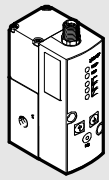


# VPPM-... (LED)

not type VPPM-...C1 (LCD)

**FESTO**



Operating instructions  
Original instructions



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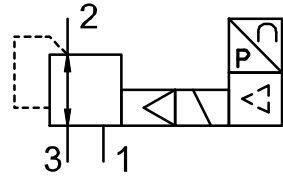
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1703f

Proportional pressure regulator valve ..... English

## 1 Application and function

The VPPM-... is intended for regulating pressure proportionally to a specified setpoint value. A built-in pressure sensor records the pressure at the working port and compares this value with the setpoint value. If the actual value differs from the setpoint value, the regulating valve is actuated until the output pressure reaches the setpoint value.



## 2 Range of applications and certifications

In combination with the UL mark on the product, the information included in this section is also applicable for compliance with the certification requirements of Underwriters Laboratories Inc. (UL) for USA and Canada. Observe the following notes from UL:

→ ..... Note

- The Unit shall be supplied by a power source which fulfils the requirements on a limited-energy circuit in accordance to IEC/EN/UL/CSA 61010-1 or on a Limited Power Source (LPS) in accordance to IEC/EN/UL/CSA 60950-1 or IEC/EN/UL/CSA 62368-1 or a Class 2 circuit in accordance to NEC or CEC.

## UL approval information

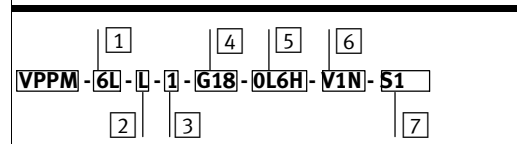
Product category code	QUYX, QUYY7
File number	E322346
Considered standards	UL 61010-1, CAN/CSA-C22.2 No. 61010-1
UL mark	

## Electrical and environmental ratings

Supply voltage	24 V DC
Max. power VPPM-6, VPPM-8	7 W
Max. power VPPM-12,	12 W
Rated pressure	Up to 1.1 MPa
Altitude up to	2000 m.

## 3 Variants of the VPPM-...

### Type codes of the VPPM-...



Pos.	Characteristics	Significance
1	Nominal width in [mm] Valve type	6, 8, 12 F (flange), L (sleeve)
2	Dynamic response class	L (Low)
3	Valve function	1 (3-way pressure-reducing valve, normally closed)
4	Pneumatic connection - Flange/sub-base - ISO thread - NPT thread	F G18 (1/8"), G14 (1/4"), G12 (1/2") N18 (NPT 1/8), N14 (NPT 1/4), N12 (NPT 1/2)
5	Control ranges: - Lower pressure value - Upper pressure value Alternative control ranges: - Lower pressure value - Upper pressure value	0L (0 bar) 2H (2 bar), 6H (6 bar), 10H (10 bar) ...L (... = value between 0 ... 10 bar) e.g. 1L ...H (... = value between 0 ... 10 bar) e.g. 7H
6	- Setpoint specification - Switching output	O4 (4 ... 20 mA), V1 (0 ... 10 V) P (PNP), N (NPN)
7	Accuracy Operator unit	... (2 %), S1 (1 %) ... (LED), C1 (LCD)

## 4 Requirements for product use

- General conditions for the correct and safe use of the product, which must be observed at all times:
- Compare the limit values contained in these operating instructions with those of your application (e.g. operating media, pressures, forces, torques, temperatures, masses, speeds, voltages).
  - Take into consideration the ambient conditions at the location of use.
  - All applicable national and international regulations must be complied with.
  - Remove all transport packing such as protective wax, foils (polyamide), caps (polyethylene), cardboard boxes.
  - The material used in the packaging has been specifically chosen for its recyclability (exception: oil paper = residual waste).
  - Use the product in its original state. Unauthorised modification is not permitted.
  - Observe the warnings and notes on the product and in these operating instructions.
  - Ensure that the compressed air is properly prepared (→ Technical data).
  - Pressurize your entire system slowly. There will then be no uncontrolled movements.

