonally arranged 3 mm screws. • On ZS5300-0001 mounting rail.
permissible ambient temperature range during operation	-30°C ... + 70°C
permissible ambient temperature range during storage	-40°C ... + 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
Protection class (according to EN 60529)	IP65, IP66, IP67
Installation position	Any
Approval	CE

3 Mounting and cabling

3.1 Dimensions

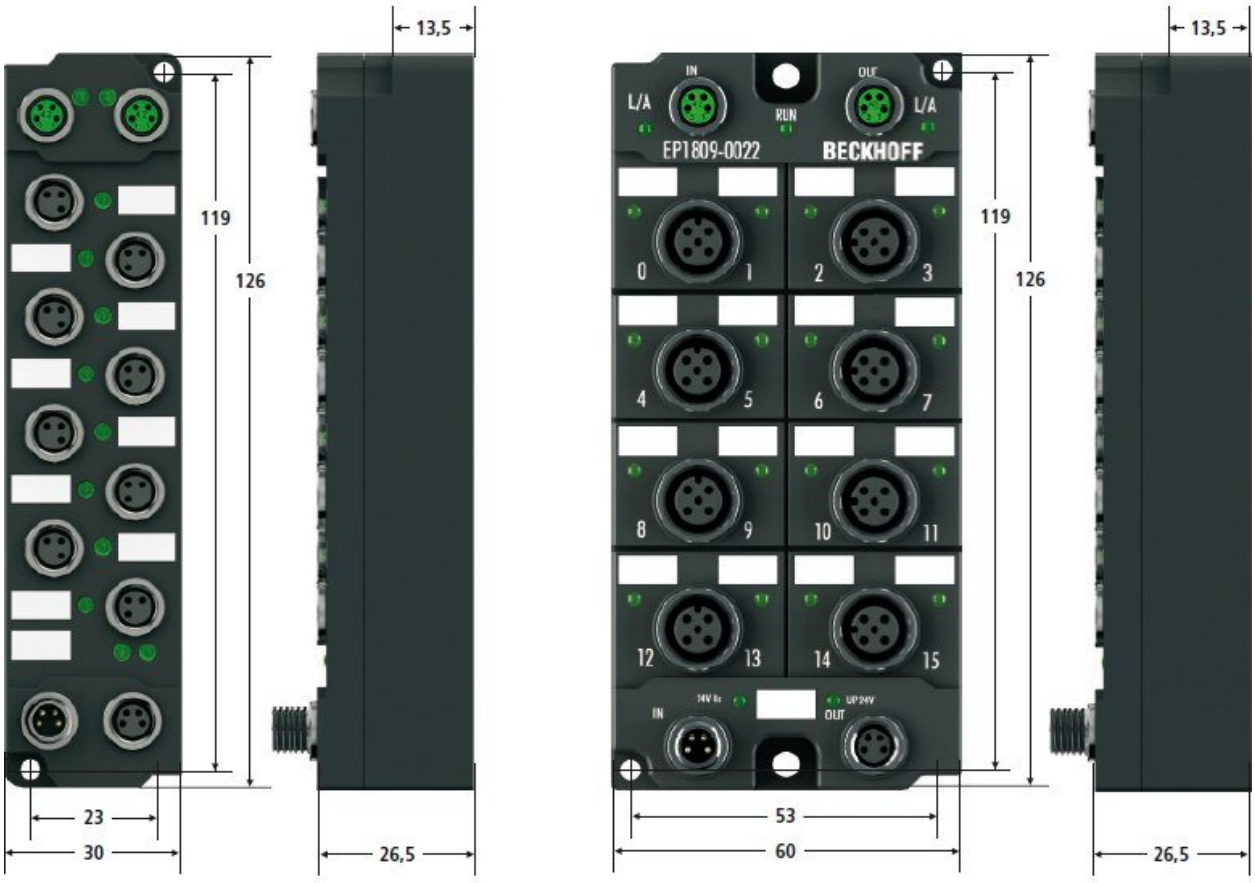

Fig. 3: Dimensions (all dimensions are given in millimeters)

