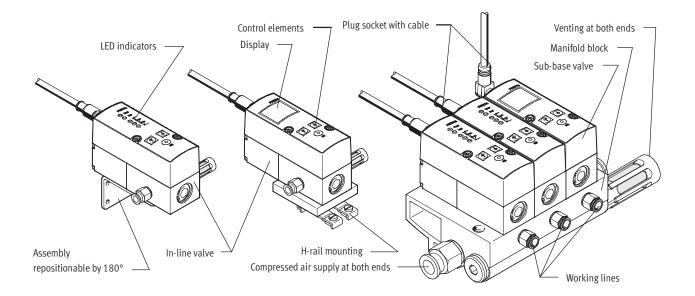
### **FESTO**



### **Proportional pressure regulators VPPM**General information





### Innovative

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

### Versatile

- Individual valves (in-line valve)
- Manifold valves (sub-base/flange
- · Various user interfaces
  - LED indicators
  - LCD display
  - Adjustment/selection buttons
- A 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 independent output
- Open circuit monitoring
- Pressure is maintained if the controller fails

### Easy to mount

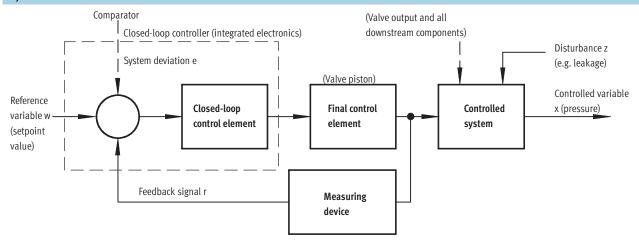
- Manifold block
- H-rail mounting
- Individually via mounting bracket
- QS fittings



General information



#### Layout of a control circuit



#### Layout

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 controlled variable x value (actual value, e.g. 3 bar) to the comparator as a feedback signal r. The closed-loop control element detects the system

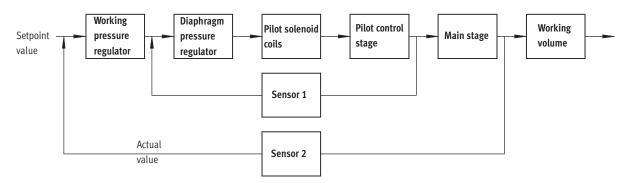
deviation e and actuates the final control element. The output of the final control element acts on the controlled system. The closed-loop control element thus attempts to compensate for the difference between the reference variable w and the controlled variable x by using the final control element.

#### 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 subcontrolled circuits that are easier to control for the specific task.

### Control precision

Multi-sensor control significantly improves control precision and dynamic

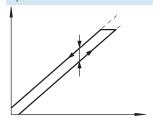
response in comparison with single-acting regulators.

General information

### **FESTO**

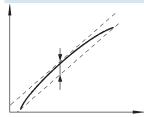
### Terms related to the proportional pressure regulator

#### Hysteresis



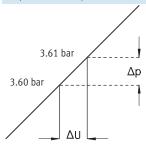
There is always a linear relationship within a certain tolerance between the setpoint value entered and the pressure output. Nevertheless it makes a difference whether the setpoint value is entered as rising or falling. The difference between the maximum deviations is referred to as hysteresis.

### 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.

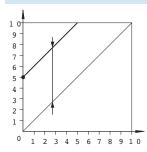
The smallest setpoint value difference that results in a change in the output pressure is referred to as the response sensitivity. In this case, 0.01 bar.

### Repetition accuracy (reproducibility)



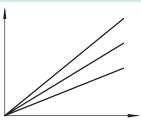
The repetition accuracy is the margin within which the fluid output variables are scattered when the same electrical input signal coming from the same direction is repeatedly adjusted. The repetition accuracy is expressed as a percentage of the maximum fluid output signal.

#### Zero offset



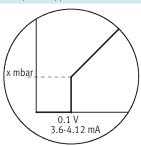
If, for example, a VPPM cannot be vented for safety reasons, the minimum pressure can be increased from the zero point. The smallest setpoint value is then assigned an output pressure of 5 bar, for example, and the largest setpoint value an output pressure of 10 bar. Zero suppression is automatically 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 there exists the possibility of residual voltage or residual current at the setpoint input of the VPPM via the setpoint generator.

