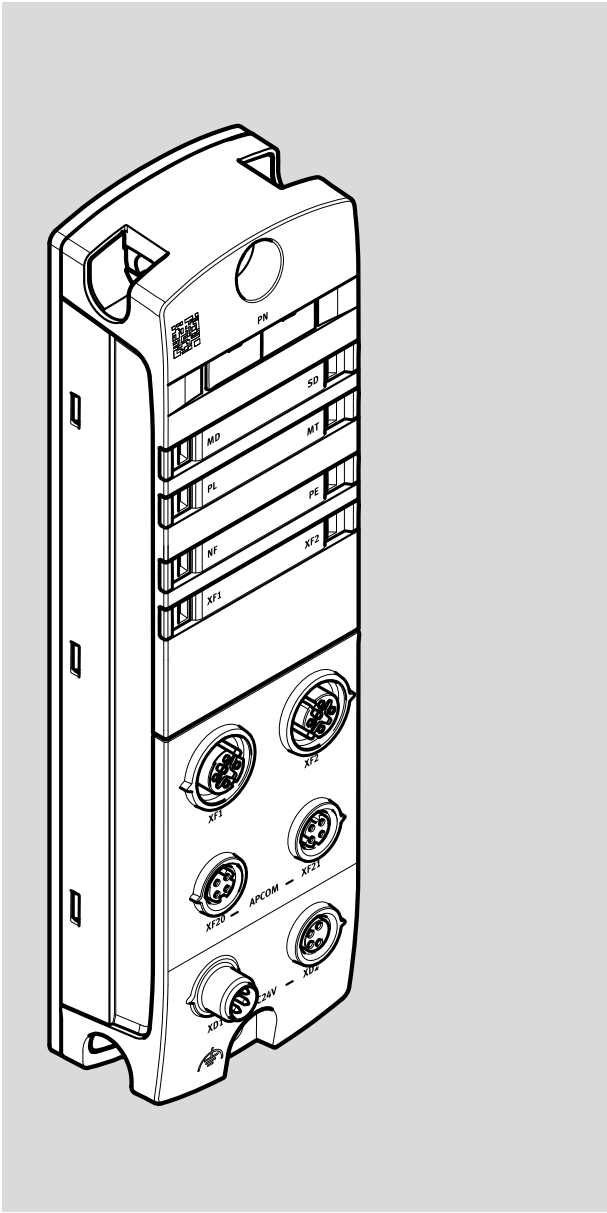


CPX-AP-I-PN-M12
PROFINET interface



FESTO

Instructions | Operat-
ing



8099693
2019-06
[8099695]

Translation of the original instructions

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1 About this document

1.1 Applicable documents



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

Document	Contents
Instruction manual for automation system CPX-AP	Instruction manual and important information on assembly, electrical installation and maintenance tasks as well as description of the automation system CPX-AP

Tab. 1 Applicable documents

1.2 Product version

This document refers to the following product versions:

Product	Version
CPX-AP-I-PN-M12	PROFINET interface CPX-AP-I-PN-M12 revision 1 or later

Tab. 2 Product version

The product version can be identified from the product labelling.



There may be an updated version of this document for these or later product versions

→ www.festo.com/sp.

1.3 Product labelling

The product labelling is located on the right-hand side of the module. The Data Matrix code is on the connection side. Scanning the printed Data Matrix Code with an appropriate device opens the Festo Support Portal with the 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 → www.festo.com/sp.

1.4 Specified standards

Version	
IEC 60204-1:2016-10	EN 60529:1991-10
IEC 61158:2014-07	DIN 46211:1965-03
IEC 61784:2014-08	DIN 46225:1976-12
IEC 61918:2013-08	DIN 46234:1980-03
EN 60204-1:2018-09	IEEE 802.3:2014-00

Tab. 3 Standards specified in the document

2 Safety

2.1 Safety instructions

- Take into consideration the legal regulations for the respective destination.
- Use the product only within the defined values → 12 Technical data.
- Observe labelling on the product.
- Observe further applicable documents.
- Store the product in a dry, UV- and corrosion-protected environment.
- Before working on the product:
Switch off the power supply and secure it against being switched on again.

