CPX-AP-A
Remote I/O system

FESTO

Original instructions

Table of contents

1 About this document

1.1 Applicable documents

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

1.2 Product version

This document refers to the following product version:

Product	Version
CPX-AP-A	Remote I/O system CPX-AP-A from revision 1

Tab. 1: 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 Product labelling

The product labelling and the Data Matrix Code are printed on the housings of the modules. Scanning the 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.

1.4 Specified standards

Version	
IEC 60204-1:2016-10	EN 60068-2-27:2009-05
IEC 60364-4-41:2005-12	EN 60529:1991-10
EN 60068-2-6:2008-02	–

Tab. 2: 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.
– Before working on the product, switch off the power supply and secure it against being switched on again.

2.2 Intended use

The remote I/O system described in this document is intended exclusively for control tasks on machines and automation systems.
Use the product as follows:

– Use only in an industrial environment. Outside 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 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

In combination with the UL inspection mark on the product, the information in this section must also be observed in order to comply with the certification conditions of Underwriters Laboratories Inc. (UL) for USA and Canada.

UL certification information	
Product category code	CPX-AP-A
File number	E239998
Considered standards	UL 61010-1 UL 61010-2-201 CAN/CSA C22.2 No. 61010-1-12 CAN/CSA-IEC 61010-2-201
UL mark	c (UL) US LISTED
UL control number	E239998

Tab. 3: UL certification information

– Technical data and environmental conditions may be subject to change in order to comply with Underwriters Laboratories Inc. (UL) certification requirements for the USA and Canada.
   Deviating values ➜ 12.4 Technical data for UL certification.
– The supply and external circuits (I/Os) intended to be connected to this device shall be separated from the mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV-Limited Energy (IEC 61010-1 Cl. 9.4) or Class PS2 acc. to IEC 62368-1 or LPS acc. to IEC 60950 or Class 2 acc. to NEC.
– If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

3 Additional information

– Contact the regional Festo contact if you have technical problems
   ➜ www.festo.com.
– Accessories and spare parts ➜ www.festo.com/catalogue.

4 Product overview

4.1 System structure
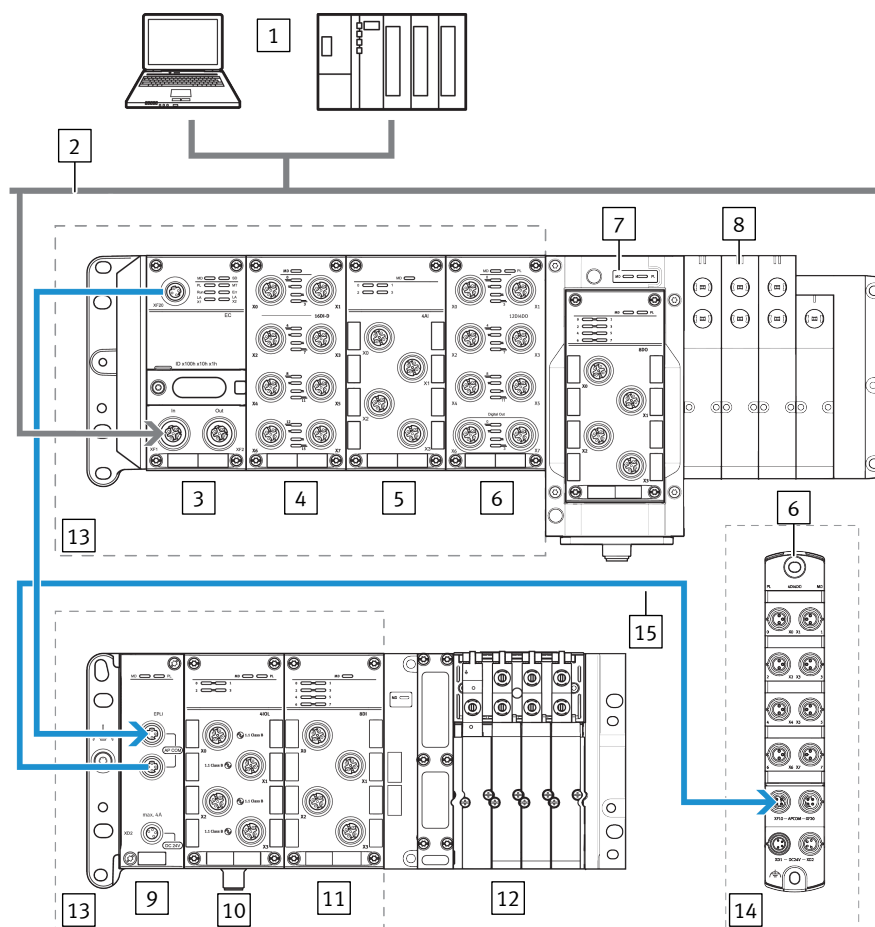
Fig. 1: Example of system structure

1 Higher-order controller	9 End plate with AP system communi-cation
2 Network	
3 EtherCat interface	10 IO-Link master on system supply
4 Digital input module with channel diagnostics	11 Digital input module
	12 Interface with valve terminal MPA-S
5 Analogue input module	13 CPX-AP-A modules
6 Digital input/output module	14 CPX-AP-I module
7 VTSA interface with M12-L system supply	15 AP system communication (example for CPX-AP-I)
8 Valve terminal VTSA	

4.2 CPX-AP-A and CPX-AP-I combination options

The modules of the remote I/O system CPX-AP-A and CPX-AP-I can be combined. Modules up to the maximum permissible number of modules including a bus interface are possible in any combination.

Module	Combination options
CPX-AP-A interface	XF20 connection: – connect CPX-AP-I modules directly – connect additional CPX-AP-A terminals using CPX-AP-A-EPLI or CPX-AP-A-EPLI-S
CPX-AP-EPLI/EPLI-S	XF20 connection: – connect CPX-AP-I modules directly – connect additional CPX-AP-A terminals using CPX-AP-A-EPLI or CPX-AP-A-EPLI-S
CPX-AP-I interface	XF20 or XF21 connection: – connect CPX-AP-I modules directly – connect additional CPX-AP-A terminals using CPX-AP-A-EPLI or CPX-AP-A-EPLI-S

Tab. 4: Combination options

ℹ **Exception for the combination of CPX-AP-A and CPX-AP-I**
CPX-AP-I and CPX-AP-A cannot be combined with a CPX-AP-I-PB interface.

ℹ If a bus interface and a CPX-AP-A-EPLI or CPX-AP-A-EPLI-S are used in a CPX-AP-A remote I/O system, the connection [XF10] of the CPX-AP-A-EPLI or CPX-AP-A-EPLI-S must not be used.
The combination of a bus interface and a CPX-AP-A-EPLI or CPX-AP-A-EPLI-S is only necessary if 2 AP-Out ports are required.

4.3 Modules
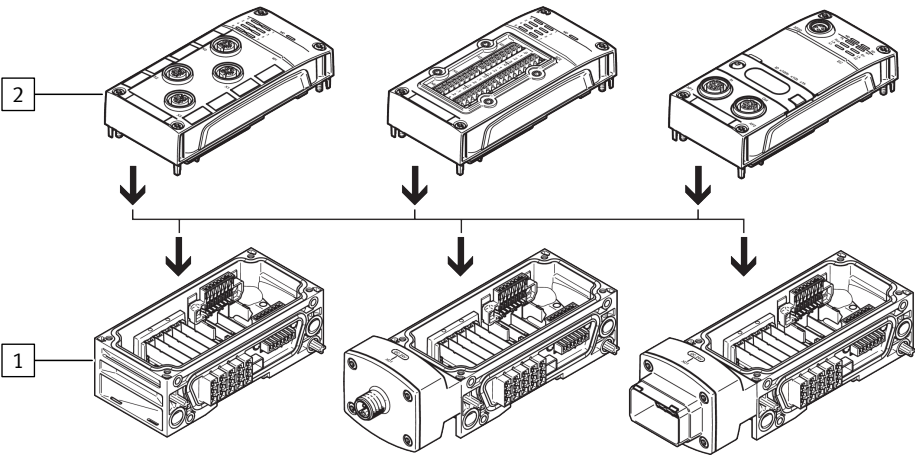
Fig. 2: Modular design

| 1 | Interlinking module | | 2 | Electronics module |

Electronics module The housing top part of CPX-AP-A modules is called the electronic module. Electronic modules provide the necessary connections for sensors, actuators or interfaces.

Interlinking module The housing bottom part of CPX-AP-A modules is called the interlinking module. Interlinking modules are used for the electrical and mechanical linkage of the modules. If required, they offer a connection for the operating voltage supply, the load voltage and supply operating voltage and load voltage to the adjacent modules. Interlinking modules are screwed together individually.

4.4   Product variants

Interface
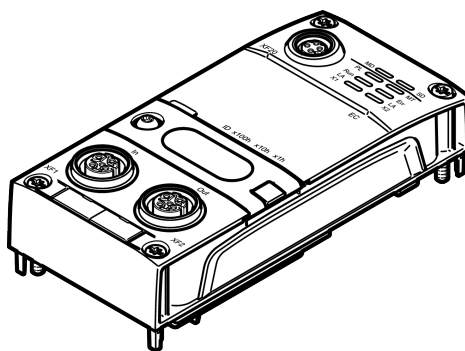
Fig. 3: Interface, example CPX-AP-A-EC-M12

An interface is the interface of the remote I/O system to the network and has the following functions:
– Data transfer between the remote I/O system and the higher-order controller.
– Transmission of control signals to the connected modules.
– Monitoring the functionality of the connected modules.
– Access to system parameters (read/write), input/output signals and diagnostics data (depending on the interface).

Input/output module
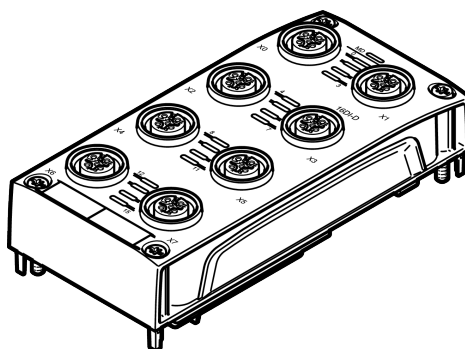
Fig. 4: Input/output module, example CPX-AP-A-16DI-D-M12-5P

The input/output modules include various module types:
– Digital input/output modules can be used, for example, to query sensor signals or to control actuators.
– Analogue input modules capture analogue input signals in a remote I/O system.
– A IO-Link master in a remote I/O system provides multiple IO-Link-Ports for integration of IO-Link-Devices.

Basic interlinking module
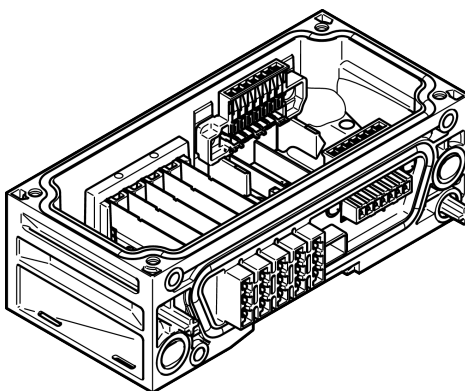
Fig. 5: Basic interlinking module, example CPX-AP-A-SB

The basic interlinking module is used for the electrical linkage of modules.

Key features
– Double or single interlinking module

Interlinking module with system supply
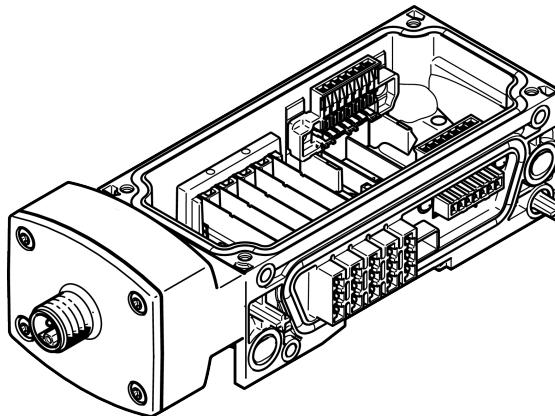
Fig. 6: Interlinking module with system supply, example CPX-AP-AS-1-M12

The operating voltage and load voltage are supplied via the interlinking modules with system supply. The voltages are supplied via an M12 plug, M18 plug, 7/8" plug or push-pull plug and are available to other electrical modules and valves. The system supply can be positioned as required and the appropriate additional supplies must be selected depending on the location.

