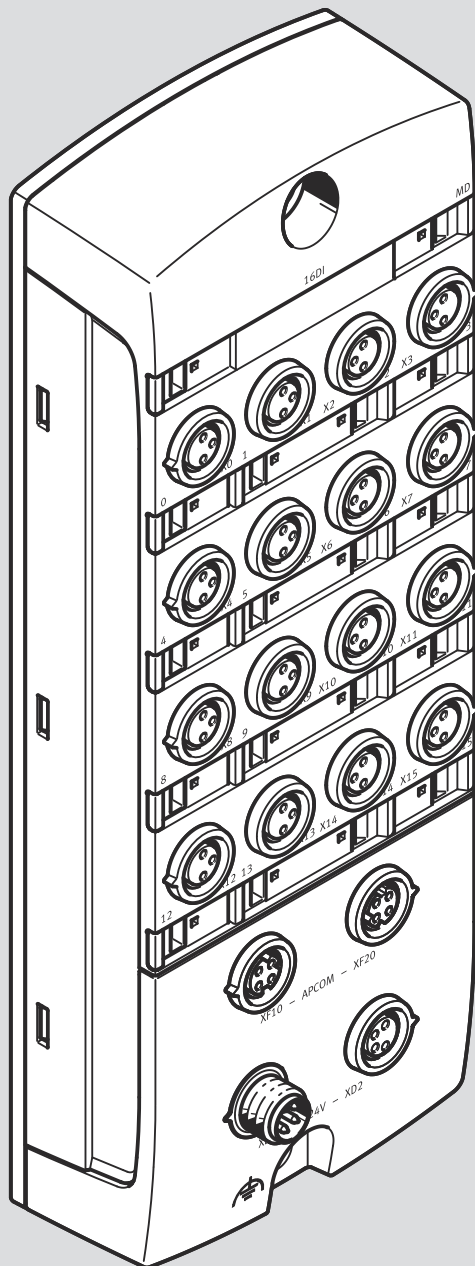


CPX-AP-I-16DI-M8-3P

Digital input module

FESTO

Operating instructions



8218745

8218745
2025-10
[8218747]

Original instructions

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1 About this document

1.1 Applicable documents

Document	Contents
Operating instructions for the modules in a remote I/O system CPX-AP-I	Information on using the modules

Tab. 1: Applicable documents

1.2 Product version

This document refers to the following product versions:

Product	Version
CPX-AP-I-16DI-M8-3P	Digital input module CPX-AP-I-16DI-M8-3P revision 1 or later

Tab. 2: Product version

The product version can be determined from the product labelling.



There may be an updated version of this document for this or later product versions → www.festo.com/sp.

1.3 Specified standards

Version	
IEC 60204-1:2016-10	EN 60204-1:2018-09
IEC 61131-2:2017-08	EN 60529:1991-10

Tab. 3: Standards specified in the document

2 Safety

2.1 Safety instructions

- Only use the product if it is in perfect technical condition.
- Observe the identifications on the product.
- Store the product in a cool, dry environment protected from UV and corrosion. Keep storage times short.
- If there is a connection to other circuits at one of the connections for inputs or outputs, the circuits must also comply with SELV/PELV.
- 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 solely for use in a remote I/O system CPX-AP.

Use the product 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 approved for the applicable product variant → www.festo.com/catalogue.

2.3 Training of qualified personnel

Work on the product may only be carried out by qualified personnel who can evaluate the work and detect dangers. The qualified personnel have skills and experience in dealing with electrical (open-loop) control technology.

2.4 UL certification

The information in the operating instructions for the remote I/O system CPX-AP-I in combination with the UL inspection mark on the product is also applicable to ensure compliance with the certification conditions of Underwriters Laboratories Inc. (UL) for USA and Canada → 1.1 Applicable documents.

3 Additional information

- Contact the regional Festo contact if you have technical problems
→ www.festo.com.
- Accessories → www.festo.com/catalogue.

