

Valve terminal MPA-...

FESTO

Description Electronics MPA-...

MPA electronic
modules

Types:

- VMPA1-FB-...
- VMPA2-FB-...
- VMPA1-FB-...D2...
- VMPA2-FB-...D2...

VPPM/MPA
proportional-
pressure regulator

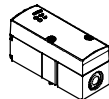
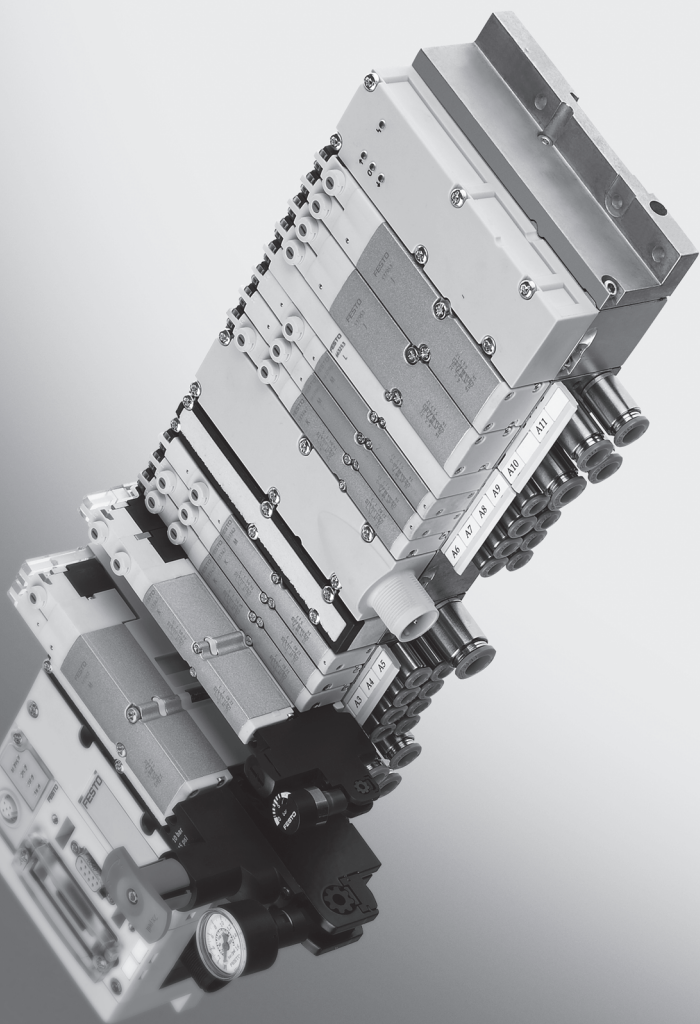
Type:

- VPPM-...TA-...
- VPPM-...TA-...C1

MPA pressure
sensors

Types:

- VMPA-FB-PS-...
- VMPAF-FB-EPLM...



Description

562113
en 1109b
[759108]

Contents and general instructions

Original de

Version en 1109b

Designation P.BE-MPA-ELEKTRONIK-EN

Order no. 562113

© (Festo SE & Co. KG, D-73726 Esslingen, 2011)

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Contents

Intended use	V
Target group	VI
Service	VI
Important user instructions	VII
Instructions for this description	IX
Structure of a CPX terminal	X
Diagnosis via the fieldbus or a network	XI
1. MPA pneumatic modules	1-1
1.1 Function of the MPA pneumatics modules	1-3
1.1.1 Display and connecting elements	1-6
1.2 Mounting	1-7
1.3 Installation	1-11
1.4 Parametrisation	1-17
1.4.1 Parameter of the MPA pneumatics modules	1-18
1.4.2 Further parameters for electronics module type VMPA...-D2-.. ...	1-20
1.5 Diagnostics	1-23
1.5.1 Composition of the LED display on MPA1	1-24
1.5.2 Design of the LED display on MPA2	1-25
1.5.3 LED signals for MPA electronics modules with standard diagnostics	1-27
1.5.4 LED signals for MPA electronics modules with diagnostics D2	1-29
1.5.5 Error handling and parametrisation	1-30
2. Proportional pressure regulators	2-1
2.1 VPPM proportional pressure regulators VPPM-...TA-...	2-3
2.1.1 Function	2-3
2.1.2 Mounting	2-4
2.1.3 Brief instructions for commissioning	2-5
2.1.4 Parametrisation of the proportional pressure regulator	2-8
2.1.5 Parametrisation example	2-16
2.1.6 Diagnostics	2-20

3.	MPA pressure sensors	3-1
3.1	Pressure sensor plates VMPA...-FB-PS-... and MPA-F pneumatics interface VMPAF-FB-EPL...-PS-...	3-3
3.1.1	Function	3-3
3.1.2	Mounting	3-5
3.1.3	Brief instructions for commissioning	3-6
3.1.4	Parametrisation of the MPA pressure sensors	3-7
3.1.5	Parametrisation example	3-15
3.1.6	Diagnostics	3-17
A.	Technical appendix	A-1
A.1	Technical data of the MPA electronics modules	A-3
A.2	Technical data Proportional pressure regulator VPPM/MPA	A-6
A.3	Technical data MPA pressure sensors/pressure sensor plates	A-7
B.	Index	B-1

Intended use

The MPA modules documented in this description have been designed exclusively for use only in combination with CPX terminals from Festo. The pneumatics interfaces and modules are only to be used as follows:

- As intended in an industrial environment.
- In original condition, without unauthorised modifications. Only the conversions or modifications described in the documentation supplied with the product are permitted.
- In excellent technical condition.

If standard ancillary components, such as sensors and actuators, are connected, the specified limits for pressures, temperatures, electrical data, torques, etc. must be complied with. Observe the standards specified in the respective chapters and comply with the regulations of the trade association and the German Technical Control Board (TÜV), the VDE specifications or relevant national regulations.



Warning

- Use only PELV **circuits** in accordance with IEC/DIN EN 60204-1 (protective extra-low voltage, PELV) for the electrical power supply. Also comply with the general requirements for PELV circuits laid down in IEC/DIN EN 60204-1.
- Use only power **sources** that guarantee safe electrical isolation of the operating voltage in accordance with IEC/DIN EN 60204-1.

Protection against electric shock (protection against direct and indirect contact) is guaranteed in accordance with IEC/DIN EN 60204-1 by using PELV circuits (Electrical equipment of machines, general requirements).

Target group

This description is intended exclusively for technicians trained in control and automation technology, who have experience in installation, commissioning, programming and diagnosing of programmable logic controllers (PLC) and field-bus systems.

Service

Please consult your local Festo Service agent if you have any technical problems.

Important user instructions

Danger categories

This description contains instructions on the possible dangers which can occur if the product is not used correctly. These instructions are marked (Warning, Caution, etc.), printed on a shaded background and marked additionally with a pictogram. A distinction is made between the following danger warnings:



Warning

... means that failure to observe this instruction may result in serious personal injury or material damage.



Caution

... means that failure to observe this instruction may result in personal injury or material damage.



Note

... means that failure to observe this instruction may result in material damage.

In addition, the following pictogram describes passages in the text which describe activities with electrostatically sensitive devices:



Electrostatically sensitive devices: Incorrect handling may result in damage to components.

Identification of special information

The following pictograms identify passages in the text which contain special information.

Pictograms



Information:

Recommendations, tips and references to other information sources.



Accessories:

Specifications on necessary or useful accessories for the Festo product.



Environment:

Information on the environmentally friendly use of Festo products.

Text designations

- Bullet points indicate activities which may be carried out in any sequence.
- 1. Numerals denote activities which must be carried out in the specified sequence.
- Arrowheads indicate general lists.

Instructions for this description

This description contains general basic information on the mode of operation, mounting and installation of MPA pneumatics and electronics modules.

Information on MPA pneumatics can be found in the MPA description of pneumatics.

An overview of the CPX pneumatics interfaces can be found in the description for the “CPX I/O modules”.

General basic information about the mode of operation, mounting, installation and commissioning of CPX terminals can be found in the CPX system description.

Special information about commissioning, parametrisation and diagnostics of a CPX terminal with the bus node you are using can be found in the corresponding description for the bus node.

Information about additional CPX modules can be found in the description for the respective module.



An overview of the structure of the CPX terminal user documentation is contained in the CPX system description.

Conventions

The special parameters of the modules are described in the individual chapters. These appear on the Handheld type CPX-MMI-1 in English.

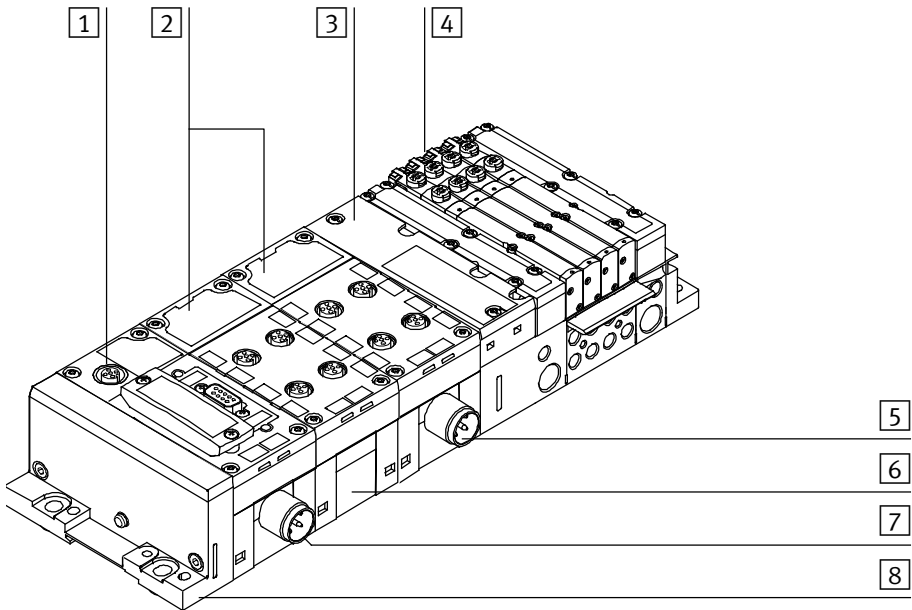
[.....]

The data and parameters which appear in English on the Handheld are shown in square brackets in this description, e.g. [Debounce time]. Next to this may be another description, e.g.:

Input debounce time [Debounce time].

Structure of a CPX terminal

CPX terminals consist of electric function modules, individual modules and components. The diagram below shows an example.



- | | |
|-----------------------------------|---|
| 1 Bus nodes | 5 Interlinking block with additional power supply |
| 2 I/O modules | 6 Interlinking block without supply |
| 3 Pneumatic interface | 7 Interlinking block with system supply |
| 4 Pneumatic modules (example MPA) | 8 End plate |

Fig. 0/1: Example of CPX terminal

Diagnosis via the fieldbus or a network

Dependent on the parametrisation, CPX pneumatics interfaces and CPX I/O modules signal specific errors via the fieldbus or your network.

These can be evaluated via the:

- Status bits (system status)
- I/O diagnostic interface (system diagnosis)
- Module diagnosis
- Error numbers



Additional information on diagnostics can be found in the CPX system description or the description of the bus node.

The following product-specific terms and abbreviations are used in this description:

Term/abbreviation	Significance
Bus node	Establishes the connection to the fieldbus or network. Transmits control signals to the connected modules and monitors their ability to function.
CPX modules	Collective term for the various modules which can be integrated into a CPX terminal.
DIL switch	Dual-in-line switches consist of several switch elements with which settings can be made.
Diagnostics D2	Additional diagnostic functions of MPA-E modules (see section 1.5)
I	Digital input
I/O diagnostic interface	The I/O diagnostic interface is a bus-independent diagnostic interface at I/O level, permitting access to internal data of the CPX terminal.
I/Os	Digital inputs and outputs
Interlinking block	Lower part of the housing of a CPX module for electrical interlinking of the module with the CPX terminal. There are different variants with and without power supplies as well as those made of plastic and metal.
MPA electronics module	Electronic module which provides the electronic function, including the diagnostic functions for the valve solenoid coils of the MPA pneumatics.
MPA pneumatics module	Pneumatic module which provides digital outputs for the attached valves (valve solenoid coils).
O	Digital output
PLC/IPC	Programmable logic controller/industrial PC
Pneumatics interface	The pneumatics interface is the interface between the modular electrical peripherals and the pneumatics.

Tab. 0/1: Product-specific terms

MPA pneumatic modules

Chapter 1

Contents

1. MPA pneumatic modules 1-1

1.1 Function of the MPA pneumatics modules 1-3

1.1.1 Display and connecting elements 1-6

1.2 Mounting 1-7

1.3 Installation 1-11

1.4 Parametrisation 1-17

1.4.1 Parameter of the MPA pneumatics modules 1-18

1.4.2 Further parameters for electronics module type VMPA...-D2-.. ... 1-20

1.5 Diagnostics 1-23

1.5.1 Composition of the LED display on MPA1 1-24

1.5.2 Design of the LED display on MPA2 1-25

1.5.3 LED signals for MPA electronics modules with standard
diagnostics 1-27

1.5.4 LED signals for MPA electronics modules with diagnostics D2 1-29

1.5.5 Error handling and parametrisation 1-30

1. MPA pneumatic modules

1.1 Function of the MPA pneumatics modules

In the CPX terminal the MPA pneumatics modules provide digital outputs for controlling the valves and thus enable pneumatic actuators to be controlled.

From a technical point of view, the individual pneumatic modules each represent a separate **electric** module with digital outputs.

Without intermediate electrical supply (see section 1.3) maximum 8 MPA pneumatic modules are permitted per CPX terminal. Up to 64 valve solenoid coils (exclusively MPA1) or 32 valve solenoid coils (exclusively MPA2) are therefore possible.

With intermediate electrical supply (see section 1.3) maximum 16 MPA pneumatic modules are permitted per CPX terminal. Up to 128 valve solenoid coils (exclusively MPA1) or 64 valve solenoid coils (exclusively MPA2) are therefore possible.