Key features
– Operating voltage supply for the modules and sensors
– Load voltage for valves and outputs

Interlinking module with system supply and voltage forwarding supply
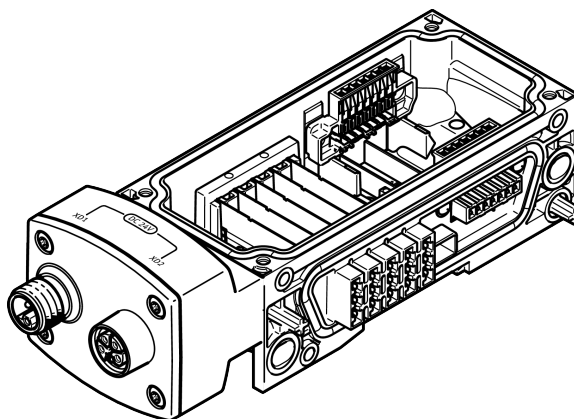
Fig. 7: Interlinking module with system supply and voltage forwarding supply, example CPX-AP-AS-2-M12-5P

The operating voltage and load voltage are supplied via the interlinking modules with system supply. The voltages are supplied via an M12 plug and are available to other electrical modules and valves. In addition, the operating and load voltage in the module can be forwarded directly via an additional M12 socket. If interlinking blocks with additional supply are not required, the installation location of the interlinking block with system supply can be selected as required.

Interlinking modules with additional supply to left or right
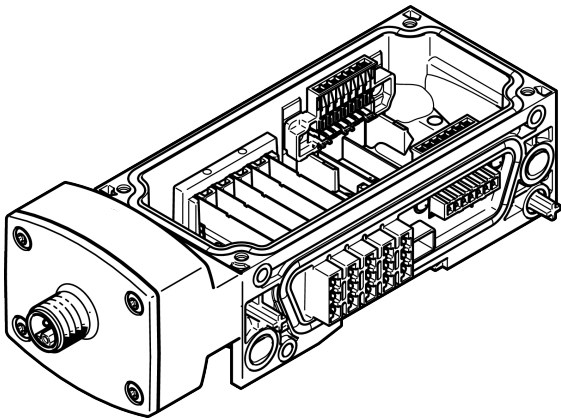
Fig. 8: Interlinking modules with additional supply to left or right, example CPX-AP-A-M12-AL

Additional load voltage for outputs and valves is supplied via the interlinking modules with additional supply. The load voltage of the output modules supplied from the modules can be switched separately.

Key features
– Current consumption load voltage of the outputs
– Load voltage to right (CPX-AP-A-M12-AR) or to left (CPX-AP-A-M12-AL)

Connection	Position next to the system supply
M12	right and left
M18	right
7/8"	right
push-pull	right and left

Tab. 5: Placement of the additional supply

Interlinking module with forwarding supply
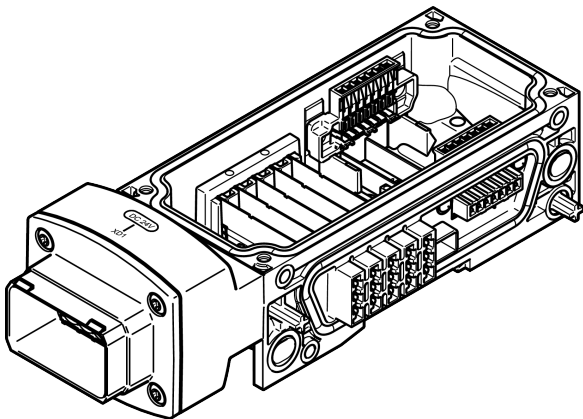
Fig. 9: Interlinking module with forwarding supply, example CPX-AP-AW-1-PP-5P

The operating and load voltage in the module can be forwarded via the interlinking modules with forwarding supply via a 5-pin push-pull connection. The interlinking module with forwarding supply must be installed immediately to the right or left of the system supply.

End plates
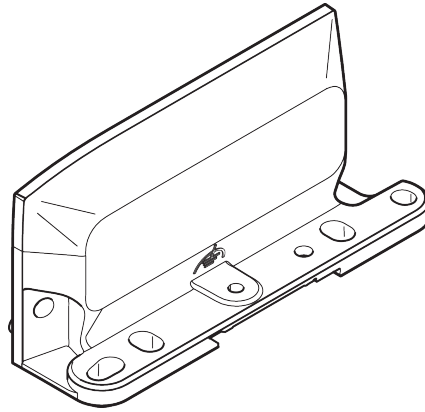
Fig. 10: End plate, example CPX-AP-A-EPL

Key features
– Right end plate (CPX-AP-A-EPR) for operation without valve terminal.
– Left end plate (CPX-AP-A-EPL) with connection for functional earth.

End plates CPX-AP-A-EPLI, CPX-AP-A-EPLI-S
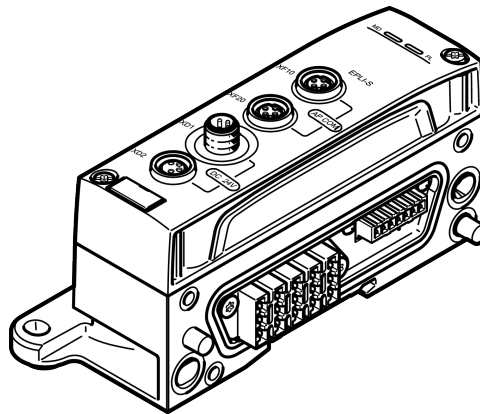
Fig. 11: End plates, example CPX-AP-A-EPLI-S

Key features
– System communication to connect additional AP devices.
– Connection for functional earth.
– Forwarding supply
– CPX-AP-A-EPLI-S: system supply

4.5 LED indicators

Depending on the module, the modules have various LED displays for visualising status and diagnostics.

> ℹ️ Detailed information on the LED displays of the individual modules
> ➜ Product-specific documentation

4.6 Labelling elements
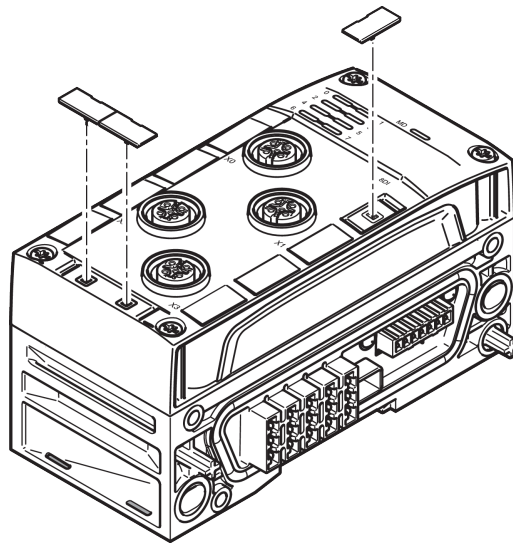
Fig. 12: Inscription label

The same clip-on inscription label is available for all modules. The inscription label is in two parts and can be divided into two smaller units if necessary.

5 Function

5.1 Operating mode

The remote I/O system is connected to a higher-order controller via an interface. The response of the remote I/O system can be adapted to the specific requirements by access to internal parameters. Various diagnostics functions such as open load and channel diagnostics are also available.

5.2 System communication and address assignment

The internal system communication is at the level of the interlinking modules. The addresses of the modules are automatically allocated every time the remote I/O system is started.
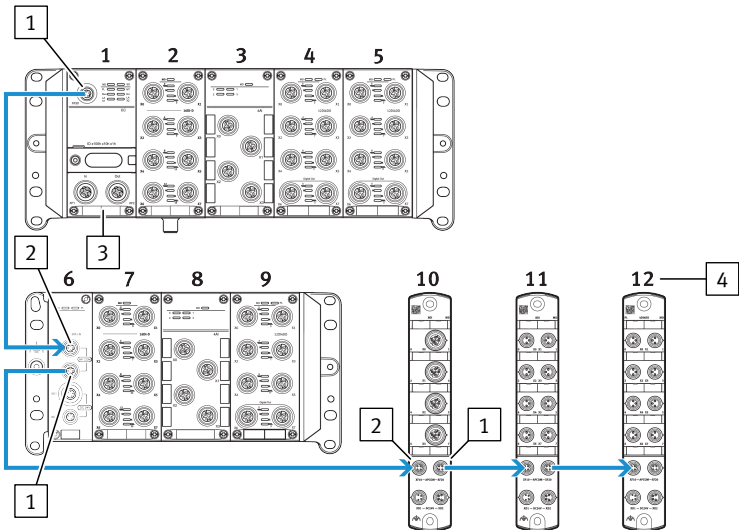
Fig. 13: Example of addressing with bus interface position on the left

1	Connection for system communication [XF20] OUT	3	Interface
2	Connection for system communication [XF10] IN	4	Module address
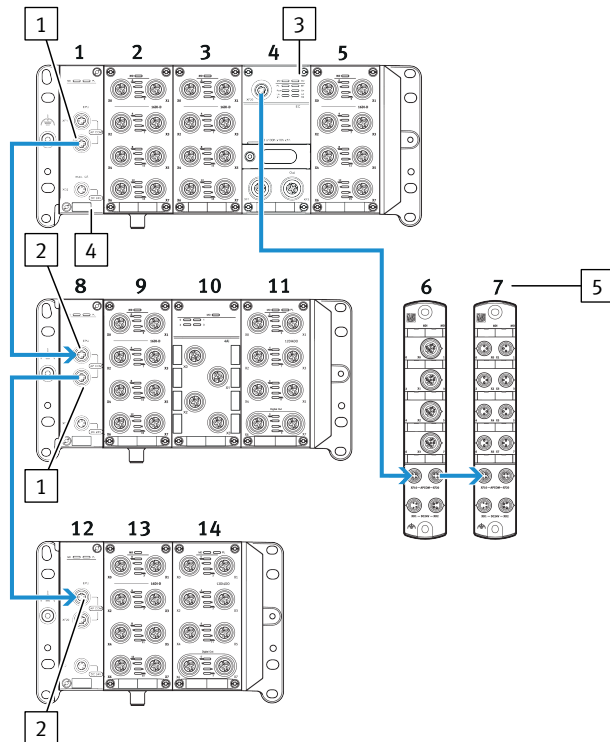
Fig. 14: Example of addressing with bus interface position in the middle

1	Connection for system communication [XF20] OUT	3	Interface
2	Connection for system communication [XF10] IN	4	CPX-AP-A-EPLI
		5	Module address

Loss of function due to incorrectly connected or non-approved connecting cables.

– Always attach the connecting cables for the modules to the connection [XF10].
– Always attach the forwarding of the connecting cables to the connection [XF20].
– Only use approved connecting cables from the Festo catalogue
  ➔ www.festo.com/catalogue.

> **i** If a bus interface and a CPX-AP-A-EPLI or CPX-AP-A-EPLI-S are used in a CPX-AP-A remote I/O system, the connection [XF10] of the CPX-AP-A-EPLI or CPX-AP-A-EPLI-S must not be used.
> The combination of a bus interface and a CPX-AP-A-EPLI or CPX-AP-A-EPLI-S is only necessary if 2 AP-Out ports are required.

Response in the event of incorrect configuration after restart

When establishing a connection with the higher-order controller, the configuration is checked for the following criteria, depending on the network protocol of the interface:
– Total number of input bytes and output bytes
– Module codes and sequence of modules
– Length and format of the start-up parameterisation
In the event of deviations the connection to the higher-order controller is rejected and a network-specific error message is generated.

Response when changing the configuration during operation

– If a module is removed during operation, process data are not transferred to the higher-order controller for this module and all downstream modules. The failure of the module is signalled via a diagnostics message and, if necessary, network-specific status bytes in the process data.
– If an additional module is added after the connection is established with the higher-order controller or an existing module is replaced, this module is not included in the active configuration and data exchange with this module is not possible.
The system must be restarted for changes to the configuration to become active.

