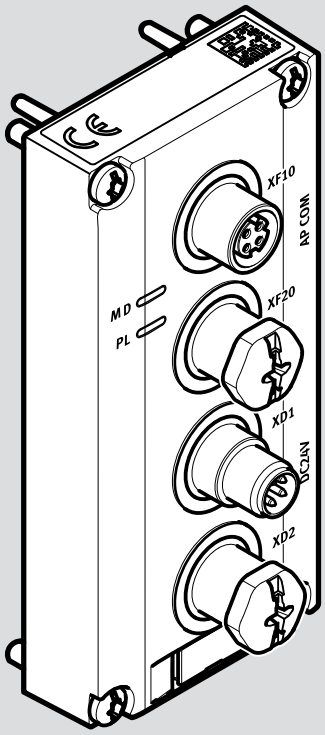
VAEM-L1-S-...-AP
Electrical interface



FESTO

Operating instruction

8227805

8227805
2025-02b
[8227807]

Original instructions

Table of contents

1 About this document

1.1 Applicable documents

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

Document	Contents
Operating instructions remote I/O system CPX-AP-I	Instruction manual and important information on the assembly, electrical installation and maintenance tasks and also description of the remote I/O system CPX-AP-I
Operating instructions for valve terminal VTUG-...-M/VTUG-...-V	Information on the design and installation of the valve terminal

Tab. 1: Applicable documents

1.2 Product version

This document refers to the following product versions:

Product	Version
VAEM-L1-S-12-AP	Revision 1 and above
VAEM-L1-S-24-AP	Revision 1 and above

Tab. 2: Product version

The product version can be determined from the product labelling.

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

1.3 Specified standards

Version	
IEC 60204-1:2016-10	EN 60529:1991-10
EN 60204-1:2018-09	–

Tab. 3: Standards specified in the document

2 Safety

2.1 Safety instructions

- Only use the product if it is in perfect technical condition.
- Observe the identifications on the product.
- Store the product in a cool, dry environment protected from UV and corrosion. Keep storage times short.
- 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 operation as an electrical interface between a remote I/O system CPX-AP and a valve terminal VTUG.
Use the product only as follows:

– Use only in an industrial environment. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.
– Use only in combination with modules and components that are approved for the applicable product variant ➔ www.festo.com/catalogue.

2.3 Training of qualified personnel

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

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 Design

4.1.1 Product design

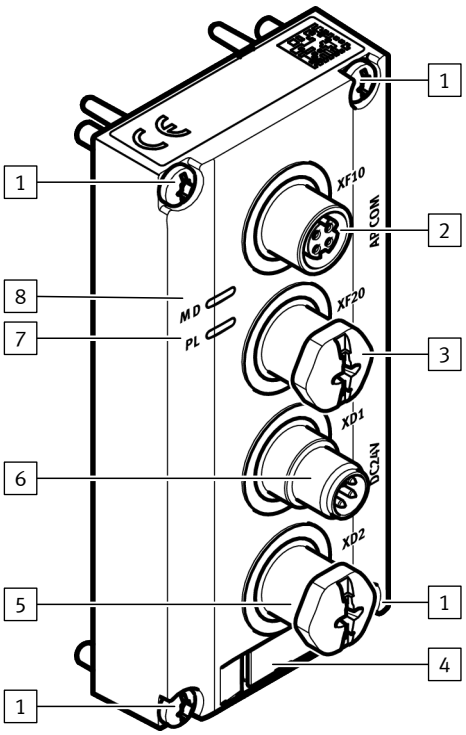
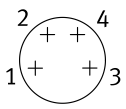


Fig. 1: Product design

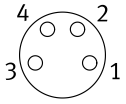
1 Retaining screw
2 Connection for system communication [XF10]
3 Connection for system communication forwarding [XF20]
4 Inscription label (optional)
5 Port for forwarding supply [XD2]
6 Power supply connection [XD1]
7 LED load voltage [PL]
8 Module diagnostics LED [MD]

4.1.2 Connecting elements

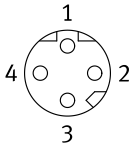
Power supply connection [XD1]		
M8 plug, 4-pin, A-coded		Signal
	1	+24 V DC logic supply PS
	2	0 V DC load supply PL
	3	0 V DC logic supply PS
	4	+24 V DC load supply PL

Tab. 4: Power supply connection

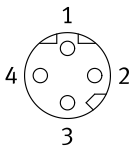
For information on power supply, see operating instructions for remote I/O system CPX-AP-I ➔ 1.1 Applicable documents.

