

## Proportional pressure regulators VPPM, NPT

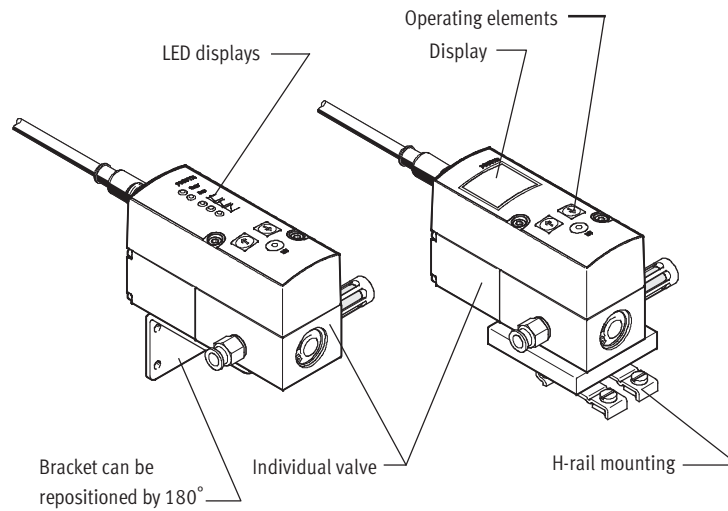
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## Proportional pressure regulators VPPM, NPT

Key features

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### Innovative

- Multi-sensor control (cascade control)
- Diagnostics
- Choice of regulation characteristic
- Temperature compensated
- High dynamic response
- High repetition accuracy
- Modular product system

### Versatile

- Individual valves (in-line valve)
- Various user interfaces
  - LED displays
  - LCD display
  - Adjustment/selection buttons
- Choice of valves with different pressure ranges
- Pressure range can be modified on the valve
- Choice of different setpoint specifications
  - Current input
  - Voltage input

### Reliable

- Integrated pressure sensor with separate output
- Cable break monitoring
- Pressure is maintained if the controller fails

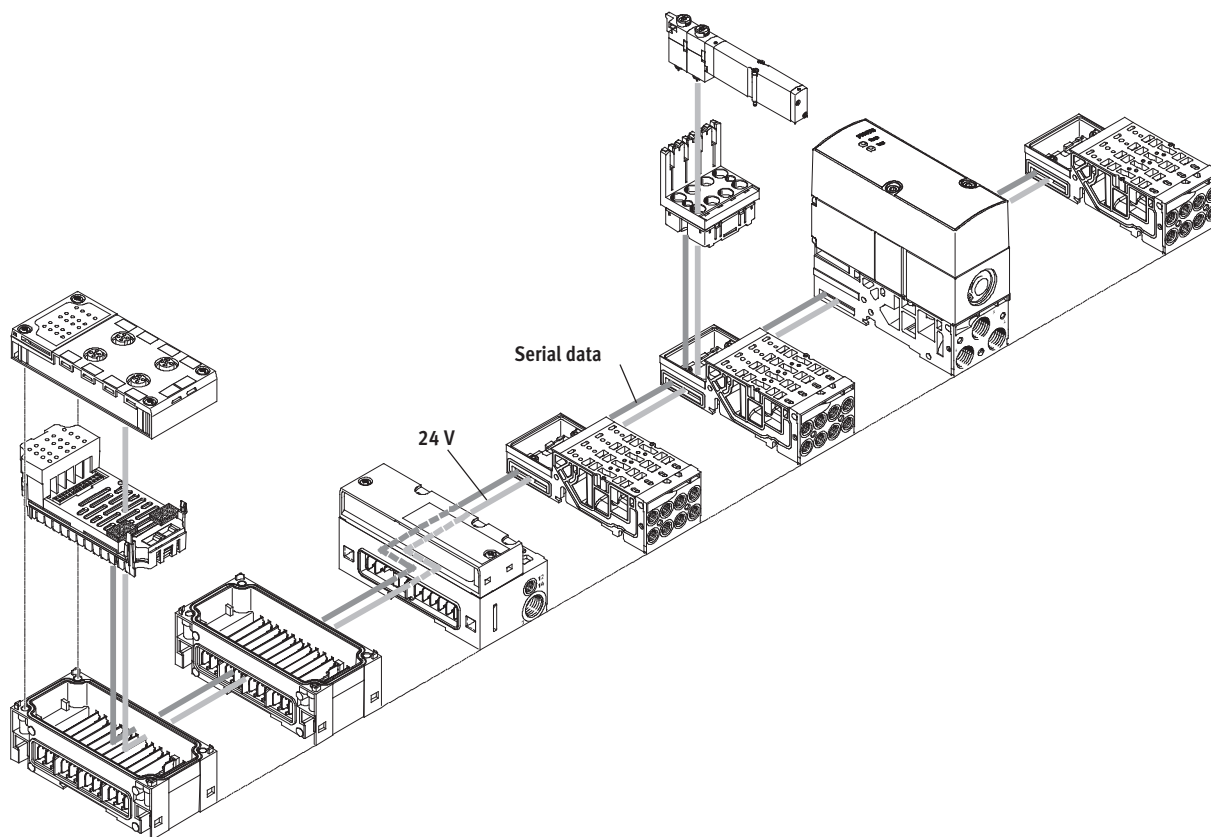
### Easy to mount

- H-rail mounting
- Individually via mounting bracket
- QS fittings

# Proportional pressure regulators VPPM, NPT

Key features

## VPPM on the valve terminal type 32 MPA



### Innovative

- Multi-sensor control
- Diagnostics via the bus
- Choice of regulation characteristic
- High dynamic response
- 2 accuracy levels

### Versatile

- For all common protocols
- As an individual pressure regulator
- As a pressure zone regulator
- Choice of 3 valves with different pressure ranges
- 3 pressure ranges (presets) can be set via the bus
- Internal or external compressed air supply possible

### Reliable

- Long service life
- LED display for the operating status
- Pressure is maintained if the supply voltage fails
- Fast troubleshooting thanks to LEDs on the valves and diagnostics via fieldbus
- Ease of servicing through replaceable valves

### Easy to mount

- Easy replacement of the valves
- Tested units
- Easy extension of the valve terminal

### Note

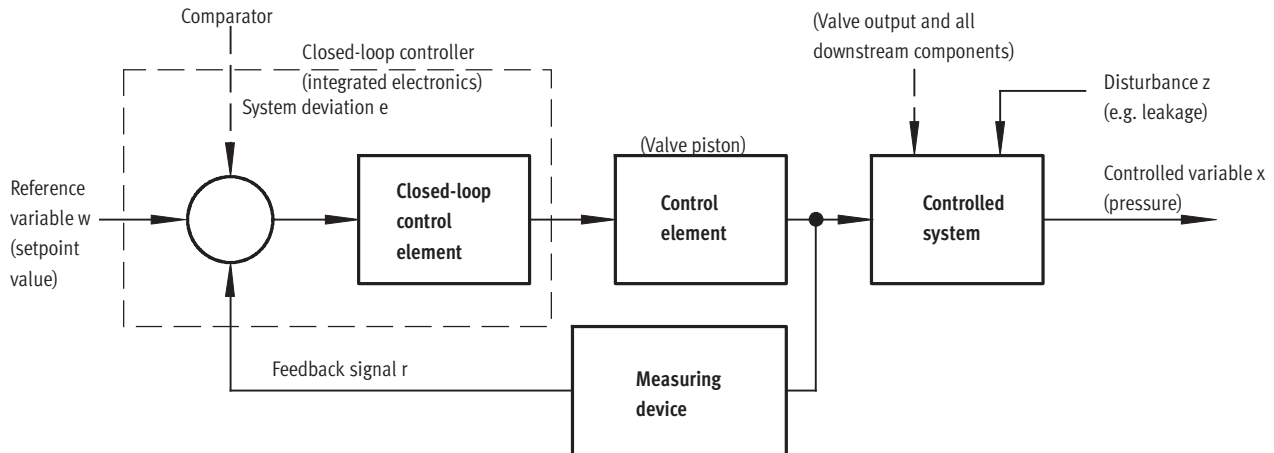
More information on the VPPM valves for type 32 MPA  
→ type 32