6 Mounting

6.1 Mounting types

The following mounting types are available, depending on the version:

Mounting	Wall	Support system	H-rail
CPX-AP-A modules	Mounting bracket CAFM-X5-A	Mounting bracket CAFM-X5-K	Mounting CAFM-X5-H

Tab. 6: Mounting types

6.2 H-rail mounting

The mounting points of the remote I/O system are limited to the end plates. The interlinking module and end plates are attached to the H-rail.
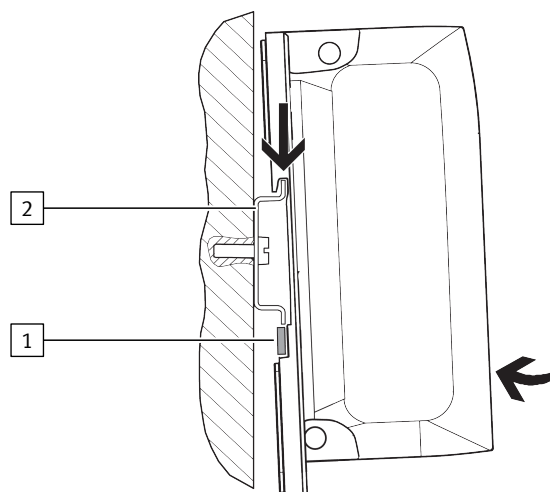
Fig. 15: H-rail mounting

| 1 | Clamping piece | | 2 | H-rail |

1. Make sure the mounting surface supports the weight
2. Mount the H-rail and make sure there is enough free space for connections.
3. Mount H-rail every 100 mm on the mounting surface.
4. Mount the clamping piece on the right and left end plates.
5. Attach the remote I/O system to the upper slot of the H-rail.
6. Swivel the remote I/O system onto the H-rail.
7. Tighten screws. Tightening torque: 1.3 Nm ± 10%.
   ⇨ Tightening the screws turns the clamping elements 90°. The remote I/O system is secured to prevent tipping and slipping.
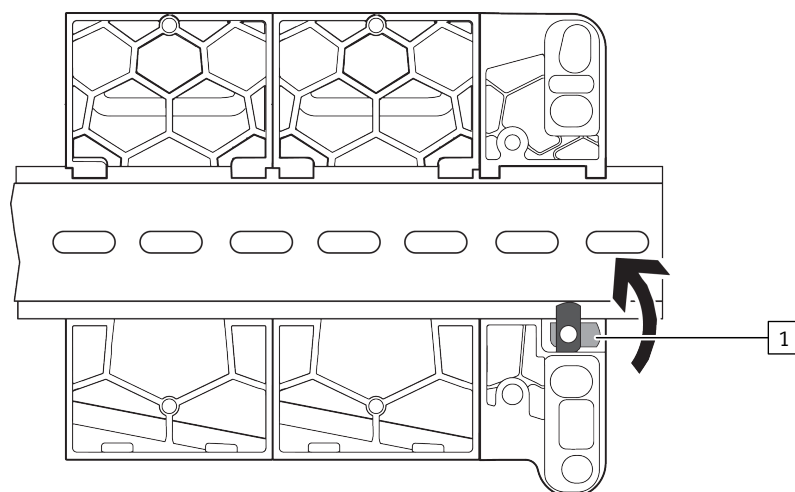
Fig. 16: Rear view: H-rail mounting

| 1 | Clamping piece |

6.3 Support system mounting

ℹ️ Mountings are pre-assembled depending on the configuration.

– A maximum of 6 CPX-AP-A modules between the end plates or between the end plate and pneumatic interface.
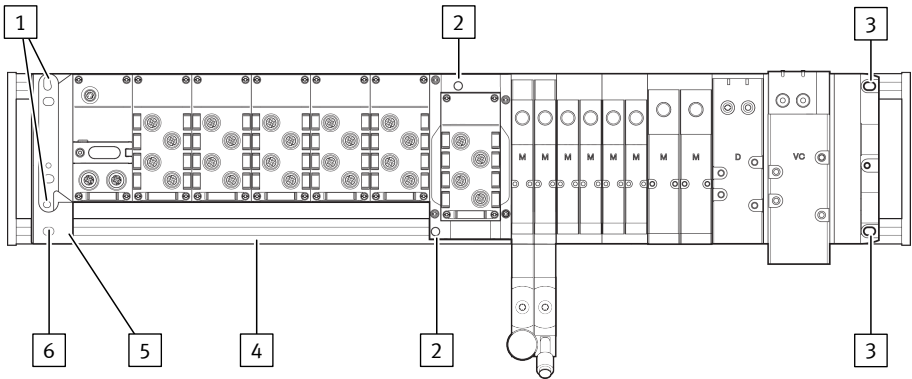
Fig. 17: Mounting system attachment point

1	End plate attachment points	4	Support system
2	Pneumatic interface attachment point	5	Mounting bracket CAFM-X5-K
3	Valve terminal end plate attachment point	6	Mounting bracket attachment point

6.4 Wall mounting

– Mount the device only on even, torsionally rigid surfaces.
– Make sure the mounting surface supports the weight.
– Make sure there is enough free space for the supply cables.

Number of mounting brackets
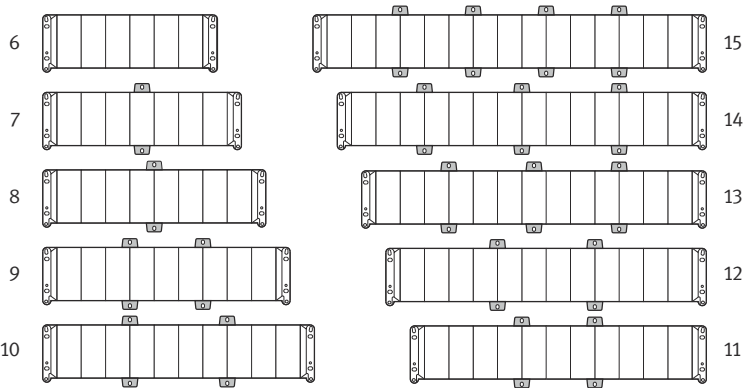
Fig. 18: Number of mounting brackets per expansion stage

Select the number and position of the mounting brackets so that there is a maximum of 3 single-width modules side-by-side that are not also fastened with a mounting bracket.

Mounting point	Screw size	Number
End plate	M5 or M6	2x
Mounting bracket	M6	1x

Tab. 7: Screw size for the mounting points

Position of the mounting brackets for supply
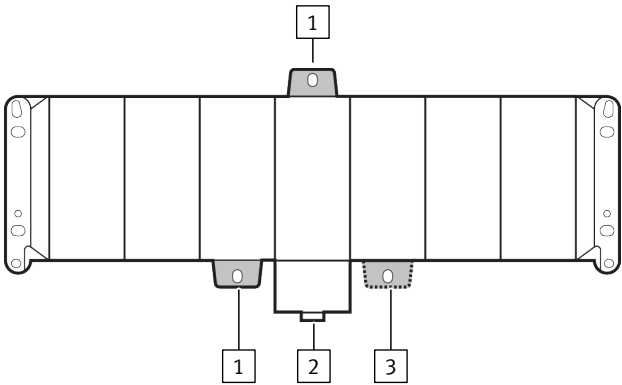
Fig. 19: Mounting bracket for supply

1	Mounting bracket	3	Alternative position
2	Supply		

If the position for the mounting bracket is occupied by a power feed, attach the mounting bracket to the left of it. If this is not possible due to another power feed, attach the bracket to the right of it.

Attaching mounting bracket

Attach the mounting brackets to one module or between two modules depending on the number of modules.
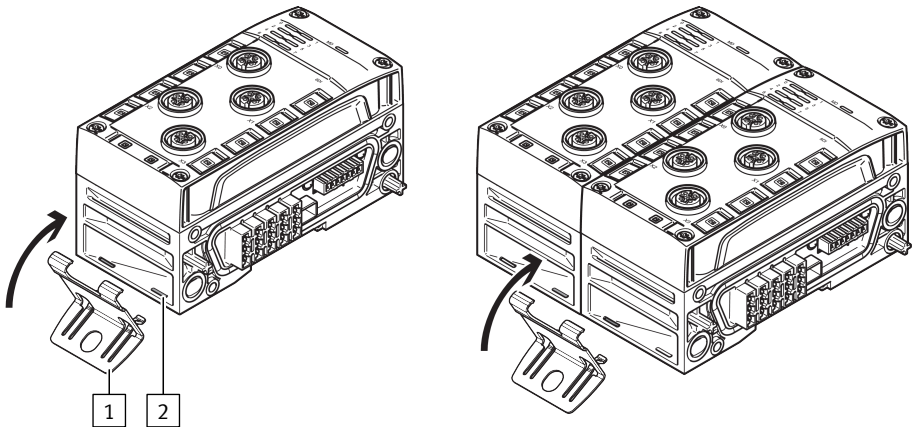
Fig. 20: Attaching mounting bracket

1	Mounting bracket	2	Recess

1. Insert the clamps for the mounting brackets into the recesses.
2. Snap in the mounting bracket.
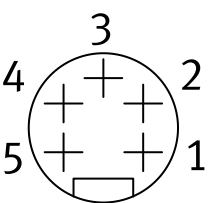
7 Installation

7.1 Connecting elements
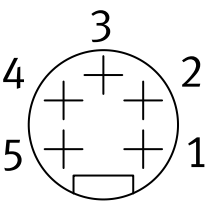
Device-side connections of the interlinking modules.

Connecting elements 7/8"

System supply	
Plug 7/8", 5-pin	Signal
	1 0 V DC load supply PL
	2 0 V DC logic supply PS
	3 Functional earth FE
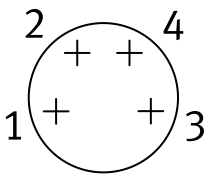
System supply		
Plug 7/8", 5-pin		Signal
	4	+24 V DC logic supply PS
	5	+24 V DC load supply PL

Tab. 8: System supply
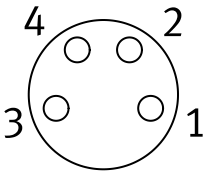
Additional supply		
Plug 7/8", 5-pin		Signal
	1	0 V DC load supply PL
	2	–
	3	Functional earth FE
	4	–
	5	+24 V DC load supply PL

Tab. 9: Additional supply

Connecting elements M8

System supply		
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
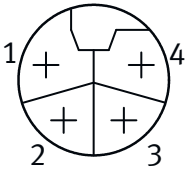
Tab. 10: System supply

Forwarding supply		
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
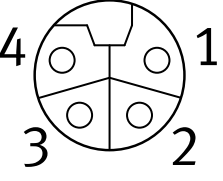
Tab. 11: Forwarding supply

Connecting elements M12
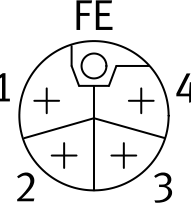
The M12, 4-pin, L-coded and M12, 5-pin, L-coded connecting elements are plug-compatible, but FE is not contacted.

System supply

M12 plug, 4-pin, L-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
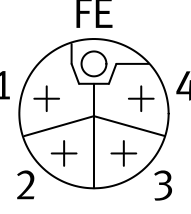
Tab. 12: System supply

Forwarding supply

M12 socket, 4-pin, L-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
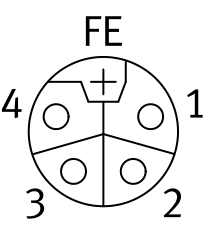
Tab. 13: Forwarding supply

System supply

M12 plug, 5-pin, L-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
	FE	Functional earth FE

Tab. 14: System supply

Additional supply

M12 plug, 5-pin, L-coded	Signal	
	1	–
	2	0 V DC load supply PL
	3	–
	4	+24 V DC load supply PL
	FE	Functional earth FE
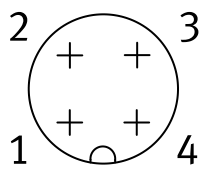
Tab. 15: Additional supply

Forwarding supply

M12 socket, 5-pin, L-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
	FE	Functional earth FE
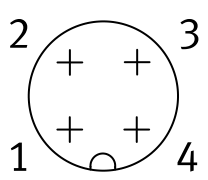
Tab. 16: Forwarding supply

Connecting elements M18
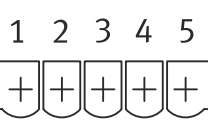
System supply

M18 plug, 4-pin		Signal
	1	+24 V DC logic supply PS
	2	+24 V DC load supply PL
	3	0 V (DC load supply PL + DC logic supply PS)
	4	Functional earth FE

Tab. 17: System supply
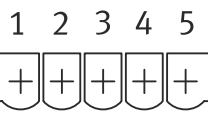
Additional supply

M18 plug, 4-pin		Signal
	1	–
	2	+24 V DC load supply PL
	3	0 V DC load supply PL
	4	Functional earth FE

Tab. 18: Additional supply

Push-pull connecting elements

System supply

Push-pull plug, 5-pin		Signal
	1	+24 V DC logic supply PS
	2	0 V DC logic supply PS
	3	+24 V DC load supply PL
	4	0 V DC load supply PL
	5	Functional earth FE

Tab. 19: System supply

Additional supply

Push-pull plug, 5-pin		Signal
	1	–
	2	–
	3	+24 V DC load supply PL

Additional supply		
Push-pull plug, 5-pin		Signal
1 2 3 4 5 [+][+][+][+][+]	4	0 V DC load supply PL
	5	Functional earth FE

Tab. 20: Additional supply

Forwarding supply		
Push-pull plug, 5-pin		Signal
1 2 3 4 5 [+][+][+][+][+]	1	+24 V DC logic supply PS
	2	0 V DC logic supply PS
	3	+24 V DC load supply PL
	4	0 V DC load supply PL
	5	Functional earth FE

Tab. 21: Forwarding supply

7.2 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. Close the unused connections with cover caps to ensure IP protection.

