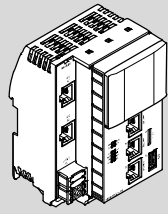


# Controller CPX-E-CEC-...-PN



## FESTO

**Festo AG & Co. KG**  
Rüter Straße 82  
73734 Esslingen  
Germany  
+49 711 347-0  
www.festo.com

Instructions for use  
(Original instructions)

8071195  
2017-06  
[8071197]

### Controller CPX-E-CEC-...-PN (PROFINET IO) ..... 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.

PI PROFIBUS PROFINET IO®, Modbus®, EtherCAT®, Windows®, CoDeSys® and SoftMotion® are registered trademarks of the respective brand owner in certain countries.

#### 1.1 Further applicable documents

Document	Table of contents
Description of system CPX-E	Detailed description of the system CPX-E
Instructions for use of system CPX-E	Instructions and important notes on mounting, electrical installation and maintenance tasks for system CPX-E
Description of controller CPX-E-CEC-...-PN	Detailed description of controller CPX-E-CEC-...-PN
Device description file (GSDML)	Definition of the modules in system CPX-E for integration into a higher-order controller.
CoDeSys Installation and Start.pdf	Handling CoDeSys
CoDeSys_OPC_Ser ver_V3_User_Guide.pdf	→ Installation directory of the software
Online help for CoDeSys V3	Detailed information on using the product with CoDeSys V3 and the Festo extensions.
Online help for CoDeSys libraries	Description of the function blocks for an expanded function range of controller CPX-E-CEC

Fig. 1



All available documents for the product → [www.festo.com/pk](http://www.festo.com/pk).

#### 1.2 Product version

This document refers to the following product versions:

Product	Programming	Version number
CPX-E-CEC-C1-PN	With CoDeSys V3	Revision 01 and above
CPX-E-CEC-M1-PN	With CoDeSys V3 and SoftMotion	Revision 01 and above

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 support portal of Festo → [www.festo.com/sp](http://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 in the Support Portal of Festo → [www.festo.com/sp](http://www.festo.com/sp).

#### 1.3 Product labelling

The product label 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 or product label) can be entered in the search field of the Support Portal.



Detailed information on product labelling can be found in the description of the module → 1.1 Further applicable documents.

#### 1.4 Specified standards

Version status	
EN 60529:2013-10	IEC 60204-1:2014-10
EN 61000-6-2:2009-04	IEC 61158:2014-07
EN 61000-6-4:2011-09	IEC 61784:2014-08
NE 21:2012-05	IEC 61918:2013-08

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 (→ 12 Technical data).
- Observe product labelling.
- Observe further applicable documents → 1.1 Further applicable documents.
- Protect the product during storage and operation from damaging influences. Damaging influences include:
  - Corrosion-causing coolant or other materials (e.g., ozone)
  - Grinding dust, glowing chips or sparks
- Before work on the product, make sure the voltage supply is switched off and secured against reactivation.
- Observe the handling specifications for electrostatically sensitive devices.
- Activate the load voltage first when the system is properly installed, configured and parameterised.

### 2.2 Use for intended purpose

The product described in this document is defined as an autonomous CoDeSys controller for system CPX-E. Interfaces for PROFINET IO are available for communication with a higher-order controller. An EtherCAT master interface enables connection to lower-order devices → 5 Product overview.

The product is used only as follows:

- Use only in an industrial environment: Outside of industrial environments, e.g. in commercial and mixed-residential areas, 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](http://www.festo.com/catalogue).
- Use in technically perfect original status without unauthorised modifications. Only the conversions or modifications described in this and the other applicable documents are permitted.

### 2.3 Training of specialized personnel

Installation, commissioning, maintenance and disassembly should only be conducted by qualified personnel.

The qualified personnel must be familiar with installation and operation of electrical control systems.

## 3 Further information

- Accessories → [www.festo.com/catalogue](http://www.festo.com/catalogue)
- Spare parts → [www.festo.com/spareparts](http://www.festo.com/spareparts)

## 4 Service

- Contact your regional Festo contact person if you have technical questions → [www.festo.com](http://www.festo.com).



Including the following information will make it easier to process support queries:

- Save/send the CoDeSys project from the project archive → Menu command in CoDeSys V3: [File][Project archive][Save/send archive]
- Version of the programming environment → Menu command in CoDeSys V3 [Help][Information...][Version information...]
- Controller data → Copy data properties with suitable software of Festo, e.g. Festo Field Device Tool (FFT).

