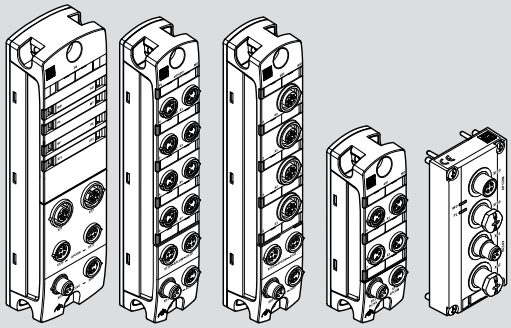
CPX-AP-I
Automation system



FESTO

Operating instructions

8168784
2022-06a
[8168786]

Translation of the original instructions

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1 About this document

1.1 Applicable documents

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

Document	Contents
Operating instructions for the modules in an automation system CPX-AP-I	Information on using the modules

Tab. 1: Applicable documents

1.2 Product version

This document refers to the automation system CPX-AP-I.
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		DIN 46211:1965-03
EN 60068-2-6:2008-02		DIN 46225:1976-12
EN 60068-2-27:2009-05		DIN 46234:1980-03
EN 60204-1:2018-09		DIN EN ISO 4762:2004-06
EN 60529:1991-10		–

Tab. 2: Standards specified in the document

2 Safety

2.1 Safety instructions

- Take the legal regulations for the installation location into account.
- Operate the product only within the defined values ➔ 11 Technical data.
- Observe the identifications on the product.
- Observe further applicable documents.
- Store the product in a dry environment protected from UV and corrosion
- 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 exclusively for control tasks on machines or automation systems.
Use the product only 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.
- Only use the product if it is in perfect technical condition.

2.3 Training of qualified personnel

Work on the product should only be conducted by qualified personnel. The qualified personnel must be familiar with installation of electrical control systems.

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 approval information	
Product category code	NRAQ, NRAQ7
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	29TS

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 ➔ 11.2 Technical data for UL certification.

- The unit shall be supplied by a power source which fulfils the requirements on a limited-energy circuit in accordance to IEC/EN/UL/CSA 61010-1 or on a Limited Power Source (LPS) in accordance to IEC/EN/UL/CSA 60950-1 or IEC/EN/UL/CSA 62368-1 or a Class 2 circuit in accordance to NEC or CEC.
- UL: The integrated semiconductor short-circuit protection does not protect the downstream power circuit. The power circuit must be protected in conformity with the National Electrical Code and all other local regulations.
  cUL: The integrated semiconductor short-circuit protection does not protect the downstream power circuit. The power circuit must be protected in conformity with the Canadian Electrical Code, part I.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- External backup fuses: use UL-certified fuses that are designed in accordance with UL 61010-1.

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 Function

The automation system CPX-AP-I is a decentralised system for connecting electrical peripherals. Different module types with different connection technology are available. An automation system CPX-AP-I consists of an interface and at least one other module. For system communication, the individual modules in an automation system CPX-AP-I are connected to each other by connecting cables. The process data is exchanged cyclically.
The automation system CPX-AP-I is connected to a higher-level controller via an interface. By accessing internal parameters, the behaviour of the automation system CPX-AP-I can be adapted to the respective requirements. Various diagnostic functions are also available.

4.2 Structure

4.2.1 System structure

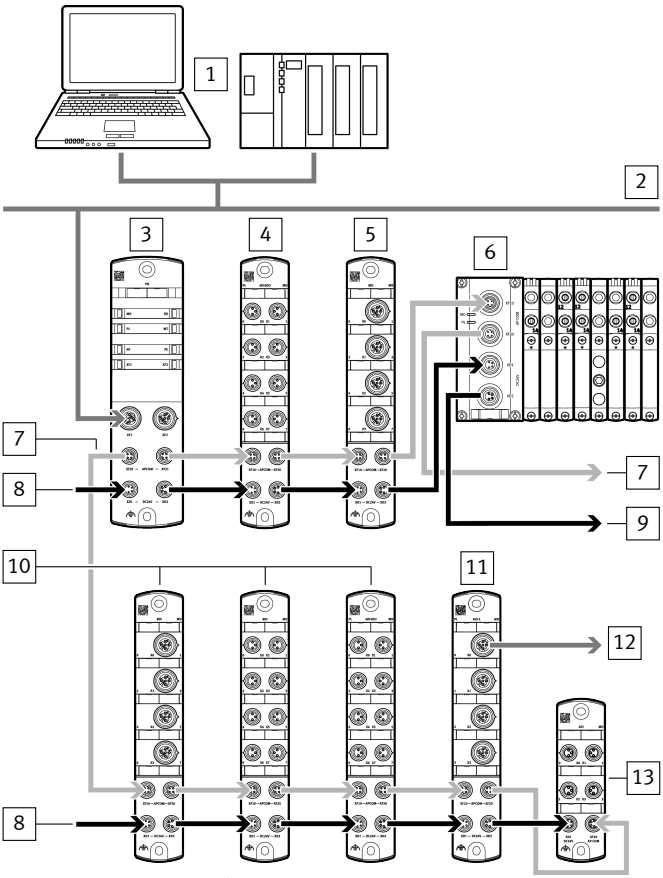
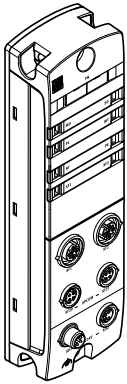


Fig. 1: System structure (example for PROFINET interface and electrical interface for VTUG)

1 Higher-order controller
2 Network
3 Interface (example for PROFINET)
4 Digital input/output module
5 Digital input module or analogue input module
6 Electrical interface (example for valve terminal VTUG)
7 AP system communication
8 Power supply
9 Power transmission
10 Digital input/output modules
11 IO-Link master
12 IO-Link device
13 Digital input module (without transmission)

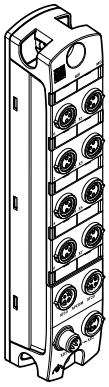
4.2.2 Product variants

Interfaces

Module	Function
 Example for CPX-AP-I-PN-M12	The interface between the automation system CPX-AP-I and the network performs the following functions: – Connection of the automation system CPX-AP-I to the network – Data transfer between the automation system CPX-AP-I 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 diagnostic data (depending on the interface) – Controller of the automation system CPX-AP-I

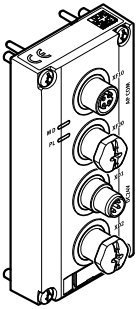
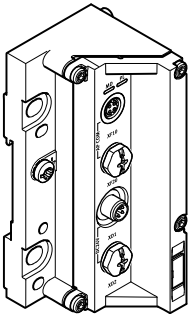
Tab. 4: Interfaces

Input/output modules

Module	Function
 example for CPX-AP-I-8DI-M8-3P	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. – An analogue input module in an automation system CPX-AP-I receives analogue input signals. – A IO-Link master in an automation system CPX-AP-I includes multiple IO-Link Ports for the integration of IO-Link Devices.