2.2 Intended use

The product described in this document is intended only for use as an interface between an automation system CPX-AP and a higher-order controller through participation in an PROFINET IO network. Use the product only as follows:

- Use only in an industrial environment. Outside of industrial environments, e.g. in commercial and residential/mixed-use areas, it may be necessary to take measures to suppress radio interference.
- 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.

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 installation of electrical control systems.

3 Additional information

- Accessories → www.festo.com/catalogue.

4 Service

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

5 Product overview

5.1 Function

The product establishes, as a participant in an PROFINET IO network, the connection between a higher-order controller and the modules of an automation system CPX-AP.

Data is transmitted on the basis of Industrial Ethernet following the IEEE 802.3 protocol. Communication takes place in real time, using the Real-Time Protocol (RT) or the Isochronous Real-Time Protocol (IRT).

The product has two equivalent Ethernet interfaces with integrated switch, and therefore supports both star and line topology. The network can be divided into segments using additional switches and routers.

Device description file

A device description file (GSDML file) is used for project engineering of the PROFINET interface in the higher-order controller software.

This contains all the information required to parameterise the automation system CPX-AP via control software.



The current device description file is available on the Festo Support Portal → www.festo.com/sp.

Identification & Maintenance (I&M)

The “Identification and Maintenance” (I&M) function serves as an electronic rating plate of the interface and offers uniform, manufacturer-independent access to device-specific online information over the network.

PROFenergy

The product supports the PROFenergy profile for energy management. This makes it possible to switch off specific consumers that are not required in order to reduce energy demand.

Crossover detection (auto MDI/MDI-X)

The product supports crossover detection (auto MDI/MDI-X), which means that there is the option of using patch cables or crossover cables.



When using patch cables and crossover cables in the same network, crossover detection must be activated in the higher-order controller.

Priority start-up (Fast Start-Up)

The “Fast Start-Up” function ensures that the automation system CPX-AP is able to start up quickly.



When using the “Fast Start-Up” function, crossover detection (auto MDI/MDI-X) must be deactivated.