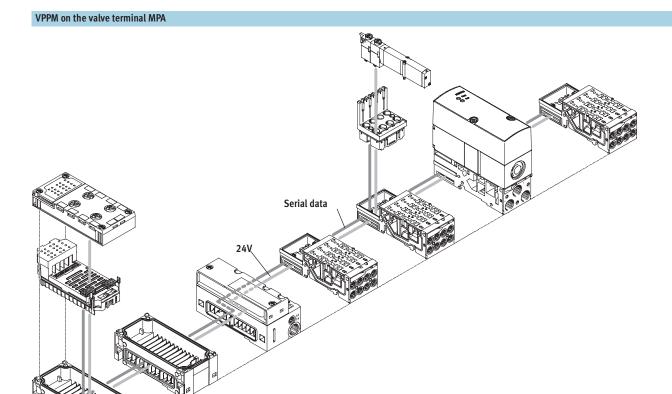
Zero point suppression is used so that

the valve is reliably vented at a setpoint value of zero.



### **Proportional pressure regulators VPPM**General information





### Innovative

- Multi-sensor control
- Diagnostics via bus
- Choice of regulation characteristics
- 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

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



# Proportional pressure regulators VPPM Product range overview

**FESTO** 

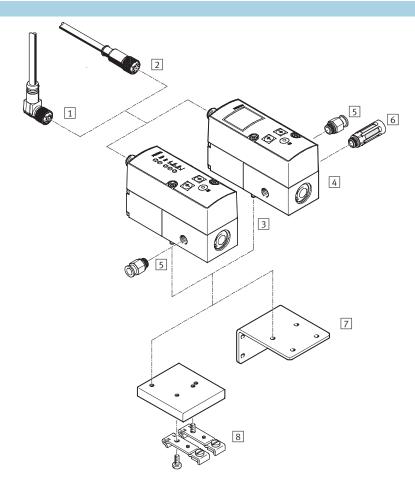
Function	Version		Pneumatic connection	Nominal diameter	Pressure regulation	Setpoint value in	Setpoint value input				
		design	1, 2, 3	pressurise/ exhaust	range	Voltage type	Current type	Digital			
				[mm]	[bar]	0 10 V	4 20 mA	-			
Pressure	With LED										
regulators	( in the second	Pilot actuated	G <sup>1</sup> / <sub>8</sub>	6/4.5	0.02 2				11		
	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	diaphragm			0.06 6	-	•	_			
		valve			0.1 10						
			Sub-base	6/4.5	0.02 2						
					0.06 6	-	-	-			
					0.1 10						
	With LCD	With LCD									
		Pilot actuated	G <sup>1</sup> /8	6/4.5	0.02 2				11		
	4 4 4 A	diaphragm			0.06 6	-	•	_			
		valve			0.1 10						
			Sub-base	6/4.5	0.02 2						
					0.06 6	-	-	-			
					0.1 10						
	With LED for val	ve terminal MPA									
	(E)	Pilot actuated	Manifold	6/4.5	0.02 2				11		
		diaphragm	block MPA		0.06 6						
		valve			0.1 10			•			



# Proportional pressure regulators VPPM Peripherals overview

**FESTO** 

### Individual valve



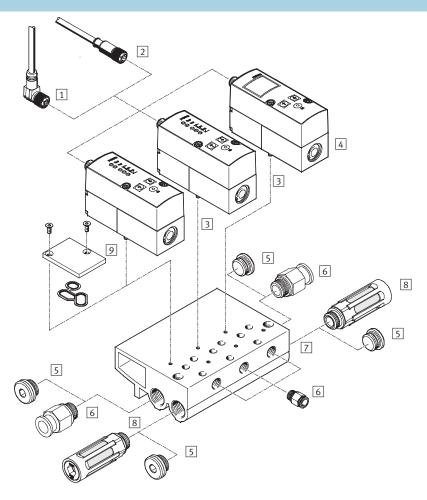
Accessories	Accessories							
	Brief description	→ Page/Internet						
1 Plug socket with cable, angled NEBU-M12W8	-	25						
2 Plug socket with cable, straight SIM-M12-8GD	-	25						
3 Proportional pressure regulator VPPM	Operator unit with LED	11						
4 Proportional pressure regulator VPPM	Operator unit with LCD	11						
5 Push-in fitting QS	For connecting compressed air tubing with standard outside diameter	qs						
6 Silencer	For fitting on exhaust ports	u						
7 Mounting bracket VAME-P1-A	For attaching the valve	22						
8 H-rail mounting VAME-P1-T	For mounting on a H-rail	20						