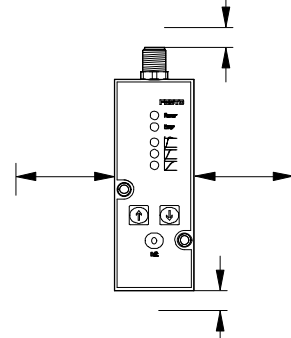
## 5 Installation

### 5.1 Mechanical

→ ..... Note

- Installation and commissioning may only be performed in accordance with the operating instructions and by qualified personnel.

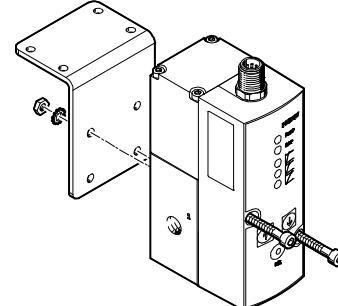
- Make sure there is sufficient space for the cable connection and tubing connections (→ Fig.). In this way you will prevent the connecting cable from being bent.



- Place the VPPM-... as close to the consumer as possible. This leads to improved control precision and shorter response times.

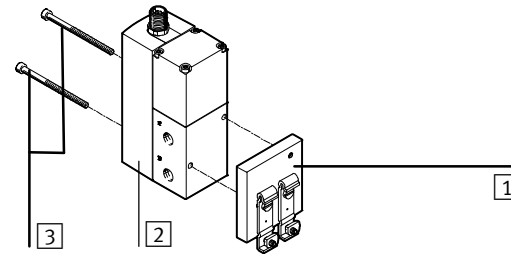
### Wall mounting (in-line valve)

- Fasten the VPPM-... (1/8" and 1/4") at the intended position with two M4 screws. In order to do this use bracket type VAME-P1-A (see figure). When mounting the VPPM with the aid of the bracket, the VPPM-... may only be loaded statically (tightening torque approx. 1.5 Nm).
- Fasten the VPPM-... (1/2") in the intended position with two M5 screws (tightening torque 2.0 Nm).



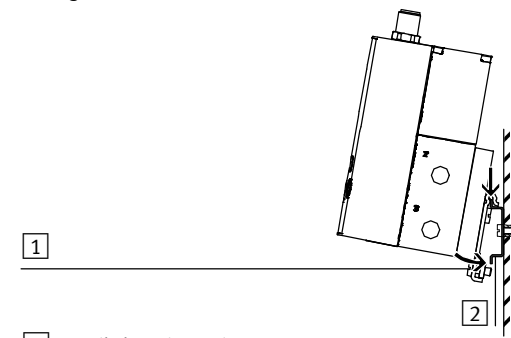
### H-rail mounting (in-line valve)

- Mount the H-rail adapter using the included screws (1/8": M4 x 65, 1/4": M4 x 77) to the VPPM-... (tightening torque approx. 1.5 Nm).



- 1 H-rail adapter type VAME-P1-T
- 2 VPPM-...
- 3 Mounting screws

- Hang the VPPM-... onto the H-rail.

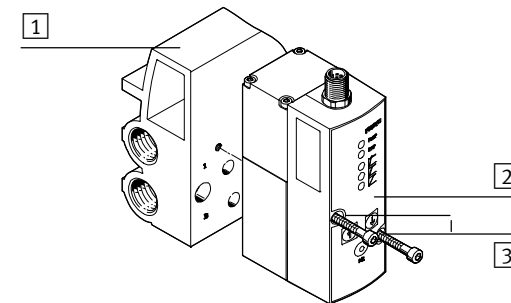


- 1 H-rail clamping unit
- 2 H-rail

- Secure the VPPM-... with the retaining screws of the H-rail adapter (tightening torque 1.5 Nm).