4 Product overview

4.1 Product design

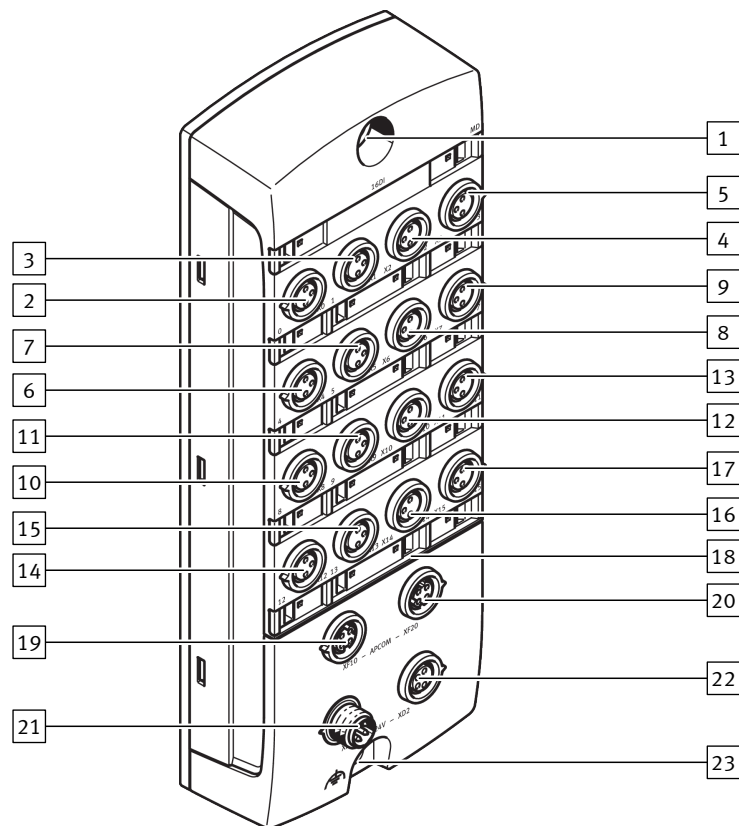
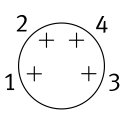


Fig. 1: Product design

- | | |
|----------------------------|-----------------------------|
| 1 Mounting front top | 6 Connection [X4]: input 4 |
| 2 Connection [X0]: input 0 | 7 Connection [X5]: input 5 |
| 3 Connection [X1]: input 1 | 8 Connection [X6]: input 6 |
| 4 Connection [X2]: input 2 | 9 Connection [X7]: input 7 |
| 5 Connection [X3]: input 3 | 10 Connection [X8]: input 8 |

- 11 Connection [X9]: input 9
- 12 Connection [X10]: input 10
- 13 Connection [X11]: input 11
- 14 Connection [X12]: input 12
- 15 Connection [X13]: input 13
- 16 Connection [X14]: input 14
- 17 Connection [X15]: input 15
- 18 Inscription label attachment (optional)
- 19 Connection [XF10]: system communication
- 20 Connection [XF20]: system communication forwarding
- 21 Connection [XD1]: power supply
- 22 Connection [XD2]: forwarding supply
- 23 Front bottom mounting with functional earth connection

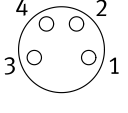
4.2 Connecting elements

Power supply connection [XD1]			
M8 plug, 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	

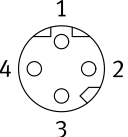
Tab. 4: Power supply connection



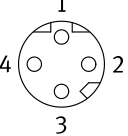
For information on power supply, see operating instructions for remote I/O system CPX-AP-I → 1.1 Applicable documents.

Connection for voltage forwarding [XD2]			
M8 socket, 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	

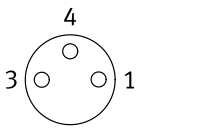
Tab. 5: Connection for voltage forwarding

Connection for system communication [XF10]			
Socket M8, 4-pin, D-coded		Signal	
	1	TX–	Transmitted data –
	2	RX+	Received data +
	3	TX+	Transmitted data +
	4	RX–	Received data –

Tab. 6: Connection for system communication

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

Tab. 7: Connection for system communication forwarding

Connection for inputs [X0] ... [X15]		
M8 socket, 3-pin, A-coded		Signal
	1	+24 V DC sensor supply
	3	0 V DC sensor supply
	4	Input 0 ... 15

Tab. 8: Connection for inputs



If there is a connection to other circuits at one of the connections for inputs or outputs, the circuits must also comply with SELV/PELV.

4.3 Product labelling

The product labelling is located on the side panel 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 Internet page with documents appropriate for the product. Alternatively, the Product Key (11-digit alphanumeric code on the product labelling) can be entered in the search field → www.festo.com/sp.