# Proportional pressure regulators VPPM Peripherals overview

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### Valve manifold



Acce	Accessories								
		Brief description	→ Page/Internet						
1	Plug socket with cable, angled	-	25						
	NEBU-M12W8								
2	Plug socket with cable, straight	-	25						
	SIM-M12-8GD								
3	Proportional pressure regulator	Operator unit with LED	11						
	VPPM								
4	Proportional pressure regulator	Operator unit with LCD	11						
	VPPM								
5	Blanking plug	-	b						
	В								
6	Push-in fitting	For connecting compressed air tubing with standard outside diameter	qs						
	QS								
7	Manifold block	-	20						
	VABM								
8	Silencer	For fitting on exhaust ports	u						
9	Blanking plate	For vacant position; seal and countersunk screws included in the scope of delivery	21						
	VABB-P1								



# **Proportional pressure regulators VPPM** System overview

**FESTO** 

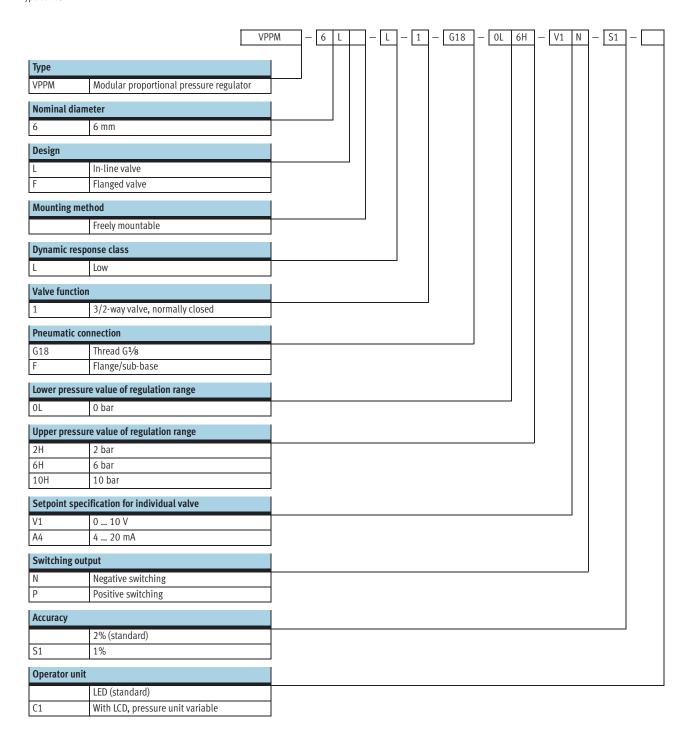
# VPPM for valve terminal MPA 1 2

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



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Type codes





### **Proportional pressure regulators VPPM** Technical data

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380 ... 1,400 l/min



- Pressure regulation range 0.02 ... 10 bar

### Variants

- Setpoint input as analogue voltage signal 0 ... 10 V
- Setpoint input as analogue current signal 4 ... 20 mA
- LED version
- With LCD display
- NPN or PNP switching output
- Integration in valve terminal via fieldbus



General technical data							
			G½8	Sub-base	Valve terminal MPA		
Constructional design			Pilot actuated d	liaphragm regulator			
Sealing principle			Soft				
Actuation type			Electric				
Type of control			Pilot actuated via 2/2-way valves				
Type of mounting			Via through-hol	e, via accessories			
Mounting position			Any				
Nominal diameter	Pressurisation	[mm]	6				
	Exhaust	[mm]	4.5				
Standard nominal flow rate		[l/min]	→ Graphs				
Product weight		[g]	400				