### Sub-base mounting (flanged valve)

- Fasten the VPPM-... to the connection block using the screws included (1/8": M4x65, 1/4": M4x77). Location of the fastening holes (see figure).
- Tighten the mounting screws (tightening torque 1.5 Nm).



- 1 Sub-base
- 2 VPPM
- 3 Mounting holes

### 5.2 Pneumatic (in-line valve)

- Remove the covers on the compressed air connections.
- Attach the pneumatic tubing to the following connections (→ Fig. 1):
  - Supply port (1) pos. 4
  - Pressure output (2) pos. 2
- Install a silencer at the air vent (3) (pos. 5) or remove the exhaust air with ducts.

## Operating medium

→ ..... Note

Too much residual oil content in the compressed air will reduce the service life of the valve.

- When using bio-oils (oils that are based on synthetic ester or native ester, e.g. rapeseed oil methyl ester), the maximum residual oil content of 0.1 mg/m<sup>3</sup> must not be exceeded (→ ISO 8573-1:2010 [-:2]).

## 5.3 Electrical

⚠ ..... Warning

### Electric voltage

Injury caused by electric shock, damage to machine and system

- For the electrical power supply, use only PELV circuits in accordance with IEC 60204-1/EN 60204-1.
- Use only voltage sources that ensure a reliable electric separation from the mains network in accordance with IEC 60204-1/EN 60204-1.
- Observe the requirements of IEC 60204-1/EN 60204-1 for PELV circuits.

→ ..... Note

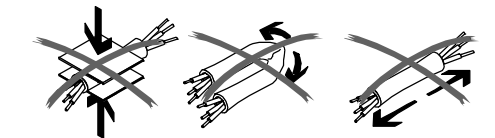
Long signal lines reduce the interference immunity.

- Make sure that the signal cables are always shorter than 10 m.

- Check by means of the type plate to determine which valve variant you have:

	Designation on the rating plate	
	VPPM-...-V1...	VPPM-...-A4...
Designation	Voltage variant	Current variant
Electrical setpoint value	DC 0 ... 10 V	4 ... 20 mA

Make sure that the cables are not squashed, bent or stretched:



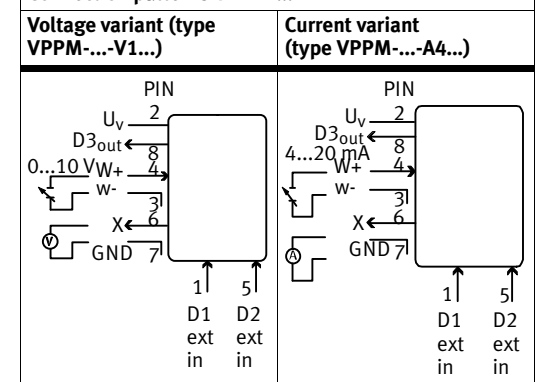
- Use the pre-assembled plug socket with cable from Festo (accessories → www.festo.com/catalogue). You can then guarantee that the specified protection class IP 65 and EMC are fulfilled.
- If a screened cable is used, earth the insulation at the cable end which is farther away from the VPPM.

→ ..... Note

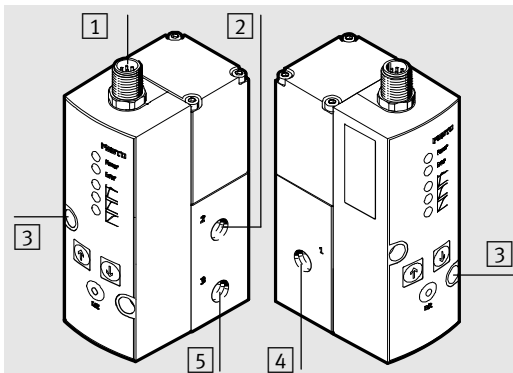
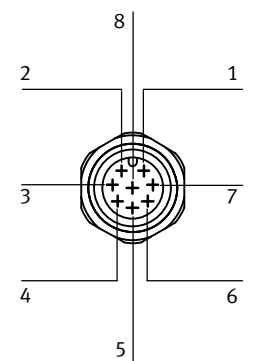
If the Y-connecting cable type NEBV-M12G8-KD-...-M12G5 is connected to CPX I/O modules, galvanic separation of the I/O modules is no longer guaranteed!