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

Tab. 5: Connection for voltage forwarding

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

Tab. 6: Connection for system communication

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

Tab. 7: Connection for system communication forwarding

4.2 Function

The module establishes the connection between a valve terminal VTUG and a remote I/O system CPX-AP.

5 Mounting

NOTICE

Damage to internal electronics.
Damage to components and malfunctions due to incorrect handling.
- Observe the handling specifications for electrostatically sensitive devices.

- Mount the module on the terminal strip of the valve terminal VTUG with the included retaining screws ➔ tightening torque 0.7 Nm ± 20 %.

6 Installation

- Install in accordance with the operating instructions for remote I/O system CPX-AP-A" ➔ 1.1 Applicable documents.
- Connect the earth cable to the earth terminal of the valve terminal in accordance with the "valve terminal VTUG-...-M/VTUG-...-V operating instructions" ➔ 1.1 Applicable documents.

6.1 Connecting cables

⚠ WARNING

Risk of injury due to electric shock.

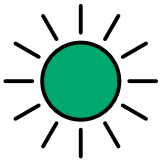
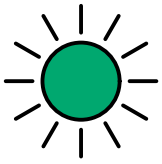
- For the electric power supply, use SELV or PELV circuits that guarantee a reliable electric disconnection from the mains network.
- Observe IEC 60204-1/EN 60204-1.

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

7 Commissioning

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

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

[MD]	[PL]
	
Green light	Green light

Tab. 8: Response of the LED displays of the module after error-free commissioning

8 Parameterisation

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

Fieldbus startup parameters

ID	Parameters	Number of instances[1]	Data type	Access[2]	Array size
20021	Activation of diagnostics for defective valve Factory setting = 0 (no diagnostics)	1	BOOL	rw	–
20022	Configuration for load supply PL voltage monitoring – 0: load voltage monitoring inactive – 1: load voltage monitoring active, with suppression of diagnostics at switch-off (factory setting) – 2: load voltage monitoring active	1	UINT8	rw	–
20052	Response in error status (communication malfunction) – 0: reset outputs (factory setting) – 1: maintain status	1	UINT8	rw	–

1) Counting starting at 0.
2) ro = read only; rw = read write

Tab. 9: Fieldbus startup parameters

Fieldbus parameters VAEM-L1-S-12-AP

ID	Parameters	Number of instances[1]	Data type	Access[2]	Array size
20094	Condition counter limit	24	UINT32	rw	–
20095	Condition counter actual value	24	UINT32	rw	–

1) Counting starting at 0.
2) ro = read only; rw = read write

Tab. 10: Fieldbus parameters VAEM-L1-S-12-AP

Fieldbus parameters VAEM-L1-S-24-AP

ID	Parameters	Number of instances[1]	Data type	Access[2]	Array size
20094	Condition counter limit	48	UINT32	rw	–
20095	Condition counter actual value	48	UINT32	rw	–

1) Counting starting at 0.
2) ro = read only; rw = read write

Tab. 11: Fieldbus parameters VAEM-L1-S-24-AP

AP parameter

ID	Parameters	Number of instances[1]	Data type	Access[2]	Array size
246	Fieldbus serial number	1	UINT32	ro	–
791	Product Key	1	CHAR	ro	12
960	Firmware version	1	CHAR	ro	30
20000	Module code	1	UINT32	ro	–
20085	Measured value of temperature AP-ASIC [°C]	1	INT16	ro	–
20087	Current measured value of logic supply PS [mV]	1	UINT16	ro	–
20088	Current measured value of load supply PL [mV]	1	UINT16	ro	–
20093	Hardware version	1	UINT8	ro	–

1) Counting starting at 0.
2) ro = read only; rw = read write

Tab. 12: AP parameter

9 Diagnostics and fault clearance

9.1 Diagnostic messages

For all diagnostics messages of the remote I/O system and for information on grouping and displaying the diagnostic messages see the operating instructions for remote I/O system ➔ 1.1 Applicable documents.
The table below contains the diagnostic messages of the module.