7.3 Power supply

> **i** When configuring the EMERGENCY STOP concept, check which measures are required for the machine or system in order to set the system to a safe state in the event of an EMERGENCY STOP, e.g. shutdown of the load voltage.

> **i** **Loss of function due to voltage drop.**
> Loss of function with delayed connection of the PS logic supply. If the modules are supplied by different fixed power supplies, the interface must be switched on last, because otherwise the modules will not be detected by the interface when the remote I/O system CPX-AP starts.

The power is supplied to the remote I/O system via feeds in the interlinking modules. They forward the operating voltage and the load voltage to the adjacent modules.

The voltages can be supplied jointly by one fixed power supply or separately by two fixed power supplies.

7.3.1 Connection example
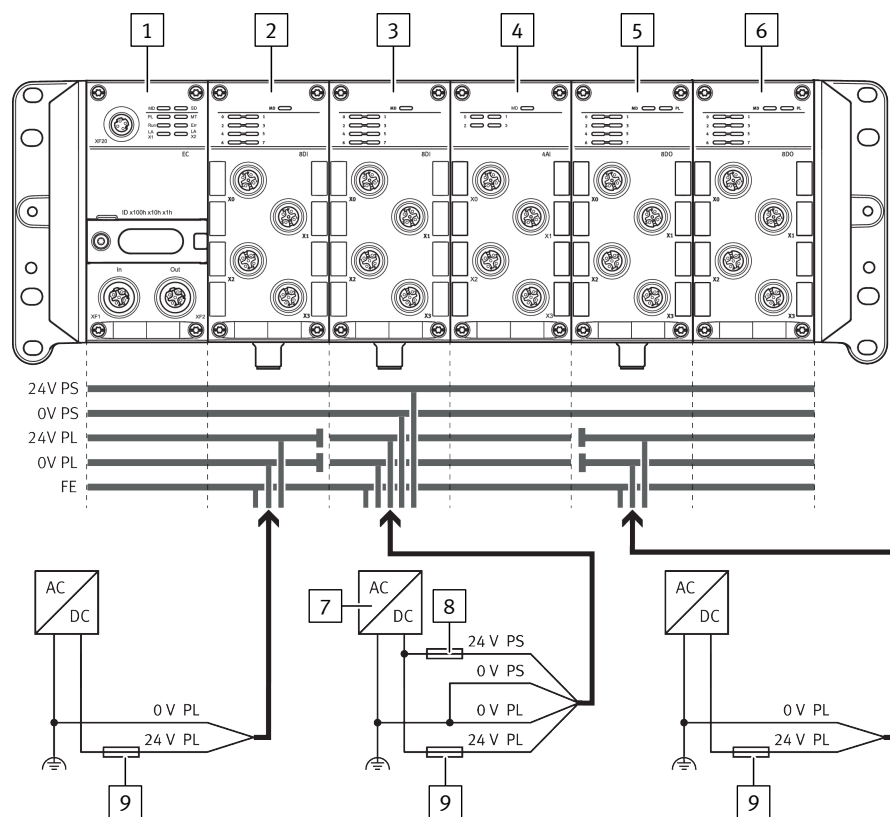
Fig. 21: Power supply concept

1	Interface	6	Digital output module
2	Digital output module on additional supply to the left	7	SELV/PELV fixed power supply
3	Digital output module on system supply	8	Fuse for operating voltage line protection
4	Analogue input module	9	Fuse for load voltage line protection
5	Digital output module on additional supply to the right		

> **i** The load supply PL can be switched on and off at any time. When switched off, the electrical outputs or valves are not active, even if they are actuated.

> **i** Use a maximum of 10 A per CPX-AP-A voltage zone, the remaining current is only available for forwarding.

Fuse for line protection
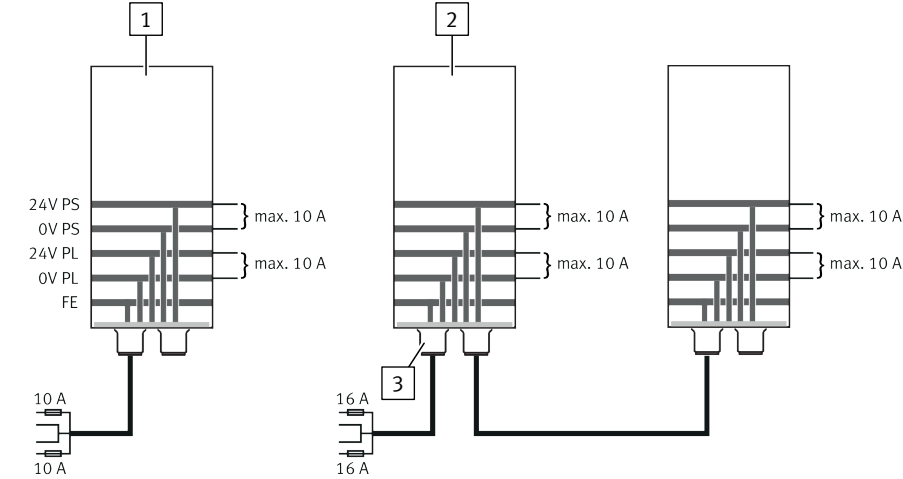
Fig. 22: Current rating

| 1 | Without forwarding | 3 | Max. 16 A per pin (with M12 supply) |
| 2 | With forwarding | | |

Connection	Acceptable current load for load supply
M8	4 A
7/8"	8 A
M12	10 A without forwarding. 16 A with forwarding. If necessary, note derating of the plug connectors.
M18	10 A
Push-pull	10 A without forwarding. 16 A with forwarding. If necessary, note derating of the plug connectors.

Tab. 22: Fuse for line protection

Connection	Without forwarding	With forwarding
M8	Max. 4 A, feed for both PS and PL power supply.	Max. 4 A, feed for both PS and PL power supply.
7/8"	Max. 8 A, feed for both PS and PL power supply.	–
M12	Max. 10 A, feed for both PS and PL power supply.	Max. 16 A, feed for both PS and PL power supply. Use a maximum of 10 A per voltage zone, the remaining current is available for forwarding, i.e. the incoming current minus the forwarded current must not exceed 10 A.
M18	Max. 10 A, feed for both PS and PL power supply. Total current PS + PL max. 16 A.	–
Push-pull	Max. 10 A, feed for both PS and PL power supply.	Max. 16 A, feed for both PS and PL power supply. Use a maximum of 10 A per voltage zone, the remaining current is available for forwarding, i.e. the incoming current minus the forwarded current must not exceed 10 A.

Tab. 23: Permissible currents for power supply feed

Supply

Power is supplied to the system supply at connection [XD1]. The supply voltages for supplying other devices can be forwarded via the connection [XD2] if a system supply with forwarding or a forwarding supply has been selected.

Electrical isolation	The modules of the remote I/O system have a potential separation between the internal electronics and the:

– Network connection of the interface
– System communication
– Load supply

> ℹ️ Information on the electrical isolations of the inputs and outputs of the modules ➔ technical data of the product-specific documentation

7.4 Earthing

The earth terminal is a functional earth connection. It serves to reduce the immunity to interference and is not for protection.
Options for earthing:
– Left end plate
– Left end plate and supply cable
– Supply cable
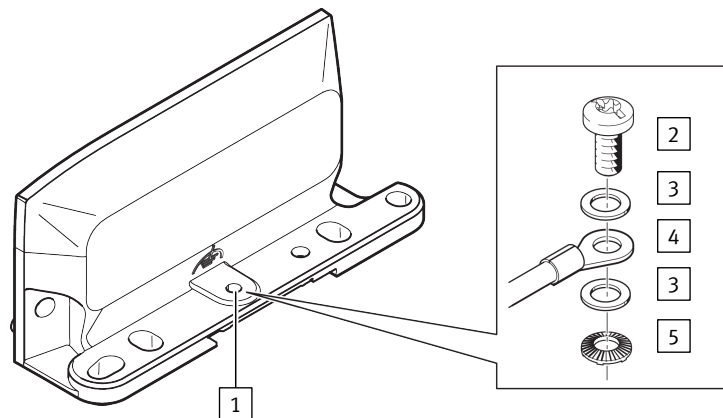
Fig. 23: Earthing via the left end plate

1	Earth terminal	4	Earthing cable
2	Screw	5	Contact washer
3	Washer		

Malfunction due to electrostatic influence

– Connect the earth terminal to the earth potential with low impedance.
– Avoid interference voltages on the conductive substrate.
– Use earth wire with a nominal cross-section 4 … 6 mm^2, preferably an earthing strap made of copper braid.
– Earthing cables should be kept as short as possible.

8 Commissioning

The remote I/O system CPX-AP-A must be commissioned in stages to prevent connection and addressing errors:

1. Check assembly and connections.
2. Configure the settings at the interface.
3. Without higher-order controller: check function of remote I/O system.
4. With higher-order controller: commissioning on the network.

8.1 Checking assembly and connections

1. Check that the modules are installed securely.
2. Check connection of functional earth FE.
3. Check that connected cables are seated firmly.

8.2 Configuring the settings at the interface

- If necessary, configure the settings using the control elements on the interface.

> **i** Detailed information on the control elements of the specific interface
> ➔ Instruction manual for the interface

8.3 Testing function without higher-order controller

1. Switch on PS and PL power supplies.
2. Check the response of the remote I/O system CPX-AP-A:
   – Connected actuators
   – LED indicators
     The following LED displays must be green:
     – [SD] system diagnostics, only available for interfaces
     – [MD] module diagnostics, available for all modules
     – [PL] voltage PL, only available for interfaces, electrical interfaces and modules with outputs

8.4 Commissioning in network with higher-order controller

> **i** Information on commissioning on the network ➔ Instruction manual for the applicable interface

9 Parameterisation

Various parameters are available to adapt the remote I/O system CPX-AP and the modules to the application and to access the corresponding data.

> **i** Detailed information on the parameters ➔ Product-specific documentation

10 Diagnostics

10.1 Diagnostics options

Various options are available for error diagnostics, depending on the parameterisation and network protocol used:
– LED displays on the product
– Internal System Diagnostics
– Diagnostics via the host system

10.2 Diagnostic status

The degree of severity of a diagnostic message is indicated by the diagnostic status.

Status	Description
Error	Error The remote I/O system/module is no longer operational. Urgent troubleshooting action required.
Warning	Warning The remote I/O system/module cannot be operated with its full functions. Troubleshooting action required.
Maintenance	Maintenance Maintenance required.
Information	Information No action required.

Tab. 24: Diagnostic status

10.3 Grouping and overview of the diagnostics messages

The diagnostics messages are grouped according to their cause.
This grouping is visible in the corresponding overview:
– Grouped overview:
  Main group | Sub-group | Error number
  e.g. 02 | 01 | 0022
– Ungrouped overview:
  diagnostics number
  e.g. 33619990

The diagnostics messages are mapped within the Interfaces corresponding profiles of the Host-Systeme and device profiles in use. If the Host-System or device profile only allows 16 bits, only the unique error number is transferred.
The diagnostics number of the ungrouped overview is determined from the grouped overview as follows:

1. Combine main group, sub-group and error number byte by byte as a hexadecimal 4-byte value:
   – Main group = byte 4
   – Sub-group = byte 3
   – Error number = byte 2 and 1
2. The resultant hexadecimal 4-byte number displayed as a decimal number equals the diagnostics number in the ungrouped overview.

> **i** The diagnostics categories listed are used in several product areas, including outside CPX-AP. Depending on the specific product used, only parts of this complete list will be used.