- Connect the cables of the VPPM-... in accordance with the circuit diagram:

### Connection patterns VPPM-...

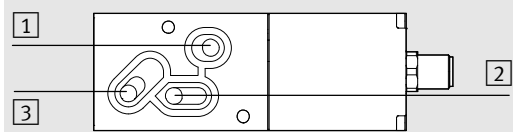


- The individual pins on the electrical connection are assigned as follows:



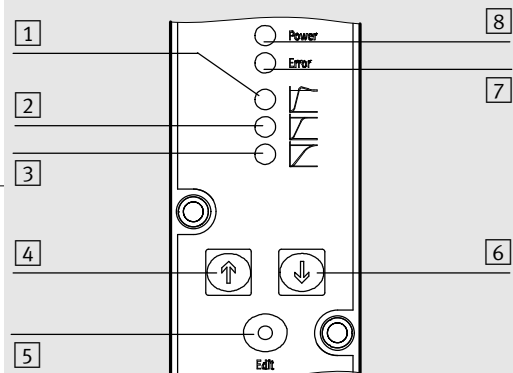
- 1 Electrical connecting plug (8-pin)
- 2 Air connection (2), pressure output
- 3 Through-holes for fastening
- 4 Compressed air connection (1), supply port
- 5 Exhaust connection (3)

Fig. 1: Connections and mounting holes (in-line valve)



- 1 Duct (2) air, pressure output
- 2 Duct (1) compressed air, supply port
- 3 Duct (3) exhaust

Fig. 2: Pneumatic connections (flanged valve)



- 1 LED (yellow) fast control behaviour
- 2 LED (yellow) universal control behaviour (factory setting)
- 3 LED (yellow) for precise control behaviour
- 4 UP button
- 5 EDIT button
- 6 DOWN button
- 7 LED (red) ERROR
- 8 LED (green) POWER

Fig. 3: Display and control elements

Pin	Cable colour <sup>1)</sup>	Port identifications	
		Voltage variant type VPPM-...-V1...	Current variant type VPPM-...-A4...
1	White (WH)	Digital input D1	
2	Brown (BN)	+24 V DC supply voltage	
3	Green (GN)	Analogue input W- (- setpoint value)	
4	Yellow (YE)	Analogue input W+ (+ setpoint value) 0 ... 10 V	Analogue input W+ (+ setpoint value) 4 ... 20 mA
5	Grey (GY)	Digital input D2	
6	Pink (PK)	Analogue output X (actual value)	
7	Blue (BU)	0 V DC or GND	
8	Red (RD)	Digital output D3 <sup>2)</sup>	

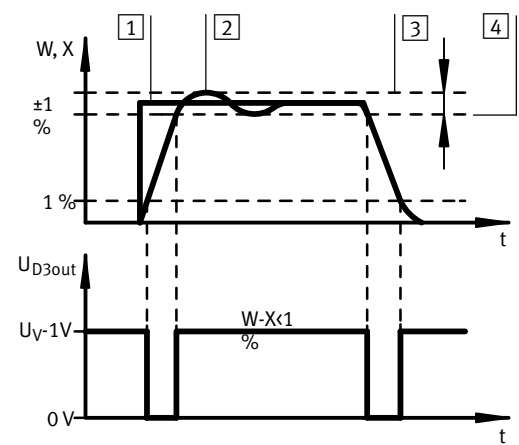
<sup>1)</sup> With usage of the plug socket with cable as specified in Accessories.  
The tightening torque of the plug socket M12 is max. 0.5 Nm  
<sup>2)</sup> The hysteresis of the digital comparator output D3 is 0.5 % FS

### Digital comparator output D3

The function "Pressure reached" permits monitoring of the pressure control function. To do this, the setpoint value is compared with the actual value.