Tab. 5: Input/output modules

Electrical interfaces

Module	Function
 VAEM-L1-S-...-AP	Valve terminals, e.g. VTUG or MPAL, can be controlled via the automation system CPX-AP-I with electrical interfaces.
 VMPAL-EPL-AP	

Tab. 6: Electrical interfaces

4.2.3 LED displays

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

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Detailed information on the LED displays of the individual modules ➔ Product-specific documentation

4.2.4 Labelling elements

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 System communication and address assignment

For internal system communication between the modules, two strings can be implemented via the connections [XF20] and [XF21] of the interfaces with connecting cables. The connecting cables are connected to the individual modules via connection [XF10]. Connection [XF20] is available for transmission to another module.

The addresses of the modules are assigned automatically every time the automation system CPX-AP-I is started. The interface is assigned address 1. The modules are addressed at terminals [XF20] and [XF21] in ascending order for each string, starting with the string at terminal [XF20].

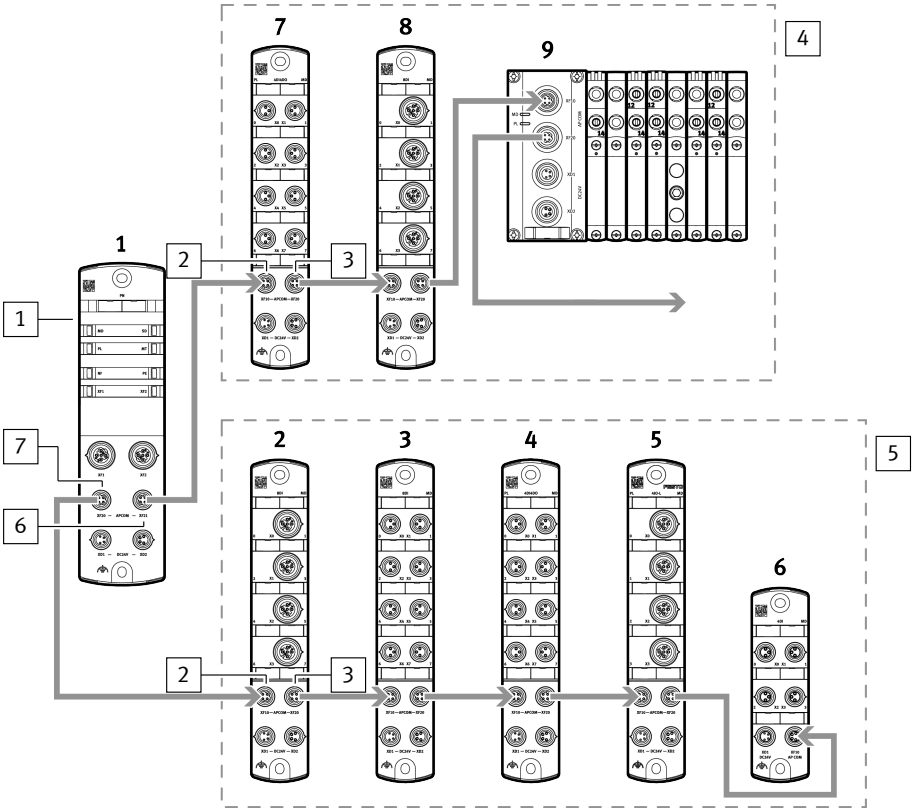


Fig. 2: System communication and addressing

1 Interface
2 Connection for system communication [XF10]
3 Connection for system communication forwarding [XF20]
4 String 2
5 String 1
6 Connection for system communication string 2 [XF21]
7 Connection for system communication string 1 [XF20]

NOTICE

Loss of function due to incorrectly connected or impermissible connecting cables.

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

Behaviour 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 and output bytes
– Module codes and sequence of modules
– Length and format of the start-up parameterisation

If there are deviations, the connection to the higher-order controller is rejected and a network-specific error message is generated.

Behaviour when changing the configuration during operation

– If a module is removed during operation, process data is not transferred to the higher-order controller for this module and all downstream modules. The failure of the module is signalled via a diagnostic 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.

In order for changes to the configuration to become active, the system must be restarted (switched off/on).

6 Assembly

6.1 Mounting distances and installation space

Certain minimum distances must be observed when installing the modules to ensure sufficient space for the connecting cables. The minimum distances to be observed depend on the modules and the type of connectors used (straight or angled).

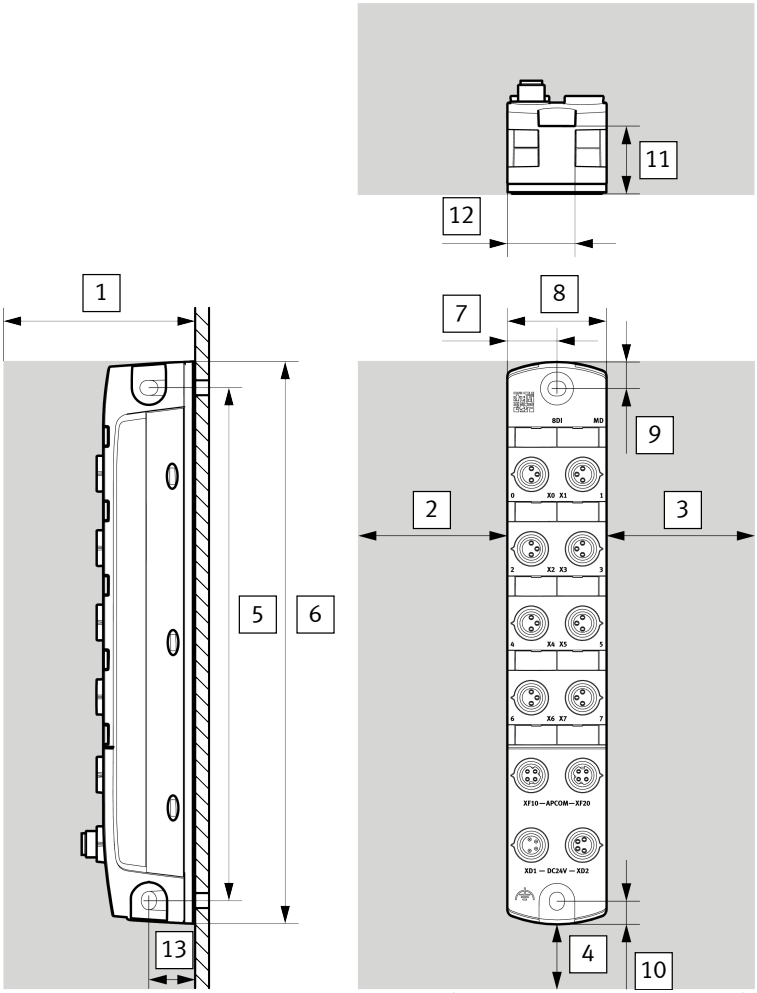


Fig. 3: Mounting distances and installation space (example for CPX-AP-I-8DI-M8-3P)

Item no. ➔ Fig. 3	Interfaces		Input/output modules IO-Link Master	
	Connector plug		Connector plug	
	straight	angled	straight	angled
Minimum distances [mm]				
1	103	62	108	66
2	35	56	35	54
3	35	56	35	54
4	64		64	
Distance between mounting holes [mm]				
5	155		155 87.5 (CPX-AP-I-4DI-M8-3P)	
6	170		170 102.5 (CPX-AP-I-4DI-M8-3P)	
7	22.5		15	
8	45		30	
9	8		8	
10	7		7	
11	20.5		20.5	
12	35.5		20.5	
13	13.8		13.8	