4.4 LED displays

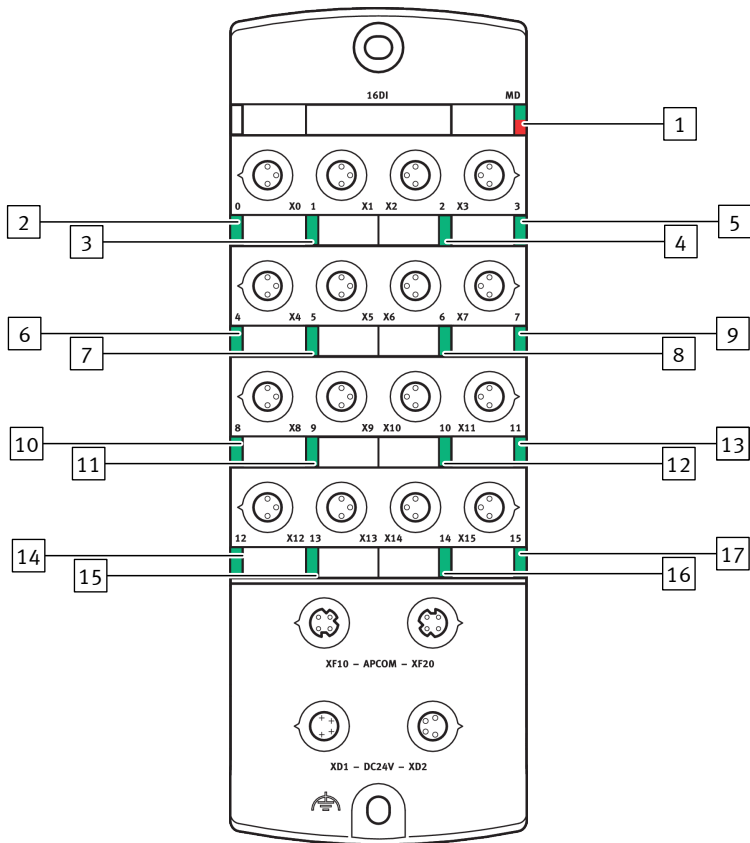


Fig. 2: LED displays

- 1

LED [MD]: module diagnostics
- 2

LED [X0]: input 0 status
- 3

LED [X1]: input 1 status
- 4

LED [X2]: input 2 status
- 5

LED [X3]: input 3 status
- 6

LED [X4]: input 4 status
- 7

LED [X5]: input 5 status
- 8

LED [X6]: input 6 status
- 9

LED [X7]: input 7 status
- 10

LED [X8]: input 8 status
- 11

LED [X9]: input 9 status
- 12

LED [X10]: input 10 status

- 13 LED [X11]: input 11 status
- 14 LED [X12]: input 12 status
- 15 LED [X13]: input 13 status

- 16 LED [X14]: input 14 status
- 17 LED [X15]: input 15 status

5 Function

Function description

The module provides 16 digital inputs in one remote I/O system CPX-AP. The module response can be parameterised. Status and error messages are indicated by LED displays on the module and reported to the bus interface via system communication.

5.1 Digital inputs

The digital inputs are used to connect sensors, thereby enabling the recording and further processing of digital input signals. The sensors are supplied with a voltage of 24 V DC via the module and return a logic 0 or logic 1 to the inputs. The sensor supply has an electronic fuse for protection against short circuit or overload. If this electronic fuse is triggered, the sensor supply of the module is switched off and the error is shown by an LED indicator on the module. After the short circuit or the overload has been cleared, the sensor supply is switched on again automatically. The electronic fuse of the module is a slow-blow type. Sensors with a higher short-term current requirement can therefore also be connected.

6 Assembly

- Carry out assembly in accordance with the operating instruction for remote I/O system CPX-AP-I → 1.1 Applicable documents.

7 Installation

7.1 Connecting cables

WARNING

Risk of injury due to electric shock.

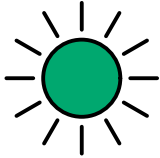
- For the electric power supply, use SELV or PELV circuits that guarantee a reliable electric disconnection from the mains network.
- Observe IEC 60204-1/EN 60204-1.

