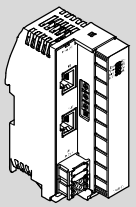
Bus module
CPX-E-EC



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Instructions for use 8071147
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Bus module CPX-E-EC (EtherCAT) . . . . . English

1 About this document

This document describes the use of the above-mentioned product.
Certain aspects of use are described in other documents and must be observed ➔ 1.1 Further applicable documents.
EtherCAT® is a registered trademark of the trademark holder in certain countries.

1.1 Further applicable documents

Document	Contents
Description of system CPX-E (CPX-E-SYS)	Detailed description of system CPX-E
Instructions for using system CPX-E (CPX-E-SYS)	Instructions and important notes on mounting, electrical installation and maintenance tasks for a system CPX-E
Description of bus module CPX-E-EC (CPX-E-EC)	Detailed description of product function and parameterisation possibilities
Device description file (ESI)	Definition of the modules of a system CPX-E for integration into the higher-order controller
Documentation for the components in a system CPX-E and the connected peripherals	Information on using the components
Documentation for the higher-order controller and the additional participants in the network	Information on commissioning and parameterisation of the components

Fig. 1

All available documents for the product ➔ www.festo.com/pk.

1.2 Product version

This document refers to the following product versions:

Product	Version
CPX-E-EC	Bus module CPX-E-EC as of Revision 1

Fig. 2

The product version can be identified from the product label or with the help of appropriate software from Festo.

Suitable software for determining the product version is available on the Festo Support Portal ➔ www.festo.com/sp. Information on using the software can be found in the integrated Help function.

There may be an updated version of this document for these or later product versions.
- Check whether a corresponding version of this document is available on the Festo Support Portal ➔ www.festo.com/sp.

1.3 Product labelling

The product labelling is located on the left-hand side of the module. Scanning the printed Data Matrix Code with an appropriate device calls up the Festo Support Portal, with information appropriate for the product. Alternatively, the product key (11-digit alphanumeric code on the product labelling) can be entered in the search field of the Support Portal.

You can find detailed information on the product labelling in the description of the module ➔ 1.1 Further applicable documents.

1.4 Specified standards

Version status		
EN 60529:2013-10		IEC 61784:2014-08
EN 61000-6-2:2009-04		IEC 61918:2013-08
EN 61000-6-4:2011-09		IEEE 802.3:2014-00
IEC 60204-1:2014-10		ISO/IEC 8802-3:2000-10
IEC 61158:2014-07		NE 21:2012-05

Fig. 3

2 Safety

2.1 General safety information

- Take into consideration the legal regulations for the respective destination.
- Use the product only within the defined values (➔ 13 Technical data).
- Observe product labelling.
- Observe further applicable documents ➔ 1.1 Further applicable documents.
- Store the product in a cool, dry, UV-protected and corrosion-protected environment. Ensure storage times are short.
- Before working on the product: Switch off the power supply and secure it against being switched on again.
- Observe the handling specifications for electrostatically sensitive devices.

2.2 Intended use

The product described in this document is exclusively intended to be used as an interface between a system CPX-E and a higher-order controller by means of participation in an EtherCAT network.
The products must be used only as follows:
– In an industrial environment only: Outside of industrial environments – in commercial and mixed-residential areas, for example – actions to suppress interference may have to be taken.
– Use only in combination with modules and components that are permissible for the respective product variant ➔ www.festo.com/catalogue.
– Only use the product if it is in perfect technical condition.
– Only use the product in original status without unauthorised modifications. Only the conversions or modifications described in this and the further applicable documents are permitted.

2.3 Training of qualified personnel

Installation, commissioning, maintenance and disassembly should only be conducted by qualified personnel.
The qualified personnel must be familiar with the installation of electrical control systems.

3 Additional information

– Accessories ➔ www.festo.com/catalogue
– Spare parts ➔ www.festo.com/spareparts

4 Service

- Contact your regional Festo contact person if you have technical questions ➔ www.festo.com.

5 Product overview

5.1 Function

The product acts as a participant in an EtherCAT network, establishing a connection between a higher-order controller and the modules in a system CPX-E.

Web server

The integrated web server provides read access to the key parameters and diagnostic functions of the system CPX-E.

The web server can be reached via the Ethernet over EtherCAT (EoE) protocol and must be configured accordingly in the controller.
The IP address and the subnet mask must be assigned individually.
You can find detailed information on accessing the web server in the description of the module ➔ 1.1 Further applicable documents.