## 5 Product overview

### 5.1 Function

Together with additional CPX-E modules, the product forms a CPX-E system that can be commissioned using CoDeSys V3.

#### Network integration (industrial Ethernet)

The product can be integrated directly into a higher-order network. Communication is implemented through PROFINET IO. Modbus/TCP and standard Ethernet (TCP/IP) are also supported.

#### EtherCAT master

EtherCAT slave devices can be connected to the product.

#### CoDeSys libraries and plug-ins

Various libraries and plug-ins for CoDeSys V3 is available for the easy actuation and visualisation of CPX-E modules.

#### 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 accessed by entering the IP address in the address bar of a web browser.

IP address of controller: 192.168.2.1 (factory setting)

### 5.2 Product design

- 1 Network connection PROFINET IO Port 1 [XF1]
- 2 Network connection PROFINET IO Port 2 [XF2]
- 3 Cover of slot for optional extension
- 4 LED display components
- 5 Ethernet network connection [ETH 1]
- 6 MicroSD slot [Card]
- 7 USB interface [USB]
- 8 EtherCAT master network connection [EC]
- 9 Ethernet network connection [ETH 2]
- 10 Terminal strip for operating voltage supply  $U_{EL/SEN}$  [XD]
- 11 Terminal block interlock

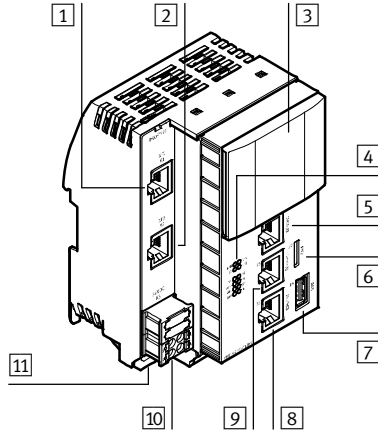


Fig. 4

### 5.3 Display components

#### Module-specific LED indicators

- Application [Run] (green)
- Connection/data traffic [LA ETH 1][LA ETH 2][LA EC] (green)



Fig. 5

#### 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. 6

#### Network-specific LED indicators for PROFINET IO

- Network fault [NF] (red)
- Reserved [M/P]
- Connection [XF1][XF2] (green)

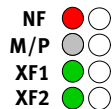


Fig. 7

**i** The system-specific LED displays are described in the "Instructions for use of system CPX-E" → 1.1 Further applicable documents. The module- and network-specific LED displays are described further below → 9.3 LED displays.

### 5.4 Control components

#### Run/stop switch

The run/stop switch is located under the cover [3].

- 1 DIL switch for run/stop
- 2 Reserved

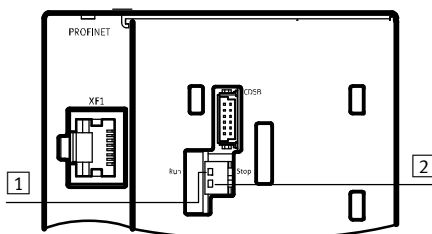


Fig. 8

Switch status	Functions
Run (standard setting)	A project can be started using CoDeSys (run mode active). A CoDeSys boot application can be started.
Stop	A project can <b>not</b> be started using CoDeSys. A CoDeSys boot application can <b>not</b> be started.
Run → stop	A project that is running will be stopped.
Stop → run	A project stopped by the run/stop switch is continued again.

Fig. 9

### 5.5 Connecting components

#### Operating voltage supply [XD]

Connection [XD] <sup>1)</sup>	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 connections X3.0 and X3.1 and also X3.2 and X3.3 are interconnected in the terminal strip.

Fig. 10

#### Network connections

Connection	Functions
[XF1]	PROFINET IO port 1
[XF2]	PROFINET IO port 2
[ETH 1]	Ethernet interfaces for the connection of a programming device, PC or CDPX operating unit.
[ETH 2]	
[EC]	EtherCAT master

Fig. 11

RJ45 port	Signal	Designation
[XF1], [XF2], [EC], [ETH1], [ETH2]	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.	-
	2) Shield	Functional earth

2) Housing

Fig. 12

#### Memory card slot [Card]

The slot is used to save data and results to a memory card CAMC-M-MS-G32.

- The data are saved in the directory /mnt/sdcard.
- The data is accessed through SysFile and CAA.File → CoDeSys libraries.

#### Requirements

- Maximum memory size: 32 GB
- Formatting: FAT32 (one partition only)



#### Note

Damage due to incorrect handling.

- When using a memory card, observe the direction and orientation.