Housing features

EtherCAT Box	Narrow housing	Wide housing
Housing material	PA6 (polyamide)	
Sealing compound	Polyurethane	
Mounting	Two mounting holes Ø 3 mm for M3	Two mounting holes Ø 3 mm for M3 Two mounting holes Ø 4.5 mm for M4
Metal parts	Brass, nickel-plated	
Contacts	CuZn, gold-plated	
Current transfer	max. 4 A	
Installation position	variable	
Protection class	in screwed state IP65/66/67 (according to EN 60529)/	
Dimensions (H x W x D)	approx. 126 x 30 x 26.5 mm	approx. 126 x 60 x 26.5 mm
Weight	approx. 125 g, depending on module type	approx. 250 g, depending on module type
Approvals	CE, cULus	CE

3.2 Mounting

Note	**Protect connectors against soiling** Protect all connections from contamination during module installation! Protection class IP65 can only be guaranteed if all cables and connectors are connected! Unused connections must be protected with the appropriate connectors! Connector sets see catalogue.

Modules with narrow housing are installed with two M3 screws.
Modules with wide housing are installed with two M3 screws in the mounting holes in the corners or two M4 screws in the central mounting holes.

The bolts must be longer than 15 mm. The mounting holes in the modules have no thread.

Note when mounting that the overall height is increased further by the fieldbus connections. See the Accessories section

Mounting rail ZS5300-0001

The mounting rail ZS5300-0001 (500 mm x 129 mm) allows time-saving configuration of the modules.

The rail is made of 1.5 mm thick stainless steel (V2A) and features ready-made M3 threads. The rail has 5.3 mm slots for mounting on the machine with M5 screws.

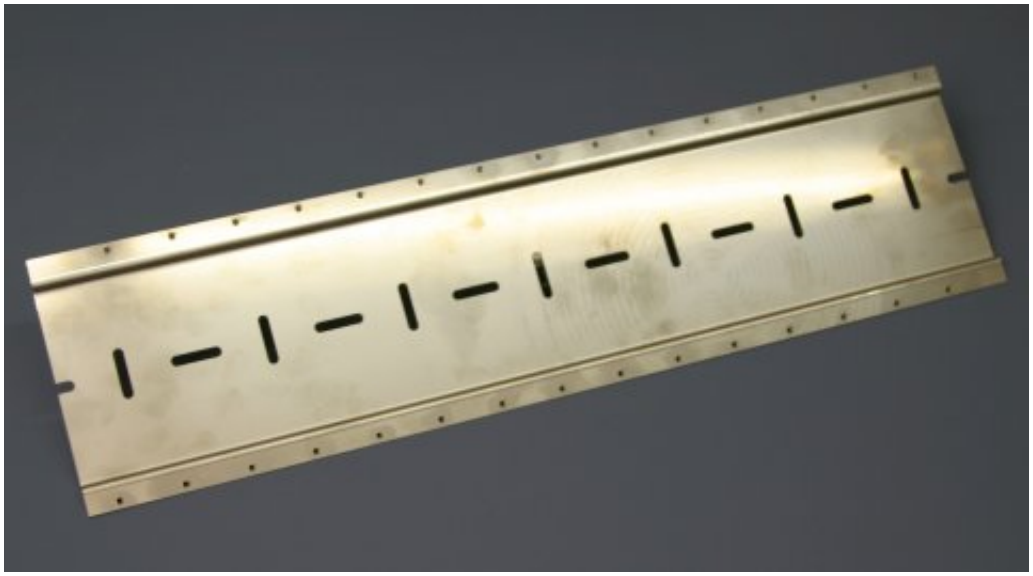

Fig. 4: Mounting rail

The mounting rail is 500 mm long and enables the installation of 15 narrow modules, with a distance of 2 mm between them. It can be shortened as required for your particular application.

3.3 Tightening torque for connectors

M8 connector

We recommend fastening the M8 connector with a torque of **0.4 Nm**.