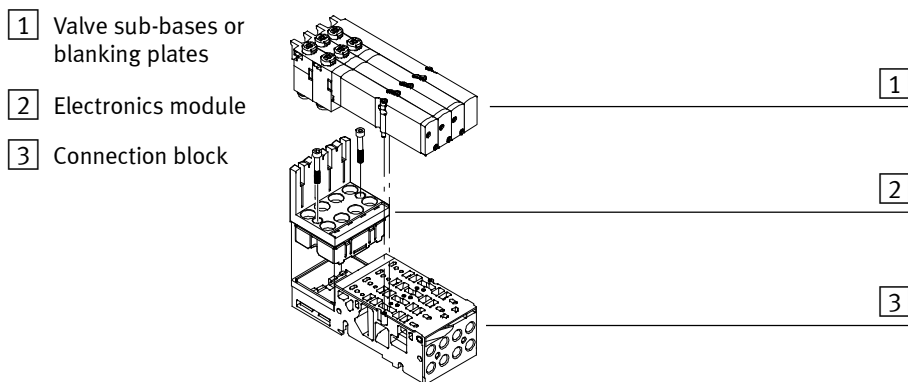
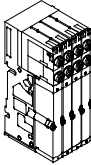
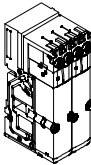


Fig. 1/1: Components of an MPA pneumatics module (example MPA1)

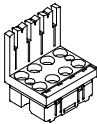
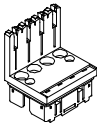
1. MPA pneumatic modules

Type		Description of the MPA pneumatics module
 MPA1	– VMPA1-FB-EM... – VMPA1-FB-AP-4-1 – VMPA1-M1H... – VMPA1-RP	MPA1 pneumatics module: output module with MPA pneumatics, consisting of: – Electronics module with 8 outputs variants and description, see Tab. 1/2 – Connecting plate for 4 valve sub-bases – Valve sub-bases (or corresponding pneumatic components) or – Blanking plates for spare position.
 MPA2	– VMPA2-FB-EM... – VMPA2-FB-AP-2-1 – VMPA2-M1H... – VMPA2-RP	MPA2 pneumatics module: output module with MPA pneumatics, consisting of: – Electronics module with 4 outputs variants and description, see Tab. 1/2 – Connecting plate for 2 valve sub-bases, – Valve sub-bases (or corresponding pneumatic components) or – Blanking plates for spare position.
Outputs correspond to valve solenoid coils		

Tab. 1/1: Overview of MPA pneumatics modules

1. MPA pneumatic modules

The electrical function of an MPA pneumatics module is determined by the electronics module used. The following table provides an overview of the MPA electronics modules:

Type	Description of the electronics module	
 VMPA1...	VMPA1-FB-EMG-8	8 outputs with electrical isolation
	VMPA1-FB-EMG-D2-8	8 outputs with electrical isolation with diagnostic functions D2
	VMPA1-FB-EMS-8	8 outputs without electrical isolation
	VMPA1-FB-EMS-D2-8	8 outputs without electrical isolation with diagnostic functions D2
 VMPA2...	VMPA2-FB-EMG-4	4 outputs with electrical isolation
	VMPA2-FB-EMG-D2-4	4 outputs with electrical isolation with diagnostic functions D2
	VMPA2-FB-EMS-4	4 outputs without electrical isolation
	VMPA2-FB-EMS-D2-4	4 outputs without electrical isolation with diagnostic functions D2
Outputs correspond to valve solenoid coils		

Tab. 1/2: Overview of the MPA electronics modules

1. MPA pneumatic modules

1.1.1 Display and connecting elements

The MPA pneumatic modules have the following display and connecting elements:

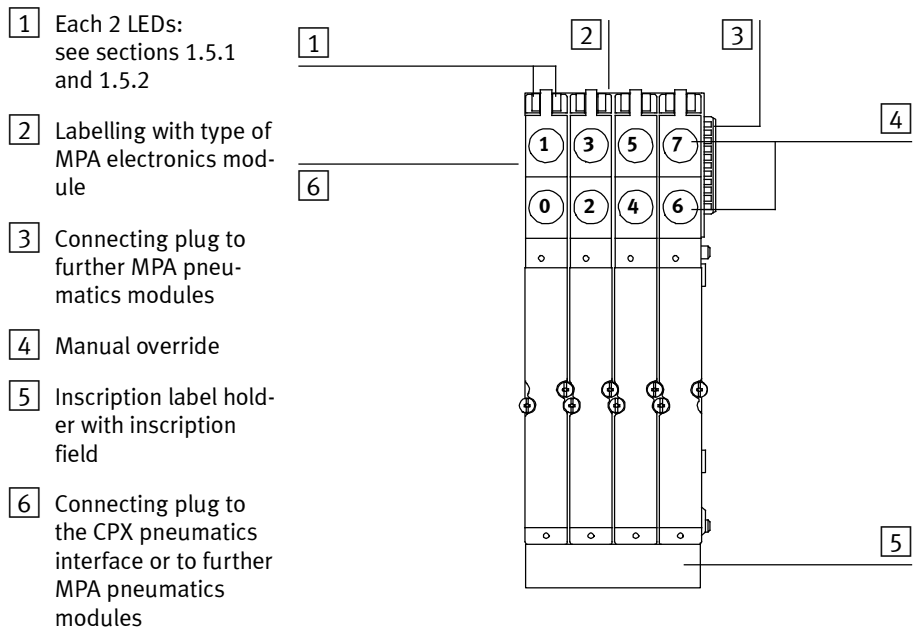


Fig. 1/2: Display and connecting elements (example: MPA1)



Use inscription label holders of type VMPA1-ST-1-4 for identi-
fication of the MPA pneumatics modules.

1. MPA pneumatic modules

1.2 Mounting



Warning

Accidental movements of the connected actuators and uncontrolled movements of loose tubing can cause injury to people or material damage.

Before carrying out installation and maintenance work, switch off the following:

- Compressed air supply
- Operating and load voltage supplies.



The CPX terminal must first be dismantled before it can be extended or modified and when a pneumatics interface must be replaced. Instructions on this can be found in the CPX system description.

Instructions on extending or modifying the MPA pneumatics modules can be found in the related pneumatics description.

Electronics modules or valve slices can be replaced on the mounted CPX terminal.



Caution

Incorrect handling can result in damage to the modules.

- Do not touch any components.
- Observe the handling specifications for electrostatically sensitive devices.
- Discharge yourself from static discharges before assembling or disassembling modules to protect the modules.

1. MPA pneumatic modules



Note

Handle all modules and components of the CPX terminal with care. Pay particular attention to the following:

- Position screws exactly before tightening (otherwise their threads will be damaged).
Screws must be set by hand. Screws must be placed so that the self-cutting threads can be used.
- The specified torques must be observed.
- Threaded fittings must be free of distortion and mechanical tension.
- Check the seals for damage.
- Connecting surfaces must be clean (to ensure sealing effect, avoid leakage and contact errors).

Dismantling the electronics module

1. Use a screwdriver with a narrow blade to loosen the mounting screws of all valve sub-bases or blanking plates and remove them from the connection blocks.
2. Loosen the screws with which the electronics module is fastened to the connection block.
3. Pull the electronics module upwards out of the body of the connection block.

1. MPA pneumatic modules

- 1 Fastening screws of the valve plate or blanking plate
- 2 Valve sub-bases or blanking plates
- 3 Flat seals
- 4 Electronics module
- 5 Connection block
- 6 Inscription label holder
- 7 Sealing lip of the electronics module
- 8 Mounting screws of the electronics module
- 9 2 conical ring seals per valve sub-base or blanking plate

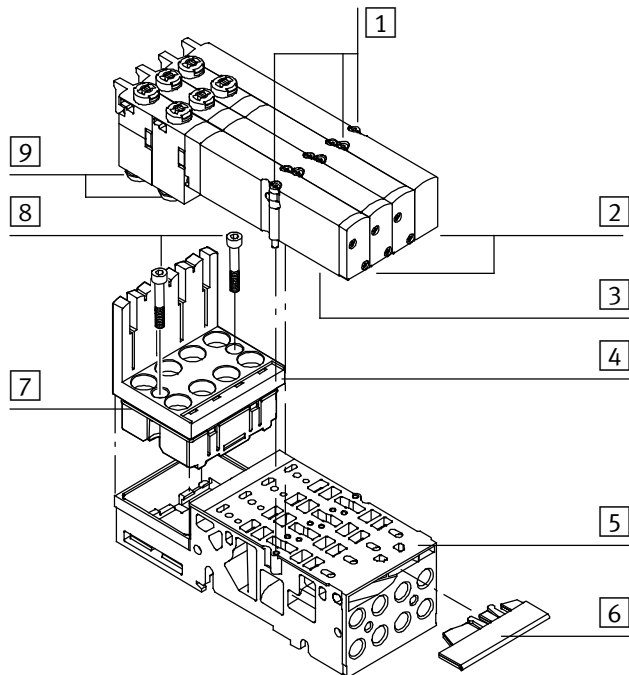


Fig. 1/3: Dismantling and mounting the electronics module (example MPA1)

Mounting the MPA electronics module

**Caution**

Replace an electronics module only by an electronics module of the same type (see section 1.3).

**Note**

Before mounting, check the condition and position of the following seals:

- Sealing lip of the electronics module
- Ring seal of the electrical contacts
- Flat seal of the valve sub-base or blanking plates

1. Place the electronics module into the connection block.
2. Tighten the screws of the electronics module with 0.2 ... 0.25 Nm.
3. Then mount the valve sub-bases or blanking plates. Make sure the seal of the valve sub-base or blanking plate is not damaged. Replace seals if they are damaged.
4. Make sure that the seals are seated correctly.
The flat seal between the connection block and the component must be seated in the recess in the component. The ring seals between the electronics module and the component are conical. The ring seals must be mounted on the guide pins of the components so that the cone slides easily into the corresponding recess in the electronic module when mounting (see Fig. 1/3).
5. Place the components onto the connection block.
6. Screw the components at first only slightly and then tighten with 0.2 ... 0.25 Nm.

1.3 Installation

Power supply

The 24 V supply for the valves is provided via the load voltage for the valves of the CPX terminal (V_{VAL}).

The power supply for the MPA electronics modules is provided via the operating voltage supply for the electronics/sensors ($V_{EL/SEN}$).



Caution

Damage to components and operative malfunctions!

Use of the following power supplies for MPA pneumatics modules with electronics modules **without** electric isolation (VMPA...-FB-EMS...) is **not** permitted:

- Interlinking block Typ CPX-GE-EV-V... (valve supply)
- Interlinking block CPX-GE-EV-S-7/8-5POL (5-pin system supply)
- Supply plate type VMPA-FB-SP-...-V... (electric intermediate supply)

For these MPA electronics modules, use **only** one of the following power supplies:

- Interlinking block with **four-pin** system supply CPX-GE-EV-S (M18) or CPX-GE-EV-S-7/8-4POL (7/8")
- CPI interface VMPA-CPI for CPI systems



Observe the overview of all permitted power supplies in Tab. 1/3 and in the appendix in Tab. A/3.

1. MPA pneumatic modules

MPA electronics modules may only be supplied with power via the following:

MPA electronics module	Permitted supply modules (type)
Electronics modules with electric isolation (VMPA...-FB-EMG-...)	M18, 4-pin: – CPX-GE-EV-S¹⁾ – CPX-GE-EV-Z¹⁾ – CPX-GE-EV-V²⁾ 7/8", 5-pin: – CPX-GE-EV-S-7/8-5POL²⁾ – CPX-M-GE-EV-S-7/8-5POL²⁾ – CPX-GE-EV-Z-7/8-5POL²⁾ – CPX-M-GE-EV-Z-7/8-5POL²⁾ 7/8", 4-pin: – CPX-GE-EV-S-7/8-4POL¹⁾ – CPX-GE-EV-Z-7/8-4POL¹⁾ – CPX-GE-EV-V-7/8-4POL²⁾ Intermediate supply on the pneumatics side: – VMPA-FB-SP...-V-...²⁾
Electronics modules without electric isolation (VMPA...-FB-EMS-...)	M18, 4-pin: – CPX-GE-EV-S – CPX-GE-EV-Z 7/8", 4-pin: – CPX-GE-EV-S-7/8-4POL – CPX-GE-EV-Z-7/8-4POL
¹⁾ If this supply module is used, electric isolation is eliminated ²⁾ With electric isolation	

Tab. 1/3: Permitted supply modules for use with MPA electronics modules

In the case of MPA electronics modules **with** electric isolation type VMPA...-FB-EMG-..., $V_{EL/SEN}$ and V_{VAL} are completely electrically isolated. In combination with the following voltage supply modules, which are marked in Tab. 1/3 with ²⁾, it is possible to switch off the valve supply voltage at all pins.

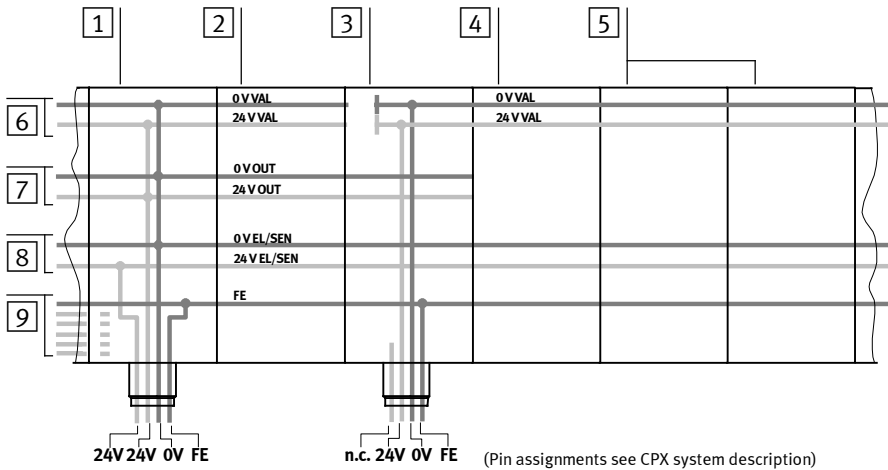
1. MPA pneumatic modules



Additional information can be found in the following user documentation from Festo:

- Pneumatic installation:
Pneumatic description P.BE-MPA-...
- Electric installation:
CPX system description P.BE-CPX-SYS-...
- Addressing of the valve solenoid coils:
Description for the corresponding bus node/control block, e.g. P.BE-CPX-FB...-...

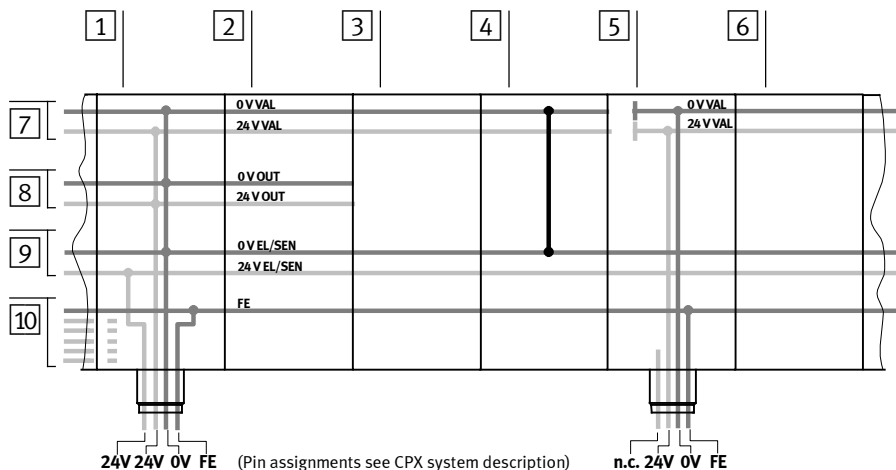
1. MPA pneumatic modules



- | | |
|---|--|
| 1 Interlinking block with system supply | 6 Load voltage for valves (V_{VAL}) |
| 2 Interlinking block without supply | 7 Load voltage for digital outputs (V_{OUT}) |
| 3 Interlinking block with electric valve supply. | 8 Operating voltage for electronics and sensors ($V_{EL/SEN}$) |
| 4 MPA pneumatics interface | 9 5 further rails |
| 5 MPA pneumatics modules with electrical isolation (necessary due to separate electrical valve supply 3. Because of this supply, modules without electric isolation are not permitted here.) | |

Fig. 1/4: Basic representation of the voltage supply for MPA pneumatics modules with separate electric valve supply (see also Tab. 1/3)

1. MPA pneumatic modules



- | | |
|---|--|
| <p>[1] Interlinking block with system supply</p> <p>[2] Interlinking block without supply</p> <p>[3] MPA pneumatics interface</p> <p>[4] MPA pneumatics module without electric isolation.
Not permitted if load voltage V_{VAL} is provided via an interlinking block with electrical valve supply or 5-pin system supply (7/8").</p> <p>[5] Electric intermediate supply (type VMPA-FB-SP-...-V-...)</p> | <p>[6] MPA pneumatics module with electric isolation (required due to intermediate electrical supply [5])</p> <p>[7] Load voltage for valves (V_{VAL})</p> <p>[8] Load voltage for digital outputs (V_{OUT})</p> <p>[9] Operating voltage for electronics and sensors ($V_{EL/SEN}$)</p> <p>[10] 5 further rails</p> |
|---|--|

Fig. 1/5: Basic representation of the voltage supply for MPA pneumatics modules with intermediate electrical supply on the pneumatics side (see also Tab. 1/3)

Protection class

When fully mounted, the MPA pneumatics modules have the protection class IP66.

