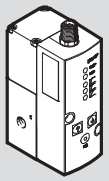
VPPM

Proportional-pressure regulator



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Operating instructions

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2021-11g
[8110179]

8110177

Translation of the original instructions

1 Applicable Documents

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

2 Safety

2.1 Safety instructions

- Only use the product in its original condition without unauthorised modifications.
- Only use the product if it is in perfect technical condition.
- Take into account the ambient conditions at the location of use.
- Before working on the product, switch off the power supply and secure it against being switched on again.
- Store the product in a cool, dry environment protected from UV and corrosion. Keep storage times short.

2.2 Intended use

The proportional-pressure regulator is intended to regulate a pressure proportional to a specified setpoint value. The product is intended for use in industrial environments.

2.3 Training of qualified personnel

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

2.4 Approvals

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

UL certification information	
Product category code	QUYX, QUYX7
File number	E322346
Considered standards	UL 610101, CAN/CSAC22.2 No. 610101
UL mark	c UL us LISTED

Tab. 1: UL certification information

- 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.

Electrical data and ambient conditions	
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
Max. installation height	2000 m

Tab. 2: Electrical data and ambient conditions

3 Additional information

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

4 Product overview

4.1 Function

The proportional-pressure regulator controls the 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 there are deviations between the setpoint value and actual values, the proportional-pressure regulator is actuated until the output pressure has reached the setpoint.

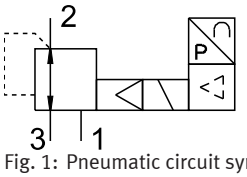


Fig. 1: Pneumatic circuit symbol

4.2 Structure

4.2.1 Product design

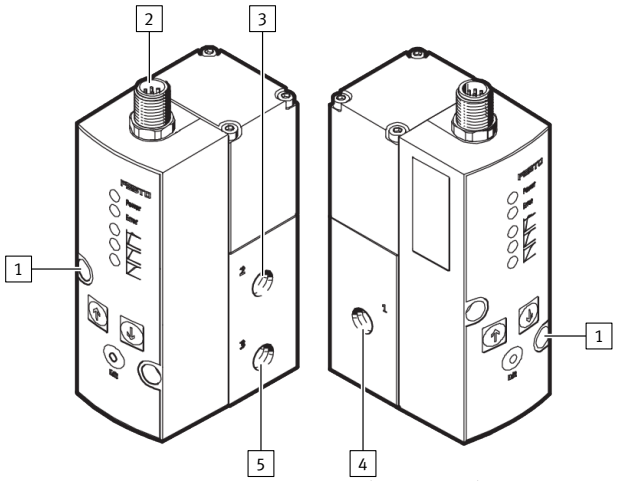
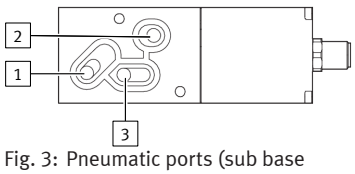


Fig. 2: Connections and mounting holes (in-line valve)

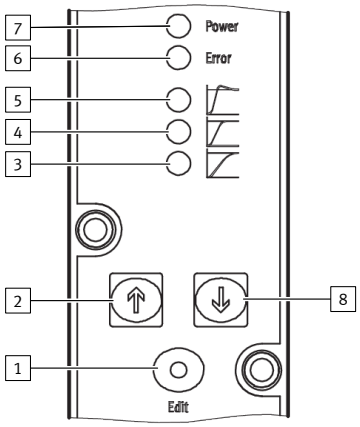
1	Through-holes for fastening	4	Compressed air port (1)
2	Electrical connecting plug	5	Exhaust air port (3)
3	Working air port (2)		



1	Exhaust air port (3)
2	Working air port (2)
3	Compressed air port (1)

Fig. 3: Pneumatic ports (sub base valve)

4.2.2 Display and control elements



1	[Edit] key
2	[UP] key
3	Yellow LED: precise control response
4	Yellow LED: universal control response (factory setting)
5	Yellow LED: fast control response
6	Red LED [error]
7	Green LED [power]
8	[DOWN] key

Fig. 4: Display and control elements

5 Transport

Store and transport the product in its original packaging. Observe the weight, the dimensions and the ambient conditions.