## Proportional pressure regulators VPPM, NPT

Key features

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### Layout of a control circuit



#### Setup

The figure shows a closed-loop control circuit. The reference variable  $w$  (setpoint value, e.g. 5 volts or 8 mA) initially acts on a comparator. The measuring device sends the value of the controlled variable  $x$  (actual value, e.g. 3 bar) to the comparator as a feedback signal  $r$ . The closed-loop control element detects the system deviation  $e$  and actuates the final

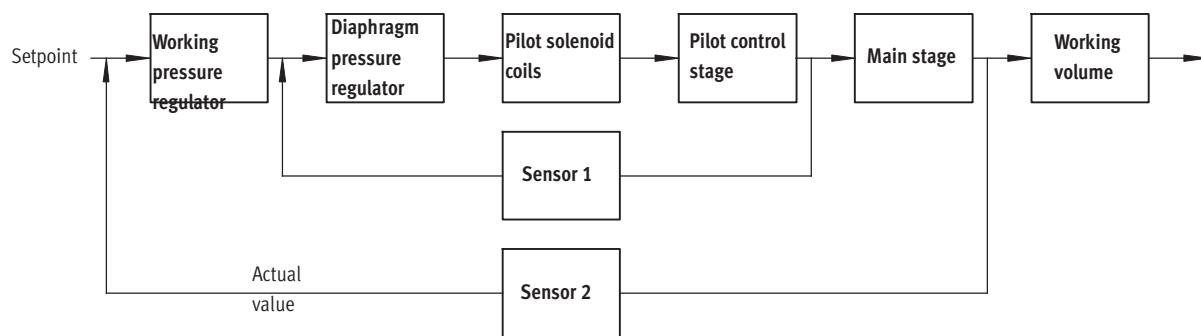
control element. The output of the final control element acts on the controlled system. The closed-loop control element thus attempts to compensate for the difference between the reference variable  $w$  and the controlled variable  $x$  by using the final control element.

#### Method of operation

This process runs continuously so changes in the reference variable are always detected. However, a system deviation will also appear if the reference variable is constant but the controlled variable changes. This happens when the flow through the valve changes in response to a switching action, a cylinder movement

or a change in load. The disturbance variable  $z$  will also cause a system deviation. An example of this is when the pressure drops in the air supply. The disturbance variable  $z$  acts on the controlled variable  $x$  unintentionally. In all cases, the regulator attempts to readjust the controlled variable  $x$  to the reference variable  $w$ .

### Multi-sensor control (cascade control) of the VPPM



#### Cascade control

Unlike conventional direct-acting regulators, with multi-sensor control several control circuits are nested inside each other. The overall controlled system is divided into

smaller sub-controlled circuits that are easier to control for the specific task.

#### Control precision

Multi-sensor control significantly improves control precision and

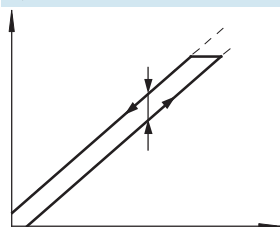
dynamic response in comparison with single-acting regulators.

# Proportional pressure regulators VPPM, NPT

Key features

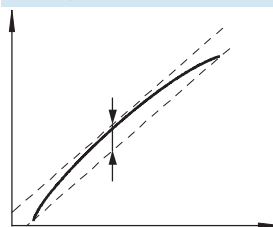
## Terms related to the proportional pressure regulator

### Hysteresis



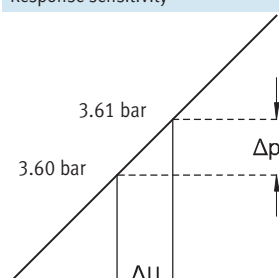
There is always a linear relationship within a certain tolerance between the setpoint value entered and the pressure output. Nevertheless it makes a difference whether the setpoint value is entered as rising or falling. The difference between the maximum deviations is referred to as hysteresis.

### Linearity error



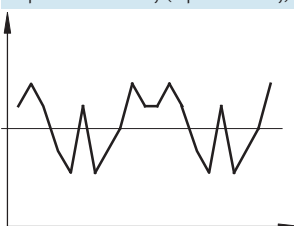
A perfectly linear progression of the control characteristic of the output pressure is theoretical. The maximum percentage deviation from this theoretical control characteristic is referred to as the linearity error. The percentage value refers to the maximum output pressure (full scale).

### Response sensitivity



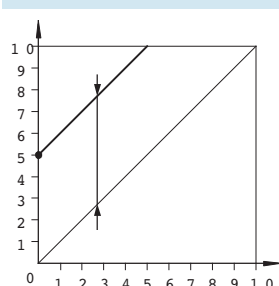
The response sensitivity of the device determines how sensitively one can change, i.e. adjust, a pressure. The smallest setpoint value difference that results in a change in the output pressure is referred to as the response sensitivity. In this case, 0.01 bar.

### Repetition accuracy (reproducibility)



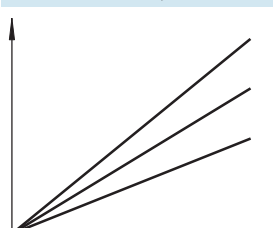
The repetition accuracy is the margin within which the fluid output variables are scattered when the same electrical input signal coming from the same direction is repeatedly adjusted. The repetition accuracy is expressed as a percentage of the maximum fluid output signal.

### Zero offset



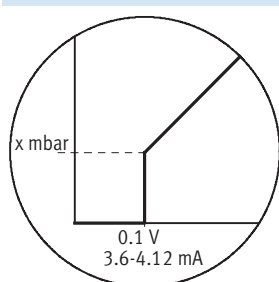
If, for example, a VPPM cannot be vented for safety reasons, the minimum pressure can be increased from the zero point. The smallest setpoint value is then assigned an output pressure of 5 bar, for example, and the largest setpoint value an output pressure of 10 bar. Zero suppression is automatically switched off if zero offsetting is used.

### Pressure range adaptation



In the delivery condition, 100% setpoint value equals 100% fluid output signal. Pressure range adaptation or adjustment enables the fluid output variable to be matched to the setpoint value.

### Zero point suppression

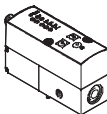
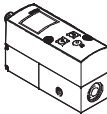
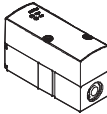


In practice it is possible that there is residual voltage or residual current at the setpoint input of the VPPM via the setpoint generator. Zero point suppression is used so that the valve is reliably vented at a setpoint value of zero.