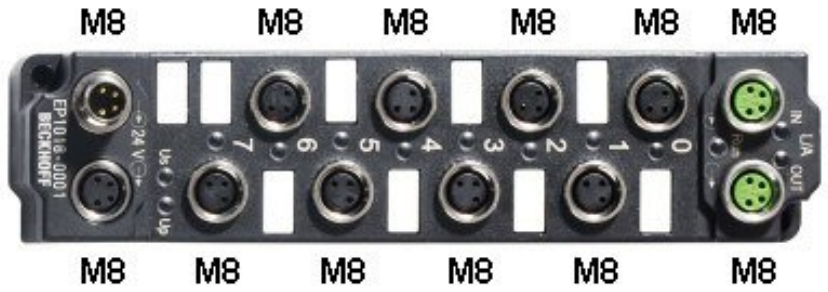

Fig. 5: M8 connector

M12 connector

We recommend fastening the M12 connector with a torque of **0.6 Nm**.

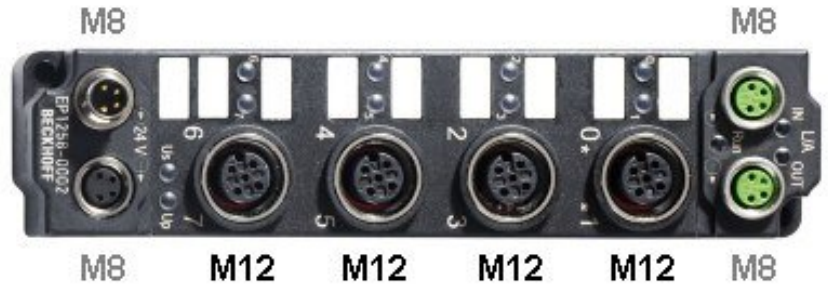

Fig. 6: M12 connector

Torque wrench

Note	**Ensure the proper torque is used** Use torque wrenches available from Beckhoff to tighten the connectors (see accessories [▶ 20])!

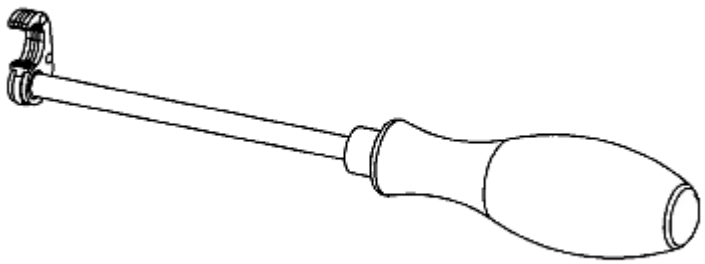

Fig. 7: Torque wrench

3.4 Power cable

Ordering data

Order identifier	Power cable	Screw connector	Contacts	Cross-section	Length
ZK2020-3200-0020	Straight socket, open end	M8	4-pin	0.34 mm²	2.00 m
ZK2020-3200-0050					5.00 m
ZK2020-3200-0100					10.00 m
ZK2020-3400-0020	Angled socket, open end				2.00 m
ZK2020-3400-0050					5.00 m
ZK2020-3400-0100					10.00 m
ZK2020-3132-0001	Straight socket, straight connector				0.15 m
ZK2020-3132-0005					0.50 m
ZK2020-3132-0010					1.00 m
ZK2020-3132-0020					2.00 m
ZK2020-3132-0050					5.00 m
ZK2020-3334-0001	Angled socket, angled connector				0.15 m
ZK2020-3334-0005					0.50 m
ZK2020-3334-0010					1.00 m
ZK2020-3334-0020					2,00 m
ZK2020-3334-0050					5.00 m

Further available power cables and the associated data sheets can be found in the Beckhoff catalogue or on our website (http://www.beckhoff.de).

Technical data

Data	
Rated voltage according to IEC61076-2-101	30 V_{DC}
Contamination level according to IEC 60 664-1	3/2
Insulation resistance IEC 60 512-2	>10^9W
Current carrying capacity according to IEC 60512-3	4 A
Volume resistance according to IEC 60512-2	< 5 mW
Protection class conforms to IEC 60529	IP65/66/67, when screwed together
Ambient temperature	-30°C to +80°C

3.5 Conductor losses

The ZK2020-xxxx-yyyy power cables should not exceed the total length of 15 m at 4 A (with continuation). When wiring, note that with a rated voltage of 24 V the function of the modules can no longer be guaranteed from a voltage drop of 6 V. Variations in the output voltage from the power supply unit must also be taken into account.