6 Assembly

6.1 Mounting clearances

During assembly make sure that there is sufficient space for the cable connection and the tubing connections. Place the device as close to the consumer as possible. This leads to better control accuracy and shorter response times.

6.2 Wall mounting (in-line valve)

VPPM-6L-... and VPPM-8L-...

- Fasten the VPPM-... [2] with 2 M4 screws. If necessary, use the bracket VAME-P1-A [1].
  - Tightening torque: 1.5 Nm

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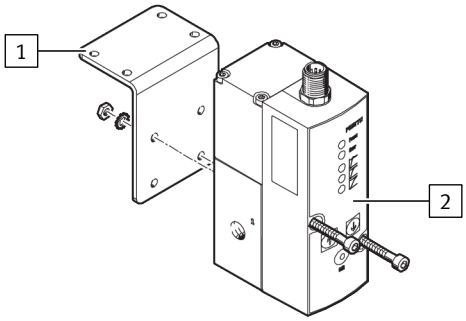
Only apply a static load to the VPPM-... when mounting the VPPM-... with the assistance of the bracket.



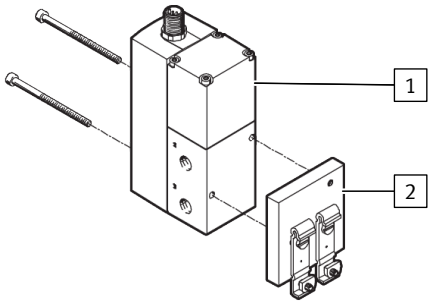
VPPM-12L-...

- Fasten the VPPM-... with 2 M5 screws.
  - Tightening torque: 2.0 Nm

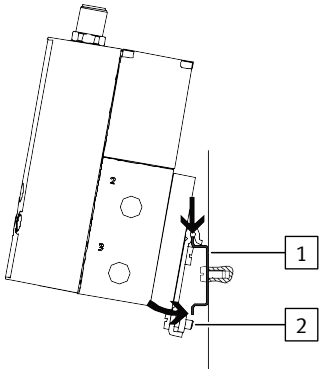
6.3 H.rail mounting (in-line valve)

VPPM-6L-... and VPPM-8L-...

1. Attach the H-rail adapter VAME-P1-T [2] to the VPPM-... with 2 screws [1].
   - Screws: M4 x 65 for VPPM-6L-..., M4 x 77 for VPPM-8L-...
   - Tightening torque: 1.5 Nm



2. Attach the VPPM -... to the H-rail.

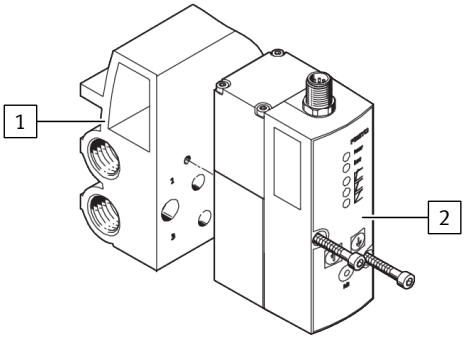


3. Fasten the VPPM-... with the retaining screw [2] of the H-rail adapter.
   - Tightening torque: 1.5 Nm

6.4 Manifold block assembly (sub base valve)

VPPM-6F-... and VPPM-8F-...

- Fasten the VPPM-... [2] to the manifold block [1] with 2 screws.
  - Screws: M4 x 65 for VPPM-6F-..., M4 x 77 for VPPM-8F-...
  - Tightening torque: 1.5 Nm



7 Installation

7.1 Pneumatic installation (in-line valve)

1. Remove the covers from the supply ports.
2. Connect the compressed air port (1) and the working air port (2) with tubing ➔ Fig. 2.
3. Fit a silencer at the exhaust air port (3) or install an exhaust air duct ➔ Fig. 2.

Operating medium

NOTICE

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/m³ must not be exceeded (ISO 8573-1:2010 [–:–:2]).

7.2 Electrical installation

⚠ WARNING

Risk of injury due to electric shock.