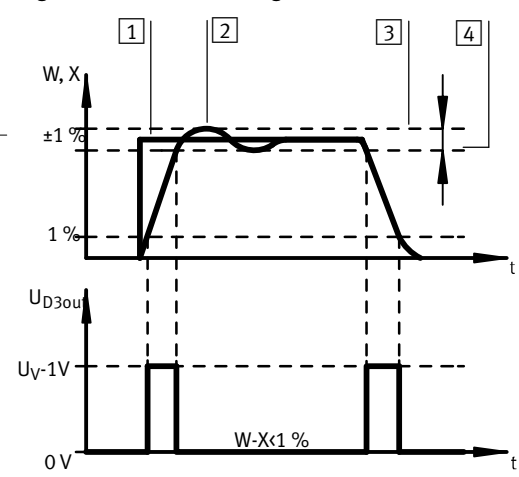
The digital switching output D3 becomes active as soon as the divergence is  $\leq 0.5\%$  FS and becomes inactive when the divergence  $> 1\%$  FS is exceeded.

### Diagram for the PNP switching variant



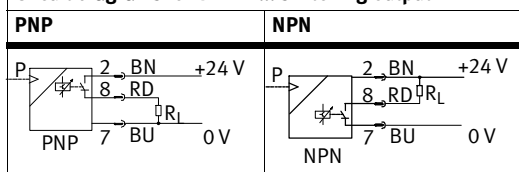
- 1 Setpoint value
- 2 Actual value
- 3 Upper tolerance limit
- 4 Lower tolerance limit

### Diagram for the NPN switching variant



- 1 Setpoint value
- 2 Actual value
- 3 Upper tolerance limit
- 4 Lower tolerance limit

### Circuit diagrams for VPPM-... switching output



### 6 Commissioning

..... **Note**

- Make sure that the VPPM-... is kept away from high-frequency radiation (e.g. from radio sets, mobile telephones or other interference-emitting devices). In this way you will avoid increased tolerances of the outlet pressure (→ Technical data).
- The VPPM-... interprets setpoint value signals smaller than 1 % of full scale as 0 V or 4 mA (→ Output pressure range table). In this case, the working pressure will be set to the ambient pressure.

- Connect the VPPM-... with a setpoint value signal. The VPPM-... possesses a so-called "differential input". The setpoint value signal 0 ... 10 V or 4 ... 20 mA is then applied to contacts 3 and 4, whereby the lower potential must be connected to contact 3 and the higher potential to contact 4. Contact 3 (- setpoint value) can be connected to contact 7 (GND).
- Supply the VPPM-... with direct current (supply voltage UV = 24 V DC  $\pm 10\%$ ).
- Select the parameter set for the regulator (→ Tech. data):
  - Press the EDIT button for 3 sec.
  - Use the UP or DOWN button to select the required parameter set. The LED of the selected parameter set lights up.
  - Press the EDIT button again to confirm your selection.

The control behaviour of the VPPM can also be set by remote control via the digital inputs D1 and D2:

Parameter set	Control response	Input D1 PIN 1	Input D2 PIN 5
1	Fast control response	1 <sup>1)</sup>	0 <sup>1)</sup>
2	Universal control response (factory setting)	0	1
3	Precise control response	1	1

<sup>1)</sup> 1 = 24 V DC / 0 = 0 V DC

Pressurize the VPPM-... with a supply pressure at least 1 bar higher than the maximum desired output pressure. An output pressure p2 proportionate to it is then set. The following output pressure is then assigned to the setpoint value signal:

VPPM-...	Output pressure with signal 1 % FS <sup>1)</sup>	Output pressure with signal 100 % FS <sup>1)</sup>
2 bar type	0.02 bar	2 bar
6 bar type	0.06 bar	6 bar
10 bar type	0.1 bar	10 bar

- <sup>1)</sup> - FS = Full scale:  
 (1 % FS = 0.1 V or 4.16 mA / 100 % FS = 10 V or 20 mA)  
 - Output pressure:  
 0 V or 4 mA creates an output pressure of 0 bar

Select a suitable parameter record:

### Recommended parameter sets VPPM-... size 1/8"

Tube length <sup>1)</sup>	Open system	Output volumes in ml		
		0 ... 100	100 ... 1000	> 1000
0 m	3	3	2	1
1 m	3	3	2	2
3 m	3	3	3	2
$\geq 5$ m	3	3	3	2

<sup>1)</sup> With tubing inner diameter 6 mm or 8 mm

### Recommended parameter sets VPPM-... size 1/4"

Tube length <sup>1)</sup>	Open system	Output volumes in ml		
		0 ... 500	500 ... 2000	> 2000
0 m	3	1	2	3
1 m	3	1	2	3
3 m	3	2	3	3
$\geq 5$ m	3	3	3	3

<sup>1)</sup> With tubing outer diameter 8 mm or 10 mm

### Recommended parameter sets VPPM-... size 1/2"

Tube length <sup>1)</sup>	Open system	Output volumes in ml		
		0 ... 2000	2000 ... 10000	> 10000
0 m	3	1	2	3
1 m	3	1	2	3
3 m	3	2	3	3
$\geq 5$ m	3	3	3	3

<sup>1)</sup> With tubing outer diameter 12 mm or 16 mm

### 7 Operation

..... **Note**

- When switching off the VPPM-... make sure that first the setpoint value is set to 0 V or 4 mA, then the supply pressure, after that the setpoint value, and finally the supply voltage is switched off.

### 8 Maintenance and care

- For cleaning:
- Switch off the following energy sources before cleaning the exterior of the device:
    - Operating voltage
    - Compressed air
  - If necessary, clean the VPPM-... on the outside with a soft cloth.
- The permitted cleaning agents are mild soapy water (max. +50 °C) or all non-abrasive media.

### 9 Disassembly

- For disassembly:
- Switch off the following energy sources:
    - Operating voltage
    - Compressed air
  - Separate the respective connections from the VPPM-...
  - Remove the VPPM-... from the mounting surface/H-rail.

### 10 Accessories

Accessories → [www.festo.com/catalogue](http://www.festo.com/catalogue)

### 11 Safety setting

Wire break	Voltage type	Current type
Reference value	Output pressure drops to 0 bar	The last value is saved. The pressure at the output can go up or down in the medium term.
Supply voltage	The last value is saved. The output pressure is maintained unregulated. In the medium term, the pressure at the output can increase or diminish.	

### 12 Trouble-shooting

Cause	Status of the LED indicators	
	Power LED (green)	ERROR LED (red)
- Undervoltage or over-voltage of the setpoint value	Lights up	Lights up
- Hardware error - Overvoltage ( $> 30$ V) - Internal temperature too high	Lights up	Flashes
- Undervoltage ( $< 18$ V)	Off	Off

### Malfunction

Malfunction	Possible cause	Remedy
VPPM-... does not react	Supply voltage not applied, POWER LED does not light up  Set value voltage or set value current not applied	Check connection of the 24 V DC power supply  Check control unit; check connection
Flow rate too low	Restriction of the flow cross section due to connection technology (swivel fittings)	Use an alternative connection
Pressure increase too slow	Large cylinder volume and long tube length	Select different parameter set
Pressure constant despite modified setpoint value specification	- Supply cable fractured (the last set working pressure is maintained unregulated. In the medium term, the pressure at the output can increase or diminish.) - Too little supply pressure P1	- Replace supply cable  - Increase supply pressure
Manual selection of the parameter sets using the UP/DOWN buttons on the VPPM-... is not possible	Voltage is present at digital inputs D1 and D2	Apply 0 V DC to digital inputs D1 and D2