## Proportional pressure regulators VPPM, NPT

Product range overview

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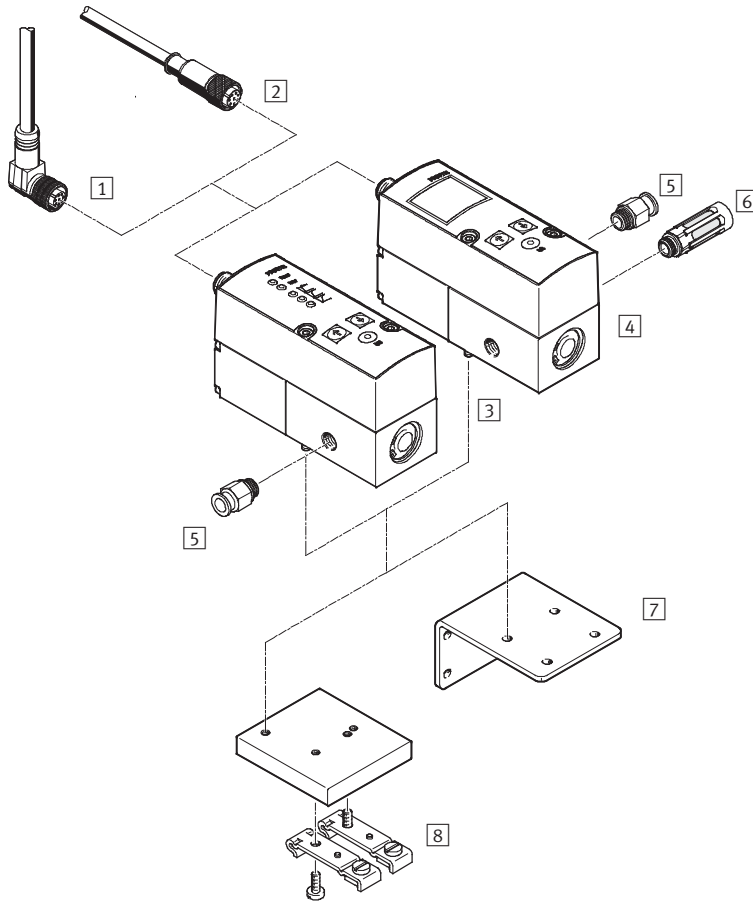
Function	Version	Design	Pneumatic connection 1, 2, 3	Nominal size pressurise/e xhaust [mm]	Pressure regulation range [psi]	Setpoint input			→ Page/ Internet
						Voltage type 0 ... 10 V	Current type 4 ... 20 mA	Digital –	
Pressure regulators	With LED								
		Pilot actuated diaphragm valve	1/8" NPT	6/4.5	0 ... 29.4 0 ... 88.2 0 ... 147	■	■	–	11
			1/4" NPT	8/7	0 ... 29.4 0 ... 88.2 0 ... 147	■	■	–	
	With LCD display								
		Pilot actuated diaphragm valve	1/8" NPT	6/4.5	0 ... 29.4 0 ... 88.2 0 ... 147	■	■	–	11
			1/4" NPT	8/7	0 ... 29.4 0 ... 88.2 0 ... 147	■	■	–	
	For valve terminal type 32 MPA, with LED display								
		Pilot actuated diaphragm valve	Sub-base MPA	6/4.5, 8/7	0 ... 29.4 0 ... 88.2 0 ... 147	–	–	■	type 32

# Proportional pressure regulators VPPM, NPT

Peripherals overview

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## Individual valve



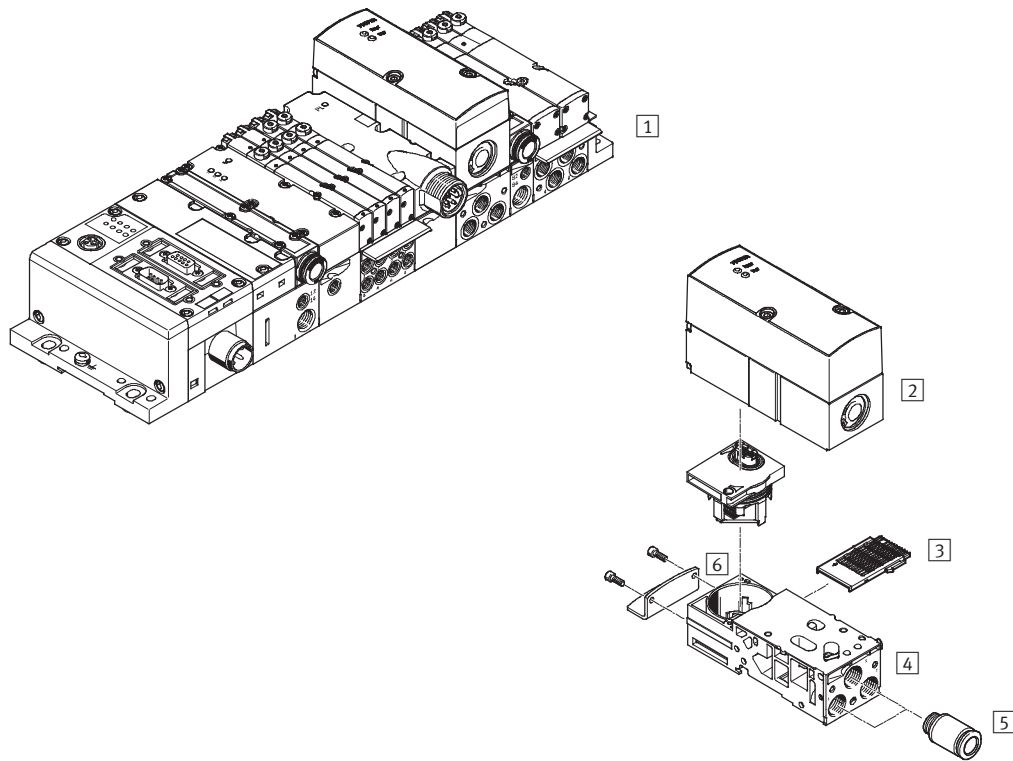
Accessories		Brief description	→ Page/Internet
1	Angled plug socket with cable NEBU-M12W8-...	–	23
2	Straight plug socket with cable SIM-M12-8GD-...	–	23
3	Proportional pressure regulator VPPM	Operator unit with LED	11
4	Proportional pressure regulator VPPM	Operator unit with LCD	11
5	Push-in fitting QS	For connecting compressed air tubing with standard O.D.	qs
6	Silencer	For fitting in exhaust ports	u
7	Bracket VAME-P1-A	For mounting the valve	20
8	H-rail mounting VAME-P1-T	For mounting on a H-rail	21

## Proportional pressure regulators VPPM, NPT

System overview

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### VPPM for valve terminal type 32 MPA



Accessories		
	Brief description	→ Page/Internet
1	Valve terminal type 32 MPA	With fieldbus connection and VPPM
2	Proportional pressure regulator VPPM	For valve terminal type 32 MPA
3	Electrical interlinking module VMPA1-FB-EV-AB	For sub-base of the proportional pressure regulator
4	Sub-base VMPA-FB-AP-P1	Without electrical interlinking module and without electrical module
5	Push-in fitting QS	–
6	Mounting attachment VMPA-BG	–



## Proportional pressure regulators VPPM, NPT

### Type codes

		VPPM	—	6	L		—	L	—	1	—	N18	—	0L	6H	—	1L	—	6H
<b>Type</b>																			
VPPM	Modular proportional pressure regulator																		
<b>Nominal size</b>																			
6	6 mm																		
8	8 mm																		
<b>Design</b>																			
L	In-line valve																		
<b>Mounting method</b>																			
—	Freely mountable																		
<b>Dynamic response class</b>																			
L	Low																		
<b>Valve function</b>																			
1	3/2-way solenoid valve, normally closed																		
<b>Pneumatic connection</b>																			
N18	Thread 1/8" - 27 NPT																		
N14	Thread 1/4" - 18 NPT																		
<b>Lower pressure value of regulation range</b>																			
0L	0 bar																		
<b>Upper pressure value of regulation range</b>																			
2H	2 bar																		
6H	6 bar																		
10H	10 bar																		
<b>Alternative lower pressure value of regulation range</b>																			
... L	0 - 9 bar																		
<b>Alternative upper pressure value of regulation range</b>																			
... H	0.2 - 10 bar																		