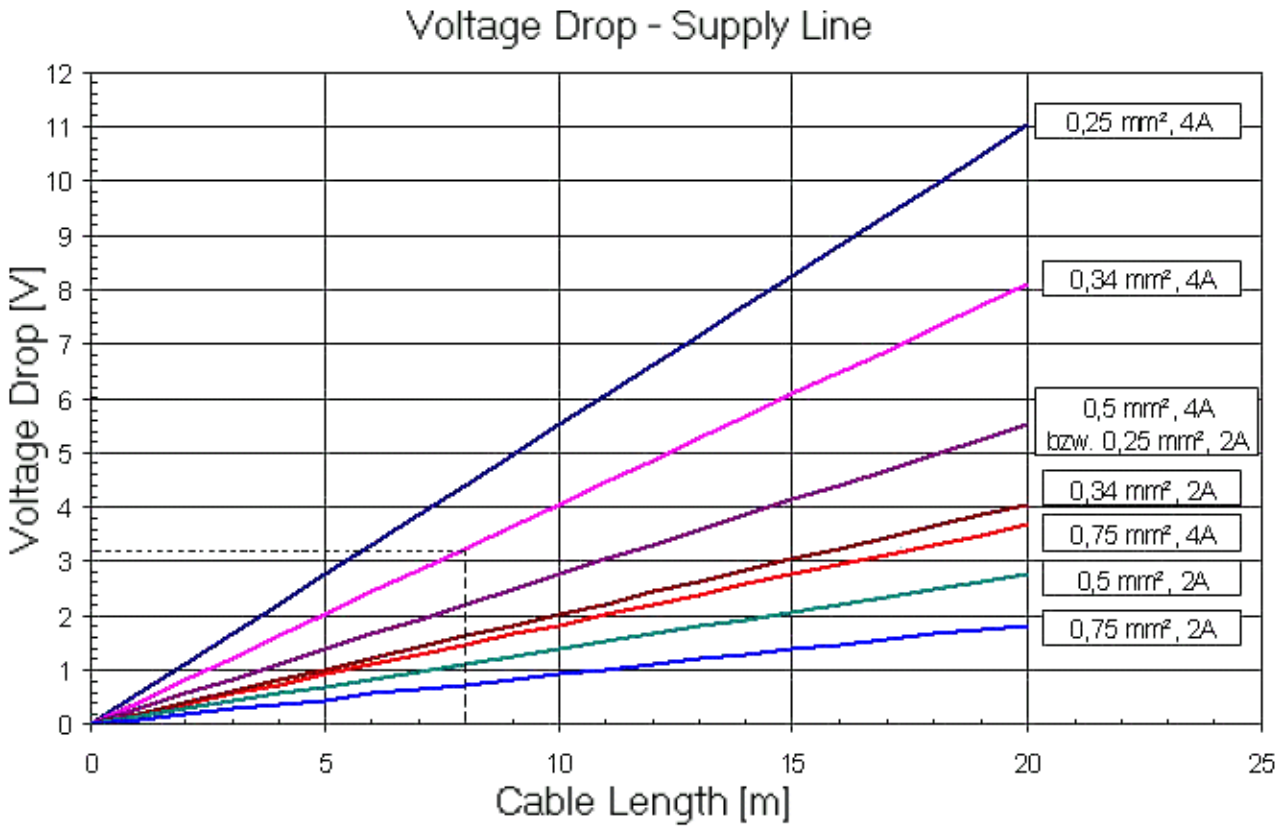

Fig. 8: Voltage drop in the power supply line

Example:
8 m power cable with 0.34 mm² cross-section has a voltage drop of 3.2 V at 4 A.

3.6 LED indicators

Ethernet

Fig. 9: LEDs CU2608

An LED for each of the eight channels shows the current status.