ID hex (dec)	Message	Description	
02 l 01 l 0016 (33619990)	Undervoltage in logic supply (PS) 24 V DC	Undervoltage of the logic supply (PS) 24 V DC was detected.	
		Remedy	– Check the power supply (logic)
		Diagnostic status	Warning Error from firmware 1.100
02 l 01 l 0017 (33619991)	Overvoltage in logic supply (PS) 24 V DC	Overvoltage of the logic supply (PS) 24 V DC was detected.	
		Remedy	– Check the power supply (logic)
		Diagnostic status	Warning Error from firmware 1.117
02 l 01 l 0105 (33620229)	Undervoltage in load supply (PL) 24 V DC	Undervoltage in the load supply (PL) 24 V DC was detected.	
		Remedy	– Check power supply (load) – Check for short circuit
		Diagnostic status	Error
02 l 01 l 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.	
		Remedy	– Check whether emergency stop was activated – Check the load voltage supply
		Diagnostic 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	– Check power supply
		Diagnostic status	Error
07 l 06 l 0268 (117834344)	Valve fault	A fault in the valve was detected.	
		Remedy	– Check and/or replace valve
		Diagnostic status	Error
08 l 01 l 0124 (134283556)	Communication to AP master interrupted	The communication to the AP Master is aborted.	
		Remedy	– Restart AP Master. – Check communication AP connecting cable.
		Diagnostic status	Error
08 l 01 l 0130 (134283568)	Output process data watchdog of the AP module expired	Output process data watchdog of the AP module expired	
		Remedy	– Restart AP system. – Check cable.
		Diagnostic status	Error
08 l 01 l 0131 (134283569)	Input process data watchdog of the AP module expired	Input process data watchdog of the AP module expired.	
		Remedy	– Restart AP system. – Check cable.
		Diagnostic status	Error

ID hex (dec)	Message	Description	
08	01	01A2 (134283682)	Device in emergency operation system state	System initialisation (module detection) has failed. The system is in maintenance mode. I/O function is not available.	
		Remedy	– Restart system – Update firmware to the latest version – Contact Festo Service
		Diagnostic status	Error
0C	01	01B5 (201392565)	Condition counter for valve coil reached	The condition counter limit for the valve coil has been reached	
		Remedy	– Perform maintenance – Reset condition counter
		Diagnostic status	Maintenance

Tab. 13: Diagnostic messages

9.2 Application-specific diagnostic functions

Switching cycle counter (Condition counter)

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

- Every solenoid coil is assigned an actual value and a critical limit: fieldbus parameters ID 20095 and ID 20094.
- The switching cycle counter is incremented at every rising edge of the switching signal.
- The switching cycle counter counts up to its maximum value of 0xFF.FF.FF.FF. The switching cycle counter then remains at the maximum value. There is no overflow.
- If the critical limit is reached of exceeded, he channel-related diagnostic message ID 0C | 01 | 01B5 (201392565) is sent.
- The diagnostic message can be cancelled by setting the critical limit to a value higher than the current actual value. Or the actual value or the critical limit can be set to 0.
- The diagnostic message ID 0C | 01 | 01B5 (201392565) is deactivated if the critical limit memory has the value 0 (factory setting).
- If the electrical interface is changed, actual values and critical limits can be manually transferred to another electrical interface by read-out and read-in.
- If a valve is replaced, the actual value remains unchanged in the electrical interface and can be reset manually with the fieldbus parameter ID 20095.
- The actual value of the switching cycle counter is saved to the non-volatile memory of the electrical interface when the logic supply PS is switched off.

Load voltage monitoring

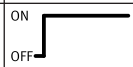
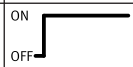
In the factory setting the load voltage monitoring differentiates between "undervoltage/overvoltage load supply PL" and "shutdown load supply PL". The difference between "undervoltage load supply PL" and "shutdown load supply PL" is helpful if a deliberately initiated shutdown is not intended to trigger an error message in the higher-level controller, e.g. emergency stop. A critical undervoltage, e.g. as a result of excessively high voltage drop in the cable, is always reported as an error.

The activation/deactivation and use of the load voltage monitoring is controlled via the fieldbus startup parameter with ID 20022.
For additional information on load voltage monitoring see ➔ operating instructions remote I/O system CPX-AP-I or CPX-AP-A ➔ 1.1 Applicable documents.