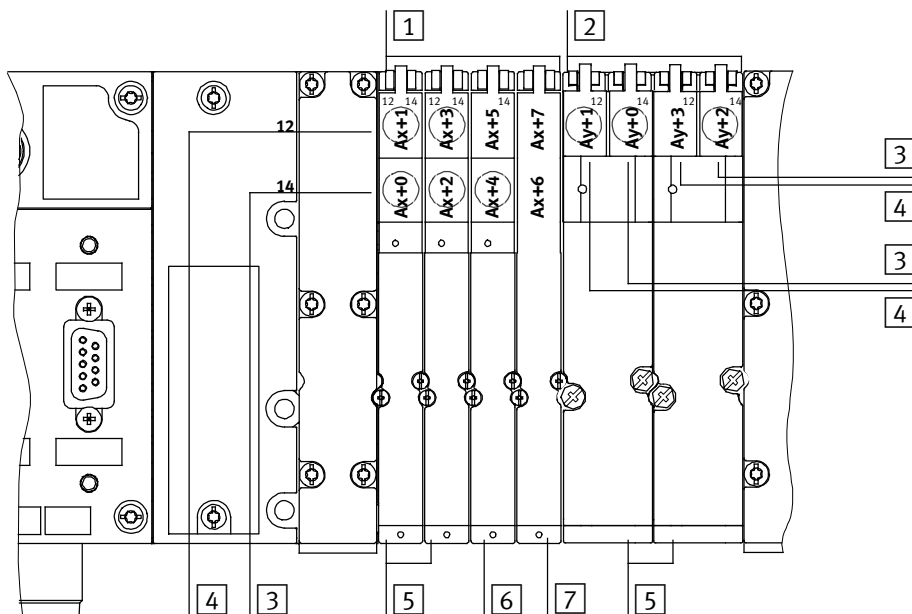
1. MPA pneumatic modules

Address assignment within the pneumatics modules

An MPA1 pneumatics module always occupies 8 output addresses; an MPA2 pneumatics module always occupies 4 output addresses.

Each valve position occupies 2 addresses, independent of which valve sub-base or whether a blanking plate is mounted. The following assignment applies:

- Solenoid coil 14 occupies the less significant address,
- Solenoid coil 12 occupies the higher-value address.



- | | |
|--|--|
| 1 MPA1 pneumatics module | 5 Valve sub-bases with two solenoid coils |
| 2 MPA2 pneumatics module | 6 Valve sub-bases with one solenoid coil (addresses $Ox+5$ unused) |
| 3 Addresses of the coils 14 (channel 0, 2, 4, 6) | 7 Blanking plate |
| 4 Addresses of the coils 12 (channel 1, 3, 5, 7) | |

Fig. 1/6: Example: Address assignment of MPA pneumatics modules (top view)

1. MPA pneumatic modules

1.4 Parametrisation

The behaviour of the MPA pneumatics modules can be parametrised. The following table shows an initial overview of the parameters for the MPA pneumatics modules. Detailed information can be found in sections 1.4.1 and 1.4.2.

Function number ¹⁾	Parameters of the MPA pneumatics modules	MPA	MPA with D2 Diag.
4828 + m * 64 + 0	Monitoring CPX module (Undervoltage valves)	See Tab. 1/5	
Protocol-specific via field-bus/network	Fail safe channel x Idle mode channel x Forcing channel x	See Tab. 1/6 See Tab. 1/7 See Tab. 1/8	
4828 + m * 64 + 0	Monitoring CPX module (Short circuit coil voltage valves)	–	See Tab. 1/9
4828 + m * 64 + 6	Wire fracture (open load) solenoid coil	–	See Tab. 1/10
4828 + m * 64 + 8 ... 23	Condition counter for MPA2 and MPA1 solenoid coils	–	See Tab. 1/11
4828 + m * 64 + 24 ... 39	Condition counter for solenoid coils and MPA1	–	See Tab. 1/11
¹⁾ m = Module number of the MPA pneumatics module (1 ... 47)			

Tab. 1/4: Overview of the parameters of the MPA pneumatics modules



Additional information on parametrisation is provided in the CPX system description and the bus node description.

1. MPA pneumatic modules

1.4.1 Parameter of the MPA pneumatics modules

The following parameters apply in general to all electronics modules of the MPA pneumatics modules. The electronics modules types VMPA...-D2-8 and VMPA...-D2-4 have additional parameters for the diagnostic functions (see section 1.4.2).

Module parameter: Monitoring CPX module		Handheld
Function no.	$4828 + m * 64 + 0$	m = Module number (1 ... 47)
Description	Monitoring of the possible errors can be activated or deactivated (suppressed) for each module independently. Active monitoring causes the following. The error is: – displayed via the Error LEDs. – sent to the CPX bus node	
Bit	Bit 2: Undervoltage, valves (V_{VAL})	[Monitor Vout/Vval]
Values	<u>Bit 2</u> Setting: 0 inactive 1 active (presetting)	[Active] [Inactive]
Note	Monitoring can also be set for the complete CPX terminal (see CPX system description).	

Tab. 1/5: Monitoring the CPX module

Module parameter: fail-safe channel x	
Function no.	Access to these module parameters is made via protocol-specific functions (see the bus node description).
Description	Fault mode channel x: Hold last state Fault state (presetting) Fault state channel x: Set output Reset output (presetting)
Note	With the aid of so-called Fail-Safe parametrisation, you can specify which signal status the outputs are to assume in the event of fieldbus communication errors (also see CPX system description).

Tab. 1/6: Fail-safe channel x (channel-specific)

1. MPA pneumatic modules

Module parameter: Idle mode channel x	
Function no.	Access to these module parameters is made via protocol-specific functions (see the bus node description).
Description	Only relevant for certain fieldbus protocols. Idle mode channel x: Hold last state Idle state (presetting) Idle state channel x: Set output Reset output (presetting)
Note	With the aid of so-called Idle Mode parametrisation, you can specify which signal status the outputs are to assume when switching is made to the Idle state (also see CPX system description). This parameter is not available with all fieldbus protocols.

Tab. 1/7: Idle mode channel x (channel-specific)

Module parameter: Forcing channel x	
Function no.	Access to these module parameters is made via protocol-specific functions (see the bus node description).
Description	Forcing mode outputs channel x: blocked (presetting) Force state Force state, outputs channel x: Set signal Reset signal (presetting)
Note	The Forcing function enables the manipulation of signal statuses detached from actual operating statuses (see also CPX system description).

Tab. 1/8: Forcing channel x (channel-specific)

1. MPA pneumatic modules

1.4.2 Further parameters for electronics module type VMPA...-D2-..

For the diagnostic functions of the MPA electronics modules-VMPA1-FB-EM...-D2-8 and VMPA2-FB-EM...-D2-4, in addition to the ones named in section 1.4.1, there are the following parameters:

Module parameter: Monitoring CPX module		Handheld
Function no.	$4828 + m * 64 + 0$ m = Module number (1 ... 47)	
Description	Monitoring of the possible errors can be activated or deactivated (suppressed) for each module independently. Active monitoring causes the following. The error is: – displayed via the Error LEDs. – sent to the CPX bus node	
Bit	Bit 3: Short circuit in valve coil voltage (V_{VAL})	[Monitor SCV]
Values	<u>Bit 3</u> Setting: 0 inactive (presetting) 1 active	[Inactive] [Active]
Note	Monitoring can also be set for the complete CPX terminal (see CPX system description).	

Tab. 1/9: Parametrisation diagnostic message “Short circuit in load voltage for valves” (only with VMPA....-D2-..)

1. MPA pneumatic modules

Module parameter: Wire fracture (open load) valve coil x		Handheld
Function no.	4828 + m * 64 + 6 m = Module number (1 ... 47)	
Description	Monitoring of the possible errors can be activated or deactivated (suppressed) for each module independently. Active monitoring causes the following. The error is: – displayed via the Error LEDs. – sent to the CPX bus node	
Bit	Bit 0 ... 7: Wire break channel 0...7 VMPA1...-D2-8 Bit 0 ... 3: Wire break channel 0...3 VMPA2...-D2-4	[Monitor open circuit]
Values	<u>Bit 0 ... 7</u> Setting: 0 inactive (presetting) 1 active	[Inactive] [Active]

Tab. 1/10: Parametrisation diagnostics message, wire break (open load) in solenoid coil (only for VMPA...-D2-..)

1. MPA pneumatic modules

Module parameter: Condition counter solenoid coil x			Handheld	
Function no.	MPA1 and MPA2: 4828 + m * 64 + 8...11 Limit value valve 1, coil 14 4828 + m * 64 + 12...15 Limit value valve 1, coil 12 4828 + m * 64 + 16...19 Limit value valve 2, coil 14 4828 + m * 64 + 20...23 Limit value valve 2, coil 12 only MPA1: 4828 + m * 64 + 24...27 Limit value valve 3, coil 14 4828 + m * 64 + 28...31 Limit value valve 3, coil 12 4828 + m * 64 + 32...35 Limit value valve 4, coil 14 4828 + m * 64 + 36...39 Limit value valve 4, coil 12 m = module number (1 ... 47)		High-Byte	Low-Byte
			11 10 9 8	
			15 14 13 12	
			19 18 17 16	
			23 22 21 20	
			27 26 25 24	
			31 30 29 28	
			35 34 33 32	
			39 38 37 36	
Description	A limit value for a counter (condition counter) can be set for each valve coil. A message is displayed if the limit value is exceeded. An activated condition counter causes the following. The message is: – displayed via the Error LEDs. – sent to the CPX bus node			
Bit	Bit 0 ... 7: High Byte or Low Byte		[Max. condition counter]	
Values	FFFFFFFF _h : Condition counter activated but limit value inactive (presetting) 2DC6C0 _h : (example) Condition counter activated and limit value 3,000,000 _d set. 0: Condition counter inactive (counter and diagnostic message deactivated, counter reset)		[4294967295 _d] equals FFFFFFFF _h [Value < FFFFFFFF _h] [0]	

Tab. 1/11: Parametrisation condition counter (only with VMPA....D2-.)

1. MPA pneumatic modules

1.5 Diagnostics

Specific errors of the MPA pneumatics modules are registered or suppressed depending on the module parametrisation.

The errors are shown on-site via the Error LEDs and, if necessary, can be evaluated with the Handheld.

VMPA1.., VMPA2..

MPA pneumatics modules with electronics modules of type VMPA1..-8 and VMPA2..-4 can report the following standard errors:

- Error: Load voltage valves (V_{VAL})

VMPA1..**D2**, VMPA2..**D2**

MPA pneumatics modules with electronics modules of type VMPA1..**D2**-8 and VMPA2..**D2**-4 can report several errors:

- Error: Load voltage valves (V_{VAL})
- Error: Wire break (open load)
- Error: Short circuit in valve coil voltage (V_{VAL})
- Signal: Condition counter

1. MPA pneumatic modules

1.5.1 Composition of the LED display on MPA1

For diagnosing the MPA1 pneumatics modules, there is a two-colour LED for each channel on the electronics modules:

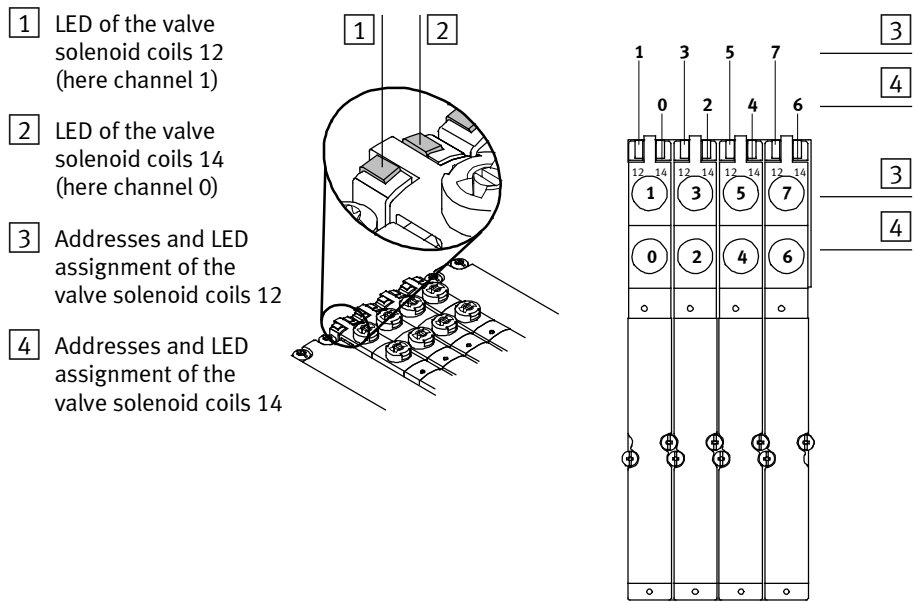


Fig. 1/7: LED display of the MPA1 pneumatics modules

1. MPA pneumatic modules

1.5.2 Design of the LED display on MPA2

For diagnosing the MPA2 pneumatics modules **up to** software version SW31.03.06, there is a two-colour LED for each channel on the electronics modules:

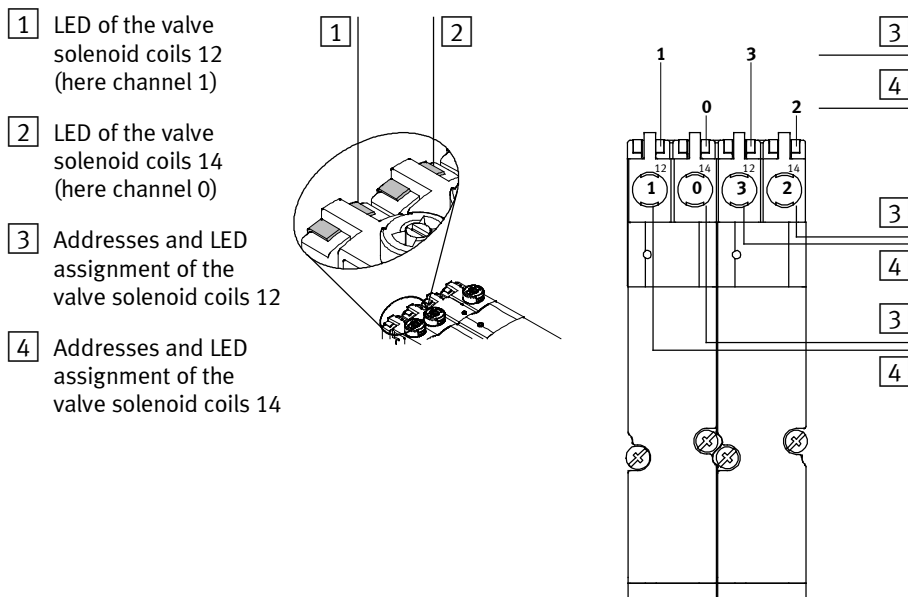


Fig. 1/8: LED display of the MPA2 pneumatics modules **up to** software version SW31.03.06 Rev. 4 (type ...-EMS-4) or SW31.03.06 Rev. 3 (type ...-EMG-4)