- For the electrical power supply, use only PELV circuits in accordance with IEC 60204-1/EN 60204-1 (Protective Extra-Low Voltage, PELV).
- Observe the general requirements of IEC 60204-1/EN 60204-1 for PELV circuits.
- Only use voltage sources that ensure a reliable electric separation from the mains network in accordance with IEC 60204-1/EN 60204-1.

NOTICE

Malfunction due to impaired immunity to interference

Long signal lines reduce the immunity to interference.

- Use the shortest possible signal lines.

NOTICE

- The connector must not be twisted out of the intended position.
- The tightening torque of the M12 plug socket with cable must not exceed 0.5 Nm.

NOTICE

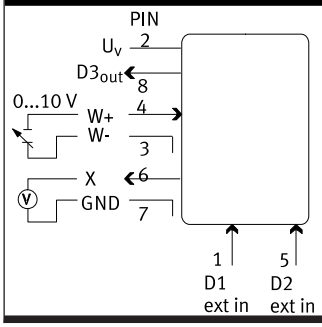
If the Y-connecting cable type NEBV-M12G8-KD-..-M12G5 is connected to CPX I/O modules, galvanic isolation of the I/O modules will not be guaranteed.

1. Use the rating plate to check which valve variant is involved.

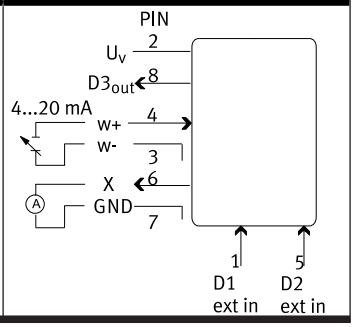
Valve variant	VPPM-...-V1...	VPPM-...-A4...
Voltage variant	0 ... 10 V DC	
Current variant	4 ... 20 mA	

2. Lay the electrical connection cable without crushing, kinking or stretching it.
3. If a shielded electrical connection cable is used, earth the shield at the end of the cable remote from the valve.
4. Wire the VPPM-... according to the corresponding plug pattern.

VPPM-...-V1...



VPPM-...-A4...



Pin allocation

The pins on the electrical connection are assigned as follows:

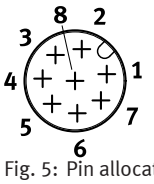


Fig. 5: Pin allocation

PIN	Wire colour[1]	Port identifications	
		VPPM-...-V1...	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)	GND supply earth	
8	red (RD)	Digital output D3[2]	

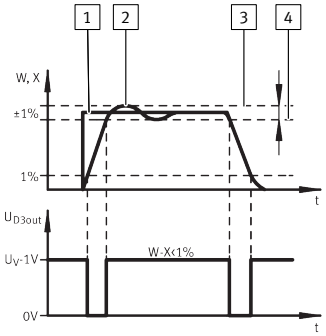
1) With usage of the plug socket with cable as specified in accessories.
2) The hysteresis of the digital comparator output D3 is 0.5% FS.

Tab. 3: Pin allocation

Digital comparator output D3

The “Pressure reached” function permits monitoring of the pressure control function. The setpoint value is compared with the actual value.
The digital switching output D3 becomes active as soon as the divergence is ≤ 0.5% FS and becomes inactive when the divergence > 1% FS is exceeded.

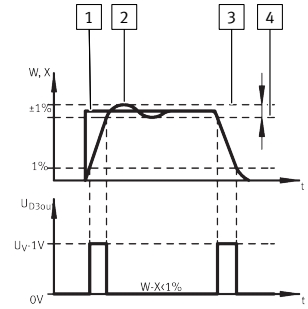
Graph for VPPM-...-...P switching variant



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

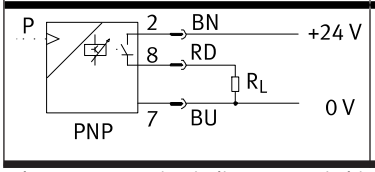
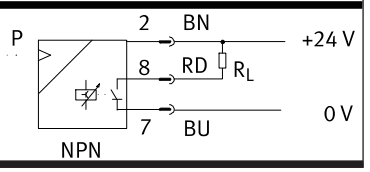
Fig. 6: Switching variant VPPM-...-...P