## Proportional pressure regulators VPPM, NPT

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Type codes

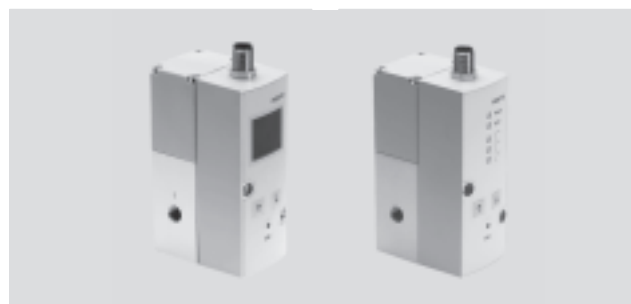


		–	V1	N	–	S1	
<b>Setpoint specification for individual valve</b>							
V1	0 ... 10 V						
A4	4 ... 20 mA						
<b>Switching output</b>							
N	Negative switching						
P	Positive switching						
<b>Accuracy</b>							
–	2% (standard)						
S1	1%						
<b>Operator unit</b>							
–	LED (standard)						
C1	With LCD, pressure unit variable						

## Proportional pressure regulators VPPM, NPT

### Technical data

Flow rate	380 ... 2,750 l/min	<b>Variants</b> <ul style="list-style-type: none"> <li>• Setpoint input as analogue voltage signal 0 ... 10 V</li> <li>• Setpoint input as analogue current signal 4 ... 20 mA</li> <li>• LED version</li> <li>• With LCD display</li> <li>• NPN or PNP switching output</li> </ul>
Voltage	21.6 ... 26.4 V DC	
Pressure	0 ... 147 psi	



General technical data				1/8" NPT	1/4" NPT
Design				Piloted diaphragm regulator	
Sealing principle				Soft	
Actuation type				Electric	
Type of control				Piloted	
Type of mounting				Via through-hole, via accessories	
Mounting position				Any	
Nominal size	Pressurisation	[mm]	6	8	
	Exhaust	[mm]	4.5	7	
Standard nominal flow rate			[l/min]	→ Graphs	
Product weight			[g]	400	500

Electrical data			
Electrical connection		Plug, round design, 8-pin, M12	
Operating voltage range		[V DC]	24 ± 10% = 21.6 ... 26.4
Residual ripple		10%	
Max. electrical power consumption		[W]	7
Setpoint input signal	Voltage	[V DC]	0 ... 10
	Current	[mA]	4 ... 20
Protection against short circuit		For all electrical connections	
Reverse polarity protection		For all electrical connections	
Protection class		IP65	
CE marking		EU conformity in accordance with the directive 89/336/EEC (EMC)	

### Note

Output pressure is maintained unregulated if the power supply cable is interrupted.

## Proportional pressure regulators VPPM, NPT

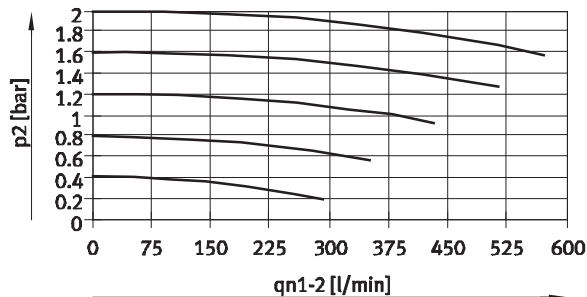
Technical data

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Flow rate  $q_n$  from 1  $\rightarrow$  2 as a function of output pressure  $p_2$

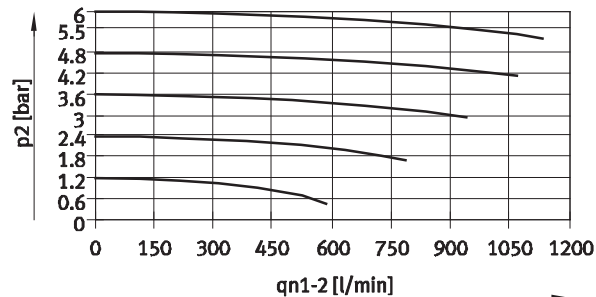
VPPM-6L-...-0L2H-...

(29.4 psi/2 bar)



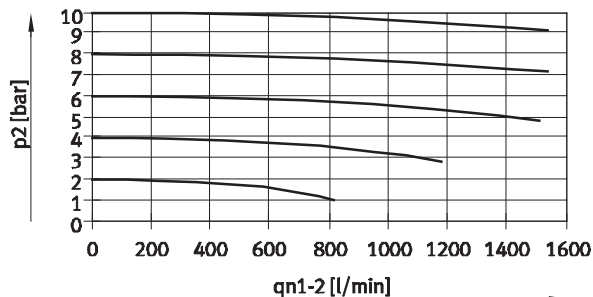
VPPM-6L-...-0L6H-...

(88.2 psi/6 bar)



VPPM-6L-...-0L10H-...

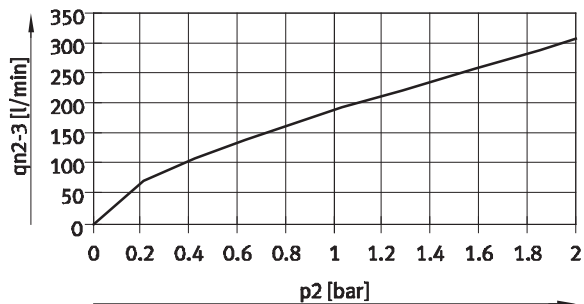
(147 psi/10 bar)



Flow rate  $q_n$  from 2  $\rightarrow$  3 as a function of output pressure  $p_2$

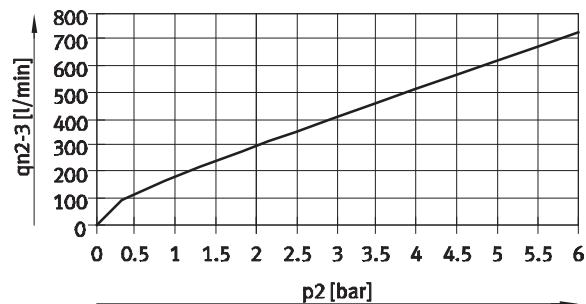
VPPM-6L-...-0L2H-...

(29.4 psi/2 bar)



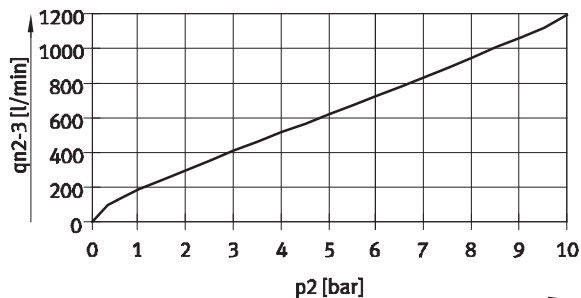
VPPM-6L-...-0L6H-...

(88.2 psi/6 bar)



VPPM-6L-...-0L10H-...