### 13 Technical data

Type VPPM-...	Type 2 bar 30 psi	Type 6 bar 90 psi	Type 10 bar 150 psi
Design	Proportional pressure regulator valve		
Mounting position	As desired, preferably horizontal (display elements facing upwards)		
Medium	Compressed air in accordance with ISO 8573-1:2010 [7:4:4] Inert gases		
Pressure ranges	[bar]		
- Permissible inlet pressure	Max. 4	Max. 8	Max. 11
- Control range	0.02 ... 2	0.06 ... 6	0.1 ... 10
	Input pressure p1 at least 1 bar above output pressure p2		
Total leakage when new	[l/h]	$< 5$	
Ports	G1/8" (1/8 NPT), G1/4" (1/4 NPT), G1/2" (1/2 NPT)		
Nominal width	[mm]		
- Pressurisation	6 (for 1/8"), 8 (for 1/4"), 12 (for 1/2")		
- Exhaust	4.5 (for 1/8"), 6 (for 1/4"), 12 (for 1/2")		
Degree of protection	IP 65 when mounted, with tightened mounting screws, in combination with plug socket according to accessories.		
Permissible temp. range	[°C]		
- Environment	0 ... +60		
- Medium	+10 ... +50		
- Storage	-10 ... +70		
Electrical connection	Pin contact M12x1, 8-pin		
Permissible operating voltage	[V DC]		
	21.6 ... 26.4 (permissible residual ripple max. 10 %)		
Max. electrical power consumption	[W]		
- Nominal size 1/8" and 1/4"	7		
- Nominal size 1/2"	12		
Power rating of digital switching output D3 (PIN 8 in el. connection)	[mA]		
	Max. 60		
Max. perm. supply and signal line length	[m]		
	10		
Overall accuracy	[bar]		
- Standard (2 %) $\pm 0.5$ x hysteresis	0.045	0.135	0.225
- Class S1 (1 %) $\pm 0.5$ x hysteresis	0.025	0.075	0.125
Hysteresis	0.5 % full scale		
Voltage type VPPM-...-V1-...	[V DC]		
- Setpoint variable	0 ... +10		
- Input resistance (setpoint value)	10 [kΩ]		
- Load of actual value output	Min. 2 [kΩ]		
Current type VPPM-...-A4-...	[mA]		
- Setpoint variable	4 ... 20		
- Input resistance (setpoint value)	250 [Ω]		
- Load of actual value output	Max. 500 [Ω]		
Electromagnetic compatibility <sup>1)</sup>	See declaration of conformity → <a href="http://www.festo.com">www.festo.com</a> CE conformity for industrial installations fulfilled		
Vibration and shock	<b>The following specifications do not apply to mounting the VPPM-... to the bracket VAME-P1-A.</b>		
- Vibration	- Tested in accordance with DIN/IEC 68/ EN 60068 parts 2-6; for wall mounting: 0.35 mm path at 10 ... 60 Hz, 5 g acceleration at 60 ... 150 Hz		
- Shock	- Tested in accordance with DIN/IEC 68/ EN 60068 parts 2-27; for wall mounting: $\pm 30$ g with 11 ms duration; 5 shocks per direction		
Materials	Wrought aluminium alloy PAXMD6 GF50/gr-P		
- Housing	Nitrile rubber		
- Seals	Silicone free		
- Lubrication			
Weight	[g]		
	1/8": 400, 1/4": 560, 1/2": 2050		
<sup>1)</sup> The valve is intended for use in an industrial environment. Outside of industrial environments, e.g. in commercial and mixed-residential areas, actions to suppress interference may have to be taken.			