1. MPA pneumatic modules

For diagnosing the MPA2 pneumatic modules **from** software version SW12.04.06, there are separate LEDs for switching status (yellow) and diagnosis (red) for each channel on the electronic modules:

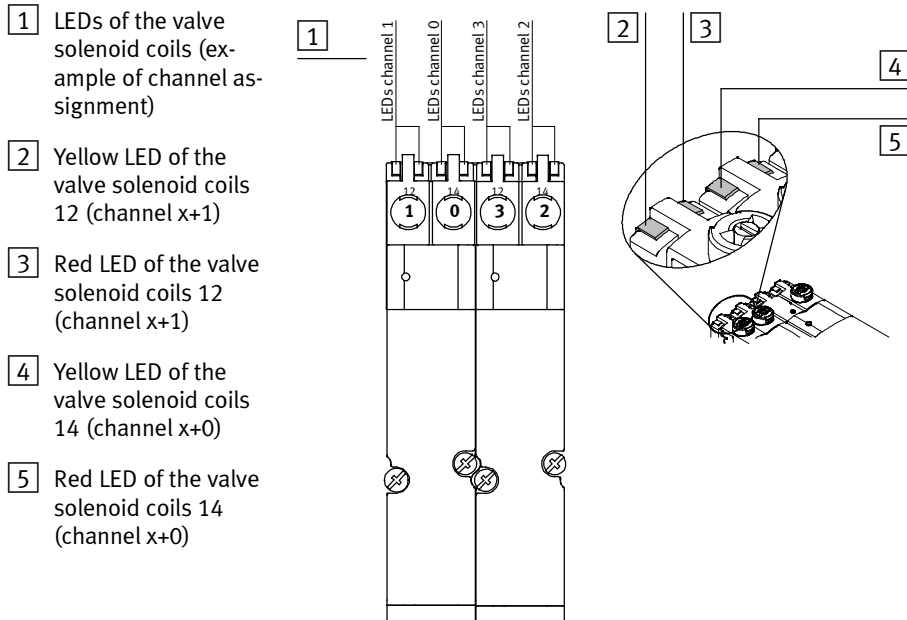


Fig. 1/9: Separate display with yellow and red LEDs on MPA2 pneumatics modules **from** software version SW12.04.06 Rev. 5 (type ...-EM...-4-D2) or Rev. 4 (type ...-EM...-4)

1. MPA pneumatic modules

1.5.3 LED signals for MPA electronics modules with standard diagnostics

The yellow LEDs indicate the status of the relevant output (see also appropriate pneumatics description).

The red-lit LEDs indicate the errors of the MPA pneumatics module depending on the parametrisation. If the module error “Load voltage for valves” occurs, all LEDs will light up red.

MPA electronics modules VMPA1...-8 and VMPA2...-4

LED (yellow/ red)	Process	Status	Error number	Error handling
 LED not illu- minated	ON  OFF	Trouble-free operation. Status of assigned channel logical 0 (output supplies 0-signal)	–	None
 Lights up yel- low	ON  OFF	Trouble-free operation. Status of assigned channel logical 1 (output supplies 1-signal)	–	None
 Lights up red	ON  OFF	Error in load voltage for valves Load voltage for the valves (V_{VAL}) missing or too low.	5	• Check load voltage
¹⁾ Tolerance range of the load voltage supply V_{VAL} see “Technical data” in the appendix Grey-marked field: Observe the note for MPA1 below.				

Tab. 1/12: LED messages of the MPA electronics modules VMPA1...-8 and VMPA2...-4

1. MPA pneumatic modules



Note

The Tab. 1/12 grey-marked error message of the red LED appears orange when displayed together with the yellow status LED (applies only to MPA1 pneumatics as from SW12.04.06 Rev. 7 (type ...-EMG) or SW12.04.06 Rev. 8 (type ...-EMS)).

Use the error number to ascertain which error has occurred (diagnostic message to the fieldbus or with the Handheld).

The error “Load voltage for valves” is sent to the bus node by the MPA electronics module (if not parametrised differently, see section 1.4.1).



Note

With MPA electronics modules, the error “Load voltage for valves” is displayed by module or channel, depending on the hardware and software status.

The following table provides an overview.

Error in load voltage for valves		MPA1	MPA2
Error is reported for the complete module (Module error, channel no. 1)	EMS EMG	up to SW31.03.06 Rev. 7 up to SW31.03.06 Rev. 5	up to SW31.03.06 Rev. 4 up to SW31.03.06 Rev. 3
Error is reported by channel (Channel diagnostics MPA1: 0-7 channel diagnostics MPA2: 0-3)	EMS EMG	from SW12.04.06 Rev. 8 from SW12.04.06 Rev. 7	from SW12.04.06 Rev. 5 from SW12.04.06 Rev. 4

Tab. 1/13: Message of the error “Load voltage for valves” with different software versions (HW)

The error “Load voltage for valves” is sent to the bus node by the MPA electronics module (if not parametrised differently, see section 1.4.1).

1. MPA pneumatic modules

1.5.4 LED signals for MPA electronics modules with diagnostics D2

MPA electronics modules VMPA1....-D2 and VMPA2....-D2

LED (yellow/red)	Process	Status	Error no.	Error handling
 LED not illuminated	ON  OFF 	Trouble-free operation. Status of assigned channel logical 0 (output supplies 0-signal)	–	None
 Lights up yellow	ON  OFF 	Trouble-free operation. Status of assigned channel logical 1 (output supplies 1-signal)	–	None
 Lights up red	ON  OFF 	Error: Load voltage for valves Load voltage for the valves (V_{VAL}) missing or too low.	5	• Check load voltage
 Lights up red	ON  OFF 	Error: Wire break (open load) Wire break or valve not mounted or incorrectly mounted	13	• Check valve or – Servicing re- quired
 Lights up red	ON  OFF 	Error: Short circuit in load voltage of valves Short circuit V_{VAL}	11	• Remove short circuit
 Flashes red	ON  OFF 	Signal: Condition monitoring Parametrised limit value is ex- ceeded.	14	• Initiate planned measures
Grey-marked fields: Observe the note for MPA1 on the next page.				

Tab. 1/14: LED messages of the MPA electronics modules VMPA1....-D2-8 and VMPA2....-D2-4

The transmission of the errors to the bus node can be parametrised (see section 1.4.1). In the factory setting with the modules VMPA1....-D2-8 and VMPA2....-D2-4 only the error “Load voltage for valves” is transmitted.

1. MPA pneumatic modules



Note

The error “Load voltage for valves” is reported for the complete module as a module error with channel number 0...7 (or 0...3).



Note

The Tab. 1/14 grey-marked error messages of the red LED appear orange when the message is displayed together with the yellow status LED (applies only to MPA1 pneumatics!).

Use the error number to ascertain which error has occurred (diagnostic message to the fieldbus or with the Handheld).

1.5.5 Error handling and parametrisation

The errors are reported to the bus node, dependent on the module parametrisation, where they can be evaluated according to the fieldbus protocol used.

Condition counter of the electronics modules type VMPA...-D2...

With the condition counter, you can have a message displayed indicating when a valve has reached a parametrised limit value of switching cycles:

- Use condition monitoring
1. Set the counter (condition counter) to 0. In order to do this, you must use the Handheld CPX-MMI (see below) or set the limit value to 0. The counter will then be reset as well.
 2. With the module parameter (see Tab. 1/11) set a limit value for the desired channel (valve coil). The condition monitoring will then be activated.
 3. When the parametrised limit value is reached, the red LED on the corresponding valve will flash (see Tab. 1/14) and error number 14 will be reported on the fieldbus. Carry out the measures planned for this case.

1. MPA pneumatic modules



Read out and reset condition counter

4. Set the counter to 0 again or deactivate the condition monitoring if you do not require the function any more.

If the limit value is set to 0 (with the Handheld or through parametrisation), the counter will then also be reset to 0.

The counter of each valve coil can be read out or reset separately. In order to do this, you will require the Handheld CPX-MMI:

1. Access the menu [Condition Monitoring] of the corresponding MPA module.
The valve coils will be listed with their current counter settings.
2. Select the desired valve coil in the list with ↓ or ↑.
3. Press “Edit”.
If necessary, you must confirm write access.
4. Use the arrow buttons to select [Reset] or set a limit value under “Max. counter value”.
5. Confirm the settings with “Set” before you exit the menu with “Back”.

1. MPA pneumatic modules

Replacing electronics modules

The counter setting of the condition counter is saved in the MPA electronics module. If you replace the electronics module before parametrised limit values have been reached:

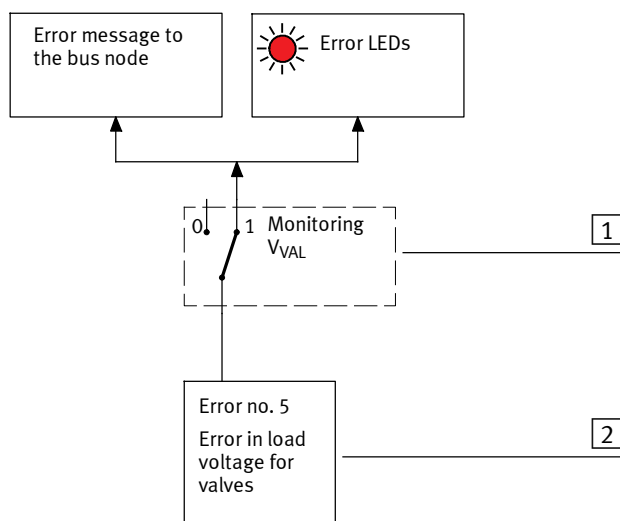
1. Note the counter settings of the valves for which a limit value has been defined. The difference between the limit value and the counter setting results in the remaining value.
2. Replace the MPA electronics module
3. Parametrise the corresponding limit values in the new electronics module on the basis of the remaining values.

Example for replacement of an MPA electronics module:
Channel x of the electronics module is parametrised to limit value 3 million. The electronics module is replaced at counter setting 2.5 million. Parametrise the limit value of channel x in the new electronics module to 0.5 million.

1. MPA pneumatic modules

Basic circuit diagrams for parametrisation and error handling

The following diagrams show error handling in the MPA pneumatics modules. Transmission and display of the errors can be suppressed as required with the corresponding module parameters, represented here as switches. The parameters are described in section 1.4.

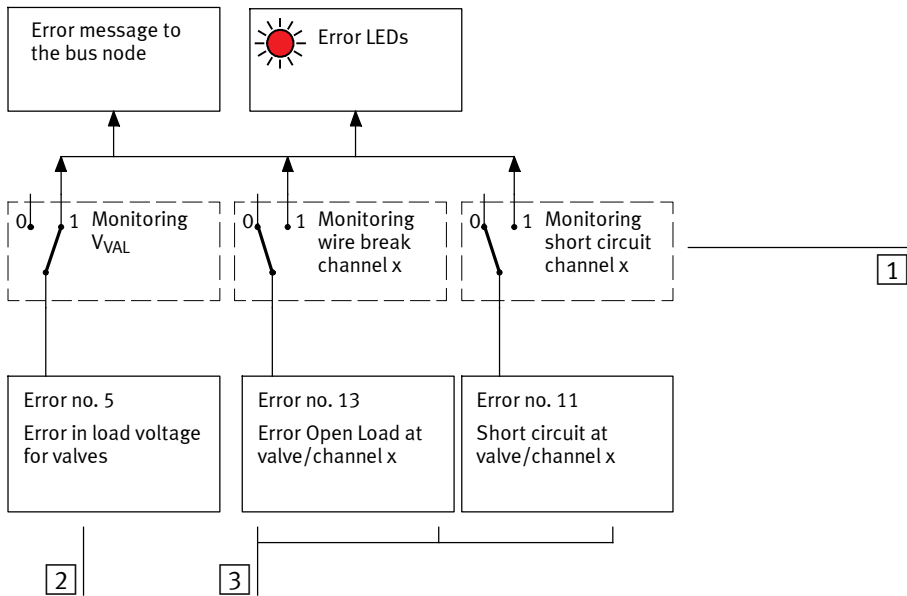


1 Module parameter
(switch position represented = default setting)

2 Module-specific error

Fig. 1/10: Principle of error handling and parametrisation
(MPA pneumatics modules VMPA1...-8 and
VMPA2...-4)

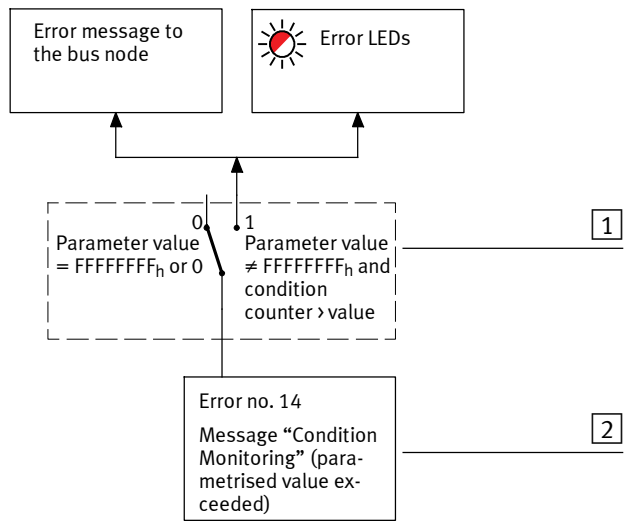
1. MPA pneumatic modules



- 1 Module parameters (switch positions represented = default settings)
- 2 Module-specific error (highest priority)
- 3 Channel-specific error (priority sequence from left to right)

Fig. 1/11: Principle of error handling and parametrisation (MPA electronics modules VMPA1...-D2-8 and VMPA2...-D2-4)

1. MPA pneumatic modules



1 Module parameters (switch position represented = default setting), message (see also Tab. 1/11)

2 Channel-specific message

Fig. 1/12: Principle of condition monitoring (MPA electronics modules VMPA1...-D2-8 and VMPA2...-D2-4)

1. MPA pneumatic modules

Proportional pressure regulators

Chapter 2

2. Proportional pressure regulators

Contents

2. Proportional pressure regulators 2-1

2.1 VPPM proportional pressure regulators VPPM-...TA-... 2-3

2.1.1 Function 2-3

2.1.2 Mounting 2-4

2.1.3 Brief instructions for commissioning 2-5

2.1.4 Parametrisation of the proportional pressure regulator 2-8

2.1.5 Parametrisation example 2-16

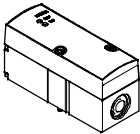
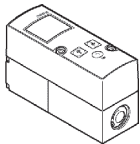
2.1.6 Diagnostics 2-20

2. Proportional pressure regulators

2.1 VPPM proportional pressure regulators VPPM-...TA-...

2.1.1 Function

The proportional pressure regulators VPPM-...TA-... (VPPM/MPA) are intended to regulate a pressure proportional to a specified setpoint value. A built-in pressure sensor records the pressure at the working line and compares this value with the nominal value. If the actual value differs from the setpoint value, the regulating valve is actuated until the output pressure reaches the setpoint value.