5.2 Product design

1 LED indicators
2 Rotary and DIL switches
3 Terminal strip for operating voltage supply $U_{EL/SEN}$ [XD]
4 Terminal strip interlock
5 Network connection [OUT]
6 Linking
7 Network connection [IN]

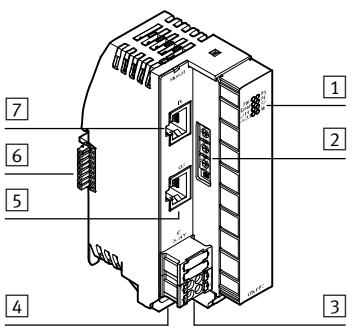


Fig. 4

5.3 Display components

1 Network-specific LED indicators:
- EtherCAT operating status [Run] (green, orange)
- EtherCAT error [Error] (red, orange)
- Connection status [LA IN]/[LA OUT] (green)

2 System-specific LED indicators:
- Operating voltage supply $U_{EL/SEN}$ [PS] (green)
- Load voltage supply U_{OUT} [PL] (green)
- System fault [SF] (red)
- Force mode [M] (yellow)

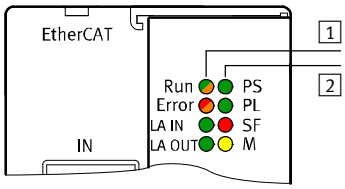


Fig. 5

The network-specific LED indicators are described later ➔ 10 Diagnostics and fault clearance.
The system-specific LED indicators are described in the "Instructions for using system CPX-E" ➔ 1.1 Further applicable documents.

5.4 Control components

Electrostatically sensitive devices.
- Before setting the address using the rotary switches, ensure your own body is electrostatically discharged.

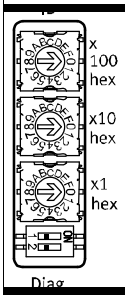
Rotary/DIL switches	Function
	The 3 rotary switches are used to set the hexadecimal coding for the EtherCAT Explicit Device ID of the bus module. **Possible settings** 0 = stored EtherCAT address, no Explicit Device ID assigned 1 ... 4095 (1_h ... fff_h) = permitted address range If 0 is set, the EtherCAT master will automatically assign the bus module address (autoincrement). Factory setting: 0
	Use the DIL switches to set the internal system diagnostics or the bootloader ➔ Fig. 7.

Fig. 6

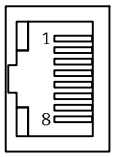
DIL switches		Function
	DIL 1: OFF DIL 2: OFF	No diagnostics[1]
	DIL 1: OFF DIL 2: ON	Status bits activated
	DIL 1: ON DIL 2: OFF	I/O diagnostic interface activated
	DIL 1: ON DIL 2: ON	Bootloader activated[2]

1) Factory setting
2) For restoring after a failed firmware update via the Festo Field Device Tool (FFT).

Fig. 7

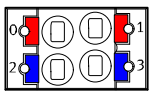
Changes to the rotary and DIL switches only take effect following a restart of the bus module.

5.5 Connecting components

[IN], [OUT] connection		Signal	Designation
	1	TD+	Transmitted data +
	2	TD–	Transmitted data –
	3	RD+	Received data +
	4	n.c.	–
	5	n.c.	–
	6	RD–	Received data –
	7	n.c.	–
	8	n.c.	–
	1)	Shield	Functional earth

1) Housing

Fig. 8

Connection [XD][1]		Signal
	0	+24 V DC operating voltage supply $U_{EL/SEN}$
	1	
	2	0 V DC operating voltage supply $U_{EL/SEN}$
	3	

1) The ports XD.0 and XD.1 and also XD.2 and XD.3 are interconnected in the terminal strip.

Fig. 9

6 Conveying and storage

- Observe specifications for the environmental and storage conditions ➔ 13 Technical data.

7 Mounting

- Mount the module as outlined in the "Instructions for using system CPX-E" ➔ 1.1 Further applicable documents.

8 Installation

8.1 Network

- Use cables as described in the cable specification ➔ Fig. 17.

8.2 Operating voltage supply $U_{EL/SEN}$

1. Make sure that the power supply is switched off.
2. Connect the lines to the terminal strips as outlined in the "Instructions for using system CPX-E" ➔ 1.1 Further applicable documents.

9 Commissioning

Note

Malfunction due to the activation of the higher-order controller and system CPX-E in the incorrect order.
- Switch on the higher-order controller and system CPX-E according to the preset order of the network used.

1. Using the appropriate software, set up an automation project for the higher-order controller.
2. Import the device description file into the software ➔ www.festo.com/sp.
3. Configure system CPX-E in the software:
   - System structure
   - Network addressing
   - I/O addressing
4. Transfer the automation project to the higher-order controller.

You can find more information on commissioning system CPX-E in the "Instructions for using system CPX-E". Information on the parameters can be found in the "Description of system CPX-E" and the descriptions of the modules being used ➔ 1.1 Further applicable documents.

Behaviour of the display components after error-free commissioning

[Run] (green)	[Error] (red)	[LA IN], [LA OUT] (green)
Lights up	Off	Lights up[1]

1) Flashes when data traffic occurs

Fig. 10

[PS] (green)	[PL] (green)	[SF] (red)	[M] (yellow)
Lights up	Lights up	Off	Off

Fig. 11

Information on troubleshooting in the event of incorrect behaviour can be found in the "Description of system CPX-E" and the descriptions of the modules being used ➔ 1.1 Further applicable documents.

10 Diagnostics and fault clearance

10.1 Diagnostics options

Various options are available for diagnosing errors:
- Internal system diagnostics
- LED indicators on the product

10.2 Internal system diagnostics

The internal system diagnostics process is described in the "Description of system CPX-E" and the module descriptions ➔ 1.1 Further applicable documents.