1. Switch off the power supply.
2. Use a suitable torque screwdriver with socket to tighten union nuts.
 - For example, use PHOENIX CONTACT SAC BIT M8-D10 with a tightening torque of 0.4 Nm ± 15% for M8. Different from the information for connecting cables.
 - For example, use PHOENIX CONTACT SAC BIT M12-D15 with a tightening torque of 0.6 Nm ± 10% for M12. Different from the information for connecting cables.
3. Seal unused connections with cover caps.

8 Commissioning

- Commissioning of the remote I/O system CPX-AP-I in accordance with the remote I/O system CPX-AP-I operating instructions → 1.1 Applicable documents.

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

[MD]	
	
Green light	

Tab. 9: Response of the LED displays of the module after error-free commissioning

9 Parameterisation

Various parameters are available for reading out information about the modules in a remote I/O system CPX-AP-A or CPX-AP-I and for configuring the modules for the application.

Write access to the parameters is typically implemented by the higher-level controller using the device descriptions specific to the host system.

Parameters

ID	Parameters	Number of instances ¹⁾	Data type	Access ²⁾	Array size
Standard parameters					
246	Fieldbus serial number	1	UINT32	ro	-
791	Product key	1	CHAR	ro	12
960	Firmware version	1	CHAR	ro	30
20000	Module code	1	UINT32	ro	-
20085	Measured value of temperature AP-ASIC	1	INT16	ro	-
20087	Current value of the logic supply (PS) 24 V DC.	1	UINT16	ro	-
20088	Current value of the load supply (PL) 24 V DC.	1	UINT16	ro	-
20093	Hardware version	1	UINT8	ro	-
20118	Application-specific identification	1	CHAR	rw, rem	32
11295004	I&M 2 Date of installation	1	CHAR	rw, rem	17
Channel parameter inputs					
20014	Input debounce time – 0: 0.1 ms – 1: 3 ms (factory settings) – 2: 10 ms – 3: 20 ms	1	ENUM_ID	rw	-
20294	Condition counter limit value input	16	UINT32	rw, rem	-
20295	Condition counter actual value input	16	UINT32	rw, rem	-

1) Counting starting at 0.

2) ro = read only; rw = read write; rem = remanent

Tab. 10

10 Diagnostics

10.1 LED displays

Module diagnostics [MD]		
LED	Meaning	Remedy
 Off	Logic supply PS not available.	Check connection of logic supply PS.
 Green light	Module diagnostics not active	–
 Flashing green 0.5 Hz	Module diagnostics active "Information" degree of severity e.g. switching off load supply PL	–
 Flashing red 0.5 Hz	Module diagnostics active "Warning" degree of severity e.g. parameterisation error	Take appropriate remedial action, e.g. check parameterisation.
 Red light	Module diagnostics active "Error" degree of severity e.g. undervoltage in logic supply PS	Take appropriate remedial action, e.g. check logic supply PS.
 Fast flashing red 2 Hz	Module ramp-up not yet completed. System communication not yet initialised.	–
 Fast flashing green 2 Hz	Module identification (service function)	–

Tab. 11: Module diagnostics LED [MD]

Status of input		
LED	Meaning	Remedy
 Green light	Input active (logic 1) Logic 1 at input	–
 Off	Input inactive (logic 0) Logic 0 at input	–

Tab. 12: LED status of input

10.2 Diagnostic messages

For all diagnostics messages of the remote I/O system and for information on grouping and displaying the diagnostic messages see the operating instructions for remote I/O system → 1.1 Applicable documents.

The following table contains the diagnostic messages of the digital input module.