Type		Description
	VPPM-6TA-...	Makes available: – an output word for the pressure setpoint value specification – an input word for the pressure actual value specification – Pressure unit adjustable in: – mbar – kPa – psi
	VPPM-8TA-...C1	Like VPPM-...TA-..., but with LCD display.

Tab. 2/1: Proportional pressure regulators

2. Proportional pressure regulators

Proportional pressure regulator	Control range	Accuracy	Module code/submodule code
VPPM-6TA-L-1-F-0L2H VPPM-6TA-L-1-F-0L2H-S1	0 ... 2 bar	2 % 1 %	138/5
VPPM-8TA-L-1-F-0L2H-C1 VPPM-8TA-L-1-F-0L2H-S1C1	0 ... 2 bar	2 % 1 %	138/6
VPPM-6TA-L-1-F-0L6H VPPM-6TA-L-1-F-0L6H-S1	0 ... 6 bar	2 % 1 %	138/3
VPPM-8TA-L-1-F-0L6H-C1 VPPM-8TA-L-1-F-0L6H-S1C1	0 ... 6 bar	2 % 1 %	138/4
VPPM-6TA-L-1-F-0L10H VPPM-6TA-L-1-F-0L10H-S1	0 ... 10 bar	2 % 1 %	138/1
VPPM-8TA-L-1-F-0L10H-C1 VPPM-8TA-L-1-F-0L10H-S1C1	0 ... 10 bar	2 % 1 %	138/2
Blanking plate	—	—	138/8

Tab. 2/2: Variants of the proportional pressure regulator

2.1.2 Mounting



Mounting of proportional pressure regulators is described in the respective VPPM-... assembly instructions. All information on pneumatics is provided in the MPA pneumatics description.



Note
When switching off the proportional pressure regulator, make sure that first the supply pressure, then the supply voltage are switched off.

2. Proportional pressure regulators

2.1.3 Brief instructions for commissioning

An overview for setting the proportional pressure regulator is provided in the following. Detailed information about making settings via parametrisation is provided in section 2.1.4.

1. Mount the proportional pressure regulator and connect it (see separate assembly instructions and MPA pneumatics description).
2. Settings for the proportional pressure regulator are made via parameters. These are set via the fieldbus/network, the CPX-FEC, the CPX-MMI Handheld or a PC (using the CPX-FMT Festo Maintenance Tool).
 - Connect the Handheld or a PC to the CPX terminal or establish a fieldbus/network connection to your PLC.
3. Use parametrisation to set the following as required:
 - Desired monitoring
 - Unit for pressure indications (presetting “mbar”)
 - Control behaviour (presetting “general”)
 - Input signal type (presetting “current pressure value”)
 - Measured value smoothing (presetting “no smoothing”)
 - Upper and lower limit values
4. For pressure control, set the nominal pressure value in the output word of the VPPM/MPA.
5. During operation, you can read the current pressure values in the input word of the VPPM/MPA via the fieldbus or the CPX-FEC.

2. Proportional pressure regulators



Note

Settings that you make using the Handheld are lost after powering off/on.

6. VPPM with display (LCD) type VPPM-...TA-...-C1:
You have the following additional setting options on these VPPMs:
 - Switch from actual to setpoint display while actuating the key [arrow up] or [arrow down]
 - ECO mode on/off
 - Activation time of the ECO mode

The settings are described in the following table.

2. Proportional pressure regulators

Function	Display	Action	Display
RUN mode			
Alternate actual-set-point value display	Actual value display of the pressure	Press and hold ↓ key or ↑ key	Setpoint value display of the pressure
If the Down or Up key is released again, the setpoint pressure display switches back to the actual pressure display.			
ECO mode			
Set activation time of the ECO mode	Actual value display of the pressure	Press the EDIT button briefly	E.OFF
	E.OFF	- Set activation time [sec] with ↑ or ↓ key - Press the EDIT button	Display of the activation time [sec]
Switch on display ¹⁾	---	Press any key	Actual value display of the pressure
Switch off ECO mode	---	- Press key - Press the EDIT button - Press ↓ key until E.OFF is displayed	Actual value display of the pressure E.OFF
1) Requirement: ECO mode is activated.			

Tab. 2/3: Display

2. Proportional pressure regulators



Note

- If the Eco mode is active, all segments are switched off. After a duration of 5 seconds, a segment appears of the bar graph that runs from the left to the right side of the display.
- The ECO mode has no effect on the pneumatic or electrical functions.
- If the MPA valve terminal with the VPPM pressure regulator is built into a control cabinet, activation of the ECO mode is recommended.

2.1.4 Parametrisation of the proportional pressure regulator

The following table provides first an overview of the parameters for the proportional pressure regulator. The Tab. 2/5 to Tab. 2/9 then show detailed information.

Function number ¹⁾	Parameter of the proportional pressure regulator
4828 + m * 64 + 0	Monitoring parametrisation errors
	Activate limit monitoring for the output word
	Monitoring of load voltage V_{out}/V_{Val}
4828 + m * 64 + 6	Unit for pressure specifications (limit values and current pressure value)
4828 + m * 64 + 7	Control behaviour (presets)
	Input signal type
	Measured value smoothing
4828 + m * 64 + 8 ... 11	Condition counter
4828 + m * 64 + 12	Low Byte lower limit value
4828 + m * 64 + 13	High Byte lower limit value
4828 + m * 64 + 14	Low Byte upper limit value
4828 + m * 64 + 15	High Byte upper limit value

2. Proportional pressure regulators

Function number ¹⁾	Parameter of the proportional pressure regulator
4828 + m * 64 + 16 ... 19	Serial number of the VPPM/MPA
¹⁾ m = Module number of the proportional pressure regulator (1 ... 47)	

Tab. 2/4: Overview of the parameters of the proportional pressure regulator

Module parameter: monitoring		Handheld																																																																																										
Function no.	4828 + m * 64 + 0 m = Module number of the proportional pressure regulator (1 ... 47)																																																																																											
Description	With the proportional pressure regulator, monitoring of individual errors can be independently activated or deactivated (suppressed): – Monitoring of parametrisation: monitors module parametrisation. In the case of the following implausible settings, an error message is issued: Upper limit value ≤ lower limit value Upper limit value < 0 or > control range (see Tab. 2/2) Lower limit value < 0 – Limit monitoring: Defines whether the limit values are monitored and a diagnostic message is generated when the limit values are exceeded or fallen below. – Monitoring of load voltage: Defines whether the load voltage V_{out}/V_{val} is monitored. If the voltage drops too much (for values see the technical data in appendix A.2), then a diagnostic message is generated. Active monitoring causes the following. The error is: – sent to the CPX bus node or FEC and – displayed via the Error LED of the VPPM/MPA																																																																																											
Bit	Bit 7: Monitoring of parametrisation errors Bit 6: Limit monitoring Bit 2: Monitoring of load voltage V _{out} /V _{val}	[Monitor parameters] [Monitor limit values] [Monitor V _{out} /V _{val}]																																																																																										
Values	<table><tr><td>Bit</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>Setting:</td></tr><tr><td>0</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Monitoring of parametrisation errors inactive</td></tr><tr><td>1</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Monitoring of parametrisation errors active</td></tr><tr><td colspan="10"> </td></tr><tr><td>x 0</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Limit value monitoring inactive</td></tr><tr><td>x 1</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Limit value monitoring active</td></tr><tr><td colspan="10"> </td></tr><tr><td>x x x x x 0</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Monitoring of V_{out}/V_{val} inactive</td></tr><tr><td>x x x x x 1</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Monitoring of V_{out}/V_{val} active</td></tr></table>		Bit	7	6	5	4	3	2	1	0	Setting:	0	x	x	x	x	x	x	x	x	Monitoring of parametrisation errors inactive	1	x	x	x	x	x	x	x	x	Monitoring of parametrisation errors active											x 0	x	x	x	x	x	x	x	x	Limit value monitoring inactive	x 1	x	x	x	x	x	x	x	x	Limit value monitoring active											x x x x x 0	x	x	x	x	x	x	x	x	Monitoring of V _{out} /V _{val} inactive	x x x x x 1	x	x	x	x	x	x	x	x	Monitoring of V _{out} /V _{val} active
Bit	7	6	5	4	3	2	1	0	Setting:																																																																																			
0	x	x	x	x	x	x	x	x	Monitoring of parametrisation errors inactive																																																																																			
1	x	x	x	x	x	x	x	x	Monitoring of parametrisation errors active																																																																																			
x 0	x	x	x	x	x	x	x	x	Limit value monitoring inactive																																																																																			
x 1	x	x	x	x	x	x	x	x	Limit value monitoring active																																																																																			
x x x x x 0	x	x	x	x	x	x	x	x	Monitoring of V _{out} /V _{val} inactive																																																																																			
x x x x x 1	x	x	x	x	x	x	x	x	Monitoring of V _{out} /V _{val} active																																																																																			
	bold = presetting, x = value is unimportant for this setting																																																																																											

Tab. 2/5: Parametrisation of different monitoring actions

2. Proportional pressure regulators

Module parameter: unit for pressure indications			Handheld																									
Function no.	4828 + m * 64 + 6 m = Module number of the proportional pressure regulator (1 ... 47)																											
Description	Defines the unit for pressure indications (limit values, pressure setpoint value specification and pressure actual value specification).																											
Bit	Bit 1, 0		[Dimension unit]																									
Values	<table><tr><td>Bit</td><td>1</td><td>0</td><td>Setting:</td><td>resolution:</td></tr><tr><td>0</td><td>0</td><td></td><td>mbar (presetting)</td><td>1 mbar/bit</td></tr><tr><td>0</td><td>1</td><td></td><td>kPa</td><td>1 kPa/bit</td></tr><tr><td>1</td><td>0</td><td></td><td>psi</td><td>0.1 psi/bit</td></tr><tr><td>1</td><td>1</td><td></td><td>reserved</td><td></td></tr></table>			Bit	1	0	Setting:	resolution:	0	0		mbar (presetting)	1 mbar/bit	0	1		kPa	1 kPa/bit	1	0		psi	0.1 psi/bit	1	1		reserved	
Bit	1	0	Setting:	resolution:																								
0	0		mbar (presetting)	1 mbar/bit																								
0	1		kPa	1 kPa/bit																								
1	0		psi	0.1 psi/bit																								
1	1		reserved																									
Note	When changing the unit, the parameters for the limit values and the output word are not automatically converted. When changing the unit, you must therefore be sure to also change the parameters for the upper/lower limit values and the output word.																											

Tab. 2/6: Setting the unit for pressure specifications



Note
Recommendation: Before changing the unit for pressure specifications, set the output word to “0”.

2. Proportional pressure regulators

Module parameters: Setting the control behaviour (presets), input signal type and measured value smoothing		Handheld																																																																																																																								
Function no.	4828 + m * 64 + 7 m = Module number of the proportional pressure regulator (1 ... 47)																																																																																																																									
Description	Parametrisation is performed via this function number: - Control behaviour (presets): defines the characteristic curve used for controlling a set nominal pressure. - Input signal type: defines 3 options for depicting the input word (data format see Tab. 2/11): - Output of the current pressure value - Output as comparator bit: - Bit 0 = 0: pressure value is outside the control range - Bit 0 = 1: pressure value is in the control range - Combined output of current pressure value and comparator bit. Bit 0 is used as the comparator bit, as above. It is no longer used for representing the pressure value. - Measured value smoothing: Sets how strongly the measured values are smoothed for limit monitoring. This can suppress possible malfunctions.																																																																																																																									
Bit	Bit 1, 0: control behaviour (presets) Bit 3, 2: Input signal type Bit 5, 4: measured value smoothing	[Controller setting] [Input signal type] [Filter]																																																																																																																								
Values	<table><tr><td>Bit</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td><td>Control behaviour setting (presets):</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>0</td><td>0</td><td>reserved</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>0</td><td>1</td><td>fast</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>1</td><td>0</td><td>general (presetting)</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>x</td><td>1</td><td>1</td><td>precise</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Input signal type setting:</td></tr><tr><td></td><td>x</td><td>x</td><td>0</td><td>0</td><td>x</td><td>x</td><td>reserved</td></tr><tr><td></td><td>x</td><td>x</td><td>0</td><td>1</td><td>x</td><td>x</td><td>Current pressure value in input word (presetting)</td></tr><tr><td></td><td>x</td><td>x</td><td>1</td><td>0</td><td>x</td><td>x</td><td>Comparator bit (bit 0 in input word)</td></tr><tr><td></td><td>x</td><td>x</td><td>1</td><td>1</td><td>x</td><td>x</td><td>Current pressure value and comparator bit</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Setting for measured value smoothing:</td></tr><tr><td></td><td>0</td><td>0</td><td>x</td><td>x</td><td>x</td><td>x</td><td>No smoothing (presetting)</td></tr><tr><td></td><td>0</td><td>1</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Smoothing over 2 values</td></tr><tr><td></td><td>1</td><td>0</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Smoothing over 4 values</td></tr><tr><td></td><td>1</td><td>1</td><td>x</td><td>x</td><td>x</td><td>x</td><td>Smoothing over 8 values</td></tr></table>		Bit	5	4	3	2	1	0	Control behaviour setting (presets):		x	x	x	x	0	0	reserved		x	x	x	x	0	1	fast		x	x	x	x	1	0	general (presetting)		x	x	x	x	1	1	precise								Input signal type setting:		x	x	0	0	x	x	reserved		x	x	0	1	x	x	Current pressure value in input word (presetting)		x	x	1	0	x	x	Comparator bit (bit 0 in input word)		x	x	1	1	x	x	Current pressure value and comparator bit								Setting for measured value smoothing:		0	0	x	x	x	x	No smoothing (presetting)		0	1	x	x	x	x	Smoothing over 2 values		1	0	x	x	x	x	Smoothing over 4 values		1	1	x	x	x	x	Smoothing over 8 values
Bit	5	4	3	2	1	0	Control behaviour setting (presets):																																																																																																																			
	x	x	x	x	0	0	reserved																																																																																																																			
	x	x	x	x	0	1	fast																																																																																																																			
	x	x	x	x	1	0	general (presetting)																																																																																																																			
	x	x	x	x	1	1	precise																																																																																																																			
							Input signal type setting:																																																																																																																			
	x	x	0	0	x	x	reserved																																																																																																																			
	x	x	0	1	x	x	Current pressure value in input word (presetting)																																																																																																																			
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	x	x	1	1	x	x	Current pressure value and comparator bit																																																																																																																			
							Setting for measured value smoothing:																																																																																																																			
	0	0	x	x	x	x	No smoothing (presetting)																																																																																																																			
	0	1	x	x	x	x	Smoothing over 2 values																																																																																																																			
	1	0	x	x	x	x	Smoothing over 4 values																																																																																																																			
	1	1	x	x	x	x	Smoothing over 8 values																																																																																																																			
Note	bold = presetting, x = value is unimportant for this setting																																																																																																																									

Tab. 2/7: Parametrisation of control parameter, input signal type and measured value smoothing

2. Proportional pressure regulators

Module parameter: condition counter solenoid coil		Handheld
Function no.	4828 + m * 64 + 8...11 Limit value condition counter m = module number (1 ... 47)	11 10 9 8 High-Byte Low-Byte
Description	A limit value for a counter (condition counter) can be set for the internal solenoid coil in the pilot control of the pressure regulator. A message is displayed if the limit value is exceeded. An activated condition counter causes the following. The message is: – displayed via the Error LEDs – sent to the CPX fieldbus node	
Bytes	Bit 0 ... 7: High Byte or Low Byte of the limit value (32 bit values hexadecimal)	[Max. condition counter]
Values	FFFFFFFF _h : Condition counter activated but limit value inactive (presetting) 2DC6C0 _h : (example) Condition counter activated and limit value 3,000,000 _d set. 0: Condition counter inactive (counter and diagnostic message deactivated, counter reset)	[4294967295 _d] equals FFFFFFFF _h [Value < FFFFFFFF _h] [0]

Tab. 2/8: Parametrisation condition counter

2. Proportional pressure regulators

Setting the pressure limit values

This parameter is used to set the upper and lower limit values for output word diagnostic messages.