5.2 Configuration

5.2.1 Product design

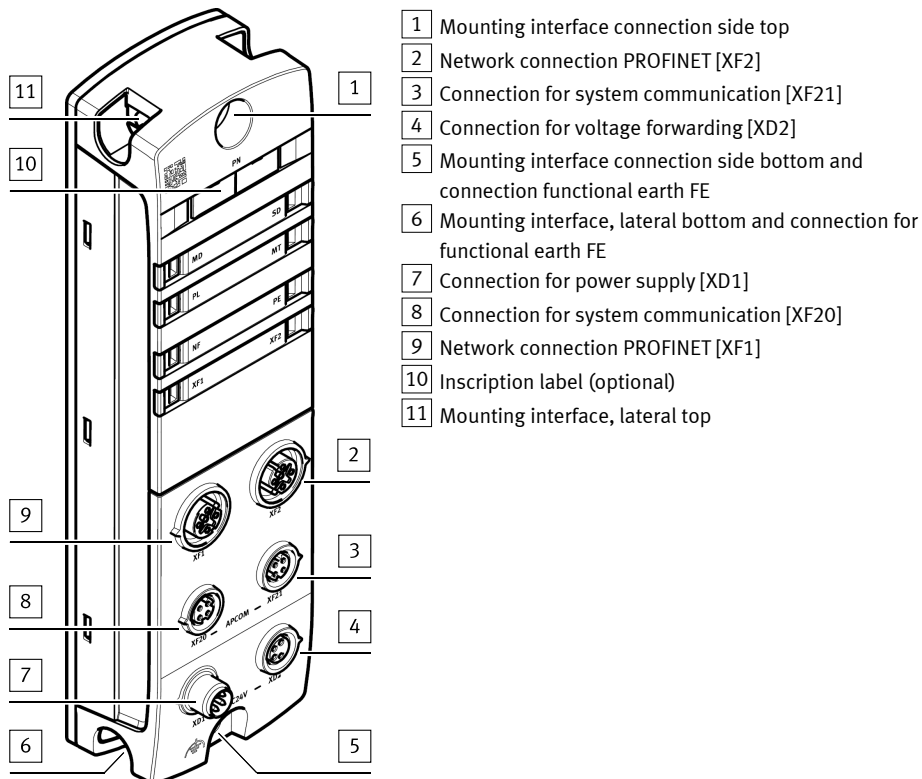


Fig. 1 Product design

5.2.2 LED displays

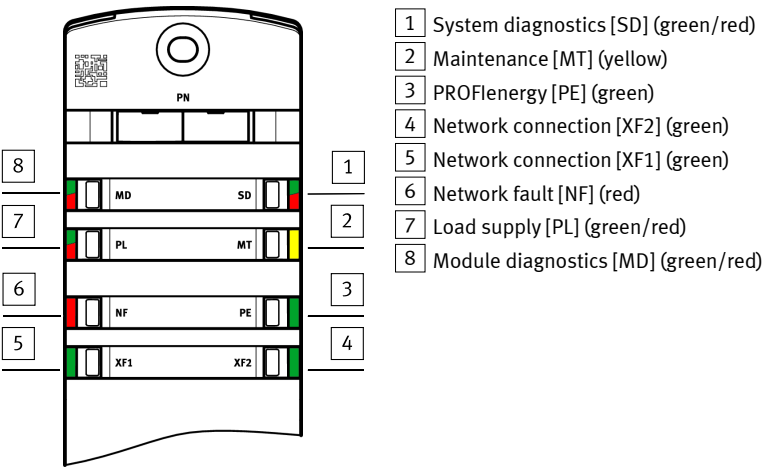


Fig. 2 LED displays

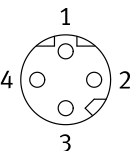
5.2.3 Connecting elements

Connection for power supply [XD1]		
Plug M8, 4-pin, A-coded		Signal
	1	+24 V DC logic supply PS
	2	0 V DC load supply PL
	3	0 V DC logic supply PS
	4	+24 V DC load supply PL

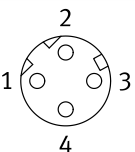
Tab. 4 Connection for power supply

Connection for voltage forwarding [XD2]		
Socket M8, 4-pin, A-coded		Signal
	1	+24 V DC logic supply PS
	2	0 V DC load supply PL
	3	0 V DC logic supply PS
	4	+24 V DC load supply PL

Tab. 5 Connection for voltage forwarding

Connection for system communication [XF20], [XF21]			
Socket M8, 4-pin, D-coded		Signal	
	1	RX-	Received data -
	2	TX+	Transmitted data +
	3	RX+	Received data +
	4	TX-	Transmitted data -

Tab. 6 Connection for system communication

Connection PROFINET network [XF1], [XF2]			
Socket M12, 4-pin, D-coded		Signal	
	1	TD+	Transmitted data +
	2	RD+	Received data +
	3	TD-	Transmitted data -
	4	RD-	Received data -
	Thread	Shield	Functional earth

Tab. 7 Connection for network

6 Assembly

- Assemble the module as outlined in the "Instruction manual for automation system CPX-AP" → 1.1 Applicable documents.

7 Installation

- Carry out the installation according to the "Instruction manual for automation system CPX-AP" → 1.1 Applicable documents.
- PROFINET Use network cables as described in the cable specification → 12 Technical data.





8 Commissioning

NOTICE!

Malfunction due to switching on the higher-order controller and automation system CPX-AP in the incorrect order.

- Switch on the higher-order controller and automation system CPX-AP 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 the automation system CPX-AP in the software:
 - System structure
 - Network addressing
 - Address assignment of modules → Instruction manual for automation system CPX-AP
 4. Transfer the automation project to the higher-order controller.