Graph for VPPM-...-...N switching variant



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

Fig. 7: Switching variant VPPM-...-...N

Circuit diagram VPPM-...-...P	Circuit diagram VPPM-...-...N
	

Tab. 4: VPPM-... circuit diagrams Switching output

8 Commissioning

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- Keep high-frequency radiation away from the VPPM-... in order to avoid increased tolerances of the outlet pressure.
- The VPPM-... interprets setpoint signals that are less than 1% Full Scale (FS) as 0 V or 4 mA. In this case the working pressure is set to ambient pressure.
- At typical input values below 3.6 mA , the valve detects a cable break and the last pressure set remains unregulated. Leakage results in a change of pressure over the long term.

1. Connect the VPPM-... with a setpoint value signal. The VPPM-... has a differential input. Apply the setpoint signal 0 ... 10 V or 4 ... 20 mA to contacts 3 and 4. Apply the lower potential to contact 3 and the higher potential to contact 4.

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   Contact 3 (– setpoint value) can be connected to contact 7 (GND).
2. Power the VPPM-... with direct current.
   - Supply voltage UV = 24 V DC ±10%
3. Select a parameter set for the regulator.
   - Press and hold the [Edit] key for 3 seconds.
   - Select a parameter set with the [UP] and [DOWN] keys. The LED of the selected parameter set lights up.
   - Press the [Edit] key to confirm the selection.

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   The control response of the VPPM-... can also be set by remote control via digital inputs D1 and D2.

Parameter set	Control response	Input D1 (PIN 1)	Input D2 (PIN 5)
1	Fast control response	1 (24 V DC)	0 (0 V DC)
2	Factory setting: universal control response	0	1
3	Precise control response	1	1

Tab. 5: Parameter sets

The following 3 tables show the recommended parameter sets for the different pneumatic ports:

Parameter sets recommended for VPPM-6...				
Tube length[1]	Open system	Output volume 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
≥ 5 m	3	3	3	2

1) with inner tubing diameter 6 mm or 8 mm

Tab. 6: Parameter sets recommended for VPPM-6...

Parameter sets recommended for VPPM-8...				
Tube length[1]	Open system	Output volume 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
≥ 5 m	3	3	3	3

1) with tubing diameter 8 mm or 10 mm

Tab. 7: Parameter sets recommended for VPPM-8...

Parameter sets recommended for VPPM-12L-...				
Tube length[1]	Open system	Output volume 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
≥ 5 m	3	3	3	3

1) with tubing diameter 12 mm or 16 mm

Tab. 8: Parameter sets recommended for VPPM-12L-...

9 Maintenance

9.1 Disassembly

NOTICE

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

1. Switch off the following energy sources:
   - Operating voltage
   - Compressed air
2. Disconnect the connections from the device.
3. Remove the device from the mounting surface or H-rail.

9.2 Cleaning

1. Switch off the following energy sources to clean the outside:
   - Operating voltage
   - Compressed air
2. Clean the device on the outside with a soft cloth as required.

10 Malfunctions

Status of the LED displays

Cause	Green LED [power]	Red LED [error]
– Undervoltage or overvoltage of the setpoint value	on	on
– Hardware error – Overvoltage (> 30 V) – Internal temperature too high	on	flashes
– Undervoltage (< 18 V)	off	off

Tab. 9: Status of the LED displays

Fault clearance

Malfunction	Possible cause	Remedy
Device does not respond	No supply voltage, LED [power] off.	Check the connection of the supply voltage 24 V DC.
	No data communication.	– Check control unit. – Check connection.
Flow rate too low	Restriction of the flow cross section by connection technology.	Use alternative connections.
Pressure rise too slow	Large cylinder volume and long tube length.	Select another parameter set.
Pressure constant despite modified setpoint specification	Break in the electrical connecting cable.	Replace supply cable.
	Supply pressure P1 too low.	Increase supply pressure.
Manual selection of parameter sets with the [UP] and [DOWN] keys on the device is not possible	Voltage is applied at digital inputs D1 and D2.	Apply 0 V DC at digital inputs D1 and D2.