Module parameter: Lower limit value / upper limit value		Handheld
Function no.	Lower limit value: m = module number (1 ... 47) 4828 + m * 64 + 12 (Low Byte) 4828 + m * 64 + 13 (High Byte) Upper limit value: 4828 + m * 64 + 14 (Low Byte) 4828 + m * 64 + 15 (High Byte)	13 12 HB LB 15 14 HB LB
Description	This parameter is used to set the upper and lower limit values for output word diagnostic messages. Undershooting or overshooting of limit values is only signaled when output word diagnosis is activated via the the limit value monitoring parameter (see Tab. 2/5).	
Bit	Bit 0 ... 7: High Byte or Low Byte of the limit value	[Lower limit] [Upper limit]
Values	Presettings: – Lower limit value = 0 (Low Byte = 0; High Byte: 0) – Upper limit: max. pressure value of the valve type (see Tab. 2/12)	
Note	The upper limit value must always be greater than the lower limit value. The limit values are checked for validity during parametrisation. If invalid parameters are present and the module parameter "Monitoring of parametrisation errors" is active, a corresponding error is signaled. Tab. 2/5 shows the possible parametrisation errors.	

Tab. 2/9: Setting the lower and upper limit values

2. Proportional pressure regulators

Module parameter: serial number of the VPPM/MPA (read-only)		Handheld
Function no.	4828 + m * 64 + 16...19 serial number m = module number (1 ... 47)	19 18 17 16 High-Byte Low-Byte
Description	The serial number of the proportional pressure regulator can be read here.	
Bit	Bit 0 ... 7: High Byte or Low Byte	[Serial number valve]
Values	32 bit hexadecimal values	

Tab. 2/10: Serial number of the VPPM/MPA

2. Proportional pressure regulators

Data format for pressure indications

The data format for setting and specifying pressure values via parametrisation is “16 Bit”.

Data format															
16 Bit															
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	B13 MSB	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0 LSB
Abbreviations used: B0...B13: pressure value D0...D15: 16 bit input data field D0: Can be used as comparator bit with parametrisation of input signal type (explanation see Tab. 2/7) MSB/LSB: most significant bit (highest value bit) / least significant bit (lowest value bit)															

Tab. 2/11: Data format for pressure indications (parametrisable limit values and current pressure in the input word)

The current pressure values are directly represented as a numerical value in the input word (see Tab. 2/12). Conversion or scaling is not required.

Proportional pressure regulator	Control range	Input word range of values (decimal)	Input word range of values (hex)
VPPM-...TA-L-...0L2...	0 ... 2 bar	0 ... 2000 ¹⁾	0 _h ... 07D0 _h
VPPM-...TA-L-...0L6...	0 ... 6 bar	0 ... 6000 ¹⁾	0 _h ... 1770 _h
VPPM-...TA-L-...0L10...	0 ... 10 bar	0 ... 10000 ¹⁾	0 _h ... 2710 _h
¹⁾ When mbar is set as the pressure unit			

Tab. 2/12: Value range of the input word for variants of the VPPM/MPA

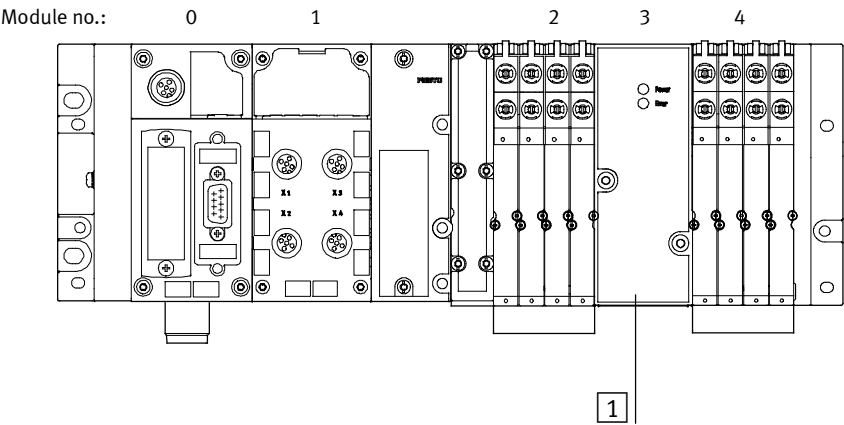
When making settings using the Handheld, you can directly enter and view data as numerical values.

2. Proportional pressure regulators

2.1.5 Parametrisation example

The following section provides an example of parametrisation of a proportional pressure regulator.

For this example, a proportional pressure regulator of type VPPM-...TA-L-...OL6... with a control range of 0 ... 6 bar should be used.



1 Proportional pressure regulator, module number 3 in this example

Fig. 2/1: Parametrisation example for the proportional pressure regulator

2. Proportional pressure regulators

The following parameters are set/changed for the proportional pressure regulator in Fig. 2/1:

Function no. ¹⁾	Parameter	Setting	Values ²⁾	Values ³⁾ Bit 7... 0
5020 + 0 = 5020	Monitoring parametrisation errors Limit monitoring Monitoring V _{Out} /V _{Val}	active active inactive		11000000 _b
5020 + 6 = 5026	Unit for pressure indications	mbar		00000000 _b
5020 + 7 = 5027	Control response Input signal type Measured value smoothing	Precise Current pressure value and comparator bit Smoothed over 4 values		00101111 _b
5020 + 8 = 5028 5020 + 9 = 5029 5020 + 10 = 5030 5020 + 11 = 5031	Condition counter	3 million switching cycles	C0 _h C6 _h 2D _h 00 _h	11000000 _b 11000110 _b 00101101 _b 00000000 _b
5020 + 12 = 5032 5020 + 13 = 5033	Low Byte lower limit value High Byte lower limit value	3800 mbar	D8 _h 0E _h	11011000 _b 00001110 _b
5020 + 14 = 5034 5020 + 15 = 5035	Low Byte upper limit value High Byte upper limit value	4200 mbar	68 _h 10 _h	01101000 _b 00010000 _b
¹⁾ The function numbers are derived from the module number 3 (see Fig. 2/1) and the calculation 4828 + 3 * 64 + x = 5020 + x (x: see tables in section 2.1.4). ²⁾ Hexadecimal, can be useful with numerical values as an intermediate step for calculating the binary values ³⁾ Binary values				

Tab. 2/13: Parameter for the proportional pressure regulator (example VPPM-...TA-L-...OL6...)

2. Proportional pressure regulators

Function no. ¹⁾	Parameter	Setting	Values ²⁾	Values ³⁾ <u>Bit 7... 0</u>
5020 + 0 = 5020	Monitoring parametrisation errors Limit monitoring Monitoring V _{Out} /V _{Val}	active active inactive		11000000 _b
5020 + 6 = 5026	Unit for pressure indications	mbar		00000000 _b
5020 + 7 = 5027	Control response Input signal type Measured value smoothing	Precise Current pressure value and comparator bit Smoothed over 4 values		00101111 _b
5020 + 8 = 5028 5020 + 9 = 5029 5020 + 10 = 5030 5020 + 11 = 5031	Condition counter	3 million switching cycles	C0 _h C6 _h 2D _h 00 _h	11000000 _b 11000110 _b 00101101 _b 00000000 _b
5020 + 12 = 5032 5020 + 13 = 5033	Low Byte lower limit value High Byte lower limit value	3800 mbar	D8 _h 0E _h	11011000 _b 00001110 _b
5020 + 14 = 5034 5020 + 15 = 5035	Low Byte upper limit value High Byte upper limit value	4200 mbar	68 _h 10 _h	01101000 _b 00010000 _b
¹⁾ The function numbers are derived from the module number 3 (see Fig. 2/1) and the calculation 4828 + 3 * 64 + x = 5020 + x (x: see tables in section 2.1.4). ²⁾ Hexadecimal, can be useful with numerical values as an intermediate step for calculating the binary values ³⁾ Binary values				

In this parametrisation example the proportional pressure regulator with the settings from Tab. 2/13 behaves as follows:

- Parametrisation errors and the set pressure limit values (see below) are monitored; V_{Out}/V_{Val} are not monitored
- The control response is “precise”: The nominal pressure is precisely actuated without overswinging
- The current pressure value is output in the input byte. Bit 0 of the input byte is also used as a comparator bit, which directly indicates if the current pressure lies within the control range.

2. Proportional pressure regulators

- The measured values for current pressure are smoothed over 4 values via the measured value smoothing.
- After 3 million switching cycles, the condition counter sends a diagnostic message to the fieldbus node or FEC (e.g. for maintenance work).
- In this example, activation of limit monitoring and the specification of upper and lower limit values limits the set pressure value of the VPPM/MPA to 3.8 ... 4.2. If the pressure value in the output word lies below 3.8 bar or above 4.2 bar, the red LED lights up and a diagnostic message is sent to the fieldbus node or FEC.

2. Proportional pressure regulators

2.1.6 Diagnostics

LED display of the VPPM with LED type VPPM-...TA-...C1

Power LED	Display	Status	Error handling
	Lights up green	Operating voltage applied	None
	Off	Operating voltage not applied	Check power supply

Tab. 2/14: Power LED of the proportional pressure regulator

Error LED	Display	Status	Error number	Error handling
	Off	No error	–	None
	Lights up red	Lower limit fallen below Output value is less than the parametrised limit. or Upper limit exceeded Output value is higher than the parametrised limit. or Error in parametrisation – Parameter lower limit – Parameter upper limit – Parametrisation error	9 10 24 25 29	• Check the supply pressure • Check the parametrised limit values
	Flashes red	Undervoltage	5	Check the power supply

Tab. 2/15: Error LED of the proportional pressure regulator with LED

2. Proportional pressure regulators

LED display of the VPPM with display (LCD) type VPPM-...TA-...C1

Display	Error LED	Status	Error no.	Error handling
Display of pressure or setpoint	Off 	No error	–	None
Active ¹⁾	Lights up red 	General error	1	• Check voltage supply • Servicing required
		Upper limit exceeded Output value is higher than the parametrised limit.	10	• Check compressed air supply • Check parametrisation • Introduce planned measures
		Incorrect module code	16	• Check hardware and replace if necessary
Active ¹⁾	Lights up red 	Wrong device/valve	27	• Check hardware and replace if necessary
		VPPM/MPA missing	38	

2. Proportional pressure regulators

Display	Error LED	Status	Error no.	Error handling
Active ¹⁾	Flashes red 	Undervoltage	5	Check the power supply
		Lower limit fallen below Output value is less than the parametrised limit.	9	• Check compressed air supply • Check parametrisation • Introduce planned measures
		Condition counter Limit value exceeded	14	• Initiate the planned measures for reaching the parametrised switching cycle rate
		Hardware error	15	• Servicing required
		Error in parametrisation – Invalid lower limit value – Invalid upper limit value	29 24 25	• Check parametrised limit values (see Tab. 2/5)
1) To display the error number. press EDIT key				

Tab. 2/16: Display and Error LED of the proportional pressure regulator with LCD

2. Proportional pressure regulators

Error messages of the proportional pressure regulator

The VPPM-...TA-... can report the following errors.

Error number	Description	Error handling
1	General error	• Check the power supply • Servicing required
5	Undervoltage in the 24 V operating voltage	• Check the power supply
9	Lower limit fallen below	• Check compressed air supply • Check parametrisation • Initiate planned measures
10	Upper limit value exceeded	
14	Condition counter limit value exceeded	• Initiate the planned measures for reaching the parametrised switching cycle rate
15	Hardware error	• Servicing required
16	Incorrect module code	• Check hardware and replace if necessary
24	Parametrisation error: invalid lower limit value	• Check parametrisation (see Tab. 2/5 to Tab. 2/9)
25	Parametrisation error: invalid upper limit value	
27	Wrong device/valve	• Check hardware and replace if necessary
29	Parametrisation error	• Check parametrisation (see Tab. 2/5 to Tab. 2/9)
38	VPPM/MPA missing	• Check hardware and replace if necessary

Tab. 2/17: Error messages of the proportional pressure regulator

2. Proportional pressure regulators

MPA pressure sensors

Chapter 3

Contents

3. MPA pressure sensors 3-1

3.1 Pressure sensor plates VMPA...-FB-PS-... and MPA-F pneumatics interface
VMPAF-FB-EPL...-PS-... 3-3

3.1.1 Function 3-3

3.1.2 Mounting 3-5

3.1.3 Brief instructions for commissioning 3-6

3.1.4 Parametrisation of the MPA pressure sensors 3-7

3.1.5 Parametrisation example 3-15

3.1.6 Diagnostics 3-17

3. MPA pressure sensors

3.1 Pressure sensor plates VMPA...-FB-PS-... and MPA-F pneumatics interface VMPAF-FB-EPL...-PS-...

3.1.1 Function

The MPA pressure sensors serve to monitor pressure in the MPA pneumatics.

The table below gives an overview of the various pressure sensors for MPA pneumatics.