Behaviour of the display components of the module after error-free commissioning

[MD]	[SD]	[PL]	[MT]
			
Illuminated green	Illuminated green	Illuminated green	Off

Tab. 8 Behaviour of the display components after error-free commissioning

[XF1], [XF2]	[NF]	[PE]
		
Illuminated green ¹⁾	Off	Off

¹⁾ only when cable is connected to [XF1] or [XF2]

Tab. 9 Behaviour of the display components after error-free commissioning

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Information on troubleshooting in the event of incorrect behaviour:

- ➔ Instruction manual for automation system CPX-AP
- ➔ 10 Diagnostics and fault clearance

9 Parameterisation

Various parameters are available for reading out information about the modules in an automation system CPX-AP and adapting the modules to the application situation.
Write access to the parameters is typically performed by the higher-level controller using the device descriptions specific to the host system.

ID	Parameter	Instances	Data type	Access ¹⁾	Arraysizes
70	Part number	1	UINT32	ro	–
246	Fieldbus serial number	1	UINT32	ro	–
791	Product key	1	CHAR	ro	12
960	Firmware version	1	CHAR	ro	30
12004	Active IP address	1	UINT32	ro	–
12005	Active subnet mask	1	UINT32	ro	–
12006	Active gateway address	1	UINT32	ro	–
12007	MAC address	1	UINT8	ro	6
20000	Module code	1	UINT32	ro	–
20022	Configuration of voltage monitoring load supply PL – 0: load voltage monitoring inactive – 1: load voltage monitoring active, with suppression of diagnostics at switch-off (factory setting) – 2: load voltage monitoring active	1	UINT8	rw	–
20085	Measured value temperature AP-ASIC [°C]	1	INT16	ro	–
20087	Current measured value of logic supply PS [mV]	1	UINT16	ro	–
20088	Current measured value of load supply PL [mV]	1	UINT16	ro	–
20093	Hardware version	1	UINT8	ro	–
20196	Diagnostic status – Index 0: diagnostic status of the entire automation system CPX-AP – Index 1: diagnostic status of module 1 (address 1) – Index 2: diagnostic status of module 2 (address 2) – ... Each entry is of the data type UINT8 with the following meaning: – Bit 0: degree of severity information (1) – Bit 1: degree of severity maintenance (1) – Bit 2: degree of severity warning (1)	1	UINT8	ro	Number of modules + 1

ID	Parameter	Instance- s	Data type	Access ¹⁾	Arraysize
	<ul style="list-style-type: none">– Bit 3: degree of severity error (1)– Bit 4: reserved– Bit 5: reserved– Bit 6: module present (1), module lost (0)– Bit 7: reserved Bit 6 is not valid for index 0				

1) ro = read only; rw = read write

Tab. 10 Parameter

10 Diagnostics and fault clearance

10.1 Diagnostics options

Diagnostics via LED displays

The system and network status and errors are displayed directly on the module via LED indicators

➔ 10.3 LED displays.

Diagnostics via web server

Read access to diagnostic messages via the integrated webserver ➔ 10.4 Diagnostics via web server.

Diagnostics via PROFINET IO

Diagnostics as part of PROFINET IO functions ➔ 10.5 Diagnostics via PROFINET IO via control software through the network.

10.2 Diagnostic messages

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Only the diagnostic messages of the interface are listed in the following table.
Module-specific diagnostic messages ➔ Instructions for the respective module

ID hex (dec)	Message	Description	
02 01 0017 (33619991)	Overvoltage in logic supply PS 24 V DC	Overvoltage in the logic supply PS 24 V DC detected.	
		Remedy	– Check logic supply PS.
		Diagnostic status	Error
02 01 0105 (33620229)	Undervoltage in load supply PL 24 V DC	Undervoltage in the load supply PL 24 V DC detected.	
		Remedy	– Check load supply PL.
		Diagnostic status	Error