(147 psi/10 bar)



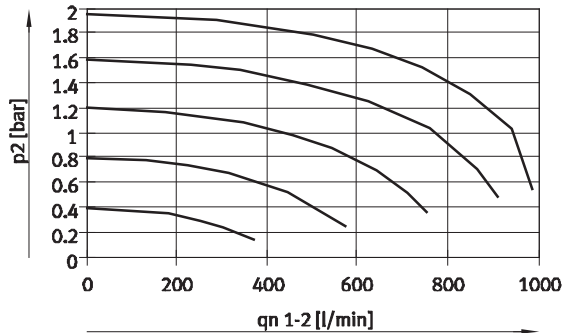
# Proportional pressure regulators VPPM, NPT

Technical data

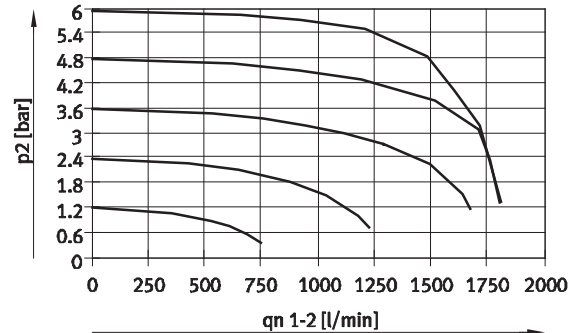
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## Flow rate $q_n$ from 1 $\rightarrow$ 2 as a function of output pressure $p_2$

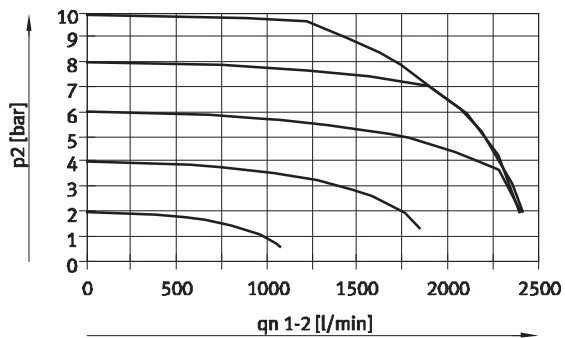
VPPM-8L-...-0L2H-... (29.4 psi/2 bar)



VPPM-8L-...-0L6H-... (88.2 psi/6 bar)

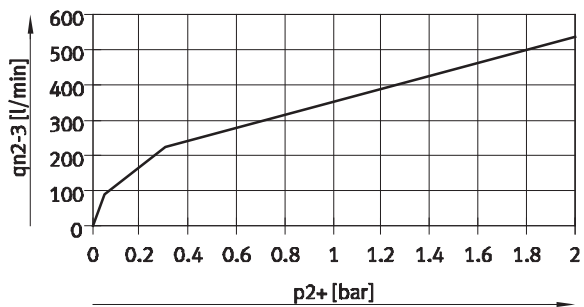


VPPM-8L-...-0L10H-... (147 psi/10 bar)



## Flow rate $q_n$ from 2 $\rightarrow$ 3 as a function of output pressure $p_2$

VPPM-8L-...-0L2H-... (29.4 psi/2 bar)



VPPM-8L-...-0L6H-... (88.2 psi/6 bar)



VPPM-8L-...-0L10H-... (147 psi/10 bar)



## Proportional pressure regulators VPPM, NPT

Technical data

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Operating and environmental conditions				
Pressure regulation range	[psi]	0 ... 29.4	0 ... 88.2	0 ... 147
	[bar]	0.02 ... 2	0.06 ... 6	0.1 ... 10
Operating medium		Filtered, unlubricated compressed air, grade of filtration 40 µm Neutral gases		
Supply pressure 1 <sup>2)</sup>	[bar]	2 ... 4	2 ... 8	2 ... 11
Max. pressure hysteresis	[mbar]	10	30	50
FS (full scale) linearity error	[%]	± 0.5		
FS (full scale) repetition accuracy	[%]	0.5		
Temperature coefficient	[%/°C]	0.04/1		
Ambient temperature	[°C]	0 ... 60		
Temperature of medium	[°C]	10 ... 50		
Note on materials		RoHS-compliant		
Corrosion resistance class	[CRC]	2 <sup>1)</sup>		

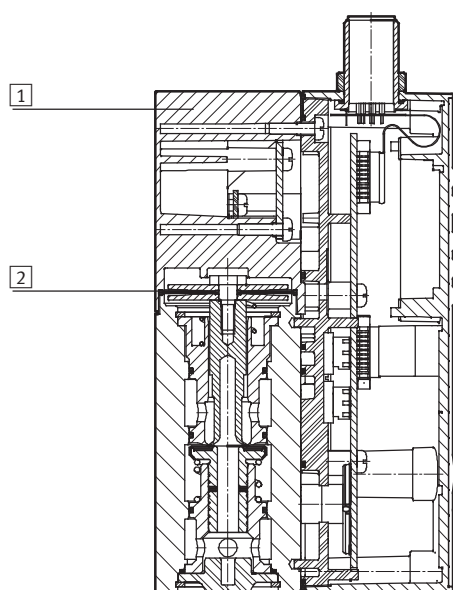
1) Corrosion resistance class 2 according to Festo standard 940 070

Components subject to moderate corrosion stress. Externally visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment or media such as coolants or lubricating agents.

2) Supply pressure 1 should always be 1 bar greater than the maximum regulated output pressure.

### Materials

Sectional view



1	Housing	Wrought aluminium alloy
2	Diaphragm	Nitrile rubber

# Proportional pressure regulators VPPM, NPT

Technical data

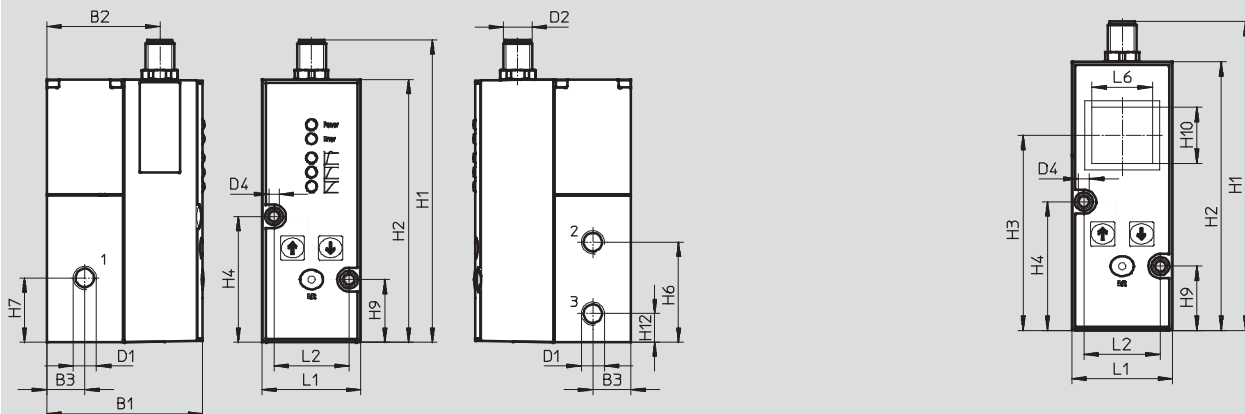
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## Dimensions

Download CAD Data → [www.festo.com/us/cad](http://www.festo.com/us/cad)

VPPM-6L

With LCD

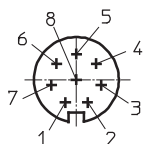


1 Socket head screw M4x65

Type	B1	B2	B3	D1 Ø	D2 Ø	D4 Ø	H1	H2	H3	H4	H6	H7	H9	H10	H12
VPPM-6L	65.5	47.5	16	1/8" NPT	M12	4.4	126.9	110.4	80.1	52.8	42	27	26.3	23	12