Valve fault

The "valve defective" diagnostic message with the ID 117834344 is triggered if a problem is detected at the switching output for the corresponding valve coil.
The diagnostics can be activated via the parameter with the ID 20021 "activation of diagnostics in case of defective valve". It is only triggered if the defective channel receives a switch-on command via the process data.
The diagnostics can be resolved by:
– Run voltage cycle 24 V PS
– Run voltage cycle 24 V PL
– Switch on channel again

9.3 LED indicators

LED		Meaning	Action
 off		The logic supply PS is not available	– Check the connection of the logic supply PS.
 green light		The logic supply (PS) is available. Module diagnostics not active.	–
 flashing green at 0.5 Hz		Module diagnostics is active. "Information" degree of severity E.g. switching off load supply (PL)	–
 flashing red at 0.5 Hz		Module diagnostics is active. "Warning" degree of severity E.g. parameterisation error	Carry out appropriate remedial measures, e.g. check parameterisation.
 red light		Module diagnostics is active. "Error" degree of severity E.g. undervoltage in load supply (PL)	Take appropriate remedial action, e.g. check load supply (PL).
 flashing red at 2 Hz		The module ramp-up is not yet completed. The system communication is not yet initialised.	–
 flashing green at 2 Hz		Module identification (service function)	–

Tab. 14: Module diagnostics LED [MD]

LED		Meaning	Action
 green light		The load supply PL is available.	–
 flashing green at 0.5 Hz		The load supply PL is not available.	Check the load supply PL.
 flashing red at 0.5 Hz		The load supply PL is outside the tolerance range.	Check the load supply PL.

Tab. 15: Load supply LED [PL]

10 Technical data

General technical data		VAEM-L1-S-12-AP	VAEM-L1-S-24-AP
Certificates, declaration of conformity		→ www.festo.com/sp	
General technical data for remote I/O system CPX-AP		Operating instructions for remote I/O system CPX-AP → 1.1 Applicable documents	
Applicable technical data for valve terminal VTUG		Operating instructions for valve terminal VTUG-...-M/VTUG-...-V → 1.1 Applicable documents	
Dimensions (length × width × height)	[mm]	91 × 42 × 30	
Product weight	[g]	76	
Mounting position		Operating instructions for valve terminal VTUG → 1.1 Applicable documents	
Ambient temperature	[°C]	–20 ... +60	
Storage temperature	[°C]	–40 ... +70	
Maximum storage time	[years]	2	
Humidity (non-condensing)	[%]	5 ... 95	
Maximum number of valves		12	24
Maximum number of valve coils		24	48
Assigned address space (inputs/outputs)	[Byte]	–/3	–/6
Module code (hex/dec)		0x200B/8203d	0x200C/8204d
Module identification		VAEM-L1-S-12-AP	VAEM-L1-S-24-AP
Degree of protection in accordance with EN 60529		IP65/IP67 (if assembled, cables connected and connections that are not needed sealed with cover caps)	
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	

Tab. 16: General technical data

Power supply		VAEM-L1-S-12-AP	VAEM-L1-S-24-AP
Logic supply PS	[V DC]	24 ± 25 %	
Intrinsic current consumption at nominal operating voltage 24 V from PS	[mA]	34	
Diagnostics message, under-voltage in logic supply PS	[V]	< 18	
Diagnostics message, over-voltage in logic supply PS	[V]	> 30	
Load supply PL	[V DC]	24 ± 10 %	
Intrinsic current consumption at nominal operating voltage 24 V from PL	[mA]	15	22
Diagnostics message, under-voltage in load supply PL	[V]	< 21.6	
Diagnostics message, over-voltage in load supply PL	[V]	>26.4	
Capacitive load at load supply PL			
24 V PL to 0 V PL	[nF]	Typically 35	
24 V PL to FE	[nF]	Typically 35	
0 V PL to FE	[nF]	Typically 20	
Electrical isolation			
Between PS and PL		Yes	
Between the channels		No	
Short-circuit protection			
Per channel		Electronic	
Response after end of overload		No automatic recovery	

Tab. 17: Power supply

Festo SE & Co. KG
Ruiter Straße 82
73734 Esslingen
Germany

Phone: +49 711 347-0
www.festo.com