Main group		Subgroup	
1	Current	1	Short circuit
		2	I²t
		3	Braking resistor
2	Voltage	1	Supply
		2	DC link circuit
		3	Principal voltage
		4	Encoder supply

Main group		Subgroup	
2	Voltage	5	Battery
3	Temperature	1	Device
		2	Output stage
		3	Motor
4	Pressure	0	No allocation
5	Motion	1	Homing
		2	Motion control
6	Configuration/parameterization	0	No allocation
		2	Critical limits
		5	Parameter set
7	Monitoring	1	Limitations
		2	Motion monitoring
		3	Critical limits
		4	Zero angle detection
		5	Analogue input
		6	Valve
8	Communication	0	No allocation
		1	AP
		2	PROFIBUS
		3	PROFINET
		4	EtherCAT
		5	DEVICENET
		6	EtherNet/IP
		7	SERCOS
		8	CBUS
		9	PROFIdrive
		10	IO-Link
		11	I-Port
		12	CiA 402
9	Safety engineering	0	No allocation
		1	STO
		2	SBC
10	Internal hardware	1	Module error
11	Software	1	Exception
		2	Task
		3	File system
		4	Firmware update
		5	Device configuration
		6	LibRTE
		7	Warm start
		8	Version management
		9	Device description
12	Maintenance	1	Operating time
13	Various	1	Diagnostics
		2	Auto-tuning
16	External device	1	CDSB

Main group		Subgroup	
16	External device	2	IO-Link device
17	Security (data)	1	User login
18	Encoder	0	No allocation
		1	EnDat
		2	Hiperface
		3	Quadrature (incremental encoder)
		4	Nikon A
		6	Sin/Cos

Tab. 25: Grouping of the diagnostics messages

10.4   Load voltage monitoring

The load voltage monitoring distinguishes:

– Undervoltage or overvoltage PL

– Switch off PL

The distinction between "undervoltage PL" and "shutdown PL" is helpful if a deliberate shutdown, e.g. emergency stop, should not trigger an error message in the higher-order controller. A critical undervoltage, e.g. due to an excessively high voltage drop in the cable, is always reported as an error.

A "shutdown PL" is detected by the module if the load supply PL falls below the permissible tolerance range and then drops to a residual voltage of <5 V within 250 ms.

The behaviour of the load supply monitoring can be set with the "diagnostics undervoltage load supply" parameter.

The diagnostics are displayed as a combination of the LED displays [MD] and [PL] and a diagnostics message is generated depending on the parameter setting.

Load voltage monitoring – inactive (0)

LED [MD]	LED [PL]	Meaning	Diagnostics
Green light	Green light	Permissible voltage range	–
Green light	Flashing red	Overvoltage PL	–
Green light	Flashing red	Undervoltage PL	–
Green light	Flashing green	Switch off PL	–

Tab. 26: Load voltage monitoring - inactive (0)

Load voltage monitoring – active, with suppression of diagnostics at switch off (1)

LED [MD]	LED [PL]	Meaning	Diagnostics
Green light	Green light	Permissible voltage range	–
Red light	Flashing red	Overvoltage PL	02 ǀ 01 ǀ 013F (error) Overvoltage in load supply (PL) 24 V DC
Red light	Flashing red	Undervoltage PL	02 ǀ 01 ǀ 0105 (Error) Undervoltage in load supply (PL) 24 V DC
Flashing green	Flashing green	Switch off PL	02 ǀ 01 ǀ 0106 (Information) Shut down of load supply (PL) 24 V DC

Tab. 27: Load voltage monitoring - active, with suppression of diagnostics at switch off (1)

Load voltage monitoring – active (2)

LED [MD]	LED [PL]	Meaning	Diagnostics
Green light	Green light	Permissible voltage range	–
Red light	Flashing red	Overvoltage PL	02 ǀ 01 ǀ 013F (error) Overvoltage in load supply (PL) 24 V DC
Red light	Flashing red	Undervoltage PL	02 ǀ 01 ǀ 0105 (Error) Undervoltage in load supply (PL) 24 V DC
Red light	Flashing red	Switch off PL	02 ǀ 01 ǀ 0105 (Error) Undervoltage in load supply (PL) 24 V DC

Tab. 28: Load voltage monitoring - active (2)

10.5 Diagnostic messages

The following table contains the diagnostic messages of all CPX-AP modules.
The %d or %u outputs are replaced by concrete values when the device outputs the diagnostic message.
See the operating instructions for the IO-Link Master for further specific diagnostic messages from the IO-Link devices as well as the mapping of the IO-Link event codes to the diagnostic IDs.

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
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
03 | 01 | 002D	50397229	Device undertemperature	Device undertemperature	– Check ambient conditions	Error
03 | 01 | 002F	50397231	Device overtemperature	Device overtemperature	– Check warning threshold parameterisation – Device fan defective? – Device overloaded? – Check installation conditions; control cabinet fan filter dirty? – Check drive layout (possible overloading during continuous operation)	Error
06 | 05 | 0062	100991074	Parameter set invalid	Parameter set invalid	Overwrite parameter set (save)	Error
0B | 03 | 00B0	184746160	CRC error in user file	A CRC error was detected in the user file.	– Restarting device – Service case	Error
0B | 04 | 00B7	184811703	Firmware invalid	Firmware invalid	– Repeat transmission of firmware package	Error
0B | 07 | 00CC	185008332	Initialisation failed	Initialisation of the device failed.	– Check whether additional diagnostic messages are pending – Reset device to factory settings	Error
0A | 01 | 00F9	167837945	RTE module watchdog monitoring error	RTE module watchdog monitoring error is triggered	– Restarting device – Update firmware – Service case	Error
02 | 01 | 0105	33620229	Undervoltage in load supply (PL) 24 V DC	Undervoltage in the load supply (PL) 24 V DC was detected.	– Check power supply (load) – Check for short circuit	Error
02 | 01 | 0106	33620230	Shutdown of load supply (PL) 24 V DC	A shutdown of the load voltage supply PL was detected. The cause can be a deliberate shutdown by emergency stop.	– Check whether emergency stop was activated – Check the load voltage supply	Information
08 | 0A | 0108	134873352	IO-Link event	An IO-Link diagnostic event (note, warning or error) has occurred. IO-Link event-specific details are attached to this message.	– See documentation of the IO-Link master or device	Error
06 | 00 | 0109	100663561	Startup parameter rejected by device	The startup parameter specified in the AP device description does not exist in the device or deviates from the specification.	– Check firmware version	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
06 ǀ 00 ǀ 010A	100663562	Start-up parameter deviation in length	The length of the start-up parameter in the device differs from the specified length in the AP device description.	– Check firmware version	Error
01 ǀ 01 ǀ 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
01 ǀ 01 ǀ 010C	16843020	Short circuit/overload output signal	Connected digital output load is too high for the channel.	– Check connected load for correct function, in particular for current consumption. – Check wiring. The output must be reset after the malfunction has been cleared.	Error
0B ǀ 00 ǀ 010E	184549646	General software error	An error has occurred that could not be assigned to any other specific diagnosis.	– Check that you are using the latest firmware version. – Please contact Festo Support	Error
08 ǀ 01 ǀ 0124	134283556	Communication to AP master interrupted	The communication to the AP Master is aborted.	– Restart AP Master. – Check communication AP connecting cable.	Error
07 ǀ 06 ǀ 0125	117834021	Valve coil not connected	The valve coil for switching is not connected or is defective.	– Do not switch unused channels. – Check or replace valve	Error
08 ǀ 01 ǀ 0127	134283559	Communication to AP module interrupted	The AP system communication to a module is aborted.	– Restart AP system. – Check communication AP connecting cable.	Error
0B ǀ 09 ǀ 0128	185139496	APDD invalid	The AP device description file is invalid or missing.	– Restart device. – Check communication lines (AP). – Check firmware version. – In the event of repeated errors contact Festo Service.	Error
0B ǀ 09 ǀ 0129	185139497	Start-up APDD invalid	The Startup AP device description file is invalid or missing.	Restart device. Check communication lines (AP). Check firmware version. In the event of repeated errors contact Festo Service.	Error
08 ǀ 00 ǀ 012E	134218030	Device address invalid	Transferred device address is invalid.	Check address configuration. Is the configuration set via software or hardware (DIL switch)? Check the assigned address for the device. Check multiple address assignment. Check DIL switch setting.	Warning
08 ǀ 01 ǀ 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 ǀ 01 ǀ 0132	134283570	Output process data watchdog of the bus interface expired	The process data watchdog for the output data in the bus interface has expired.	– Match cycle time and watchdog parameters. – Restart AP system. – Check cable.	Error
08 ǀ 01 ǀ 0133	134283571	Input process data watchdog of the bus interface expired	The process data watchdog for the input data in the bus interface has expired.	– Match cycle time and watchdog parameters. – Restart AP system. – Check cable.	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
08 | 01 | 0134	134283572	AP Master toggle bit error	A module has not mirrored the toggle bit in the process data.	– Match cycle time and toggle timeout parameters. – Restart AP system. – Check cable.	Error
08 | 00 | 0135	134218037	Wire break detected	A wire break was detected for the channel.	– Check wiring	Error
06 | 02 | 0136	100794678	Upper critical limit overshot	A channel has exceeded the upper critical limit.	– Check parameters – Check sensor	Error
06 | 02 | 0137	100794679	Lower critical limit undershot	A channel has undershot the lower critical limit.	– Check parameters – Check sensor	Error
06 | 02 | 0138	100794680	Signal range is exceeded or undershot	A channel has overshot or undershot the set signal range.	– Check signal range parameters – Check sensor	Warning
08 | 01 | 013A	134283578	Multiple AP masters detected	Another AP master with higher priority was detected.	– Check the structure, only one AP master is permitted – Restart AP Master	Error
08 | 01 | 013B	134283579	System startup failed	AP startup failed. AP system communication in emergency mode	– Check firmware versions and update if necessary – Restart AP system	Error
08 | 01 | 013C	134283580	Topology discovery failed	AP topology discovery failed	– Check firmware versions and update if necessary – Restart AP system	Error
0C | 00 | 013D	201326909	Firmware update mode	AP system communication in firmware update mode	– Install firmware updates – Restart AP system	Maintenance required
02 | 01 | 013F	33620287	Overvoltage in load supply (PL) 24 V DC	Overvoltage in load supply (PL) 24 V DC	– Check power supply	Error
0B | 00 | 0140	184549696	System start	The system starts.	– None	Information
0D | 00 | 0141	218104129	General malfunction of IO-Link device	General malfunction unknown IO-Link device error. Corresponds to IO-Link EventCode 0x1000.	– Check IO-Link device	Information
03 | 01 | 0142	50397506	Temperature error overload	Temperature error overload	– Device-specific	Error
10 | 02 | 0145	268566853	Device hardware error	Hardware error of the IO-Link device	– Repair or replace IO-Link device	Error
10 | 02 | 0146	268566854	Malfunction of a device component	Malfunction of a component of the IO-Link device	– Repair or replace IO-Link device	Error
02 | 05 | 0147	33882439	Memory error	Data loss in remanent memory	– Check batteries	Error
02 | 05 | 0148	33882440	Batteries weak	Batteries weak	– Check batteries	Warning
02 | 01 | 0149	33620297	General power supply error	General power supply error	– Check power supply	Error
0A | 00 | 014A	167772490	Fuse blown/opened	Fuse blown/opened	– Replace fuse – Eliminate cause of defective fuse	Error
08 | 0A | 014C	134873420	Invalid cycle time	Invalid cycle time of IO-Link communication	– Adjust cycle time to the permissible value	Error
08 | 0A | 014D	134873421	Version error incompatible protocol version	Version error incompatible IO-Link protocol version	– Device not compatible	Error
08 | 0A | 014E	134873422	ISDU batch failed	ISDU batch failed parameter inconsistency?	– Check parameters	Error
06 | 00 | 014F	100663631	Parameter error	Parameter was written with invalid value.	– Check datasheet and parameter values	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
06 ǀ 00 ǀ 0150	100663632	Parameter missing in the device	Parameter missing in the device	– Check datasheet and parameter values	Error
10 ǀ 02 ǀ 0152	268566866	Wire break at lower-level device 1	Wire break at lower-level IO-Link device 1	– Check wiring	Error
10 ǀ 02 ǀ 0153	268566867	Wire break at lower-level device 2	Wire break at lower-level IO-Link device 2	– Check wiring	Error
10 ǀ 02 ǀ 0154	268566868	Wire break at lower-level device 3	Wire break at lower-level IO-Link device 3	– Check wiring	Error
10 ǀ 02 ǀ 0155	268566869	Wire break at lower-level device 4	Wire break at lower-level IO-Link device 4	– Check wiring	Error
10 ǀ 02 ǀ 0156	268566870	Wire break at lower-level device 5	Wire break at lower-level IO-Link device 5	– Check wiring	Error
10 ǀ 02 ǀ 0157	268566871	Wire break at lower-level device 6	Wire break at lower-level IO-Link device 6	– Check wiring	Error
10 ǀ 02 ǀ 0158	268566872	Wire break at lower-level device 7	Wire break at lower-level IO-Link device 7	– Check wiring	Error
10 ǀ 02 ǀ 0159	268566873	Wire break at lower-level device 8	Wire break at lower-level IO-Link device 8	– Check wiring	Error
10 ǀ 02 ǀ 015A	268566874	Wire break at lower-level device 9	Wire break at lower-level IO-Link device 9	– Check wiring	Error
10 ǀ 02 ǀ 015B	268566875	Wire break at lower-level device 10	Wire break at lower-level IO-Link device 10	– Check wiring	Error
10 ǀ 02 ǀ 015C	268566876	Wire break at lower-level device 11	Wire break at lower-level IO-Link device 11	– Check wiring	Error
10 ǀ 02 ǀ 015D	268566877	Wire break at lower-level device 12	Wire break at lower-level IO-Link device 12	– Check wiring	Error
10 ǀ 02 ǀ 015E	268566878	Wire break at lower-level device 13	Wire break at lower-level IO-Link device 13	– Check wiring	Error
10 ǀ 02 ǀ 015F	268566879	Wire break at lower-level device 14	Wire break at lower-level IO-Link device 14	– Check wiring	Error
10 ǀ 02 ǀ 0160	268566880	Wire break at lower-level device 15	Wire break at lower-level IO-Link device 15	– Check wiring	Error
01 ǀ 01 ǀ 0161	16843105	Short circuit check installation	Short circuit check installation	– Check installation	Error
01 ǀ 01 ǀ 0162	16843106	Earth fault check installation	Earth fault check installation	– Check installation	Error
0D ǀ 00 ǀ 0164	218104164	Simulation active	Simulation active	– Check operating mode	Warning
07 ǀ 07 ǀ 0165	117899621	Process variable range overflow	Overflow of the process variable range process data uncertain	– Check input signal – Check parameters and configuration	Warning
07 ǀ 05 ǀ 0166	117768550	Measuring range exceeded	Measuring range exceeded	– Check application – Check input signal – Check parameters and configuration	Error
07 ǀ 07 ǀ 0167	117899623	Underflow of the process variable range	Underflow of the process variable area process data uncertain	– Check input signal – Check parameters and configuration	Warning
0C ǀ 01 ǀ 0168	201392488	Cleaning maintenance required	Cleaning maintenance required	– Cleaning the device	Warning
0C ǀ 00 ǀ 0169	201326953	Refill maintenance requirement	Refill maintenance requirement	– Refill	Warning
0C ǀ 01 ǀ 016A	201392490	Maintenance required replacement of wearing parts	Maintenance required replacement of wearing parts	– Check wearing parts and replace if necessary	Warning