Type	L1	L2	L6
VPPM-6L	41.5	31.5	25

## M12 – Pin allocation



- |                           |                     |                     |
|---------------------------|---------------------|---------------------|
| 1 Digital input D1        | 4 Analogue input W+ | 7 0 V DC or GND     |
| 2 +24 V DC supply voltage | 5 Digital input D2  | 8 Digital output D3 |
| 3 Analogue input W-       | 6 Analogue output X |                     |

## Proportional pressure regulators VPPM, NPT

Technical data

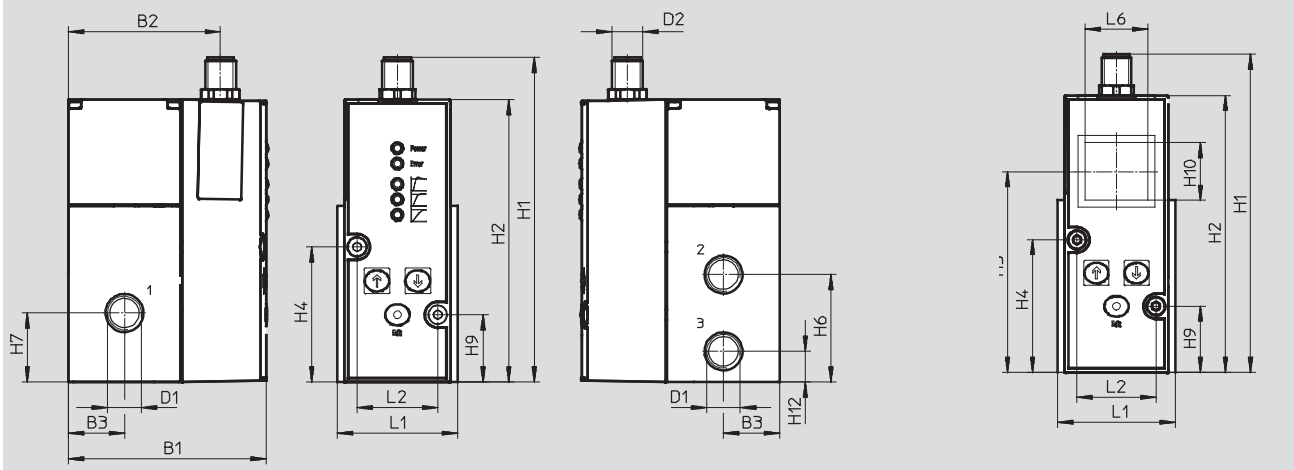
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### Dimensions

Download CAD Data → [www.festo.com/us/cad](http://www.festo.com/us/cad)

VPPM-8L

With LCD



Type	B1	B2	B3	D1 Ø	D2 Ø	H1	H2	H3	H4	H6	H7	H9	H10	H12
VPPM-8L	77.4	59.5	22	1/4" NPT	M12	126.9	110.4	80	52.8	42	27	26.3	23	12

Type	L1	L2	L6
VPPM-8L	47	31.5	25



# Proportional pressure regulators VPPM, NPT

Technical data

Ordering data				
Proportional pressure regulators VPPM	Pneumatic connection	Pressure regulation range [bar]	Part No.	Type
Voltage type 0 ... 10 V				
Overall accuracy 2%	1/8" NPT	0.02 ... 2	542211	VPPM-6L-L-1-N18-OL2H-V1N
		0.06 ... 6	542212	VPPM-6L-L-1-N18-OL6H-V1N
			558349	VPPM-6L-L-1-N18-OL6H-V1N-C1
			558343	VPPM-6L-L-1-N18-OL6H-V1P-C1
		0.1 ... 10	542213	VPPM-6L-L-1-N18-OL10H-V1N
Overall accuracy 1%	1/8" NPT	0.02 ... 2	542205	VPPM-6L-L-1-N18-OL2H-V1N-S1
		0.06 ... 6	542206	VPPM-6L-L-1-N18-OL6H-V1N-S1
		0.1 ... 10	542207	VPPM-6L-L-1-N18-OL10H-V1N-S1
			558348	VPPM-6L-L-1-N18-OL10H-V1N-S1C1
			558341	VPPM-6L-L-1-N18-OL10H-V1P-S1C1
			558348	VPPM-6L-L-1-N18-OL10H-V1N-S1C1
		Current type 4 ... 20 mA		
Overall accuracy 2%	1/8" NPT	0.02 ... 2	542214	VPPM-6L-L-1-N18-OL2H-A4N
		0.06 ... 6	542215	VPPM-6L-L-1-N18-OL6H-A4N
			558344	VPPM-6L-L-1-N18-OL6H-A4P-C1
		0.1 ... 10	542216	VPPM-6L-L-1-N18-OL10H-A4N
Overall accuracy 1%	1/8" NPT	0.02 ... 2	542208	VPPM-6L-L-1-N18-OL2H-A4N-S1
		0.06 ... 6	542209	VPPM-6L-L-1-N18-OL6H-A4N-S1
		0.1 ... 10	542210	VPPM-6L-L-1-N18-OL10H-A4N-S1
			558342	VPPM-6L-L-1-N18-OL10H-A4P-S1C1

## Proportional pressure regulators VPPM, NPT

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Ordering data – Modular products

Mandatory data →						
Module No.	Design	Nominal size	Valve type	Dynamic response	Valve operating mode	Connection type
546953 546954	VPPM (NPT)	6 8	L L	L	1	N18 N14
<b>Ordering example</b>						
<b>546953</b>	<b>VPPM</b>	<b>- 6</b>	<b>L</b>	<b>- L</b>	<b>- 1</b>	<b>- N18</b>

Ordering table					
Size	6	Condition s	Code	Enter code	
M Module No.	<b>546953</b>				
Design	Modular pressure regulator		<b>VPPM</b>		VPPM
Nominal size	6		<b>-6</b>		
	8		<b>-8</b>		
Valve type	In-line	<b>1</b>	<b>L</b>		
Dynamic response	Low dynamic response (pilot-actuated, soft-sealing)		<b>-L</b>		-L
Valve operating mode	3/2-way valve, normally closed		<b>-1</b>		-1
Connection type	NPT thread 1/8" NPT		<b>-N18</b>		
	NPT thread 1/4" NPT		<b>-N14</b>		

1 L Only with connection type N18, N14 (NPT thread 1/8" NPT, 1/4" NPT)

# Proportional pressure regulators VPPM, NPT

Ordering data – Modular products

FESTO

→ [M] Mandatory data					[O] Options	
Pressure regulation range	Alternative lower pressure regulation range	Alternative upper pressure regulation range	Setpoint specification	Switching output	Overall accuracy	Operator unit
0L2H 0L6H 0L10H	–	–	V1 A4	P N	S1	C1
–	6.5L	7.1H	– A4	P	– S1	C1

Ordering table					
Size	6	Condition s	Code		Enter code
↓ [M]	Pressure regulation range	0 ... 29.4 psi	–0L2H		
		0 ... 88.2 psi	–0L6H		
		0 ... 147 psi	–0L10H		
	Alternative lower pressure regulation range	–	[2] –...L		
	Alternative upper pressure regulation range	–	[3] ...H		
	Setpoint specification	Voltage (standard 0 ... 10 V)	–V1		
		Current (standard 4 ... 20 mA)	–A4		
	Switching output	PNP switching	P		
		NPN switching	N		
[O]	Overall accuracy	1%	–S1		
	Operator unit	With LCD, pressure unit variable	C1		

[2] ...L Not with pressure regulation range (0L2H, 0L6H, 0L10H).  
Must always be less than alternative upper pressure regulation range H

[3] ...H Not with pressure regulation range (0L2H, 0L6H, 0L10H).  
Must always be greater than alternative lower pressure regulation range L