10.3 LED indicators

This document describes the network-specific LED indicators. The system-specific LED indicators are described in the documentation for system CPX-E ➔ 1.1 Further applicable documents.

EtherCAT operating status [Run]

LED (green, orange)	Significance	Remedy
 Lights up green	Operational Normal operating status	–
 Flashes green	Pre-operational Configuration of EtherCAT network	–
 Flashes green[1)]	Safe-operational Only the input signals (e.g. sensor data) are updated. The outputs retain their current status.	–
 Flickers green	Bootstrap The bus module receives a firmware update.	–
 Lights up orange	Bootloader or firmware update active	–
 Off	Init Normal status after switching on or after a restart.	–

1) Single flash: short flashing once (1x flash, pause, 1x flash, etc.)

Fig. 12

EtherCAT error [Error]

LED (red, orange)	Significance	Remedy
 Lights up red	Serious communication error (application controller failure) Possible causes: – Application controller not responding – Watchdog timeout due to ESC	• Contact Festo's service team (➔ www.festo.com).
 Flashes red	Configuration error (invalid configuration), no network connection. Possible causes: – Line/connection interrupted – No connection to master – Master is not active	• Check network connections. • Check configuration and addressing of bus module.
 Flashes red[1)]	EtherCAT state change (unsolicited state change) from Operational to Safe-Operational due to synchronisation error	–
 Flashes red[2)]	Application watchdog timeout Watchdog timeout due to sync manager	–
 Flashes red[3)]	Reserved	–
 Flickers red	Booting error Checksum error in application controller flash memory	–
 Lights up orange	Bootloader or firmware update active	–
 Off	No error	–

1) Single flash: short flashing once (1x flash, pause, 1x flash, etc.)
2) Double flash: short flashing twice (2x flash, pause, 2x flash, etc.)
3) Triple flash: short flashing three times (3x flash, pause, 3x flash, etc.)

Fig. 13

Connection status [LA IN]/[LA OUT]

LED (green)	Significance	Remedy
 Lights up	Network connection OK	–
 Flickers[1)]	Data traffic ongoing	–
 Off	No network connection	• Check network connection.

1) Fast flickering represents lighting up; the light intensity depends on the data traffic.

Fig. 14

11 Maintenance

➔ **Note**

Accumulation of heat due to reduced air supply to electronics.
- Keep the ventilation slots free and regularly remove contamination.

12 Disposal

- Dispose of the packaging and the product at the end of its useful life through environmentally friendly recycling in accordance with applicable specifications.

13 Technical data

General

Key feature		Specification/value
General technical data, system CPX-E		Description of system CPX-E ➔ 1.1 Further applicable documents
Dimensions (length x width x height)	[mm]	125.8 x 37.8 x 76.5
Product weight[1)]	[g]	145
Mounting position		Vertical/horizontal
Ambient temperature	[°C]	–5 ... +60 (–5 ... +50)[2)]
Storage temperature	[°C]	–20 ... +70
Air humidity (non-condensing)	[%]	0 ... 95
Assigned address space (inputs/outputs)		
Without diagnostics	[bit]	–/–
With status bits	[bit]	16[3)]/–
With I/O diagnostic interface	[bit]	16/16
Module code/submodule code (CPX-E-specific)		222/37
Module identification		E-EC
Degree of protection in accordance with EN 60529		IP20
Protection against electric shock (protection against direct and indirect contact to IEC 60204-1)		Through the use of PELV circuits (Protected extra-low voltage)
Electromagnetic compatibility		To EN 61000-6-2/-4 and NE 21

1) Including linking
2) With horizontal mounting position
3) Status bits occupy 2 bytes of address space, although only 8 bits are used (8 bits remain unused).

Fig. 15

Power supply

Key feature		Specification/value
Operating voltage supply for electronics/sensors ($U_{EL/SEN}$)	[V DC]	24 ± 25 %
Intrinsic current consumption at nominal operating voltage 24 V from $U_{EL/SEN}$	[mA]	50
Reverse polarity protection 24 V $U_{EL/SEN}$ against 0 V $U_{EL/SEN}$		Yes
Mains buffering time	[ms]	20

Fig. 16

Network-specific

Key feature		Specification/value
Protocol		EtherCAT[1)]
Specification[2)]		IEC 61158, IEC 61784, IEC 61918, ISO/IEC 8802-3
Transmission rate	[Mbps]	100
Crossover detection		Auto-MDI/MDI-X
Maximum cable length per segment	[m]	100
Cable specification		
Cable type		Ethernet twisted pair cable, screened
Transmission class		Category Cat 5 or higher
Cable diameter	[mm]	6 ... 8
Wire cross section	[mm²]	0.14 ... 0.75; 22 AWG[3)]

1) Based on Ethernet protocol IEEE 802.3, optimised for process data, real-time-capable
2) Standards with reference to EtherCAT
3) Required for maximum connection length between network participants

Fig. 17