#### Note

- Use only memory cards offered by Festo as accessories for the product → [www.festo.com/catalogue](http://www.festo.com/catalogue).

Festo assumes no guarantee for the use of other memory cards.



#### Note

- Do not use memory cards for continuous data recording. The memory card slot is only intended for user-monitored operation.



Memory cards cannot be used to execute CoDeSys boot projects.

## USB interface [USB]

The USB interface (A-coded socket, USB specification 2.0) is used to save data and results to external storage media.

- The data of the USB memory is stored in the /mnt/usb directory.
- The data is accessed through SysFile and CAA.File → CoDeSys libraries.

### Requirements

- Maximum memory size: 32 GB
- Formatting: FAT32 (one partition only)



#### Note

Impermissible operating states of the controller result from high current consumption at the USB interface.

- Only storage media with a current consumption of  $\leq 0.5$  A are used.



#### Note

- Do not use storage media for continuous data recording. The USB interface is only intended for user-monitored operation.



USB storage devices cannot be used to execute CoDeSys boot projects.

## 6 Transport and storage

- Observe specifications on the environmental and storage conditions → 12 Technical data.

## 7 Installation

### 7.1 Network



#### Note

Transmission errors due to faulty installation or excessive transmission rates.

- Observe the line specifications in the documentation of the controller.



#### Note

Unauthorised access to the product can cause damage or malfunctions. When connecting the product to a network:

- Protect the network against unauthorised access. Measures for the protection of the network, for example:
  - Firewall
  - Intrusion prevention system (IPS)
  - Network segmentation
  - Virtual LAN (VLAN)
  - Virtual private network (VPN)
  - Safety at physical access level (port security)

Additional information → directives and standards for security in information technology, e.g., IEC 62443, ISO/IEC 27001. An access password only protects against unintentional modification.

### 7.2 Operating voltage supply $U_{EL/SEN}$



#### Note

Malfunction due to faulty installation.

- Observe the information regarding the line specification, voltage supply and earthing measures in the “Instructions for use of system CPX-E” → 1.1 Further applicable documents.

1. Ensure the voltage supply is deactivated.
2. Connect the lines to the terminal strip according to the “Instructions for use of system CPX-E” → 1.1 Further applicable documents.

## 8 Commissioning



Information regarding the commissioning of system CPX-E can be found in the “Instructions for use of system CPX-E.” Information on the parameters can be found in the “Description of system CPX-E” and in the descriptions of the modules used → 1.1 Further applicable documents.

## 8.1 Behaviour of the display components after error-free commissioning





Module-specific LED indicators			
[PS] (green)	[PL] (green)	[SF] (red)	[M] (yellow)
 Lights up	 Lights up	 Off	 Off

Fig. 13





Network-specific LED indicators for PROFINET IO			
[NF] (red)	[M/P] (green/yellow)	[XF1] (green)	[XF2] (green)
 Off	 Off	 Lights up or flashes	 Lights up or flashes

Fig. 14

Information on error elimination in case of deviating behaviour can be found in the “Description of system CPX-E” and in the descriptions of the modules used → 1.1 Further applicable documents.

## 8.2 Commissioning with CoDeSys



### Caution

Risk of injury due to uncontrolled movements of the connected actuators.

- Perform test runs of projects and applications without active actuators first.

- For the configuration, parameterisation and programming of the product: use CoDeSys V3.

### Prerequisites

- PC (Windows 7 or higher) with Ethernet interface
- Components for network connection
- Programming software CoDeSys V3
- Package CPX-E-CEC compliant with firmware of product → [www.festo.com/sp](http://www.festo.com/sp)

### Preparations

For the installation and operation of programming software CoDeSys V3, administration rights are required.

1. Install CoDeSys V3.
2. Start CoDeSys V3 with administration rights.
3. Open Package Manager → Menu command [Tools][Package Manager].
4. Install the current Package for CPX-E-CEC → online help of CoDeSys V3 → “Package-Manager”.
5. Restart CoDeSys V3 in order to use the new Package.
6. Connect the controller to the network connection [ETH 1] or [ETH 2] through a switch/hub or directly to the PC → 7.1 Network.
7. Adapt the network settings → Menu command [Online][Scan Festo Devices] → online help of CoDeSys V3 → “Scan Festo Devices”.

The current version of package CPX-E-CEC for CoDeSys V3 can be found on the Support Portal of Festo → [www.festo.com/sp](http://www.festo.com/sp). Additional support can be found in the product-specific help → Online help of CoDeSys V3 → “Erste Schritte”.