Tab. 7: Mounting distances and installation space

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Mounting distances of the electrical interfaces ➔ Product-specific documentation

6.2 Direct mounting

The modules are installed directly via the fastening interfaces with two M4 socket head screws with internal hexagon in accordance with DIN EN ISO 4762.
When installing the modules, note the following:
- Always use two retaining screws.
- Use suitable washers.
- Observe a tightening torque of 1.2 Nm.
- Functional earth connection ➔ 7.2 Functional earth FE

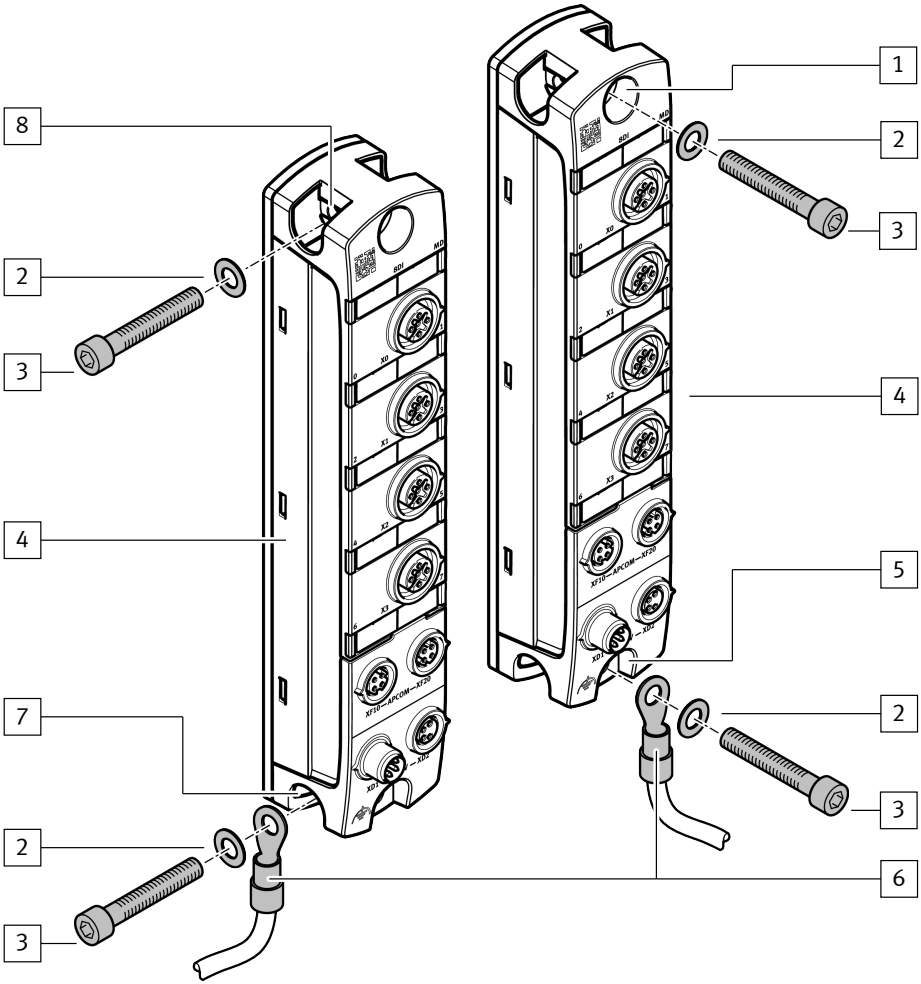


Fig. 4: Direct mounting

1 Mounting interface connection side top
2 Washer
3 Socket head screw M4
4 Module
(example for CPX-AP-I-8DI-M12-5POL)
5 Mounting interface connection side bottom and connection functional earth FE
6 Cable lug with earthing cable (optional)
7 Mounting interface, lateral bottom and connection for functional earth FE
8 Mounting interface, lateral top

7 Installation

7.1 Power supply

7.1.1 Power supply concept

The automation system CPX-AP-I uses two separate voltages:
- Logic supply PS: power supply for the internal electronics and sensors
- Load supply PL: power supply for the electrical outputs and valves

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

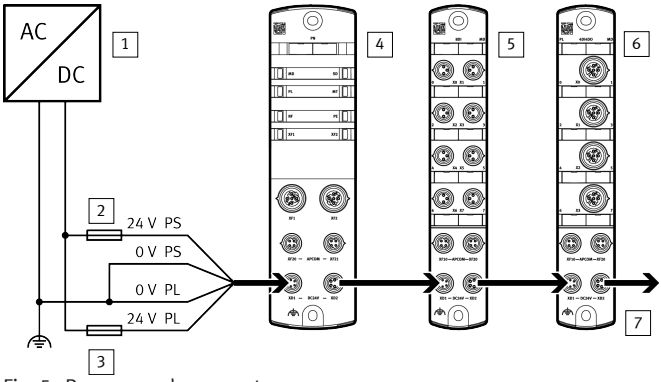


Fig. 5: Power supply concept

1 SELV/PELV fixed power supply
2 Fuse for line protection logic supply PS (max. 4 A)
3 Fuse for line protection load supply PL (max. 4 A)
4 Interface
5 Digital input module
6 Digital input/output module
7 Voltage forwarding (if necessary)

NOTICE

Property damage due to overload of the cables.
- Observe the maximum acceptable current load of the cables.
- Only use permissible cables from the Festo catalogue for the power supply ➔ www.festo.com/catalogue.

NOTICE

Loss of function due to voltage drop.
- Take into account the voltage drop at the supply feed and in the voltage forwarding ➔ 7.1.2 Voltage drop.

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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 controlled.

Supply

Power is supplied to each module at connection [XD1]. The voltages can be forwarded to other modules via the connection [XD2].

Each module can also be powered directly from the fixed power supply, e.g.

- to reduce voltage drops,
- to form voltage zones,
- if the maximum current is exceeded.

NOTICE

Loss of function if logic supply PS is switched on late.

If the modules are supplied by different fixed power supplies, the interface must be switched on last, as otherwise they will not be detected by the interface when the automation system CPX-AP starts up.

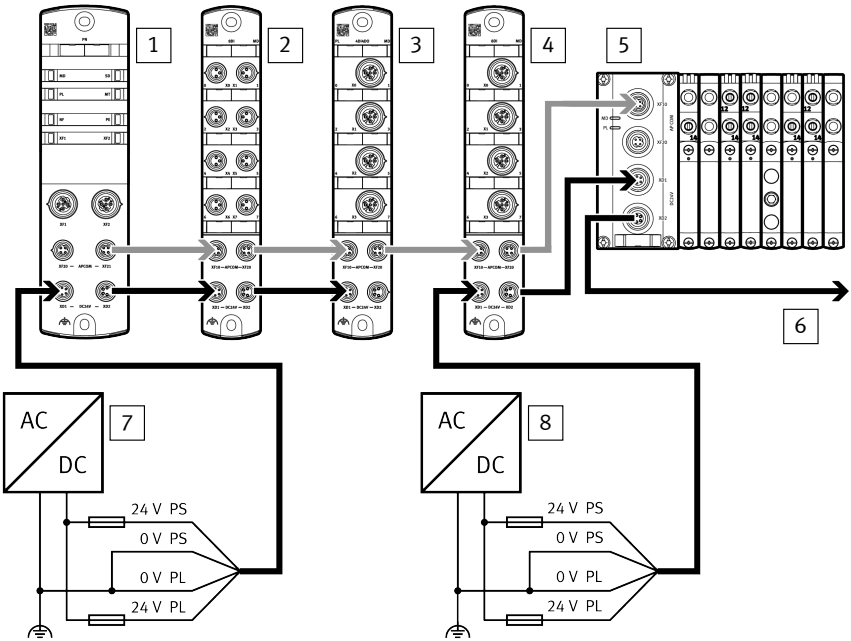


Fig. 6: Voltage zones

1 Interface
2 Digital input module
3 Digital input/output module
4 Digital input module
5 Electrical interface (example for valve terminal VTUG)
6 Voltage forwarding (if necessary)
7 SELV/PELV fixed power supply for feeding the power supply to the interface
8 SELV/PELV fixed power supply for separate feed of the power supply

7.1.2 Voltage drop

The connecting cables for the power supply and power transmission between the modules and the modules themselves cause a voltage drop that must be taken into account in the project engineering.