ID hex (dec)	Message	Description	
02 01 0106 (33620230)	Switch-off load supply PL 24 V DC	A switch-off of the load supply PL was detected. The cause can be a deliberate shutdown by the emergency stop.	
		Remedy	<ul style="list-style-type: none"> – Check if the emergency stop was activated. – Check load supply PL.
		Diagnostic status	Information
02 01 013F (33620287)	Overvoltage in the load supply PL 24 V DC	Overvoltage in the load supply PL 24 V DC	
		Remedy	<ul style="list-style-type: none"> – Check load supply PL.
		Diagnostic status	Error
08 01 0127 (134283559)	Communication to AP module interrupted	The AP system communication to a module is aborted.	
		Remedy	<ul style="list-style-type: none"> – Restart AP system. – Check the cable.
		Diagnostic status	Error
0B 09 0128 (185139496)	APDD invalid	The device description file stored in the device at the factory is invalid or missing.	
		Remedy	<ul style="list-style-type: none"> – Restart device. – Check AP system communication. – Check firmware version. – In the event of repeated errors, contact Festo Service.
		Diagnostic status	Error
0B 09 0129 (185139497)	Start-up APDD invalid	The start-up device description file stored in the device at the factory is invalid or missing.	
		Remedy	<ul style="list-style-type: none"> – Restart device. – Check AP system communication. – Check firmware version. – In the event of repeated errors, contact Festo Service.
		Diagnostic status	Error

Tab. 11 Diagnostic messages




10.3 LED displays

Module diagnostics [MD]		
LED (red, green)	Meaning	Remedy
 Off	Logic supply PS not available.	Check connection of logic supply PS.
 Illuminated green	No module diagnostics active	–
 Flashes green	Module diagnostics active Degree of severity "Information" e. g. switching off load supply PL	–
 Flashes red	Module diagnostics active Degree of severity "Warning" e. g. parameterisation error	Take appropriate remedial action, e. g. check parameterisation.
 Illuminated red	Module diagnostics active Degree of severity "Error" e. g. undervoltage in load supply PL	Take appropriate remedial action, e. g. check load supply PL.
 LED flashes red quickly	Module ramp-up not yet completed. System communication not yet initialised.	–
 Flashes quickly green	Module identification (service function)	–



Tab. 12 LED module diagnostics [MD]

System diagnostics [SD]		
LED (red, green)	Meaning	Remedy
 Off	Logic supply PS not available.	Check connection of logic supply PS.
 Illuminated green	No system diagnostics active	–
 Flashes green	System diagnostics active Degree of severity "Information" e. g. load supply PL to a module not available or firmware update in a module active.	–
 Flashes red	System diagnostics active Degree of severity "Warning" e. g. e.g. parameterisation error in a module.	
 Illuminated red	System diagnostics active Degree of severity "Error" e. g. sensor supply short circuit in a module.	
 Flashes quickly green	Module identification (service function)	–



Tab. 13 LED system diagnostics [SD]

Load supply [PL]		
LED (red, green)	Meaning	Remedy
 Illuminated green	Load supply PL available.	–
 Flashes green	Load supply PL not available.	Check load supply PL.
 Flashes red	Load supply PL outside the tolerance range.	Check load supply PL.



Tab. 14 LED load supply [PL]

Maintenance [MT]		
LED (yellow)	Meaning	Remedy
 Off	No maintenance needed.	–
 Illuminated	Maintenance required in at least one module in the automation system CPX-AP.	Carry out the necessary remedial measures → Instructions on the respective module.




Tab. 15 LED maintenance [MT]

PROFINET network fault [NF]		
LED (red)	Meaning	Remedy
 Off	No error (if the LED system diagnostics [SD] are illuminated green).	–
 Flashes red	Network configuration faulty.	Check network configuration.
	Network connection interrupted, short-circuited or disturbed.	Check network connection.
	Device name/device number not correct.	Check device name/device number.
	IO controller defective.	Perform maintenance on IO controller.

Tab. 16 LED PROFINET network fault [NF]

PROFenergy [PE]		
LED (green)	Meaning	Remedy
 Off	PROFenergy not activated.	–
 Flashes green	PROFenergy activated.	–

Tab. 17 LED PROFenergy [PE]

Connection status [XF1], [XF2]		
LED (green)	Meaning	Remedy
 Off	No network connection.	Check network connection.
 Flashes green	Module positioning if both LEDs (XF1 and XF2) flash synchronously, e. g. for troubleshooting purposes or during configuration.	–
 Illuminated green	Network connection OK.	–

Tab. 18 LED connection status [XF1], [XF2]

10.4 Diagnostics via web server


A webserver is available to display the diagnostic messages.
The web server can be accessed by entering the IP address in the address bar of a web browser.