Electrical data							
			G½8	Sub-base	Valve terminal MPA		
Electrical connection			Plug, round des	sign, 8-pin, M12	Terminal linking		
Operating voltage range		[V DC]	24 ± 10% = 21	.6 26.4			
Residual ripple			10%				
Max. electrical power consumption		[W]	7				
Signal setpoint input	Voltage	[V DC]	0 10		Digitally via fieldbus		
	Current	[mA]	4 20				
Protection against short circuit			For all electrical connections				
Protection against polarity reversal			For all electrical connections				
Protection class		IP65					
CE mark		EU conformity in accordance with the directive 89/336/EEC (EMC)					



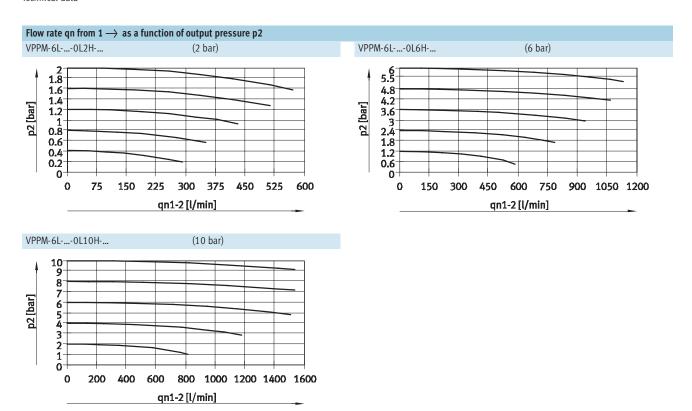
Note

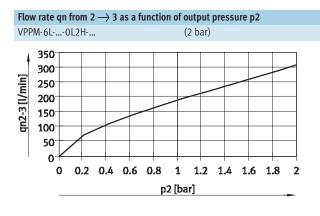
If the power supply cable is interrupted, output pressure is maintained unregulated.

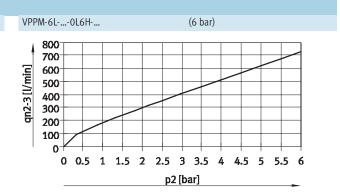


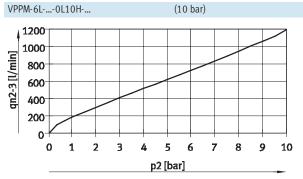
### **Proportional pressure regulators VPPM** Technical data

**FESTO** 











### **Proportional pressure regulators VPPM** Technical data

**FESTO** 

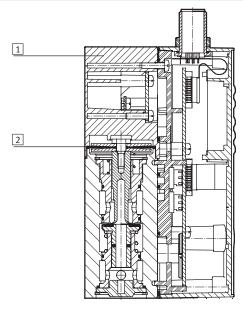
Operating and environmental conditions				
Pressure regulation range	[bar]	0.02 2	0.06 6	0.1 10
Operating medium		Compressed air, filtered, unlub	ricated, grade of filtration 40 μπ	1
		Neutral gases		
Supply pressure 1	[bar]	0 4 <sup>2)</sup>	0 8 <sup>2)</sup>	0 11 <sup>2)</sup>
Max. hysteresis	[mbar]	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		
Corrosion resistance	[CRC]	21)		

<sup>1)</sup> Corrosion resistance class 2 as per 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