Tab. 10: Fault clearance

11 Technical data

General technical data		
Design		Proportional-pressure regulator
Mounting position		As desired, preferably horizontal (display elements facing upwards)
Materials		
Housing		Wrought aluminium alloy
Cover		PAXMD6 GF50/gr-P
Seals		Nitrile rubber
Lubrication		silicone-free
Weight		
VPPM-6...	[g]	400
VPPM-8...	[g]	560
VPPM-12...	[g]	2050

Tab. 11: General technical data

Operating and environmental conditions		
Medium		Compressed air in accordance with ISO 8573-1:2010 [7:4:4] inert gases
Information on operating medium		Lubricated operation not possible
Degree of protection		IP 65 when mounted, with tightened mounting screws, in combination with plug socket according to accessories.
Ambient temperature	[°C]	0 ... 60
Temperature of medium	[°C]	10 ... 50
Storage temperature	[°C]	–10 ... +70
Vibration and shock		
Vibration		Tested in accordance with DIN/IEC 68/EN 60068 Part 2-6; wall mounting: 0.35 mm path at 10 ... 60 Hz, 5 g acceleration at 60 ... 150 Hz[1)]
Shock		Tested in accordance with DIN/IEC 68/EN 60068 Part 2-27; wall mounting: ±30 g at 11 ms duration; 5 shocks per direction[1)]

1) Information does not apply when mounting the VPPM-.../VPPX-... on bracket VAME-P1-A/-T.

Tab. 12: Operating and environmental conditions

VPPM-...		0L2H	0L6H	0L10H
Pressure ranges				
Permissible input pressure P1	[MPa]	0 ... 0.4	0 ... 0.8	0 ... 1.1
	[bar]	0 ... 4	0 ... 8	0 ... 11
	[psi]	0 ... 58	0 ... 116	0 ... 159.5
Control range (output pressure P2)[1)]	[MPa]	0.002 ... 0.2	0.006 ... 0.6	0.01 ... 1
	[bar]	0.02 ... 2	0.06 ... 6	0.1 ... 10
	[psi]	2.9 ... 29	8.7 ... 87	1.45 ... 145
Total leakage when new	[l/h]	< 5		
Connection		G 1/8, 1/8 NPT, G 1/4, 1/4 NPT, G 1/2, 1/2 NPT		
Nominal width				
Pressurisation	[mm]	6 for VPPM-6... 8 for VPPM-8... 12 for VPPM-12...		
Exhaust port	[mm]	4.5 for VPPM-6... 6 for VPPM-8... 12 for VPPM-12...		

1) Input pressure P1 at least 0.1 MPa (1 bar, 14.5 psi) above output pressure P2.

Tab. 13: Characteristic pneumatic values

Characteristic electrical values		
Electrical connection		Pin contact M12x1, 8-pin
Permissible operating voltage	[V DC]	21.6 ... 26.4 Permissible residual ripple max. 10%
Power rating of digital switching output D3 (PIN 8 in el. connection)	[mA]	max. 60
Max. permissible supply line length and signal line length	[m]	10
Max. electrical power consumption		
VPPM-6... and VPPM-8...	[W]	7
VPPM-12L-...	[W]	12
Voltage type VPPM-...-V1...		
Setpoint variable	[V DC]	0 ... 10
Input resistance (setpoint value)	[kΩ]	10
Output actual value load	[kΩ]	min. 2
Current type VPPM-...-A4...		
Setpoint variable	[mA]	4 ... 20
Input resistance (setpoint value)	[Ω]	250
Output actual value load	[Ω]	max. 500

Tab. 14: Characteristic electrical values

Control characteristics[1)]	
Linearity	1% Full Scale (FS)/2% Full Scale (FS)
Hysteresis	0.5% Full Scale (FS)
Reproducibility	0.5% Full Scale (FS)
Total accuracy	1.25% (S1)/2.25 (2%)
Temperature coefficient	0.04/K

1) Maximum deviation, characteristic values determined at room temperature in accordance with ISO 10094. Linearity refers to the ideal characteristic curve.

Tab. 15: Control characteristics