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Determination of the voltage drop based on the cable length and current ➔ Tab. 8 Determination of voltage drop in the cables. The values specified here are valid for approved cables with a core cross-section of 0.5 mm² from the Festo catalogue.
Information for the exact calculation ➔ 7.1.2.1 Calculating the voltage drop.

	Cable length [m]								
	0.3	0.5	1.0	2.0	5.0	7.5	10.0	15.0	20.0
Voltage drop at 1 A [V]	0.0	0.1	0.1	0.2	0.4	0.5	0.7	1.1	1.4
Voltage drop at 2 A [V]	0.1	0.1	0.2	0.3	0.7	1.1	1.4	2.1	2.8
Voltage drop at 3 A [V]	0.1	0.2	0.3	0.5	1.1	1.6	2.2	3.2	4.3
Voltage drop at 4 A [V]	0.2	0.2	0.4	0.6	1.5	2.2	2.9	4.3	5.7

Tab. 8: Determination of voltage drop in the cables

7.1.2.1 Calculating the voltage drop

With the steps described, the specific voltage drop for PL and PS can be calculated for each string. To do this, the power requirement of the modules with peripherals and the line resistance in the cable are combined.

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The specification of the line resistance in the table comprises the forward and return line including the forward resistance of the modules. The specified values are valid for approved connecting cables with a core cross-section of 0.5 mm² from the Festo catalogue.

	Cable length [m]								
	0.3	0.5	1.0	2.0	5.0	7.5	10.0	15.0	20.0
Line resistance [Ω]	0.04	0.06	0.09	0.16	0.37	0.55	0.72	1.07	1.42

Tab. 9: Line resistance depending on the cable length

1. Calculate the current consumption of the modules in the string for PL and PS.
2. Calculate the line resistance of the supply cable or connecting cable to the module.
3. Calculate the expected power requirements of the external sensors, the electrical outputs and the valves.
4. From the previous steps calculate the resulting sum of the power requirements of each module.
5. Add the power requirements of the modules in the string. The values result from adding the power requirement of the module itself to the power requirement of the following modules in the string.
6. Determine the voltage drop per cable. The voltage drop on the cable can be calculated from the current consumption of a module.
   Formula: voltage drop = line resistance × current
7. Determine the minimum voltage at the module from the voltage of the fixed power supply.
8. Compare the result with the permitted voltage range of the last module in the string from the technical data. The voltage drops of every connecting cable must be added up to the last module and subtracted from the minimum voltage of the power supply.
   Sample calculation ➔ 7.1.2.2 Example for calculation of the voltage drop.

7.1.2.2 Example for calculation of the voltage drop

In the example, the voltage drop on a string with 3 modules is calculated.
The current consumption of the VTUG valve terminal at PL for step 3 was calculated separately as follows:

- Inrush current (0 ... 20 ms): 47 mA
  Holding current (> 20 ms): 15.5 mA
- Number of valve solenoids: 12
- Maximum current consumption when switching on, here assuming that all coils are switched on at the same time: 12 × 47 mA = 564 mA

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With the result in the example, it is advisable to slightly increase the output voltage on the fixed power supply so that the voltage drops on the connecting cables are compensated. At the same time, it must be ensured that the maximum permissible voltage on the module or on the valve terminal is not exceeded at minimum load.

Step			**Modules**		
		No.	1	2	3
		Type	Bus interface CPX-AP-I-PN-M12	Digital input/output module CPX-AP-I-4DI4DO-xx	Valve terminal VTUG VAEM-L1-S-12-AP
1	Intrinsic current consumption				
	PS	[mA]	80	35	34
	PL	[mA]	5	10	15
2	Line resistance to the module from ➔ Tab. 8 Determination of voltage drop in the cables				
	Cable		Supply line	Connecting cable	Connecting cable
	Length	[m]	10	2	5
	Line resistance	[Ω]	0.72	0.16	0.37
3	Power requirements of external sensors, electrical outputs and valves assumed in the example				
	PS	[mA]	0	750	0
	PL	[mA]	0	1500	564
4	Total power requirement per module				
	PS	[mA]	80	785	34
	PL	[mA]	5	1510	579
5	Addition of power requirements of the modules in the string				
	The values result from adding the power requirement of the module itself to the power requirement of the following modules in the string. E.g. 785 mA + 34 mA = 819 mA				
	PS	[mA]	899	819	–
	PL	[mA]	2094	2089	–
6	Voltage drop per connecting cable				
	The voltage drop on the cable can be calculated from the current consumption of a module: U = R × I				
	PS	[mV]	647	131	13
	PL	[mV]	1508	334	214

Step			Modules		
		No.	1	2	3
		Type	Bus interface CPX-AP-I-PN-M12	Digital input/output module CPX-AP-I-4DI4DO-xx	Valve terminal VTUG VAEM-L1-S-12-AP
7	Minimum voltage on the module at nominal voltage on the fixed power supply = 24 V				
	PS	[V]	23.4	23.2	23.2
	PL	[V]	22.5	22.2	21.9
8	Permissible voltage range of the last module from the technical data				
	PS	[V]	–	–	18
	PL	[V]	–	–	21.6
	The voltage drops of every connecting cable must be added up to the last module and subtracted from the minimum voltage of the power supply. Result here: VTUG requires at least 21.6 V for PL. In the worst case, at least 21.9 V are available here, so operation is possible.				

Tab. 10: Example for calculation of the voltage drop

7.1.3 Electrical isolation

There is potential separation between the internal electronics and the following interfaces in the modules of the CPX-AP-I automation system:

- Network interfaces of the interfaces,
- System communication
- Load supply PL

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Information on the potential separations of the inputs and outputs of the modules

➔ Technical data of the product-specific documentation

7.2 Functional earth FE

NOTICE

Malfunction due to electromagnetic interference.

Depending on the substrate of the mounting surface, the modules must be connected to the functional earth with low impedance.

The general rule is:

- Remove paint, corrosion and anodised layers.
- Earthing cables should be as short as possible.
- Screws, slot nuts, profiles etc. must have a high electrical conductivity.

For installation on conductive substrates:

- Establish a low impedance connection between the module and conductive substrate as well as between the conductive substrate and functional earth.
- Establish equipotential bonding between different system components on which the modules are mounted.
- Avoid interference voltages on the conductive substrate.