10.5 Diagnostics via PROFINET IO

The automation system CPX-AP supports diagnostic options via PROFINET IO in accordance with IEC 61158, e. g. module-related and channel-related status information as well as error detection in the online mode of the control software and in the user program of the high-order controller. Diagnostic messages from the automation system CPX-AP that cannot be seen on the PROFINET standard diagnostics are shown as manufacturer-specific PROFINET channel diagnostics. For PROFINET, only the lower 16 bits of the diagnostic ID (error number) are shown. The display rule is as follows:

- Error number 1 ... 32767:
ChannelErrType = 2001 with ExtChannelErrType = error number
- Error number 32768 ... 65535:
ChannelErrType = 2002 with ExtChannelErrType = error number – 32768

The error number 0 is reserved.



Information on grouping and displaying the diagnostic messages
➔ Instructions on the automation system CPX-AP.

11 Disposal

ENVIRONMENT!

Send the packaging and product for environmentally sound recycling in accordance with the current regulations → www.festo.com/sp.

12 Technical data

General technical data	
General technical data for automation system CPX-AP	Instruction manual for automation system CPX-AP → 1.1 Applicable documents
Dimensions [mm] (length × width × height)	170 × 45 × 35
Product weight [g]	186
Ambient temperature [°C]	−20 ... +50
Storage temperature [°C]	−40 ... +70
Storage time [Years]	2 (max.)
Humidity (non-condensing) [%]	5 ... 95
Assigned address [Bytes] space (inputs/outputs)	1024/1024 (max.)
Number of modules	80 (max.)
Module code (hex/dec)	0x2081/8321d
Module identification	CPX-AP-I-PN-M12
Degree of protection in accordance with EN 60529	IP65/IP67 (if lines are connected and connections that are not required are closed with a cover cap)
Protection against electric shock (protection against direct and indirect contact in accordance with IEC 61010-1)	through the use of SELV/PELV circuits (safe extra-low voltage/protected extra-low voltage)
Electromagnetic compatibility	See declaration of conformity → www.festo.com
Mounting position	Any

Tab. 19 General technical data

Power supply		
Logic supply PS	[V DC]	24 ± 25 %
Intrinsic current consumption at nominal operating voltage 24 V from PS	[mA]	Typ. 80
Reverse polarity protection 24 V PS against 0 V PS		Yes
Diagnostic message, overvoltage in logic supply PS	[V DC]	≥ 31
Mains buffering time, logic supply PS	[ms]	10
Load supply PL	[V DC]	24 ± 25 %
Intrinsic current consumption at nominal voltage 24 V from PL	[mA]	Typ. 5
Reverse polarity protection 24 V PL against 0 V PL		Yes
Diagnostic message, undervoltage in load supply PL	[V DC]	≤ 17
Diagnostic message, overvoltage in load supply PL	[V DC]	≥ 31
Capacitive load at load supply PL		
24 V PL to 0 V PL	[nF]	Typ. 35
24 V PL to FE	[nF]	Typ. 35
0 V PL to FE	[nF]	Typ. 20

Tab. 20 Power supply

Network-specific data	
Protocol	PROFINET ¹⁾ With functionalities of Class C (CC-C) <ul style="list-style-type: none"> – LLDP – DCP – CiR – MRP, MRPD – FSU – IRT
Specification (Standards and norms with reference to PROFINET)	IEC 61158, IEC 61784, IEC 61918
Transmission rate [Mbps]	100
Crossover detection	Auto-MDI/MDI-X
Cable length per segment [m]	100 (max.)
Factory settings	
IP address	0.0.0.0
Subnet mask	0.0.0.0
Cable specification	
Cable type	Ethernet twisted pair cable, shielded
Transmission class	Category Cat 5 or higher
Cable diameter [mm]	6 ... 8
Wire cross section [mm ²]	0.14 ... 0.75 AWG 22 (required for maximum connection length between network participants)

1) Based on the Ethernet protocol IEEE 802.3

Tab. 21 Network-specific data

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