MPA pressure sensor	Types	Function
MPA pressure sensor for MPA-S and MPA-F pneumatics	VMPA-FB-PS-1 VMPAF-FB-PS-1	Monitoring the operating pressure of channel 1
	VMPA-FB-PS-3/5 VMPAF-FB-PS-3/5	Monitoring the pressure in exhaust channels 3 and 5. Purpose: monitoring of exhaust performance or pressure monitoring with reversibly operated valve terminal.
	VMPA-FB-PS-P1 VMPAF-FB-PS-P1	Monitoring of an externally connected pressure
Pneumatic interface for MPA-F pneumatics with integrated pressure sensor	VMPAF-FB-EPL-PS VMPAF-FB-EPLM-PS	Monitoring the operating pressure of channel 1

Tab. 3/1: Function of the different MPA pressure sensors

3. MPA pressure sensors

The MPA pressure sensors VMPA-FB-PS-... and VMPAF-FB-PS-... have the following display components:

- 1 Pressure sensor plate
- 2 Red LED: pressure exceeded
- 3 Green LED: pressure maintained
- 4 Red LED: pressure not reached
- 5 Red LED: common error display

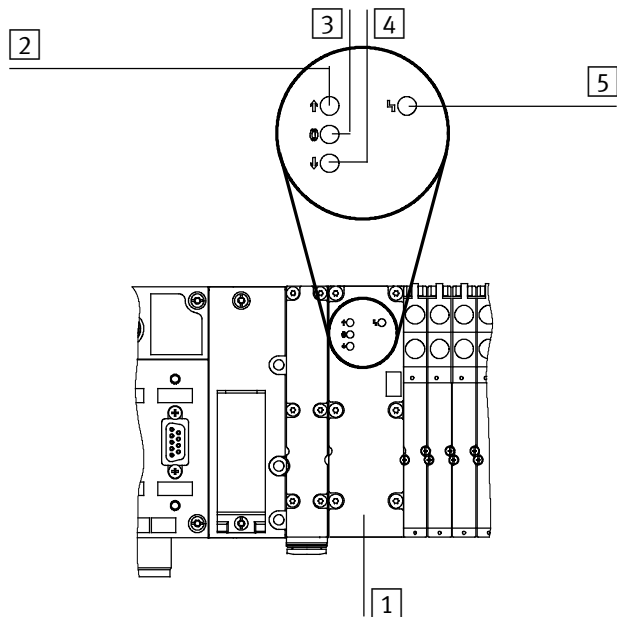


Fig. 3/1: Display components of the MPA pressure sensors VMPA-FB-PS-... and VMPAF-FB-PS-... (pressure sensor plate)

3. MPA pressure sensors

The pneumatic interface VMPAF-FB-EPL...-PS with integrated pressure sensor has the following display and connecting elements:

- 1 Pneumatics interface
- 2 Red LED: pressure not reached
- 3 Display
- 4 Green LED: pressure maintained
- 5 Red LED: pressure exceeded
- 6 Red LED: common error display
- 7 Yellow LED “bar”: Value in the display is shown in bar
- 8 Yellow LED “psi”: Value in the display is shown in psi

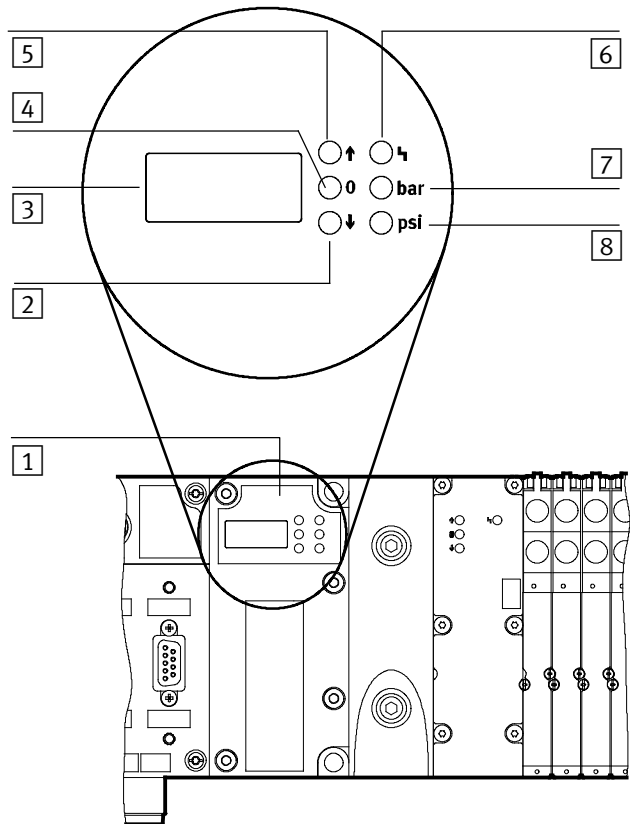


Fig. 3/2: Display components of the MPA-F pneumatics interface VMPAF-FB-EPL...-PS

3.1.2 Mounting



Mounting of the MPA pressure sensors is described in the respective assembly instructions. All information about the **pneumatics** can be found in the corresponding MPA pneumatics descriptions.

3. MPA pressure sensors

3.1.3 Brief instructions for commissioning

Setting through parametrisation is the same for all MPA pressure sensors and is described in an overview in the following. Detailed information on the parameters is provided in section 3.1.4.

1. Mount the module and connect it (see separate assembly instructions and MPA description of pneumatics).
2. Settings for the MPA pressure sensor take place with the Handheld (CPX-MMI), a PC (with the Festo Maintenance Tool CPX-FMT) or the fieldbus:
 - Connect the Handheld or a PC to the CPX terminal or establish a fieldbus/network connection to your PLC.
3. Make the following settings as required:
 - Unit for pressure indications (presetting “bar”/“mbar”)
 - Upper and lower pressure limit
 - Activate the pressure diagnostics by selecting whether failure to reach a limit or exceeding a limit should be signaled.
4. If required, you can make further delay settings for the pressure diagnostics, measured value smoothing and hysteresis.

Pressure monitoring

When pressure diagnostics is activated, overshooting or undershooting of limit values (dependent on the parametrisation) is displayed by the diagnostics LEDs and reported via the fieldbus.

You can also display the current pressure values on the Handheld or analyse them via the fieldbus.

3. MPA pressure sensors

3.1.4 Parametrisation of the MPA pressure sensors

The following table provides an overview of the MPA pressure sensor parameters. The Tab. 3/3 to Tab. 3/8 then show detailed information.

Function number ¹⁾	Parameters of the MPA pressure sensors
4828 + m * 64 + 0	Monitoring parametrisation errors
4828 + m * 64 + 6	Unit for pressure indications (limit values, hysteresis and current pressure value)
	Delay for pressure diagnostics
4828 + m * 64 + 7	Activate and set limit monitoring
4828 + m * 64 + 8	Measured value smoothing
4828 + m * 64 + 9	Low Byte lower limit value
4828 + m * 64 + 10	High Byte lower limit value
4828 + m * 64 + 11	Low Byte upper limit value
4828 + m * 64 + 12	High Byte upper limit value
4828 + m * 64 + 13	Low Byte hysteresis
4828 + m * 64 + 14	High Byte hysteresis
¹⁾ m = Module number of the MPA pressure sensor (1 ... 47)	

Tab. 3/2: Overview of the parameters of the MPA pressure sensors

3. MPA pressure sensors

Module parameters: monitoring parametrisation errors		Handheld
Function no.	4828 + m * 64 + 0 m = module number of the MPA pressure sensor (1 ... 47)	
Description	Monitors the parametrisation of the module (plausibility check of the values set for limits and hysteresis) An error message is generated for the following implausible settings: Upper limit value < lower limit value Upper limit value > 10000 or < 0, lower limit value < 0 or > 10000 Hysteresis < 0 or > (upper limit value – lower limit value)	
Bit	Bit 7	[Monitor parameters]
Values	<u>Bit 7</u> Setting: 0 inactive 1 active (presetting)	

Tab. 3/3: Monitoring parametrisation errors

3. MPA pressure sensors

Module parameter: unit for pressure indications, delay for pressure diagnostics		Handheld																																																																																
Function no.	4828 + m * 64 + 6 m = module number of the MPA pressure sensor (1 ... 47)																																																																																	
Description	Parametrisation is performed via this function number: – Unit for pressure indications: Sets the unit for pressure indications (limit values, hysteresis, current pressure value). – Delay for pressure diagnostics: Defines the time delay before a message is generated when a limit value is exceeded or not reached. This avoids faulty diagnostic messages because the limit must be exceeded or not reached for somewhat longer before a diagnostic message is generated. Only the occurrence of the diagnosis is signaled with a delay! When the pressure returns to the limit range, this is always signaled immediately.																																																																																	
Bit	Bit 1, 0 Bit 4, 3	[Dimension unit] [Diagnostic delay]																																																																																
Values	<table><tr><td><u>Bit</u></td><td><u>4</u></td><td><u>3</u></td><td><u>2</u></td><td><u>1</u></td><td><u>0</u></td><td>Setting unit for pressure indications:</td><td>resolution:</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>0</td><td>0</td><td>mbar (presetting)</td><td>1 mbar/bit</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>0</td><td>1</td><td>kPa</td><td>1 kPa/bit</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>1</td><td>0</td><td>psi</td><td>0.1 psi/bit</td></tr><tr><td></td><td>x</td><td>x</td><td>x</td><td>1</td><td>1</td><td>reserved</td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td>Setting delay for pressure diagnostics:</td><td></td></tr><tr><td></td><td>0</td><td>0</td><td>x</td><td>x</td><td>x</td><td>no delay (default setting)</td><td></td></tr><tr><td></td><td>0</td><td>1</td><td>x</td><td>x</td><td>x</td><td>40 ms</td><td></td></tr><tr><td></td><td>1</td><td>0</td><td>x</td><td>x</td><td>x</td><td>160 ms</td><td></td></tr><tr><td></td><td>1</td><td>1</td><td>x</td><td>x</td><td>x</td><td>640 ms</td><td></td></tr></table>		<u>Bit</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>	Setting unit for pressure indications:	resolution:		x	x	x	0	0	mbar (presetting)	1 mbar/bit		x	x	x	0	1	kPa	1 kPa/bit		x	x	x	1	0	psi	0.1 psi/bit		x	x	x	1	1	reserved								Setting delay for pressure diagnostics:			0	0	x	x	x	no delay (default setting)			0	1	x	x	x	40 ms			1	0	x	x	x	160 ms			1	1	x	x	x	640 ms	
<u>Bit</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>	Setting unit for pressure indications:	resolution:																																																																											
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	x	x	x	1	0	psi	0.1 psi/bit																																																																											
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	1	0	x	x	x	160 ms																																																																												
	1	1	x	x	x	640 ms																																																																												
Note	Unit for pressure indication: When changing the unit, the parameters for the limit values and hysteresis are not automatically converted. When changing the unit, therefore, you must also change the parameters for the upper/lower limit values and the hysteresis. Delay for pressure diagnostics: This parameter is especially useful when monitoring exhaust channels 3 and 5.																																																																																	

Tab. 3/4: Set unit for pressure indications and delay for pressure diagnostics

3. MPA pressure sensors

Module parameter: Activate limit monitoring		Handheld
Function no.	4828 + m * 64 + 7 m = module number of the MPA pressure sensor (1 ... 47)	
Description	Defines which limit values are to be monitored.	
Bit	Bit 1, 0	[Monitor lower limit] [Monitor upper limit]
Values	<u>Bit 1 0</u> Setting: 0 0 No limit monitoring (pre-setting) 0 1 Monitoring of lower limit value 1 0 Monitoring of upper limit value 1 1 Monitoring of upper and lower limit value	
Note	With the setting "No limit monitoring" the green 0 LED is always lit.	

Tab. 3/5: Activate and set limit monitoring

Module parameter: measured value smoothing		Handheld
Function no.	4828 + m * 64 + 8 m = module number of the MPA pressure sensor (1 ... 47)	
Description	Sets how strongly the measured values are smoothed for limit monitoring. This can suppress possible malfunctions.	
Bit	Bit 1, 0	[Filter]
Values	<u>Bit 1 0</u> Setting: 0 0 No measured value smoothing (presetting) 0 1 Smoothing over 2 values 1 0 Smoothing over 4 values 1 1 Smoothing over 8 values	

Tab. 3/6: Set measured value smoothing

3. MPA pressure sensors

Setting pressure values for limit values and hysteresis

Module parameter: Upper limit value / lower limit value		Handheld
Function no.	Lower limit value: m = module number (1 ... 47) $4828 + m * 64 + \mathbf{9}$ (Low Byte) $4828 + m * 64 + \mathbf{10}$ (High Byte) Upper limit value: $4828 + m * 64 + \mathbf{11}$ (Low Byte) $4828 + m * 64 + \mathbf{12}$ (High Byte)	10 9 HB LB 12 11 HB LB
Description	These parameters are used to set the upper and lower limit values for pressure diagnostic messages. The data format is described in Tab. 3/9. Undershooting or overshooting of limit values is only signaled when pressure diagnostics are activated via the limit value monitoring parameter (see Tab. 3/5) and no parametrisation error exists.	
Bit	Bit 0 ... 7: High byte or low byte of the limit value	[Lower limit] [Upper limit]
Values	Presettings: – Lower limit = 0 (Low Byte = 0; High Byte: 0) – Upper limit = 10000 _d (Low Byte = 16 _d ; High Byte: 39 _d) Low Byte: 0 ... 255 _d High Byte: 0 ... 39 _d	
Note	The upper limit value must always be greater than the lower limit value. The limit values are not checked for validity during parametrisation! Unsuitable parametrisations are adopted – in this case, the module can react unexpectedly. Check the parametrisation! If the “Monitoring of parametrisation errors” module parameter is active, then a corresponding error is signaled. Tab. 3/3 shows the possible parametrisation errors.	

Tab. 3/7: Setting the lower and upper limit values

3. MPA pressure sensors

Module parameter: hysteresis		Handheld
Function no.	Hysteresis: m = module number (1 ... 47) 4828 + m * 64 + 13 (Low Byte) 4828 + m * 64 + 14 (High Byte)	
Description	This parameter defines the hysteresis behaviour of the pressure diagnostics case (see following section). The data format is described in Tab. 3/9.	
Bit	Bit 0 ... 7: High byte or low byte of the hysteresis	[Hysteresis]
Values	Presetting: hysteresis = 0 (low byte = 0; high byte: 0) Minimum value: 0 Maximum value: Upper limit value - lower limit value	
Note	The set hysteresis value must not be larger than the difference between the upper and lower limit values. The hysteresis value is not checked for validity during parametrisation! Unsuitable parametrisations are adopted – in this case, the module can react unexpectedly. Check the parametrisation! If the “Monitoring of parametrisation errors” module parameter is active, then a corresponding error is signaled. Tab. 3/3 shows the possible parametrisation errors.	

Tab. 3/8: Set hysteresis

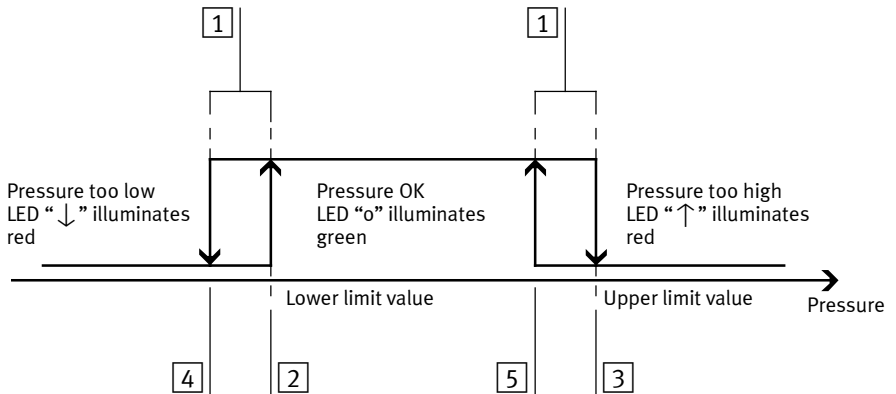
Hysteresis behaviour

If hysteresis is set, then the MPA pressure sensor behaves as follows (see also Fig. 3/3):

- The lower limit must also be fallen below by the value of the hysteresis before a diagnostic message **occurs**.
- The upper limit must also be fallen below by the value of the hysteresis before a diagnostic message is **extinguished**.

This hysteresis behaviour provides you with great flexibility in setting the limit values.

3. MPA pressure sensors



- 1 Hysteresis
- 2 Set lower limit value
- 3 Set upper limit value
- 4 The actual pressure, defined by the hysteresis setting, at which the “Pressure is less than lower limit value” diagnostic message **occurs**.
- 5 The actual pressure, defined by the hysteresis setting, at which the “Pressure is greater than upper limit value” diagnostic message **occurs**.

Fig. 3/3: Hysteresis behaviour of the MPA pressure sensor

3. MPA pressure sensors

Data format for pressure indications

The data format for setting and specifying pressure values via parametrisation is “VZ + 15 Bit”. Negative values are represented in twos-complement format.