Table 1: LEDs per channel

LED	Display	
Link Act	off	No connection
	on	Connection available (link)
	flashing	Data transfer (act)

Supply voltage

Fig. 10: Supply voltage

LED	Display	Meaning
24 V Us (control voltage)	off	the power supply voltage, Us, is not present
	green illuminated	the power supply voltage, Us, is present
	red illuminated	Due to overload (current > 0.5 A), the sensor supply generated from the supply voltage Us was switched off for all sensors supplied from it.
24 V Up (peripheral voltage)	off	the power supply voltage, Up, is not present
	green illuminated	The power supply voltage, Up, is present

The peripheral voltage Up is not required in the CU2608 and is therefore passed through.

3.7 Ethernet cable

For connecting Ethernet devices, only use shielded Ethernet cables with a minimum specification of **category 5 (CAT5) according to EN 50173 and ISO/IEC 11801**.

Note	**Wiring recommendations** Detailed recommendations for Ethernet wiring can be found in the documentation "Design recommendations for EtherCAT/Ethernet infrastructure", which is available for download from http://www.beckhoff.de/.

Ethernet uses four cable wires for signal transmission. Due to automatic cable detection (auto-crossing) symmetric (1:1) or cross-over cables can be used between Ethernet devices from BECKHOFF.

A selection of pre-configured cables (up to 10 m) and cables sold by the meter is provided below. Other cables with various lengths will be found in the full Beckhoff catalogue, and under www.beckhoff.de.

Sold by meter

Name	Description
ZB9010	CAT 5e, 4-core, for fixed laying, not for M8 connectors
ZB9020	CAT 5e, 4-core, suitable for drag chain use, not for M8 connectors
ZB9030	PVC, Ø 4.9 mm for M8 connectors
ZB9031	PUR, Ø 4.8 mm for M8 connectors
ZB9032	PUR, Ø 5.4 mm for M8 connectors, high flexibility

ZK1090-6161-00xxx: 2 x M12 connector (d-coded), pre-assembled

Fig. 11: ZK1090-6161-0xxx.

ZK1090-6161-	0005	0010	0020	0025	0050	0100
Length	0.5 m	1.0 m	2.0 m	2.5 m	5.0 m	10 m

ZK1090-6191-00xxx: M12 connector - RJ45 connector, pre-assembled

Fig. 12: ZK1090-6191-0xxx

ZK1090-6191-	0005	0010	0020	0025	0050	0100
Length	0.5 m	1.0 m	2.0 m	2.5 m	5.0 m	10 m