For installation on an insulated substrate:

- Establish a low impedance connection between the module and functional earth via an earthing cable.
- Use an earthing cable with a nominal cross section of 4 ... 6 mm^2.
- Use a suitable cable lug according to DIN 46234, DIN 46225, DIN 46211.

7.3 Connecting the lines

⚠ 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. Observe the tightening torque of the cables (e.g. hook spanner with torque adjustment).
3. Seal unused connections with cover caps.

7.4 Disconnecting the cables

1. Switch off the power supply.
2. Disconnect the cables.

8 Commissioning

In order to avoid connection and addressing errors, the automation system CPX-AP-I must be commissioned as follows:

1. Check assembly and connections.
2. Configure the settings at the interface.
3. Test the function of the automation system CPX-AP-I (without higher-order controller).
4. Commissioning in network (with higher-order controller).

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 lines are seated firmly.

8.2 Configuring the settings at the interface

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

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Detailed information on the control elements of the applicable interface
➔ Product-specific documentation

8.3 Test the function of the automation system CPX-AP-I (without higher-order controller)

1. Switch on PS and PL power supplies.
2. Test the response of the automation system CPX-AP-I:
   - Connected actuators
   - LED displays
     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)

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Information on commissioning on the network ➔ Instruction manual for the applicable interface

9 Parameterisation

Various parameters are available to adapt the automation system CPX-AP and the modules to the application and to access the corresponding data.

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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	Faults The automation system/module is no longer ready for operation. Urgent troubleshooting action required.
Warning	Warning The automation system/module cannot be operated to its full extent. Troubleshooting action required.
Maintenance	Maintenance Maintenance required.
Information	Information No action required.

Tab. 11: Diagnostic status

10.3 Grouping and overview of the diagnostic messages

The diagnostic 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:
  Diagnostic number
  e.g. 33619990

The diagnostic 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 (e.g. 0022).
The diagnostic 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 diagnostic number in the ungrouped overview.

The diagnostic categories listed are used in several products ➔ Tab. 12 Grouping of the diagnostic messages. Depending on the specific product used, only parts of this complete list will be used.

Main group		Sub-group	
1	Current	1	Short circuit
		2	I^2t

Main group		Sub-group	
1	Current	3	Braking resistor
2	Voltage	1	Supply
		2	DC link circuit
		3	Principal voltage
		4	Encoder supply
		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/parameterisation	0	No allocation
		2	Limit values
		5	Parameter set
7	Monitoring	1	Limitations
		2	Motion monitoring
		3	Limit values
		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
		7	SERCOS
		8	CBUS
		9	PROFIdrive
		10	IO-Link
		11	I-Port

Main group		Sub-group	
8	Communication	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
		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. 12: Grouping of the diagnostic messages

10.4 Load voltage monitoring

The load voltage monitoring distinguishes between "Undervoltage/overvoltage PL" and "Shutdown PL". The distinction between "Undervoltage PL" and "Shutdown PL" is helpful if a deliberate shut-down, e.g. emergency stop, should not trigger an error message in the higher-level controller. A critical undervoltage, e.g. due to an excessively high voltage drop in the cable, is always reported as an error.
A "switch off 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 via the parameter "Diagnostic undervoltage load supply".
The diagnostics are displayed as a combination of the LED displays [MD] and [PL] and a diagnostic 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. 13: 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 | 01 | 013F (error) Overvoltage in load supply PL 24 V DC
 red light	 flashing red	Undervoltage PL	02 | 01 | 0105 (error) Undervoltage in load supply PL 24 V DC
 flashing green	 flashing green	Switch off PL	02 | 01 | 0106 (information) Switch off load supply PL 24 V DC

Tab. 14: 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 | 01 | 013F (error) Overvoltage in load supply PL 24 V DC
 red light	 flashing red	Undervoltage PL	02 | 01 | 0105 (error) Undervoltage in load supply PL 24 V DC
 red light	 flashing red	Switch off PL	02 | 01 | 0105 (error) Undervoltage in load supply PL 24 V DC

Tab. 15: Load voltage monitoring - active (2)

10.5 Diagnostic messages

The following table contains the diagnostic messages of all CPX-AP modules.
The specifications %d or %u are replaced by concrete values when the diagnostic message is output by the device.

For further specific diagnostic messages of the IO-Link devices and the mapping of the IO-Link event codes to the diagnostic IDs, refer to the operating manual of the IO-Link master.

ID hex (dec)	Message	Description	
01 l 00 l 01AC (16777644)	Current sense resistor overloaded	The current sense resistor of the channel was overloaded. To protect the device the channel was automatically disabled	
		Remedy	– The current sense resistor of the channel was overloaded. To protect the device the channel was automatically disabled
		Diagnostic status	Error
01 l 01 l 010B (16843019)	Short circuit / Overload sensor supply	A short circuit/overload of the sensor supply was detected	
		Remedy	– A short circuit/overload of the sensor supply was detected
		Diagnostic status	Error
01 l 01 l 010C (16843020)	Short circuit / Overload output signal	Connected digital output load exceeds allowed power consumption.	
		Remedy	– Connected digital output load exceeds allowed power consumption.
		Diagnostic status	Error
01 l 01 l 0179 (16843129)	Short circuit / Overload load supply	The connected load is defect or exceeds allowed power consumption	
		Remedy	– The connected load is defect or exceeds allowed power consumption
		Diagnostic status	Error
02 l 01 l 0016 (33619990)	Undervoltage in logic supply (PS) 24 V DC	Undervoltage in logic supply (PS) 24 V DC	
		Remedy	– Undervoltage in logic supply (PS) 24 V DC
		Diagnostic status	Error, Warning

ID hex (dec)	Message	Description	
02 l 01 l 0017 (33619991)	Overvoltage in logic supply (PS) 24 V DC	Overvoltage in logic supply (PS) 24 V DC	
		Remedy	– Overvoltage in logic supply (PS) 24 V DC
		Diag-nostic status	Warning
02 l 01 l 0105 (33620229)	Undervoltage in load supply (PL) 24 V DC	Undervoltage in load supply (PL) 24 V DC	
		Remedy	– Undervoltage in load supply (PL) 24 V DC
		Diag-nostic status	Error
02 l 01 l 0106 (33620230)	Load supply (PL) 24 V DC switched off	Load supply (PL) 24 V DC switched off	
		Remedy	– Load supply (PL) has been switched off. This might be caused by an intented emergency stop.
		Diag-nostic status	Information
02 l 01 l 013F (33620287)	Overvoltage in load supply (PL) 24 V DC	Overvoltage in load supply (PL) 24 V DC	
		Remedy	– Overvoltage in load supply (PL) 24 V DC
		Diag-nostic status	Error
02 l 01 l 0230 (33620528)	Powerforwarding overload PL	Too much load connected at the powerforwarding ULoad. The forwarding has been switched off.	
		Remedy	– Too much load connected at the powerforwarding ULoad. The forwarding has been switched off. No automatic retry.
		Diag-nostic status	Error
02 l 01 l 0231 (33620529)	Powerforwarding overload PS	Too much load connected at the powerforwarding UElsen. The forwarding has been switched off.	
		Remedy	– Too much load connected at the powerforwarding UElsen. The forwarding has been switched off. No automatic retry.