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
08 | 0A | 016B	134873451	Wrong VendorID deviation of the inspection level	The recognised IO-Link device does not match the configured VendorID.	– Check that the correct IO-Link device is connected.	Error
08 | 0A | 0177	134873463	Backup inconsistency upload error	IO-Link backup/restore failed. Error uploading	– Device-specific	Error
08 | 0A | 0178	134873464	Parameter inconsistency download error	IO-Link backup/restore failed. Download error	– Device-specific	Error
01 | 01 | 0179	16843129	Load supply short circuit/overload	The connected consumer is defective or exceeds the permitted power consumption.	– Check the connected consumer for proper functioning, especially for current consumption – Check wiring	Error
01 | 01 | 017A	16843130	Short circuit on I/Q	Short circuit on I/Q (IO-Link)	– Check wiring	Error
01 | 01 | 017B	16843131	Short circuit on C/Q (if digital output)	Short circuit on C/Q (if digital output)	– Check wiring	Error
01 | 01 | 017C	16843132	Overload on I/Q	Overload on I/Q	– Check load	Error
01 | 01 | 017D	16843133	Overload on C/Q (if digital output)	Overload on C/Q (if digital output)	– Check load	Error
08 | 0A | 017F	134873471	Process data configuration error	Reserved process data length for the IO-Link device too small	– Set the module variant to a larger process data length	Error
08 | 0A | 0180	134873472	Short circuit C/Q	Short circuit C/Q signal (IO-Link)	– Check wiring	Error
03 | 01 | 0181	50397569	PHY overtemperature	PHY overtemperature	– Eliminate heat source	Error
08 | 0A | 0182	134873474	IO-Link events overflow	IO-Link events overflow. Data loss of the events possible.	– Device-specific	Error
08 | 0A | 0183	134873475	Backup inconsistency memory out of range (2048 octets)	IO-Link backup/restore failed. Memory out of range (2048 octets)	– Device-specific	Error
08 | 0A | 0184	134873476	Backup inconsistency DataStorageIndex not available	IO-Link backup/restore failed. DataStorageIndex not available	– Device-specific	Error
08 | 0A | 0185	134873477	Backup inconsistency non-specific error during data storage	IO-Link backup/restore failed. Non-specific error in data memory	– Device-specific	Error
06 | 00 | 0188	100663688	Module identification check skipped	No check of the target slot configuration for the actual slot configuration	– Download slot configuration	Warning
06 | 00 | 0189	100663689	Module identification check failed	Module identification failed for slot %u (detected %u - configured %u)	– Download current slot configuration	Error
0B | 08 | 018F	185074063	Unsupported Full Diagnostic Image version	The Diagnostic Full Image version is not supported.	– Check and synchronise firmware versions of master and devices.	Error
0B | 08 | 0190	185074064	Unsupported diagnostic version	The diagnostic version is not supported.	– Check and synchronise firmware versions of master and devices.	Error
08 | 04 | 0191	134480273	Status change request	Status change request from: %d to: %d	– None	Error
08 | 00 | 0192	134218130	Invalid cycle time	Calculation of bus cycle time failed (local timer too slow)	– Increase cycle time	Error
08 | 04 | 0193	134480275	Sync Manager invalid address	Sync Manager %d invalid address (%d)	– Set correct Sync Manager address	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
08 | 04 | 0194	134480276	Sync Manager invalid I/O size	Sync Manager %d invalid I/O size (%d)	– Correct I/O size	Error
08 | 04 | 0195	134480277	Sync Manager invalid configuration	Sync Manager %d invalid configuration (%d)	– Check and correct configuration	Error
08 | 04 | 0196	134480278	DC activation register invalid	DC activation register invalid	– Correct DC activation register	Error
08 | 04 | 0197	134480279	SyncType not supported	The configured SyncType (0x1C32.1 or 0x1C33.1) is not supported. Check DC registers and supported SyncTypes (0x1C32.4 and 0x1C33.4).	– Check DC registers and supported SyncTypes (0x1C32.4 and 0x1C33.4).	Error
09 | 03 | 0198	151191960	Short circuit to 24V	Short circuit to 24V	– Check wiring	Error
09 | 03 | 0199	151191961	Short circuit to external cycle	Short circuit to external cycle	– Check wiring	Error
09 | 03 | 019A	151191962	No signal at the input	No signal at the input	– Check wiring	Error
09 | 03 | 019B	151191963	Signal discrepancy at inputs	Signal discrepancy at inputs, different input signals	– Check wiring	Error
09 | 04 | 019C	151257500	Error cross circuit P channel	Cross circuit test on P channel failed. When the output driver is switched off, there is a connection to 24V at the output.	– Check wiring – Acknowledgement and reintegration of the module – If the problem persists replace the module and contact Festo Service	Error
09 | 04 | 019D	151257501	Error cross circuit M channel	Cross-circuit test on M channel failed. When the output driver is switched off, the output is connected to 0V.	– Check wiring – Acknowledgement and reintegration of the module – If the problem persists replace the module and contact Festo Service	Error
08 | 08 | 019F	134742431	General CBUS error	Diagnostics is pending on the CBUS master.	– Contact Festo Service	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
08 | 01 | 01A4	134283684	Incorrect device variant set	The currently set device variant does not match the system configuration. The device variant is automatically adapted to the system configuration.	– If the device variant was not automatically adjusted, set the configured device variant in the device.	Information
07 | 0A | 01A5	118096293	Minimum pulse length undershot	The parameterised minimum pulse length was undershot.	– None	Warning
07 | 0A | 01A6	118096294	Maximum pulse length overshot	The parameterised maximum pulse length was overshot.	– None	Warning
0A | 00 | 01A7	167772583	Remanent memory fault	Remanent memory fault	– Restarting device – If the problem persists, contact Festo Service	Error
08 | 0A | 01A8	134873512	Incorrect DeviceID deviation of the inspection level	The detected IO-Link device does not match the configured DeviceID.	– Check that the correct IO-Link device is connected.	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
08 | 0A | 01A9	134873513	No device connected	No IO-Link device connected	– Check that the correct IO-Link device is connected.	Error
07 | 0A | 01AA	118096298	New smallest measured pulse length	The pulse length is shorter than the last measured minimum value.	– None	Information
07 | 0A | 01AB	118096299	New longest measured pulse length	The pulse length is longer than the last measured maximum value.	– None	Information
08 | 01 | 01AD	134283693	Switch to operating mode operation failed	The AP device could not change the operating mode from Configuration to Operation.	– Restart system – Update firmware to the latest version – Contact Festo Service	Warning
08 | 01 | 01AE	134283694	AP device detected invalid	The "device invalid" device status was detected for the AP device.	– Check AP device – Restart system	Error
08 | 01 | 01B1	134283697	AP system startup delayed	Unexpected error during system startup. Startup is repeated.	– Check communication AP connecting cable – Check AP devices – Check that current firmware versions are being used	Warning
0C | 01 | 01B3	201392563	Lifecycle Counter threshold reached	The set threshold of the lifecycle counter for the valve has been reached.	– Replace valve – Increase lifecycle counter threshold	Maintenance required
0C | 01 | 01B4	201392564	Wrong valve connected	The target/actual comparison for the valve failed.	– Adjust configuration – Connect the correct valve	Maintenance required
0C | 01 | 01B5	201392565	Condition counter for valve coil reached	The condition counter limit for the valve coil has been reached.	– Perform maintenance – Reset condition counter	Maintenance required
08 | 01 | 01C4	134283716	AP module(s) detected	One or more new AP modules were detected in the system.	– None	Information
09 | 05 | 01C5	151323077	Overvoltage channel A	Overvoltage channel A	– Restarting device – Service case	Error
09 | 05 | 01C6	151323078	Overvoltage channel B	Overvoltage channel B	– Restarting device – Service case	Error
09 | 05 | 01C7	151323079	Undervoltage channel A	Undervoltage channel A	– Restarting device – Service case	Error
09 | 05 | 01C8	151323080	Undervoltage channel B	Undervoltage channel B	– Restarting device – Service case	Error
09 | 06 | 01CB	151388619	Main switch channel A error	Main switch channel A error	– Restarting device – Service case	Error
09 | 06 | 01CC	151388620	Main switch channel B error	Main switch channel B error	– Restarting device – Service case	Error
09 | 00 | 01D5	150995413	Incorrect safety version channel A	Incorrect safety version channel A	– Restarting device – Service case – Check that current firmware versions are being used	Error
09 | 00 | 01D6	150995414	Incorrect safety version channel B	Incorrect safety version channel B	– Restarting device – Service case – Check that current firmware versions are being used	Error
0D | 01 | 01DD	218169821	Diagnostic trace reset	The diagnostic trace has been reset and all diagnostics removed.	– None	Information