## 8.3 Commissioning on higher-order controller

A device description file is available for the commissioning of CPX-E-CEC... on a PROFINET master system.

## 9 Diagnostics and fault clearance

### 9.1 Diagnostics options

For the diagnostics of errors, various possibilities are available:

- Internal system diagnosis
- LED indicators on the product

### 9.2 Internal system diagnosis

The internal system diagnostics is described in the “Description of system CPX-E” and in the descriptions of the modules used → 1.1 Further applicable documents.

### 9.3 LED displays

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

## Module-specific LED indicators



Operation [Run]		
LED (green)	Significance	Remedy
 Lights up	CoDeSys application is running	–
 Off	CoDeSys application is not available or has stopped	–

Fig. 15




Ethernet interfaces [LA ETH 1][LA ETH 2]		
LED (green)	Significance	Remedy
 Lights up	Ethernet connection established at the switch port – status “Link”	–
 Flashes	Ethernet connection established at the switch port – status “Activity”	–
 Off	No connection at the switch port or line not connected	• Check connection.

Fig. 16




EtherCAT interface [LAEC]		
LED (green)	Significance	Remedy
 Lights up	Ethernet connection established at the EtherCAT® port – status “Link”	–
 Flashes	Ethernet connection established at the EtherCAT® port – status “Activity”	–
 Off	No connection at the EtherCAT port or line not connected	• Check connection.

Fig. 17

## Network-specific LED indicators for PROFINET IO




Network fault [NF]		
LED (red)	Significance	Remedy
 Flashes	Network connection not OK. Possible causes: • Device name not correct • No connection to master • Incorrect configuration • PROFINET IO controller defective	• Check device name. • Switch on master. • Correct MAC addresses for fieldbus interface. • Repair controller.
 Flashes	Network connection interrupted, short-circuited or disturbed	• Check network connection.
 Off	Network connection to PROFINET IO controller active, no network fault.	–

Fig. 18




Connection status [XF1][XF2]		
LED (green)	Significance	Remedy
 Lights up	PROFINET IO connection established – status “Link”	–
 Flashes	Module locating in progress when both LEDs are flashing in synchronisation, e.g., for troubleshooting or configuration.	–
 Off	No connection at the respective port or line not connected.	• Check network connection.

Fig. 19

## 10 Maintenance



### Note

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

### 10.1 Firmware maintenance (update)

- Update of the controller firmware with suitable software from Festo  
→ [www.festo.com/sp](http://www.festo.com/sp).

## 11 Disposal

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

## 12 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 <sup>1)</sup> )	[mm]	124.3 x 75.9 x 82.5
Product weight <sup>2)</sup>	[g]	288
Assembly position	Vertical/horizontal	
Ambient temperature	[°C]	-5 ... +60 (-5 ... +50) <sup>3)</sup>
Storage temperature	[°C]	-20 ... +70
Air humidity	[%]	0 ... 95
Module code/submodule code		
CPX-E-CEC-C1-PN	222/100	
CPX-E-CEC-M1-PN	222/101	
Module identification	E-CEC	
Degree of protection to EN 60529	IP20	
Protection against electric shock (protection against direct and indirect contact to IEC 60204-1)	Through the usage of PELV circuits (protective extra-low voltage)	
Electromagnetic compatibility	To EN 61000-6-2/-4 and NE 21	
CE marking (see declaration of conformity → <a href="http://www.festo.com">www.festo.com</a> )	To EU EMC Directive According to EU Machinery Directive The device is intended for use in an industrial environment. Measures for interference suppression may be required in residential areas.	

1) Including cover (Fig. 4 [3]), without linking

2) Including linking

3) With horizontal mounting position

Fig. 20

## Power supply

Key feature	Specification/value	
Operating voltage supply of electronics/sensors ( $U_{EL/SEN}$ )	[V DC]	24 ± 25 %
Intrinsic current consumption at nominal operating voltage 24 V from $U_{EL/SEN}$	[mA]	130
Reverse polarity protection 24 V $U_{EL/SEN}$ against 0 V $U_{EL/SEN}$	Yes	
Mains buffering time	[ms]	20

Fig. 21

## Network-specific

Feature	Specification/value	
Protocols	PROFINET IO <sup>1)</sup> EtherCAT Modbus/TCP	
Specification	Standards with reference to PROFINET: – IEC 61158 – IEC 61784 – IEC 61918	
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	[mm <sup>2</sup> ]	0.14 ... 0.75; 22 AWG2)

1) Based on the Ethernet protocol IEEE 802.3

2) Required for maximum connection length between network participants

Fig. 22