ID hex (dec)	Message	Description	
02 I 01 I 0231 (33620529)	Powerforwarding overload PS	Diagnostic status	Error
04 I 01 I 0223 (67174947)	Supply pressure diagnostic	Indicates fluctuations in the supply pressure.	
		Remedy	– Indicates fluctuations in the supply pressure.
		Diagnostic status	Warning
04 I 01 I 0246 (67174982)	Vacuum not reached	The vacuum could not be established.	
		Remedy	– The vacuum could not be established.
		Diagnostic status	Warning
04 I 01 I 0247 (67174983)	Error air saving function	Switching frequency of the air saving function exceeds the critical limit (1 Hz).	
		Remedy	– Switching frequency of the air saving function exceeds the critical limit (1 Hz).
		Diagnostic status	Warning
04 I 02 I 0224 (67240484)	Working pressure leakage	Shows the level of the leakage at the corresponding connection to the cylinder.	
		Remedy	– Shows the level of the leakage at the corresponding connection to the cylinder.
		Diagnostic status	Maintenance Required
06 I 00 I 0109 (100663561)	Startup parameter rejected by device	The startup parameter specified in the AP device description does not exist in the device or is different from the specification.	
		Remedy	– The startup parameter specified in the AP device description does not exist in the device or is different from the specification.
		Diagnostic status	Error

ID hex (dec)	Message	Description	
06 I 00 I 010A (100663562)	Mismatch in startup parameter size	The length of the startup parameter in the device and the AP device description do not match.	
		Remedy	– The length of the startup parameter in the device and the AP device description do not match.
		Diag-nostic status	Error
06 I 00 I 0188 (100663688)	Modulidentification check skipped	Ident check skipped - PLC has not written to Object 0xF030	
		Remedy	– No check of desired slot configration with existing slot configuration
		Diag-nostic status	Warning
06 I 00 I 0189 (100663689)	Modulidentification check failed	Ident check failed for configured module at slot %u (Detected %u - Configured %u)	
		Remedy	– Ident check failed for configured module at slot %u (Detected %u - Configured %u)
		Diag-nostic status	Error
06 I 00 I 0211 (100663825)	Parameter changed	The value of the parameter changed.	
		Remedy	– The value of the parameter changed.
		Diag-nostic status	Error
06 I 00 I 0217 (100663831)	Pairing Button pressed	The pairing button was pressed.	
		Remedy	– The pairing button was pressed.
		Diag-nostic status	Information
06 I 02 I 0136 (100794678)	Higher threshold exceeded	One channel has exceeded the high threshold.	
		Remedy	– One channel has exceeded the high threshold.

ID hex (dec)	Message	Description	
06 I 02 I 0136 (100794678)	Higher threshold exceeded	Diag-nostic status	Error
06 I 02 I 0137 (100794679)	Lower threshold underflow	One channel has a lower threshold underflow.	
		Remedy	– One channel has a lower threshold under-flow.
		Diag-nostic status	Error
06 I 02 I 0138 (100794680)	Value out of range	One channel is out of range of the parameterized range.	
		Remedy	– One channel is out of range of the parame-terized range.
		Diag-nostic status	Error
06 I 05 I 0062 (100991074)	Parameter set invalid	Parameter set invalid	
		Remedy	– Parameter set invalid
		Diag-nostic status	Error
07 I 03 I 0248 (117637704)	Evacuation or ventila-tion time exceeded	Evacuation or ventilation time more than doubled.	
		Remedy	– Evacuation or ventilation time more than doubled.
		Diag-nostic status	Error
07 I 03 I 0249 (117637705)	Process quality below limit	Process quality below critical limit	
		Remedy	– Process quality below critical limit
		Diag-nostic status	Warning
07 I 06 I 0125 (117834021)	Coil not connected	The valve coil, which shall be switched, is not connected or defect.	
		Remedy	– The valve coil, which shall be switched, is not connected or defect.

ID hex (dec)	Message	Description	
07 l 06 l 0125 (117834021)	Coil not connected	Diag-nostic status	Error
07 l 06 l 0268 (117834344)	Valve defect	A defect in the valve has been detected.	
		Remedy	– A defect in the valve has been detected.
		Diag-nostic status	Error
07 l 0A l 01A5 (118096293)	Minimum impulse width underrun	The parameterised minimum impulse width was underrun.	
		Remedy	– The parameterised minimum impulse width was underrun.
		Diag-nostic status	Warning
07 l 0A l 01A6 (118096294)	Maximum impulse width overrun	The parameterised maximum impulse width was overrun.	
		Remedy	– The parameterised maximum impulse width was overrun.
		Diag-nostic status	Warning
07 l 0A l 01AA (118096298)	New minimum impulse detected	The impulse length is shorter than ever detected.	
		Remedy	– The impulse length is shorter than ever detected.
		Diag-nostic status	Information
07 l 0A l 01AB (118096299)	New maximum impulse detected	The impulse length is greater than ever detected.	
		Remedy	– The impulse length is greater than ever detected.
		Diag-nostic status	Information
08 l 00 l 012E (134218030)	Device address invalid	The address, which was assigned to the device is invalid.	
		Remedy	– The address, which was assigned to the device is invalid.

ID hex (dec)	Message	Description	
08 I 00 I 012E (134218030)	Device address invalid	Diag-nostic status	Warning
08 I 00 I 0135 (134218037)	Wirefracture detected	Wirefracture detected	
		Remedy	– Wirefracture detected
		Diag-nostic status	Error
08 I 00 I 0192 (134218130)	Invalid cycle time	Calculate bus cycle time failed (Local timer too slow)	
		Remedy	– Calculate bus cycle time failed (Local timer too slow)
		Diag-nostic status	Error
08 I 00 I 0212 (134218258)	Transmission failed	The transmission of the data failed after the defined number of retries.	
		Remedy	– The transmission of the data failed after the defined number of retries.
		Diag-nostic status	Information
08 I 00 I 0216 (134218262)	IMA Timeout	The IMA timeout at the W-Master has exceeded the configured value.	
		Remedy	– The IMA timeout at the W-Master has exceeded the configured value.
		Diag-nostic status	Warning
08 I 00 I 024A (134218314)	Unknown module	The type of the module cannot be determined or the master does not support the module.	
		Remedy	– The type of the module cannot be determined or the master does not support the module.
		Diag-nostic status	Error

ID hex (dec)	Message	Description	
08 I 00 I 024B (134218315)	Too many modules connected	The maximum number of modules, which are supported by the system, has been exceeded.	
		Remedy	– The maximum number of modules, which are supported by the system, has been exceeded.
		Diagnostic status	Error
08 I 01 I 0124 (134283556)	AP master lost	No communication with AP master possible.	
		Remedy	– No communication with AP master possible.
		Diagnostic status	Error
08 I 01 I 0127 (134283559)	AP Module Disconnected	The AP system communication to a module has failed.	
		Remedy	– The AP system communication to a module has failed.
		Diagnostic status	Error
08 I 01 I 0130 (134283568)	AP module process data output watchdog timed out	The process data watchdog for the outputs timed out in the module	
		Remedy	– The process data watchdog for the outputs timed out in the module
		Diagnostic status	Error
08 I 01 I 0131 (134283569)	AP module process data input watchdog timed out	The process data watchdog for the inputs timed out in the module	
		Remedy	– The process data watchdog for the inputs timed out in the module
		Diagnostic status	Error
08 I 01 I 0132 (134283570)	AP master process data output watchdog timed out	The process data watchdog for the outputs timed out in the master	