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
08 | 01 | 01FF	134283775	Device not ready	A device delays the start-up for a disproportionately long time.	– Contact Festo Support	Error
09 | 05 | 0200	151323136	Overtemperature safety part channel A	Overtemperature safety part channel A	– Device fan defective? – Device overloaded? – Check installation conditions; control cabinet fan filter dirty? – Check drive layout (possible over-loading during continuous operation)	Error
09 | 05 | 0201	151323137	Overtemperature safety part channel B	Overtemperature safety part channel B	– Device fan defective? – Device overloaded? – Check installation conditions; control cabinet fan filter dirty? – Check drive layout (possible over-loading during continuous operation)	Error
09 | 05 | 0202	151323138	Undertemperature safety part channel A	Undertemperature safety part channel A	– Device fan defective? – Device overloaded? – Check installation conditions; control cabinet fan filter dirty? – Check drive layout (possible over-loading during continuous operation)	Error
09 | 05 | 0203	151323139	Undertemperature safety part channel B	Undertemperature safety part channel B	– Device fan defective? – Device overloaded? – Check installation conditions; control cabinet fan filter dirty? – Check drive layout (possible over-loading during continuous operation)	Error
06 | 00 | 0211	100663825	Parameters changed	The value of the parameter has been changed.	– Check configuration	Error
08 | 00 | 0212	134218258	Send failed	Sending data failed after a number of retries.	– Check connection – Increase the number of send attempts	Information
08 | 01 | 0215	134283797	Communication failure to the downstream module	The device was forced into loopback by the master due to communication errors (AP Out Port disabled). This has interrupted communication with downstream modules.	– Check wiring	Maintenance required
08 | 00 | 0216	134218262	IMA timeout	The IMA timeout of the W-Master has exceeded the configured value.	– Increase IMA timeout – Improve radio connection – Check for interference with other wireless networks	Warning
06 | 00 | 0217	100663831	Pairing button pressed	The pairing button was pressed.	– None	Information
04 | 01 | 0223	67174947	Diagnosis of supply pressure	Fluctuations in supply pressure signalled.	– Check the hose connection between the supply and the valve.	Warning
04 | 02 | 0224	67240484	Leakage diagnostics of working pressures	Displays the value of the leakage at the corresponding working port of the cylinder.	– Check the tubing connections between valve and cylinder	Maintenance required
08 | 01 | 0225	134283813	Illegal topology	The existing topology includes illegal connections.	– Check wiring	Maintenance required

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
02 | 01 | 0230	33620528	Overload shutdown power supply forwarding PL	The power forwarding PL to XD2 was switched off.	– Eliminate the cause and switch the PL supply off and on again. Possible causes: – Overload/short circuit present: reduce load or eliminate short circuit. – Voltage drop: use a greater power supply or increase the current limit of the fixed power supply. – Voltage drop: use a shorter supply cable or a larger cable cross-section. – Voltage drop: reduce load on power out. – Minimum switch-off time not observed: wait for the minimum switch-off time before switching on again. – Service case	Error
02 | 01 | 0231	33620529	Overload shutdown, power supply forwarding PS	The power forwarding PS to XD2 was switched off.	– Eliminate the cause and switch the PS supply off and on again. Possible causes: – Overload/short circuit present: reduce load or eliminate short circuit. – Voltage drop: use a greater power supply or increase the current limit of the fixed power supply. – Voltage drop: use a shorter supply cable or a larger cable cross-section. – Voltage drop: reduce load on power out. – Minimum switch-off time not observed: wait for the minimum switch-off time before switching on again. – Service case	Error
09 | 05 | 0240	151323200	Error diagnostic capability P channel	The test for diagnosing cross-circuits on the P channel failed.	– Check wiring – Acknowledgement and reintegration of the module – If the problem persists replace the module and contact Festo Service	Error
09 | 05 | 0241	151323201	Error diagnostic capability M channel	The test of the diagnostic capability of cross-circuits on the M channel failed.	– Check wiring – Acknowledgement and reintegration of the module – If the problem persists replace the module and contact Festo Service	Error
09 | 04 | 0242	151257666	Error resting potential too high P channel	The P channel resting potential test failed. The open-circuit potential is too high.	– Check wiring – Acknowledgement and reintegration of the module – If the problem persists replace the module and contact Festo Service	Error
09 | 04 | 0243	151257667	Error resting potential too low P channel	The P channel resting potential test failed. The resting potential is too low.	– Check wiring – Acknowledgement and reintegration of the module – If the problem persists replace the module and contact Festo Service	Error
01 | 01 | 0244	16843332	Short circuit to 0V (GND) P channel	Short circuit to 0V (GND) / overload detected in the P channel.	– Check wiring – Acknowledgement and reintegration of the module	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
01 | 01 | 0245	16843333	Short circuit to 24V M channel	Short circuit to 24V / overload detected in M channel.	– Check wiring – Acknowledgement and reintegration of the module	Error
04 | 01 | 0246	67174982	Vacuum not reached	The vacuum could not be generated.	– Check for leakage.	Warning
04 | 01 | 0247	67174983	Controller error or air saving function error	Malfunction in the controller function (e.g. setpoint value cannot be reached) or Malfunction of the air saving function, vacuum suction nozzle goes into "continuous suction" operating mode.	– Check pressure and actuator supply – Check for leakage – if applicable deactivate air saving function	Warning
07 | 03 | 0248	117637704	Pressurisation or evacuation time exceeded	The evacuation or pressurisation time was at least doubled.	– Check for leakage. – Extend pressurisation time. – Check throttle setting.	Error
07 | 03 | 0249	117637705	Process quality below critical limit	The process quality is below the critical limit.	– Check for leakage.	Warning
08 | 00 | 024A	134218314	Module unknown	The type of module cannot be determined or the master does not support the module.	– Check module – Update software – Contact Festo Service	Error
08 | 00 | 024B	134218315	Too many modules connected	The maximum number of supported modules that can be connected to the system has been exceeded.	– Remove modules – Change topology, use multiple gateways – Contact Festo Service	Error
08 | 08 | 024C	134742604	CPX classic diagnostics	A CPX classic diagnostics is pending.	– see CPX manual	Warning
09 | 08 | 024E	151519822	Safety addressing procedure failed	The safety addressing procedure (PROFIsafe Type 1 or Type 2) failed.	– Contact Festo Service	Error
0B | 09 | 024F	185139791	Device inconsistency detected	Different device data sources have inconsistencies for the same target data.	– Possible error in the device detected. Please contact Festo Service.	Maintenance required
09 | 06 | 0252	151388754	Self-test of logic channel A failed	The test pulse check on logic channel A failed	– none	Error
09 | 06 | 0253	151388755	Self-test of logic channel B failed	The test pulse check on logic channel B failed	– none	Error
09 | 06 | 0254	151388756	Communication between LA and FSU failed	The communication between LA and FSU has failed	– none	Error
09 | 06 | 0255	151388757	Communication between LB and FSU failed	The communication between LB and FSU has failed	– none	Error
09 | 06 | 0256	151388758	Incompatible software/hardware versions of LA and FSU	The software/hardware versions of logic channel A and FSU are incompatible	– none	Error
09 | 06 | 0257	151388759	Incompatible software/hardware versions of LB and FSU	The software/hardware versions of logic channel B and FSU are incompatible	– none	Error
09 | 00 | 0258	150995544	Error memory threshold value reached on logic channel A	The threshold value of the error memory on channel A has been reached.	– none	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
09 | 00 | 0259	150995545	Error memory threshold value reached on logic channel B	The threshold value of the error memory on channel B has been reached.	– none	Error
09 | 03 | 025A	151192154	Failed test of the digital input on LA	The test of the digital input on LA failed.	– none	Error
09 | 03 | 025B	151192155	Failed test of the digital input on LB	The test of the digital input on LB failed.	– none	Error
09 | 06 | 025C	151388764	Application-specific FSUCom error with reference to LA	An error is detected with reference to the communication from the FSU to channel A when receiving the application-specific extended data.	– Restart device, service case	Error
09 | 06 | 025D	151388765	Application-specific FSUCom error with reference to LA	An error is detected with reference to the communication from the FSU to channel B when receiving the application-specific extended data.	– Restart device, service case	Error
07 | 06 | 0268	117834344	Valve fault	A fault in the valve was detected.	– Check and/or replace valve	Error
06 | 00 | 026A	100663914	Invalid safety input configuration	The configuration for the safety inputs is invalid.	– Module is passivated, reintegration is then possible, selection of valid input modes	Error
09 | 00 | 027B	150995579	Operating mode change timeout La	Timeout when enabling the mode change on channel A	– none	Error
09 | 00 | 027C	150995580	Operating mode change timeout Lb	Timeout when enabling the mode change on channel B	– none	Error
07 | 03 | 02AD	117637805	Output pressure error	The output pressure of the valve is already present before switching on.	– Check for leakage. – Check manual override	Error
08 | 00 | 02B2	134218418	Parameter access failed	Parameter access failed.	– Check data, try parameter access again	Information
09 | 08 | 02B3	151519923	F Parameters cannot be written	F Parameters (PROFIsafe) cannot be written in the current state.	– If F parameters are to be written: abort PROFIsafe communication, only then perform write access.	Information
09 | 08 | 02B4	151519924	Safety parameters are not written	Safety parameters are not written.	– none	Information
0B | 00 | 02B6	184550070	AddressMapper addition failed	Adding an entry in AddressMapper failed.	– none	Information
0B | 00 | 02B7	184550071	AddressMapper application failed	Applying the default in AddressMapper failed.	– none	Information
02 | 01 | 02B8	33620664	Fault in actuator supply	Fault in the actuator supply	– Check actuator supply – Clear short circuit/overload – Check connected actuators	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
08 | 01 | 880F	134318095	Internal AP process data error	The AP process data controller returned an error.	– Restart device	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
01 | 01 | 0104	16843012	Short circuit/overload output signal	Output was overloaded.	– Check connected load for correct function, in particular for current consumption. – Check wiring. – The output must be reset after the malfunction has been cleared.	Error
04 | 03 | 030C	67306252	Pressure: setpoint value exceeded	Max. setpoint value of pressure switch exceeded	-	Warning
04 | 03 | 030D	67306253	Pressure: setpoint value undershot	Pressure switch minimum setpoint value undershot	-	Warning
04 | 01 | 030E	67175182	Check supply pressure	Supply pressure outside 4..7 bar range	– The function is being operated outside the specification. Expect restricted performance and accuracy	Warning
04 | 01 | 030F	67175183	Supply pressure drops	Regular pressure drops in the supply. Repetition accuracy may not be optimal	– If accuracy is insufficient, increase supply cross-sections.	Information
04 | 01 | 0310	67175184	No supply pressure	Switch on compressed air supply	– During pressurisation ‹3 bar, the smart functions are in soft-start mode to enable slow machine start-up.	Information
04 | 04 | 0311	67371793	Pressure peaks in the exhaust	Backflow in the exhaust. Repetition accuracy and performance may not be optimal	– If accuracy is insufficient, increase the exhaust cross-sections. Replace contaminated silencer.	Maintenance required
04 | 01 | 0312	67175186	Control pressure unsuitable for efficient valve function	Reliable operation requires the pilot air to correspond to the supply pressure.	The switching response suggests a deviation in the pilot air level. – Please check. – Restart terminal to reset sensor offset. – Replace valve if necessary.	Error
04 | 02 | 0313	67240723	Leakage above threshold value	Pressure loss detected at the working port	– Check actuator, ports and valve	Maintenance required
04 | 02 | 0314	67240724	Leakage in the actuator	Leakage in the actuator	– Check actuator, replace if necessary	Maintenance required
04 | 02 | 0315	67240725	Internal valve leakage	Internal valve leakage	– Check mounting, seal and valve. Replace if necessary.	Maintenance required
06 | 02 | 0316	100795158	Target pressure too low	Target pressure setting too low. The minimum permissible value is used.	-	Warning
05 | 02 | 0317	84017943	Poor movement quality	Suspected jerky movement	– Increase the target pressure, check throttle position and cushioning.	Maintenance required
05 | 02 | 0318	84017944	End position probably not reached	If necessary, increase target pressure	– Target pressure should include a safety buffer that is greater than the hysteresis	Maintenance required
05 | 02 | 0319	84017945	Hysteresis not sustainable	Hysteresis not sustainable, efficient valve function stopped.	Choose a greater hysteresis range, – use a higher target pressure, – use a small fixed flow control valve – or increase the system volume.	Error
05 | 02 | 031A	84017946	End position not detected	End position not detected even though the movement has ended.	– a) Actuator has met an obstacle – b) Boundary conditions unclear, e.g. during soft start – c) Acoustic end position detection unreliable	Warning