Transfer order code

–    –   –

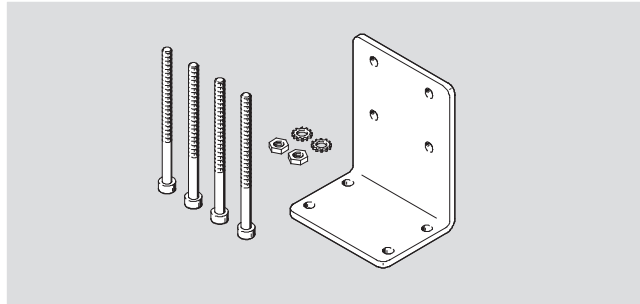
## Proportional pressure regulators VPPM, NPT

Accessories

**FESTO**

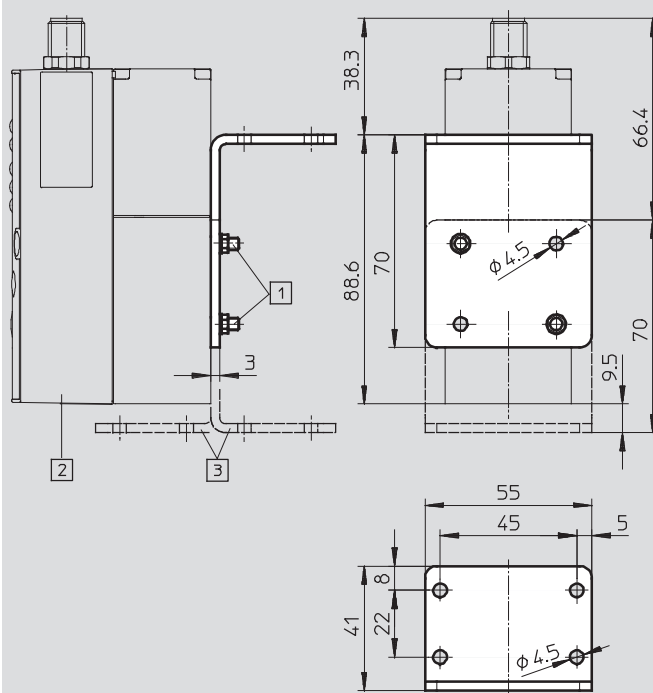
**Bracket**  
**VAME-P1-A**

Material:  
Wrought aluminium alloy, steel



### Dimensions

Download CAD Data → [www.festo.com/us/cad](http://www.festo.com/us/cad)



1 Socket head screw M4

2 Proportional pressure regulator  
VPPM

3 Bracket can be reversed if  
required

Ordering data			
Weight [g]	CRC	Part No.	Type
71	1 <sup>1)</sup>	542251	VAME-P1-A

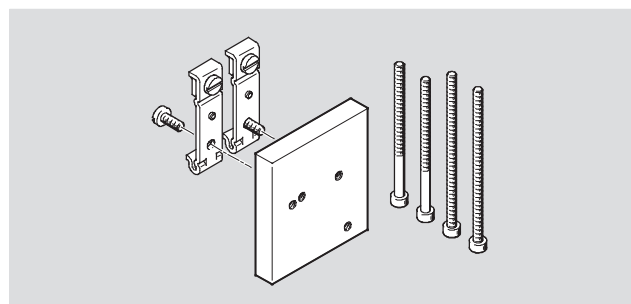
1) Corrosion resistance class 1 according to Festo standard 940 070  
Components subject to low corrosion stress. Transport and storage protection. Parts that do not have primarily decorative surface requirements, e.g. in internal areas that are not visible or behind covers.

## Proportional pressure regulators VPPM, NPT

Accessories

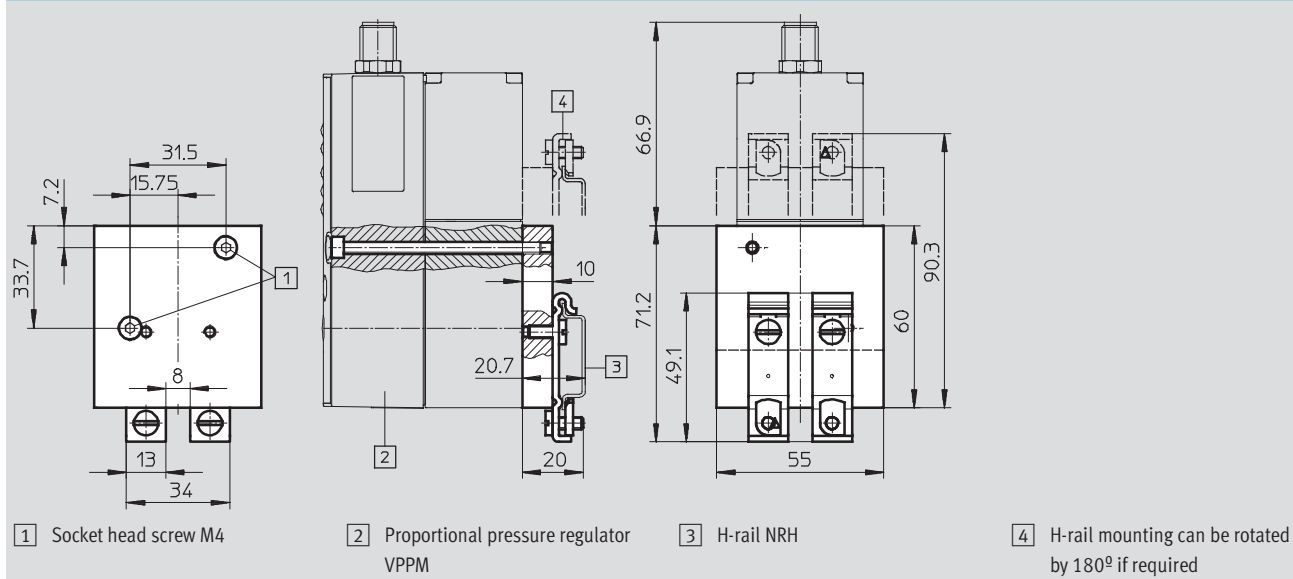
H-rail mounting  
VAME-P1-T

Material:  
Wrought aluminium alloy, steel



### Dimensions

Download CAD Data → [www.festo.com/us/cad](http://www.festo.com/us/cad)



### Ordering data

Weight [g]	CRC	Part No.	Type
150	1 <sup>1)</sup>	542255	VAME-P1-T

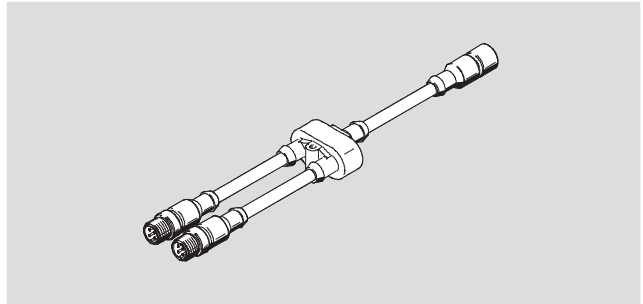
1) Corrosion resistance class 1 according to Festo standard 940 070  
Components subject to low corrosion stress. Transport and storage protection. Parts that do not have primarily decorative surface requirements, e.g. in internal areas that are not visible or behind covers.