ID hex (dec)	Message	Description	
08 l 01 l 0132 (134283570)	AP master process data output watchdog timed out	Remedy	– The process data watchdog for the outputs timed out in the master
		Diag-nostic status	Error
08 l 01 l 0133 (134283571)	AP master process data input watchdog timed out	The process data watchdog for the inputs timed out in the master	
		Remedy	– The process data watchdog for the inputs timed out in the master
		Diag-nostic status	Error
08 l 01 l 0134 (134283572)	AP master toggle bit error	A module did not mirror the toggle bit in the process data	
		Remedy	– A module did not mirror the toggle bit in the process data
		Diag-nostic status	Error
08 l 01 l 013A (134283578)	Multiple AP Master detected	Another AP Master with higher priority was recognized.	
		Remedy	– Another AP Master with higher priority was recognized. The multimaster negotiation was lost.
		Diag-nostic status	Error
08 l 01 l 013B (134283579)	System Startup failed (emergency mode)	The AP system startup failed. The AP system is in emergency mode.	
		Remedy	– The AP system startup failed. The AP system is in emergency mode. Incompatible versions of communication stac possible.
		Diag-nostic status	Error
08 l 01 l 013C (134283580)	Topology detection failed	Topology detection failed	
		Remedy	– Topology detection failed

ID hex (dec)	Message	Description	
08 l 01 l 013C (134283580)	Topology detection failed	Diagnostic status	Error
08 l 01 l 01A2 (134283682)	Device in System State Emergency Operation	The system initialization (module recognition) failed. The system is in maintenance mode. No I/O function is available.	
		Remedy	– The AP device is in system state emergency operation.
		Diagnostic status	Error
08 l 01 l 01A4 (134283684)	Device variant mismatch	The currently set device variant does not match with the system configuration. The device variant is automatically set to the system configuration.	
		Remedy	– The currently set device variant does not match with the system configuration. The device variant is automatically set to the system configuration.
		Diagnostic status	Information
08 l 01 l 01AD (134283693)	System state change to OPERATION failed	The AP device did not change the system state from CONFIGURATION to OPERATION.	
		Remedy	– The AP device did not change the system state from CONFIGURATION to OPERATION.
		Diagnostic status	Warning
08 l 01 l 01AE (134283694)	AP device invalid detected	For the AP device the device state "device invalid" was detected.	
		Remedy	– For the AP device the device state "device invalid" was detected.
		Diagnostic status	Error
08 l 01 l 01B1 (134283697)	AP Startup delayed	Unexpected error during startup. Automatic retry of startup triggered.	

ID hex (dec)	Message	Description	
08 l 01 l 01B1 (134283697)	AP Startup delayed	Remedy	– Unexpected error during startup. Automatic retry of startup triggered.
		Diag-nostic status	Warning
08 l 01 l 01C4 (134283716)	AP Module(s) detected	One or more new AP module(s) were detected in the system.	
		Remedy	– One or more new AP module(s) were detected in the system.
		Diag-nostic status	Information
08 l 01 l 01FF (134283775)	Device not ready	A device is delaying the startup excessively long.	
		Remedy	– A device is delaying the startup excessively long.
		Diag-nostic status	Error
08 l 01 l 0215 (134283797)	Communication failure to the fol-lowing module	The device was forced by the master to set the loopback on the communication port, due to commnuication errors. Communication to subsequent modules is thereby inter-rupted.	
		Remedy	– The device was forced by the master to set the loopback on the communication port, due to commnuication errors. Commu-nication to subsequent modules is thereby interrupted.
		Diag-nostic status	Maintenance Required
08 l 01 l 0225 (134283813)	Invalid Topology	The current topology contains invalid connections.	
		Remedy	– The current topology contains invalid con-nections.
		Diag-nostic status	Maintenance Required
08 l 01 l 880F (134318095)	AP process data internal error	The AP process data controller returns an error.	

ID hex (dec)	Message	Description	
08 l 01 l 880F (134318095)	AP process data internal error	Remedy	– The AP process data controller returns an error. Error returned from AP_ProcessData-Master.
		Diag-nostic status	Error
08 l 04 l 0191 (134480273)	State change request	State change request from: %d to: %d	
		Remedy	– State change request from: %d to: %d
		Diag-nostic status	Error
08 l 04 l 0193 (134480275)	Sync Manager invalid address	Sync Manager %d invalid address (%d)	
		Remedy	– Sync Manager %d invalid address (%d)
		Diag-nostic status	Error
08 l 04 l 0194 (134480276)	Sync Manager invalid size	Sync Manager %d invalid size (%d)	
		Remedy	– Sync Manager %d invalid size (%d)
		Diag-nostic status	Error
08 l 04 l 0195 (134480277)	Sync Manager invalid settings	Sync Manager %d invalid settings (%d)	
		Remedy	– Sync Manager %d invalid settings (%d)
		Diag-nostic status	Error
08 l 04 l 0196 (134480278)	DC activation register invalid	DC activation register is invalid	
		Remedy	– DC activation register is invalid
		Diag-nostic status	Error
08 l 04 l 0197 (134480279)	SyncType not sup-ported	Configured SyncType (0x1C32.1 or 0x1C33.1) not sup-ported. Check DC registers and supported SyncTypes (0x1C32.4 and 0x1C33.4)	

ID hex (dec)	Message	Description	
08 I 04 I 0197 (134480279)	SyncType not supported	Remedy	– Configured SyncType (0x1C32.1 or 0x1C33.1) not supported. Check DC registers and supported SyncTypes (0x1C32.4 and 0x1C33.4)
		Diagnostic status	Error
08 I 08 I 019F (134742431)	General CBUS Error	There is an active diagnosis at the CBUS master.	
		Remedy	– There is an active diagnosis at the CBUS master. CBUS error codes can be read via CI.
		Diagnostic status	Error
08 I 08 I 024C (134742604)	Unknown subbus diagnosis	The submodule has an active diagnosis with an unknown ID.	
		Remedy	– The submodule has an active diagnosis with an unknown ID. Check diagnosis arguments of this diagnosis.
		Diagnostic status	Warning
08 I 0A I 0108 (134873352)	IO-Link event	An IO-Link event (Notification, Warning or Error) occurred. IO-Link specific details are attached to this notification.	
		Remedy	– An IO-Link event (Notification, Warning or Error) occurred and was transported via a tunnel. IO-Link specific details are attached to this notification.
		Diagnostic status	Information, Warning, Error
08 I 0A I 017F (134873471)	Process data mismatch	Reserved process length data for IO-Link device too small	
		Remedy	– Reserved process length data for IO-Link device too small
		Diagnostic status	Error