Data format															
VZ + 15 Bit, negative values represented as twos-complement															
D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
VZ	B14 MSB	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0 LSB
Abbreviations used: VZ: prefix (0 = positive value, 1 = negative value) B0...B14: input value D0...D15: 16 bit input data field MSB/LSB: most significant bit (highest value bit) / least significant bit (lowest value bit)															

Tab. 3/9: Data format for pressure indications (limit values, hysteresis and current pressure)

When making settings using the Handheld, you can directly enter data as numerical values.

The unit for pressure indications, defined via the parameter in Tab. 3/4, applies to all pressure values (upper/lower limit values, hysteresis and current pressure value).



Note

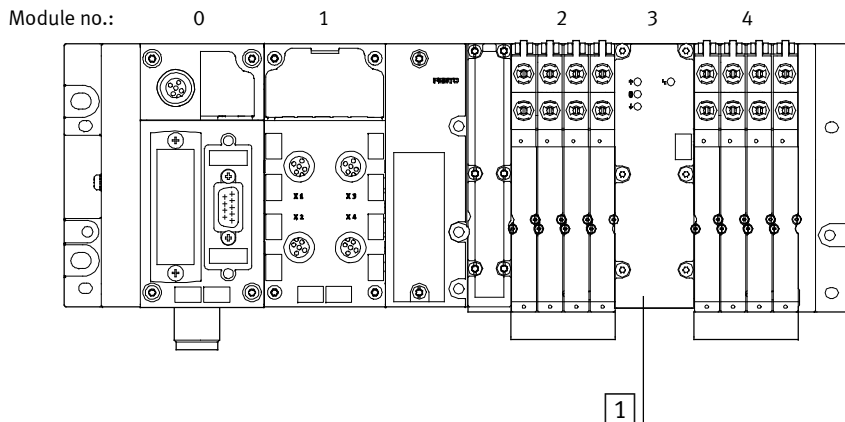
When changing the unit for pressure indications, the parameters for the limit values and hysteresis are **not** automatically converted.

When changing the unit, therefore, you must also change the parameters for the upper/lower limit values and the hysteresis.

3. MPA pressure sensors

3.1.5 Parametrisation example

The following section provides an example of parametrisation of an MPA pressure sensor.



- 1** MPA pressure sensor VMPA-FB-PS-..., with module number 3 in this example

Fig. 3/4: Parametrisation example for the MPA pressure sensor

3. MPA pressure sensors

For the MPA pressure sensor in Fig. 3/4, the following parameters are set or changed:

Parameters	Function no. ¹⁾	Setting	Values ²⁾	Values ³⁾ <u>Bit 7... 0</u>
Unit for pressure indications and delay for pressure diagnostics	5020 + 6 = 5026	mbar 160 ms		00010000 _b
Activate and set limit monitoring	5020 + 7 = 5027	Monitoring of upper and lower limit values		00000011 _b
Low Byte lower limit value High Byte lower limit value	5020 + 9 = 5029 5020 + 10 = 5030	7000 mbar	58 _h 1B _h	01011000 _b 00011011 _b
Low Byte upper limit value High Byte upper limit value	5020 + 11 = 5031 5020 + 12 = 5032	9500 mbar	1C _h 25 _h	00011100 _b 00100101 _b
Low Byte hysteresis High Byte hysteresis	5020 + 13 = 5033 5020 + 14 = 5034	500 mbar	F4 _h 01 _h	11110100 _b 00000001 _b
¹⁾ The function numbers are derived from the module number 3 (see Fig. 3/4) and the calculation $4828 + 3 * 64 + x = 5020 + x$ (x: see tables in section 3.1.4). ²⁾ Hexadecimal, can be useful with numerical values as an intermediate step for calculating the binary values ³⁾ Binary values				

Tab. 3/10: Set the parameters for the MPA pressure sensor via function numbers

In this example, the settings for all other parameters remain at their default values.

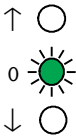
In this parametrisation example, the MPA pressure sensor with the settings from Tab. 3/10 behaves as follows:

- Diagnostic message with the red LED ↑ above 9.5 bar. The red LED ↑ goes out as soon as the pressure sinks below 9 bar (because the hysteresis is set to 0.5 bar).
- Diagnostic message with the red LED ↓ below 6.5 bar (because the hysteresis is set to 0.5 bar). The red LED ↓ goes out as soon as the pressure rises above 7 bar.
- Pressure undershooting or overshooting is signaled after a delay of 160 ms. Pressure undershooting or overshooting for periods less than 160 ms are not signaled.

3. MPA pressure sensors

3.1.6 Diagnostics

LED displays

LED	Display	Operating status
	Off Lights up green Off	Operating pressure lies in target range. No limit value undershooting or overshooting. When the limit value monitoring is inactive (see Tab. 3/5), the 0 LED always lights up green.
	Off	No error (common error LED)

Tab. 3/11: LED displays of the MPA pressure sensor in a normal operating status

LED	Display	Operating status	Error number
	Lights up red	The common error LED signals the following diagnostic cases: – Undershooting or overshooting of limit values	See LED displays in Tab. 3/13
	Flashes red	Parametrisation error	29 (see Tab. 3/3)

Tab. 3/12: Diagnostics with the common error LED 

3. MPA pressure sensors

The diagnostic messages of the following LEDs only occur when pressure diagnostics are activated (see previous section).

LED	Display	Operating status	Error number
↑  0  ↓ 	Lights up red Off Off	Operating pressure has exceeded the defined upper limit value.	10
↑  0  ↓ 	Off Off Lights up red	Operating pressure has fallen below the set lower limit value.	9

Tab. 3/13: LED displays of the MPA pressure sensor in the case of limit value overshooting or undershooting

Technical appendix

Appendix A

Contents

A.	Technical appendix	A-1
A.1	Technical data of the MPA electronics modules	A-3
A.2	Technical data Proportional pressure regulator VPPM/MPA	A-6
A.3	Technical data MPA pressure sensors/pressure sensor plates	A-7

A.1 Technical data of the MPA electronics modules

Technical data VMPA1-FB-...	-EMG-8 / -D2-8	-EMS-8 / -D2-8
General technical data of the CPX terminal	See CPX system description	
Protection class to EN 60 529	IP66, in mounted status (MPA pneumatics module completely mounted)	
Operating voltage supply, electronics ($V_{EL/SEN}$) – Nominal voltage – Intrinsic current consumption at 24 V	DC 24 V $\pm$ 25 % Type 8 mA (internal electronics, all outputs 0 signal)	
Load voltage supply of valves (V_{VAL}) – Nominal voltage – Intrinsic current consumption at 24 V (internal electronics without valves) – Diagnostic message undervoltage V_{val} (monitoring V_{val} , load voltage outside function range)	DC 24 V $\pm$ 25 % Type 23 mA $\leq 17.5 \dots 15.5$ V	DC 24 V $\pm$ 25 % Type 3 mA $\leq 17.5 \dots 15.5$ V
Digital outputs (valve solenoid coils) – Supply – Short circuit protection, valve output – Current consumption per solenoid coil – Pull current/continuous – with current reduction	8 outputs V_{VAL} Yes (electronic) (with $V_{VAL} = 24$ V) 58 mA for 24 ms 9 mA after 24 ms	
Insulation	Checked with 500 V DC	
Electrical isolation	see separate table below	
Module code [type code] (CPX-specific) – VMPA1-FB-...-8 – VMPA1-FB-...-D2-8 Module identification (Handheld) – VMPA1-FB-...-8 – VMPA1-FB-...-D2-8	80 84 MPA1G MPA1G-D	82 86 MPA1S MPA1S-D

Tab. A/1: Technical data of the MPA1 electronics module

A. Technical appendix

Technical data VMPA2-FB-...	-EMG-4 / -D2-4	-EMS-4 / -D2-4
General technical data of the CPX terminal	See CPX system description	
Protection class to EN 60 529	IP66, in mounted status (MPA pneumatics module completely mounted)	
Operating voltage supply, electronics ($V_{EL/SEN}$) - Nominal voltage - Intrinsic current consumption at 24 V	DC 24 V $\pm$ 25 % Type 8 mA (internal electronics, all outputs 0 signal)	
Load voltage supply of valves (V_{VAL}) - Nominal voltage - Intrinsic current consumption at 24 V (internal electronics without valves) - Diagnostic message undervoltage V_{val} (monitoring V_{val}, load voltage outside function range)	DC 24 V $\pm$ 25 % Type 23 mA $\leq 17.5 \dots 15.5$ V	DC 24 V $\pm$ 25 % Type 3 mA $\leq 17.5 \dots 15.5$ V
Digital outputs (valve solenoid coils) - Supply - Short circuit protection, valve output - Current consumption per solenoid coil - Pull current/continuous - with current reduction	4 outputs V_{VAL} Yes (electronic) (with $V_{VAL} = 24$ V) 99 mA for 24 ms 18 mA after 24 ms	
Insulation	Checked with 500 V DC	
Electrical isolation	see separate table below	
Module code [type code] (CPX-specific) - VMPA2-FB-...-4 - VMPA2-FB-...-D2-4 Module identification (Handheld) - VMPA2-FB-...-4 - VMPA2-FB-...-D2-4	81 85 MPA2G MPA2G-D	83 87 MPA2S MPA2S-D

Tab. A/2: Technical data of the MPA2 electronics module

A. Technical appendix

Technical data VMPA...-FB-...	-EMG-... ¹⁾	-EMS-... ²⁾
Electrical isolation between $V_{EL/SEN}$ and V_{VAL} with voltage supply via interlinking blocks:		
M18, 4-pin – CPX-GE-EV- S – CPX-GE-EV- Z – CPX-GE-EV- V	None None Yes	None None Not permitted
7/8", 5-pin – CPX-GE-EV- S -7/8-5POL – CPX-M-GE-EV- S -7/8-5POL – CPX-GE-EV- Z -7/8-5POL – CPX-M-GE-EV- Z -7/8-5POL	Yes Yes Yes Yes	Not permitted Not permitted Not permitted Not permitted
7/8", 4-pin – CPX-GE-EV- S -7/8-4POL – CPX-GE-EV- Z -7/8-4POL – CPX-GE-EV- V -7/8-4POL	None None Yes	None None Yes
Electrical isolation between $V_{EL/SEN}$ and V_{VAL} with voltage supply electrical supply plate: – VMPA-FB-SP...- V -...	Yes	Not permitted
Electrical isolation between the channels (valve solenoid coils)	None	None
1) MPA electronics module with electrical isolation 2) MPA electronics module without electrical isolation		

Tab. A/3: Permissible voltage supply for MPA1-/MPA2 electronics modules and electrical isolation

A.2 Technical data Proportional pressure regulator VPPM/MPA

Technical data	VPPM/MPA
General technical data of the CPX terminal	See CPX system description
Technical data for pneumatics	See corresponding MPA pneumatics description
Protection class to EN 60 529	IP65
Operating voltage supply, electronics – Nominal voltage – Current consumption at 24 V	21.6 ... 26.4 V Type 100 mA
Undervoltage diagnostic message	≤ 17.5 ... 16.0 V
Full scale (FS) linearity error	VPPM-...TA-...: 2% • FS VPPM-...TA-...-S1...: 1% • FS
Full scale (FS) repetition accuracy	± 0.5 % FS
Module internal update time	< 3 ms
Module code/submodule code (CPX)	138/1: 10 bar variant (150 psi) 138/2: 10 bar variant with display (150 psi) 138/3: 6 bar variant (90 psi) 138/4: 6 bar variant with display (90 psi) 138/5: 2 bar variant (30 psi) 138/6: 2 bar variant with display (30 psi) 138/8: Blanking plate

Tab. A/4: Technical data VPPM/MPA (observe also Tab. 2/2 in chap. 2)

A.3 Technical data MPA pressure sensors/pressure sensor plates

Technical data	MPA pressure sensors/pressure sensor plates
General technical data of the CPX terminal	See CPX system description
Technical data for pneumatics	See corresponding MPA pneumatics description
Protection class to EN 60 529	IP65
Function	VMPA/VMPAF-FB-PS-1: Channel 1 VMPA/VMPAF-FB-PS-3/5: Channels 3 and 5 VMPA/VMPAF-FB-PS-P1: External process pressure VMPAF-EPL-PS/VMPAF-EPLM-PS: channel 1
Operating voltage supply, electronics – Nominal voltage – Intrinsic current consumption at 24 V	24 V ± 25 % Type 14 mA
Pressure range	0 ... 10 bar
Adjustable pressure range for pressure switching points	0 ... 10 bar
Accuracy	± 2.5 % full scale
Measured value updating	≤ 10 ms
Pressure measurement display increments	Dependent on the set unit for pressure values: – 20 mbar / 2 kPa / 0.5 psi
Minimum and maximum pressure value output	Pressure values are output as “0” if they are smaller than – 100 mbar / 10 kPa / 1.5 psi Pressure values are output as 32767 _d (7FFF _h) if they are larger than – 10580 mbar/ 1058 kPa/ 153.5 psi
Measuring range of the pressure sensor	Values larger than approx. 10.2 bar are displayed with the maximum possible measured value of the sensor (approx. 10.2 bar)
Module code/submodule code (CPX)	136/0

Tab. A/5: Technical data MPA pressure sensors/pressure sensor plates

A. Technical appendix

Index

Appendix B

B. Index B-1

Index

A

Abbreviations, Product-specific XII

C

CPX terminal, Structure X

D

Diagnostics

MPA pneumatics modules 1-23

via fieldbus/network XI

Display and connection elem., MPA pneumatics modules 1-6

E

Error LED 2-9

Error messages, MPA pneumatics modules 1-27, 1-29

F

Fail-Safe parametrisation 1-18

Forcing 1-19

I

Idle mode 1-19

Instructions for this description IX

Intended use V

L

LED display, MPA pneumatics modules 1-24, 1-25

M

Module parameters	
Channel-specific module parameters	1-19
Monitoring the CPX module	1-18
Monitoring the CPX module	1-18
MPA electronics modules, Overview	1-5
MPA pneumatics modules	
Diagnostics	1-23
Error messages	1-27, 1-29
Function	1-3
Installation	1-11
LED display	1-24, 1-25
Mounting	1-7
Overview	1-4
Parametrisation	1-17
Power supply	1-11
MPA pressure sensors	3-3
Technical data	A-7

P

Parametrisation, MPA pneumatics modules	1-17
Pictograms	VIII
Power supply, MPA pneumatics modules	1-11
Pressure sensor plate	3-3
Proportional pressure regulator	2-3
Proportional pressure regulators, Technical data	A-6
Protection class	A-3, A-4

S

Service	VI
---------------	----

T

Target group	VI
Technical data	
MPA electronics modules	A-3
MPA pressure sensors	A-7
VPPM/MPA	A-6
Text designations	VIII

U

User instructions	VII
-------------------------	-----

V

VMPA...-FB-PS-...	3-3
VMPA1-FB-EMG-, Technical data	A-3
VMPA1-FB-EMS-, Technical data	A-3
VMPA2-FB-EMG-, Technical data	A-4
VMPA2-FB-EMS-, Technical data	A-4
VMPAF-FB-EPL...-PS-...	3-3
VPPM-...TA-...C1	
Display	2-7
Error LED	2-22
VPPM/MPA	2-3
Technical data	A-6