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
0D | 02 | 031B	218235675	Connection closed, regulation deactivated	Working port appears unused, the regulation is deactivated.	– To reactivate, set "EVF function mode" to 0 and then to the desired value.	Information
0D | 03 | 031C	218301212	Valve unsuitable for the efficient valve function	The pressure reduction remains switched off.	– Install a suitable 5/4 valve in order to use it.	Error
07 | 06 | 031D	117834525	No pressurisation at the working port	No pressure rise within 50 ms.	– Check the auxiliary pilot air, tubing and manual override before suspecting a valve fault.	Error
07 | 08 | 031E	117965598	Input signal does not correlate with valve actuation	no temporal relationship was found between the input signal and the switching signal. TravelTimeLog deactivated.	– The runtime monitoring only works if the proximity switch is connected to the corresponding valve.	Error
0D | 03 | 031F	218301215	System size outside the specification	Actuator and tubing volume appear to be outside the specification. Possible restricted performance or accuracy.	– Use flexible integrated flow control valve – Connection of min. 20 ml (tube+cylinder)! – less than 20 ml: with fixed flow control valves (0.8-1.2 mm)	Warning
0D | 03 | 0320	218301216	Slow pressurisation	Pressurisation not complete after 4 seconds. Application outside the specifications.	– Performance and accuracy may be restricted.	Warning
0D | 01 | 0321	218170145	End position detection is not reliable.	End position detection is not reliable. It is deactivated.	– Check the user manual for possible causes and troubleshooting.	Warning
0D | 03 | 0322	218301218	Use suitable integrated flow control valves	We recommend using suitable flow control valves in the connection plate. Accuracy probably limited.	– Use flexible integrated flow control valve – Connection of minimum volume 20 ml (tube+cylinder)! – less than 20 ml: with fixed flow control valves (0.8-1.2 mm)	Warning
0D | 02 | 0323	218235683	Pressure target was adjusted to switching accuracy	Poor pressure accuracy, internal target was adjusted to switching response.	-	Information
0D | 02 | 0324	218235684	Pressure target was adjusted to movement quality	Suspected poor movement quality, internal target was adjusted.	– To set a specific pressure, use the "Fixed Pressure Preset" function mode	Information
0D | 02 | 0325	218235685	Target pressure increased (end position)	Target pressure was increased to reach the final position.	-	Information
08 | 00 | 008C	134217868	Failure of synchronisation signal fieldbus	Failure of synchronisation signal fieldbus	– Check wiring – Check controller configuration	Error
08 | 01 | 0336	134284086	AP device port communication error	An AP device that is not communicating was detected in the system.	– Check firmware versions and update if necessary – Check wiring – Restart AP system	Error
06 | 00 | 0337	100664119	Invalid fieldbus selection	Invalid fieldbus selection (invalid switch position or incorrect parameterisation)	– Check switch position for fieldbus selection, if available – Check parameters/configuration for setting the fieldbus selection	Error

ICP ID (hex)	ICP ID (dec)	Message	Description	Remedy	Diagnostic status
09 | 04 | 0338	151257912	Error open-circuit potential too high M channel	The M channel open-circuit potential test failed. The open-circuit potential is too high.	– Check wiring – Acknowledgement and reintegration of the module – If the problem persists replace the module and contact Festo Service	Error
06 | 05 | 0339	100991801	Teach-in process active	The teach-in process is active.	– Terminate teach-in process	Information

Tab. 29: Diagnostic messages

11 Modification

11.1 Safety

Electronics modules include electrostatically sensitive devices. Incorrect handling can cause damage to the electronics modules.
– Observe the handling specifications for electrostatically sensitive devices.
– Discharge static electricity from your body before mounting or disassembly of modules to protect the modules.
– Never pull the electronics module from the interlinking module or push it in when it is live.

Checking certifications: The remote I/O system is fully assembled on delivery and is marked on the left end plate with the certifications. A conversion can be checked for plausibility in the Festo online configurator.
– The original certifications no longer apply to conversions or expansions.

When converting: – Make sure the contacts are clean and free of debris.
– Check seal and seal surfaces. Replace damaged parts.
– Carry out assembly work on a level surface.
– Make sure the connecting surfaces are clean. This serves to optimise the sealing effect.
The degree of protection of the remote I/O system depends on the installed plug connectors, cover caps and coverings.
– Use connection hardware with the required degree of protection.
– Use cover caps to seal unused connections.
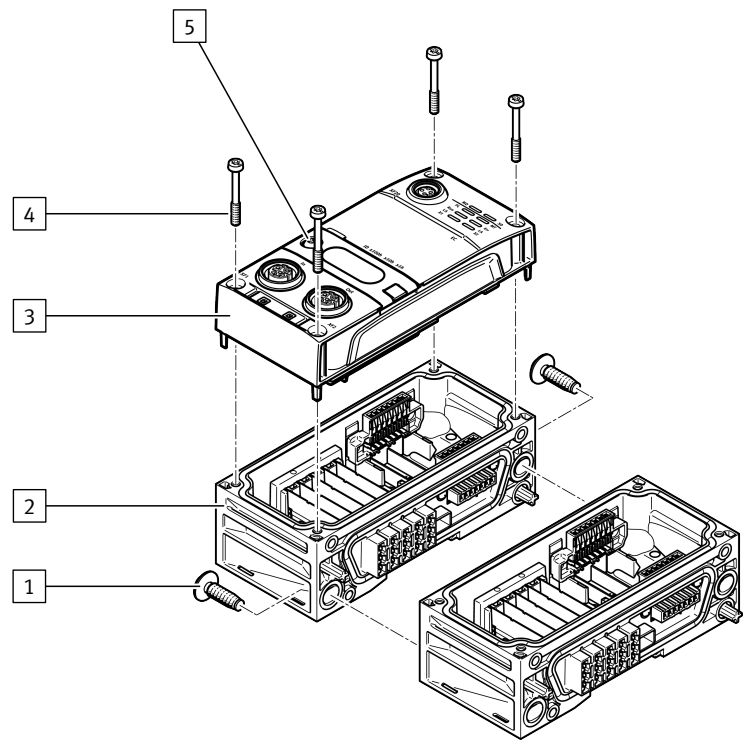
11.2 Overview

Screwing with tightening torque

Fig. 24: Modification

1	Interlinking module self-tapping screw	4	Electronics module self-tapping screw
2	Interlinking module	5	Inspection window self-tapping screw
3	Electronics module		

Screw	Tightening torque
Electronics module self-tapping screw during the initial assembly	0.85 Nm ± 10%
Electronics module self-tapping screw when changing the electronic module	0.6 Nm ± 10%
Interlinking module self-tapping screw	5.4 Nm ± 10%
Inspection window screw	0.35 Nm ± 10%

Tab. 30: Tightening torque

11.3 Exchange of modules

Demount the interlinking module

> The plugs connected to the electronics module can remain installed during disassembly of the electronic module.

1. Switch off the operating voltage supply and load voltage supply of the remote I/O system.
2. Remove electronics module if necessary.
3. Unscrew the self-tapping screws.
4. Carefully release the interlinking module.

Mounting the inter-linking module

1. Place the interlinking module in the correct position next to the adjacent interlinking module and press it in to the stop.
2. Screw self-tapping screws into the existing threads.

3. Tighten the self-tapping screws.

Disassembling the electronics module

1. Switch off the operating voltage supply and load voltage supply of the remote I/O system.
2. Unscrew the self-tapping screws.
3. Carefully lift off the electronics module.

Installing the electronics module

1. Place the electronics module in the proper position and without jamming into the interlinking block and press it in until it stops.
2. Align the interlinking module and place it on the electronics module.
3. Screw self-tapping screws into the existing threads.
4. Tighten the self-tapping screws crosswise.

11.4 Expansion

– Expansions must be checked for plausibility in the Festo online configurator. Approvals are invalid for invalid configurations.
– Note the number and position of the mounting brackets ➔ 6.4 Wall mounting.
– Do not exceed the maximum number of modules per terminal ➔ 12.1 Technical data.

Addressing

NOTICE
A conversion can result in shifts in the addresses. This applies in the following cases: • Additional modules are inserted between existing modules. • Existing modules are removed or replaced by other modules, which have fewer or more addresses.

12 Technical data

12.1 Technical data

General technical data		
Certificates, declaration of conformity		➜ www.festo.com/sp
Ambient temperature	[°C]	–20 … +50
Storage temperature	[°C]	–20 … +70
Humidity (non-condensing)	[%]	5 … 95
Max. setup altitude above MSL	[m]	≤ 2000, without reduction
	[m]	2000 … 3500, with reduction of the maximum permissible ambient temperature: 1% per 100 m at altitudes over 2000 m
Number of modules per terminal		15 modules
Address volume of the inputs/outputs	[Byte]	2048/2048, depending on the interface
Degree of protection in accordance with EN 60529		IP65/IP67[1], in fully assembled status, all cables connected and unused connections closed with cover caps
Protection against electric shock (protection against direct and indirect contact)		By the use of SELV/PELV circuits (Safe extra-low voltage/Protected extra-low voltage)
CE marking,		In accordance with EU EMC Directive See declaration of conformity ➜ www.festo.com
Electromagnetic compatibility		See declaration of conformity ➜ www.festo.com
Mounting position		Wall: any Mounting system: any DIN rail: horizontal

1) Different with some valve terminals

Tab. 31: General technical data

12.2 Technical data, mechanical

Type of severity level (SL)					
Vibration load					
Frequency range [Hz]		Acceleration [m/s²]		Deflection [mm]	
SL1	SL2	SL1	SG2	SL1	SL2
2 … 8	2 … 8	–	–	±3.5	±3.5
8 … 27	8 … 27	10	10	–	–
27 … 58	27 … 60	–	–	±0.15	±0.35
58 … 160	60 … 160	20	50	–	–
160 … 200	160 … 200	10	10	–	–
Shock load					
Acceleration [m/s²]		Duration [ms]		Shocks per direction	
SL1	SL2	SL1	SL2	SL1	SL2
±150	±300	11	11	5	5
Continuous shock load					
Acceleration [m/s²]		Duration [ms]		Shocks per direction	
±150		6		1000	

Tab. 32: Type of severity level (SL)

Vibration resistance and shock resistance in accordance with EN 60068	
Vibration (part 2-6) ➜ Tab. 34 Vibration load	Direct mounting SG2 H-rail SL1
Shock (part 2-27) ➜ Tab. 35 Shock load	Direct mounting SG2 H-rail SL1
Continuous shock (part 2-27) ➜ Tab. 36 Continuous shock load	Direct mounting SG1 H-rail SL1

Tab. 33: Vibration resistance and shock resistance in accordance with EN 60068

Vibration load					
Frequency range [Hz]		Acceleration [m/s^2]		Deflection [mm]	
SL1	SL2	SL1	SL2	SL1	SL2
2 … 9	2 … 9	–	–	±3.5	±3.5
9 … 200	9 … 200	10	10	–	–
10 … 58	10 … 60	–	–	±0.15	±0.35
58 … 150	60 … 150	20	50	–	–

Tab. 34: Vibration load

Shock load					
Acceleration [m/s^2]		Duration [ms]		Shocks per direction	
SL1	SL2	SL1	SL2	SL1	SL2
±150	±300	11	11	3	3

Tab. 35: Shock load

Continuous shock load		
Acceleration [m/s^2]	Duration [ms]	Shocks per direction
SL1	SL1	SL1
±150	6	1000

Tab. 36: Continuous shock load

12.3 Technical data, electrical

Power supply		
Logic supply PS	[V DC]	24 ± 25%
Trigger level, undervoltage identification in logic supply PS	[V DC]	Depending on the module ➜ Instructions for the specific module
Max. acceptable current load, logic supply PS	[A]	10
Mains buffering time, logic supply PS	[ms]	10
Load supply PL	[V DC]	24 ± 25%, may vary for some modules
Trigger level, undervoltage identification in logic supply PL	[V DC]	Depending on the module ➜ Instructions for the specific module
Max. acceptable current load, load supply PL	[A]	10
Capacitive load PL		
24 V PL to 0 V PL	[nF]	Typically 47
24 V PL to FE	[nF]	Typically 47
0 V PL to FE	[nF]	Typically 20

Tab. 37: Power supply

ℹ️ The tolerance specifications of the voltage values are valid for the voltages at the applicable supply port of the modules.
- Observe the voltage drop in the voltage transmission lines.

12.4 Technical data for UL certification

Technical data for the product may have different values in other documents. The technical data in this document will always have priority for the UL-certified products.

Electrical data and ambient conditions for UL	
Overvoltage category	II The supply and external circuits (I/Os) intended to be connected to this device shall be separated from the mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV/PELV-Limited Energy (IEC 61010-1 Cl. 9.4) or Class PS2 acc. to IEC 62368-1 or LPS acc. to IEC 60950 or Class 2 acc. to NEC.
Pollution degree	2 Use in an environment with pollution degree 2 (or better).
Degree of protection according to UL/CSA 61010-1 und UL/CSA 61010-2-201	Type 1
Installation site	for indoor use only, wet location
Supply voltage	Max. 30 V DC, Class 2
Maximum input current	4 A
Maximum output current	3.85 A, DC General use only
Maximum fluid temperature/ambient	50 °C/120 °F
Humidity	5-95% non-condensing
Maximum installation height	2000 m

Tab. 38: Electrical data and ambient conditions UL