ID hex (dec)	Message	Description	
0A I 00 I 01A7 (167772583)	Non-volatile memory defect	Non-volatile memory defect	
		Remedy	– Non-volatile memory defect (flash)
		Diagnostic status	Error
0A I 01 I 00F9 (167837945)	Error RTE module watchdog monitoring	Error RTE module watchdog monitoring triggers	
		Remedy	– Error RTE module watchdog monitoring triggers
		Diagnostic status	Error
0B I 00 I 010E (184549646)	General software failure	An error occurred that could not be matched with any other diagnosis.	
		Remedy	– An error occurred that could not be matched with any other diagnosis.
		Diagnostic status	Error
0B I 00 I 0140 (184549696)	Systemstart	The system is starting.	
		Remedy	– The system is starting.
		Diagnostic status	Information
0B I 03 I 00B0 (184746160)	CRC error in user file	A CRC error was detected in the user file	
		Remedy	– A CRC error was detected in the user file
		Diagnostic status	Error
0B I 04 I 00B7 (184811703)	Firmware invalid	Firmware invalid	
		Remedy	– Firmware invalid
		Diagnostic status	Error
0B I 07 I 00CC (185008332)	Initialization failed	Initialization of device failed	
		Remedy	– Initialization of device failed

ID hex (dec)	Message	Description	
0B I 07 I 00CC (185008332)	Initialization failed	Diagnostic status	Error
0B I 08 I 018F (185074063)	Unsupported Version of full diagnostic image	The version of the full diagnostic image is not supported.	
		Remedy	– The version of the full diagnostic image is not supported.
		Diagnostic status	Error
0B I 08 I 0190 (185074064)	Unsupported Version of diagnosis	The version of the diagnosis is not supported.	
		Remedy	– The version of the diagnosis is not supported.
		Diagnostic status	Error
0B I 09 I 0128 (185139496)	Invalid APDD	The AP device description is invalid or missing.	
		Remedy	– The AP device description could not be validated after reading it from the storage. Possible communication or hardware error.
		Diagnostic status	Error
0B I 09 I 0129 (185139497)	Invalid startup APDD	The startup AP device description is invalid or missing.	
		Remedy	– The startup AP device description could not be validated after reading it from the storage. Possible communication or hardware error.
		Diagnostic status	Error
0B I 09 I 024F (185139791)	Device inconsistency detected	Different data sources of the device have inconsistencies regarding the same target data.	
		Remedy	– Different data sources of the device have inconsistencies regarding the same target data. If this is an AP System inconsistencies exist between the Basic Informatios and the APDD or Startup APDD.

ID hex (dec)	Message	Description	
0B | 09 | 024F (185139791)	Device inconsistency detected	Diagnostic status	Information, Warning, Error
0C | 00 | 013D (201326909)	Firmware Update mode	The AP System is in Firmware-Update mode	
		Remedy	– The AP System is in Firmware-Update mode
		Diagnostic status	Maintenance Required
0C | 01 | 0104 (201392388)	Condition Counter Limit reached	The configured condition counter limit of the valve has been reached.	
		Remedy	– The configured condition counter limit of the valve has been reached.
		Diagnostic status	Maintenance Required
0C | 01 | 01B3 (201392563)	B10 value for cycles reached	The B10 value has been reached for this valve.	
		Remedy	– The B10 value has been reached for this valve.
		Diagnostic status	Maintenance Required
0C | 01 | 01B4 (201392564)	Wrong valve type connected	Difference between configured and connected valve type detected.	
		Remedy	– Difference between configured and connected valve type detected.
		Diagnostic status	Maintenance Required
0C | 01 | 01B5 (201392565)	Condition counter value for valve coil reached	The condition counter value for valve coil has been reached.	
		Remedy	– The condition counter value for valve coil has been reached.
		Diagnostic status	Maintenance Required
0D | 01 | 01DD (218169821)	Diagnosis Trace resetted	The diagnosis trace was resetted and all diagnoses removed.	

ID hex (dec)	Message	Description	
0D I 01 I 01DD (218169821)	Diagnosis Trace resetted	Remedy	– The diagnosis trace was resetted and all diagnoses removed.
		Diag-nostic status	Information

Tab. 16: Diagnostic messages

11 Technical data

11.1 General technical data

General technical data		
Certificates, declaration of conformity		➔ www.festo.com/sp
Ambient temperature	[°C]	–20 ... +50
Storage temperature	[°C]	–40 ... +70
Humidity (non-condensing)	[%]	5 ... 95
Max. setup altitude	[m]	2000 Observe the restrictions of the individual modules and components ➔ Operating Instructions for the applicable module.
Number of modules per interface		Depending on the interface ➔ Operating instructions for the applicable interface.
Max. cable length for system communication between 2 modules	[m]	50 Available cable lengths ➔ www.festo.com/catalogue
Address volume of the inputs/outputs	[Byte]	2048/2048, depending on the interface
Degree of protection in accordance with EN 60529		IP65/IP67, if all cables are connected and connections that are not required are closed with a cover cap. The degree of protection may differ for some valve terminals.
Protection against electric shock (protection against direct and indirect contact in accordance with IEC 61010-1)		By the use of SELV/PELV circuits (safe extra-low voltage/protected extra-low voltage)
Electromagnetic compatibility		See declaration of conformity ➔ www.festo.com/sp
Mounting position		Any

Tab. 17: General technical data

Vibration and shock resistance in accordance with EN 60068	
Vibration (part 2-6) ➔ Tab. 19 Vibration load	Direct mounting SG2
Shock (part 2-27) ➔ Tab. 20 Shock load	Direct mounting SG2
Continuous shock (part 2-27) ➔ Tab. 21 Continuous shock load	Direct mounting SG1

Tab. 18: Vibration and shock resistance in accordance with EN 60068

Vibration load					
Frequency range [Hz]		Acceleration [m/s²]		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. 19: Vibration load

Shock load					
Acceleration [m/s²]		Duration [ms]		Shocks per direction	
SL1	SL2	SL1	SL2	SL1	SL2
±150	±300	11	11	3	3

Tab. 20: Shock load

Continuous shock load		
Acceleration [m/s²]	Duration [ms]	Shocks per direction
SL1	SL1	SL1
±150	6	1000

Tab. 21: Continuous shock load

Power supply		
Logic supply PS		
Logic supply PS	[V DC]	24 ± 25 %
Trigger level, undervoltage identification in logic supply PS	[V]	Depending on the module ➔ Operating instructions for the applicable module
Max. acceptable current load, logic supply PS	[A]	4
Mains buffering time, logic supply PS	[ms]	10
Load supply PL		
Load supply PL	[V DC]	24 ± 25%, may differ for some modules
Trigger level, undervoltage identification in logic supply PL	[V]	Depending on the module ➔ Operating instructions for the applicable module
Max. acceptable current load, load supply PL	[A]	4

Tab. 22: Power supply

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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.

11.2 Technical data for 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.

Electrical data and ambient conditions UL	
Overvoltage category	II The unit shall be supplied by a power source which fulfils the requirements on a limited-energy circuit in accordance to IEC/EN/UL/CSA 61010-1 or on a Limited Power Source (LPS) in accordance to IEC/EN/UL/CSA 60950-1 or IEC/EN/UL/CSA 62368-1 or a Class 2 circuit in accordance to NEC or CEC.
Pollution degree	2 Use in an environment with pollution degree 2 (or better).
Installation site	for indoor use only
NEMA Type Rating for Enclosure	1
Supply voltage	max. 30 V DC, Class 2
Maximum fluid temperature/ambient	50 °C/120 °F

Tab. 23: Electrical data and ambient conditions UL

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Copyright:
Festo SE & Co. KG
73734 Esslingen
Ruiter Straße 82
Deutschland

Phone:
+49 711 347-0

Internet:
www.festo.com