ID hex (dec)	Message	Description	Remedy	Diagnostics status
01 01 010B (16843019)	Short circuit/overload in sensor supply	A short-circuit/overload of the sensor supply was detected	– Check sensor for correct function, in particular for current consumption. – Check sensor wiring.	Error
02 01 0016 (33619990)	Undervoltage in logic supply (PS) 24 V DC	Undervoltage of the logic supply (PS) 24 V DC was detected.	– Check the power supply (logic)	Error
02 01 0017 (33619991)	Overvoltage in logic supply (PS) 24 V DC	Overvoltage of the logic supply (PS) 24 V DC was detected.	– Check the power supply (logic)	Error
08 01 0124 (134283556)	Communication to AP master interrupted	The communication to the AP Master is interrupted.	– Restart AP Master. – Check communication AP connecting cable.	Error
08 01 0130 (134283568)	Output process data watchdog of the AP module expired	Output process data watchdog of the AP module expired	– Restart AP system. – Check cable.	Error
08 01 0131 (134283569)	Input process data watchdog of the AP module expired	Input process data watchdog of the AP module expired.	– Restart AP system. – Check cable.	Error
08 01 01A2 (134283682)	System state emergency operation mode	System initialisation (module detection) has failed. The system is in maintenance mode. I/O function is not available.	– Restart system – Update firmware to the latest version – Contact Festo Service	Error
0C 01 02B9 201392825	Application condition counter threshold reached	The set threshold of the application has been reached.	– Perform application-dependent maintenance work and reset condition counters – Increase condition counter threshold	Maintenance required

Tab. 13: Diagnostic messages

10.2.1 Application-specific diagnostic functions

Switching cycle counter (Condition counter)

The module provides a channel-based switching cycle counter. A diagnostic message is sent when the switching cycle counter reaches the critical limit (set point). The diagnostic message can be used as a trigger for all types of maintenance work in the application (e.g. reminder of lubrication or replacement of parts). The diagnostic message has the diagnostic status Maintenance and is deactivated by default.

- Every channel is assigned an actual value memory and a critical limit memory: fieldbus parameters ID 20294 and ID 20295.
- The switching cycle counter is incremented at every rising edge of the switching signal.
- The switching cycle counter counts up to its maximum value of 0xFF.FF.FF.FF. The switching cycle counter then remains at the maximum value. There is no overflow.
- If the critical limit is reached or exceeded, the channel-based diagnostic message IDOC|01|01B5 (201392565) is sent.
- The diagnostic message can be cancelled by setting the critical limit to a value higher than the current actual value. Or the actual value or the critical limit can be set to 0.
- The diagnostic message IDOC|01|01B5 (201392565) is deactivated if the critical limit memory has the value 0 (factory setting).

11 Technical data

11.1 Technical data, general

General technical data		
Certificates, declaration of conformity		➔ www.festo.com/sp
Dimensions (length × width × height)	[mm]	170 × 60 × 35
Ambient temperature	[°C]	−20 ... +60
Storage temperature	[°C]	−40 ... +70
Max. storage time	[years]	2
Humidity (non-condensing)	[%]	5 ... 95
Assigned address space (inputs/outputs)	[Byte]	2/−
Module code (hex/dec)		0x2135/8501d
Module identification		CPX-AP-I-16DI-M8-3P
Degree of protection in accordance with EN 60529		IP65/IP67, if all cables are connected and connections that are not required are closed with cover caps.
Electromagnetic compatibility		See declaration of conformity ➔ www.festo.com/sp
Mounting position		Any

Tab. 14: General technical data

Digital inputs

Digital inputs		
No. of inputs		16
Type in accordance with IEC 61131-2		3 (24 V DC)
Max. cable length	[m]	30
Design	[V DC]	0 ... 30, positive logic (PNP)
Logic level (logic 0/1)	[V DC]	≤ 5 / ≥ 11
Input debounce time		Parameterisable
Electrical isolation between the channels		No
Electrical isolation between inputs and PS		No
Sensor supply		
Sensor power supply SEN	[V DC]	24 ± 25% If there is a connection to other circuits at one of the connections for the inputs, the circuits must also comply with SELV/PELV.
Voltage drop at short-circuit protection (reduction SEN)	[V DC]	≤ 1
Reverse polarity protection 24 V SEN against 0 V SEN		Yes
Potential difference between 0 V SEN external and 0 V SEN internal		Not permissible
Sensor power supply short circuit protection		
Short-circuit protection		Electronic
Trigger level	[A]	> 1.8
Characteristic		Slow-blow
Response after end of overload		Automatic recovery

Tab. 15: Digital inputs

11.2 Technical data, electrical

Power supply		
Logic supply PS		
Logic supply PS	[V DC]	24 ± 25%
Intrinsic current consumption at nominal operating voltage 24 V from PS	[mA]	Typically 38
Undervoltage detection in logic supply PS		
Trigger level	[V]	17.2
Hysteresis	[V]	0.3
Overvoltage detection in logic supply PS		
Trigger level	[V]	> 30

Tab. 16: Power supply

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