ZK1090-6292-00xxx: M12 socket - RJ45 connector, pre-assembled

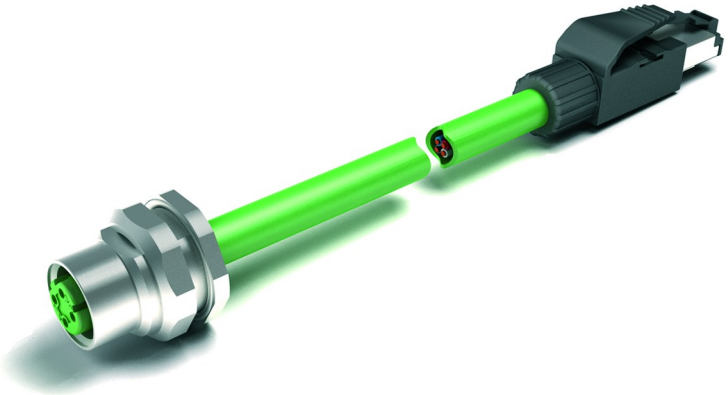

Fig. 13: ZK1090-6292-0xxx

ZK1090-6292-	0005	0020	0050	0100
Length	0.5 m	2 m	5 m	10 m

ZK1090-9191-00xxx: 2 x RJ45 connector, patch cable

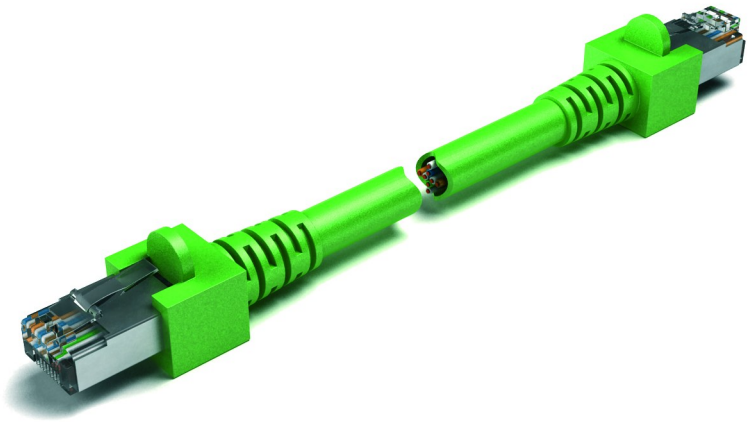

Fig. 14: ZK1090-9191-0xxx

ZK1090-9191-	0001	0002	0005	0010	0020	0030	0040	0050	0100	0150
Length	0.17 m	0.26 m	0.5 m	1.0 m	2.0 m	3.0 m	4.0 m	5.0 m	10 m	15 m

ZK1090-9191-	0200	0250	0300	0350	0400	0450	0500
Length	20 m	25 m	30 m	35 m	40 m	45 m	50 m

4 Appendix

4.1 General operating conditions

Protection classes according to IP code

The levels of protection are defined and divided into different classes in the IEC 60529 standard (DIN EN 60529). The designation follows the scheme below.

1st digit: Protection against ingress of dust and access to hazardous parts	Meaning
0	Non-protected
1	Protection against access to hazardous parts with back of hand. Protection against ingress of solid foreign objects = 50 mm diameter
2	Protection against access to hazardous parts with a finger. Protection against ingress of solid foreign objects = 12.5 mm diameter
3	Protection against access to hazardous parts with a tool. Protection against ingress of solid foreign objects = 2.5 mm diameter
4	Protection against access to hazardous parts with a wire. Protection against ingress of solid foreign objects = 1 mm diameter
5	Protection against access to hazardous parts with a wire. Protection against ingress of dust. Ingress of dust is not prevented completely, although the quantity of dust able to penetrate is limited to such an extent that the proper function of the device and safety are not impaired
6	Protection against access to hazardous parts with a wire. Dust-proof. No ingress of dust

2nd digit: Protection against ingress of water*	Meaning
0	Non-protected
1	Protection against dripping water
2	Protection against dripping water (housing tilted up to 15°)
3	Protection against spraying. Water sprayed at an angle of up to 60° from vertical must not have any adverse effect
4	Protection against splashing. Water splashing against the housing from any direction must not have any adverse effects
5	Protection against jetting.
6	Protection against powerful jetting.
7	Protection against the effects of temporary immersion. The quantity of water being able to penetrate if the housing is submerged in water for 30 minutes at a depth of 1 m must not have any adverse effects

*) These protection classes only define protection against ingress of water.

Chemical resistance

The resistance refers to the fieldbus box housing and the metal components used.

Type	Resistance
Water vapor	unstable at temperatures > 100 °C
Sodium hydroxide solution (pH value > 12)	stable at room temperature unstable > 40 °C
Acetic acid	unstable
Argon (technically pure)	stable

Legend

stable: service life several months
limited stability: service life several weeks
unstable: service life several hours, rapid decomposition

4.2 EtherCAT Box - accessories

Table 2: Mounting

Ordering information	Description
ZS5300-0001	Mounting rail (500 mm x 129 mm)

Table 3: Labelling material, plug

Ordering information	Description
ZS5000-0000	Fieldbus box set M8 (inscription labels, sealing plugs)
ZS5000-0002	Fieldbus box set M12 (inscription labels, sealing plugs)
ZS5000-0010	M8 plugs IP67 (50-off)
ZS5000-0020	M12 plugs IP67 (50-off)
ZS5100-0000	Inscription labels, blank, 4 strips of 10
ZS5100-xxxx	Printed inscription labels on enquiry

Table 4: Tool

Ordering information	Description
ZB8800	Torque socket wrench with ratchet for molded-on M8 connector
ZB8800-0001	Ratchet for field-configurable M8 connector
ZB8800-0002	Ratchet for molded-on M12 connector

Note

Further accessories

You can find further accessories in the price list for fieldbus components from Beckhoff and on our website at www.beckhoff.de.

4.3 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

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List of Illustration