## Proportional pressure regulators VPPM, NPT

Accessories

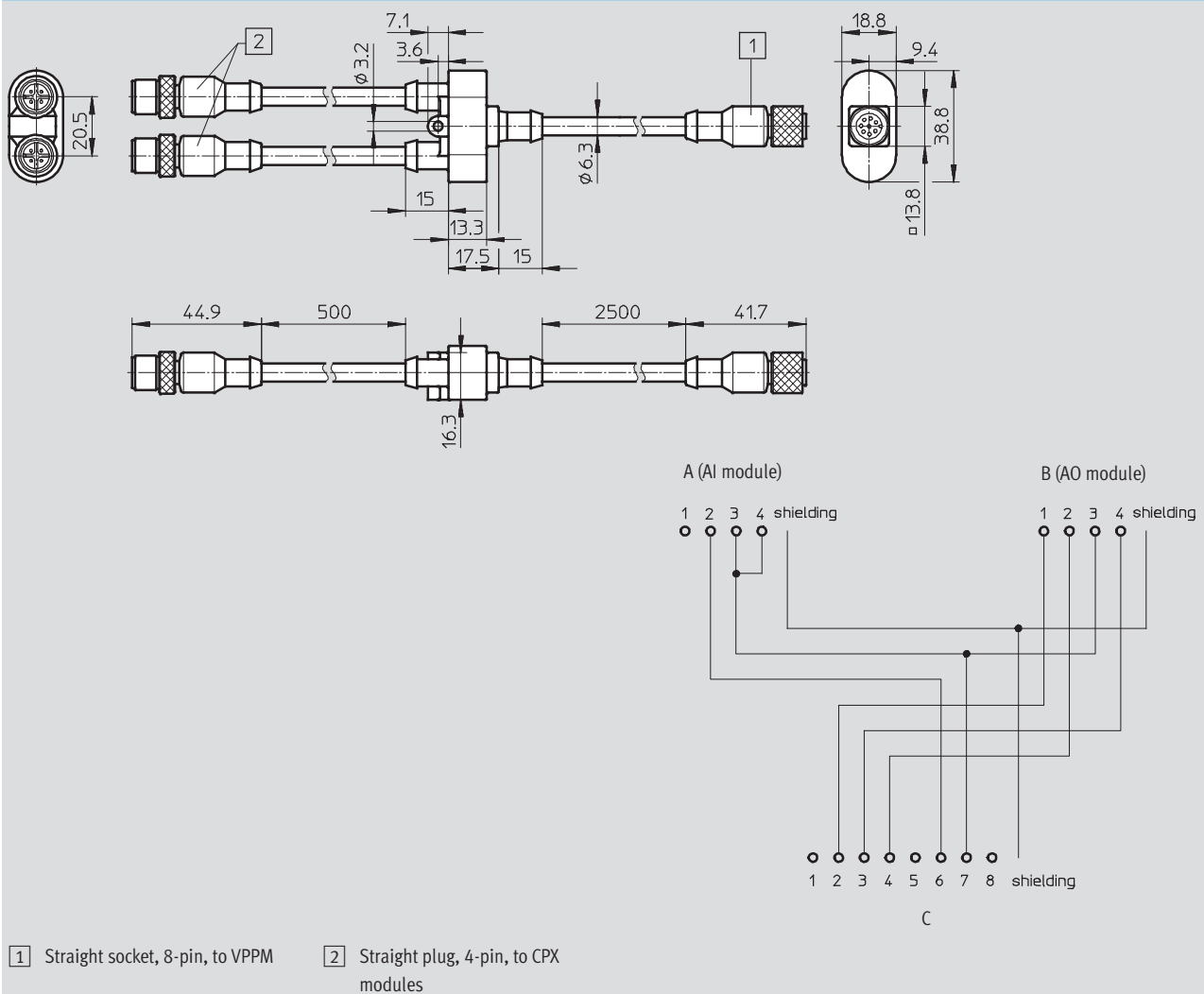
**Connecting cable**  
**NEBV-M12G8-KD-3-M12G4**

For connecting the proportional pressure regulator VPPM to the analogue input and output modules of the CPX terminal.



### Dimensions and pin allocation

Download CAD Data → [www.festo.com/us/cad](http://www.festo.com/us/cad)

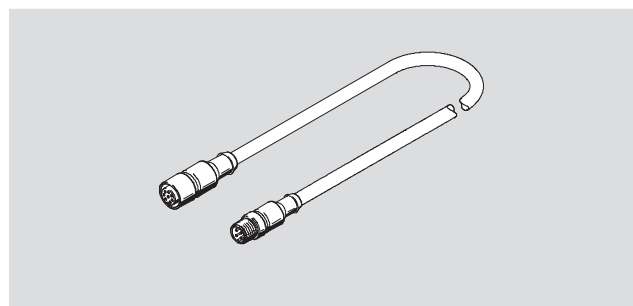


## Proportional pressure regulators VPPM, NPT

Accessories

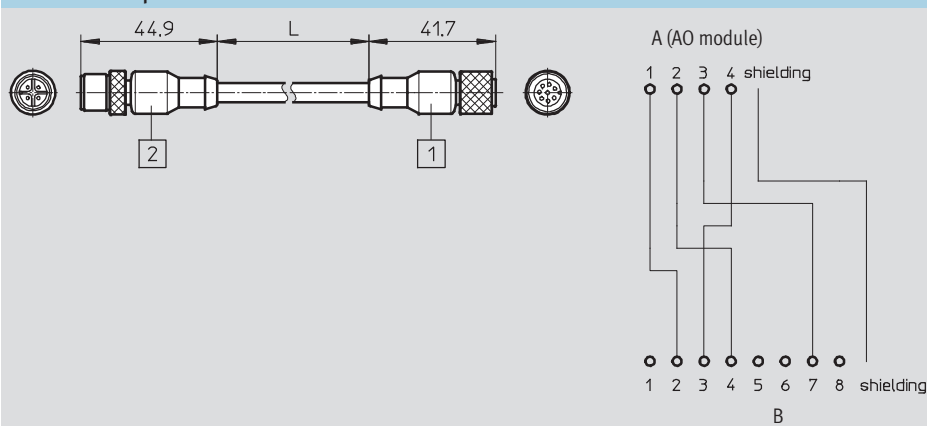
**Connecting cable**  
**NEBV-M12G8-K-5-M12G4**

For connecting the proportional pressure regulator VPPM to the analogue output modules of the CPX terminal.





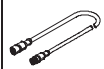
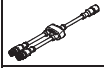
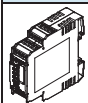
### Dimensions and pin allocation

Download CAD Data → [www.festo.com/us/cad](http://www.festo.com/us/cad)



Type	2	1	L
NEBV-M12G8-K-2-M12G4	Straight socket, M12, 8-pin, to VPPM	Straight plug, M12, 4-pin, to CPX module	2 m
NEBV-M12G8-K-5-M12G4			5 m

### Ordering data

	Description	Part No.	Type
Connecting cable			
Technical data → Internet: plug socket with cable			
	Straight socket, 8-pin, M12	2 m	525616 SIM-M12-8GD-2-PU
		5 m	525618 SIM-M12-8GD-5-PU
		10 m	570008 SIM-M12-8GD-10-PU
	Angled socket, 8-pin, M12	2 m	542256 NEBU-M12W8-2-N-LE8
		5 m	542257 NEBU-M12W8-5-N-LE8
		10 m	570007 NEBU-M12W8-10-N-LE8
	One straight socket, 8-pin, and one straight plug, 4-pin	2 m	553575 NEBV-M12G8-K-2-M12G4
		5 m	553576 NEBV-M12G8-K-5-M12G4
	One straight socket, 8-pin, and two straight plugs, 4-pin	547888	NEBV-M12G8-KD-3-M12G4
Setpoint module			
Technical data → Internet: mpz			
	Setpoint module for generating 6 + 1 analogue voltage signals	546224	MPZ-1-24DC-SGH-6-SW5

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