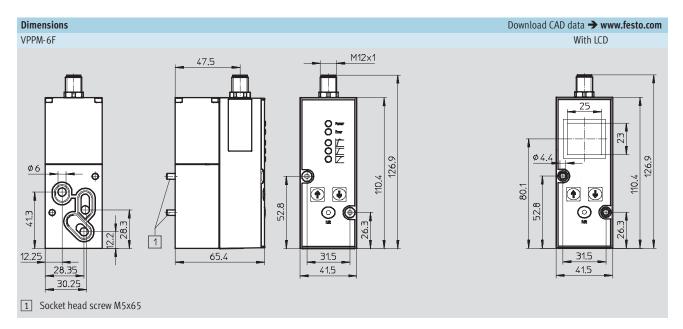


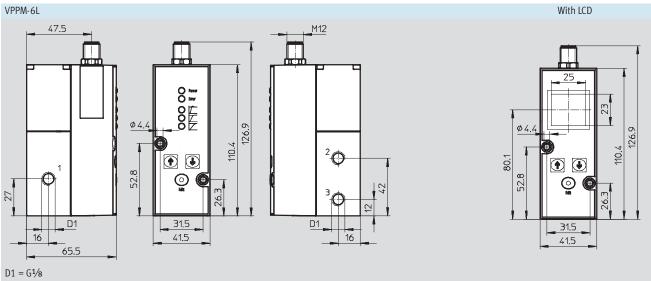
1	Housing	Wrought aluminium alloy
2	Diaphragm	Nitrile rubber



# **Proportional pressure regulators VPPM**Technical data

**FESTO** 





### M12 - Pin allocation

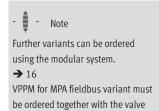


- Digital input D1
- DC +24 V supply voltage
- Analogue input W-
- Analogue input W+
- Digital input D2
- Analogue output X
- DC 0 V or GND
- Digital output D3

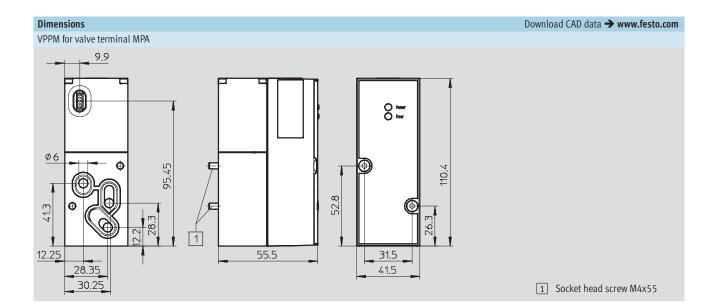


**FESTO** 

Ordering data							
Pneumatic connection	Pressure	Voltage type 0 10 V		Current type 4 20 mA			
	regulation range						
	[bar]	Part No.	Type	Part No.	Туре		
Overall accuracy 2%							
G <sup>1</sup> / <sub>8</sub>	0.02 2	542 233	VPPM-6L-L-1-G18-0L2H-V1N	542 236	VPPM-6L-L-1-G18-0L2H-A4N		
	0.06 6	542 234	VPPM-6L-L-1-G18-0L6H-V1N	542 237	VPPM-6L-L-1-G18-0L6H-A4N		
		554 043	VPPM-6L-L-1-G18-0L6H-V1P	554 045	VPPM-6L-L-1-G18-0L6H-A4P		
		558 337	VPPM-6L-L-1-G18-0L6H-V1P-C1	558 338	VPPM-6L-L-1-G18-0L6H-A4P-C1		
	0.1 10	542 235	VPPM-6L-L-1-G18-0L10H-V1N	542 238	VPPM-6L-L-1-G18-0L10H-A4N		
		554 044	VPPM-6L-L-1-G18-0L10H-V1P	554 046	VPPM-6L-L-1-G18-0L10H-A4P		
Sub-base	0.02 2	542 245	VPPM-6F-L-1-F-0L2H-V1N	542 248	VPPM-6F-L-1-F-0L2H-A4N		
	0.06 6	542 246	VPPM-6F-L-1-F-0L6H-V1N	542 249	VPPM-6F-L-1-F-0L6H-A4N		
		558 339	VPPM-6F-L-1-F-0L6H-V1P-C1	558 340	VPPM-6F-L-1-F-0L6H-A4P-C1		
		558 347	VPPM-6F-L-1-F-0L6H-V1N-C1	1			
	0.1 10	542 247	VPPM-6F-L-1-F-0L10H-V1N	542 250	VPPM-6F-L-1-F-0L10H-A4N		
Overall accuracy 1%							
G1/8	0.02 2	542 227	VPPM-6L-L-1-G18-0L2H-V1N-S1	542 230	VPPM-6L-L-1-G18-0L2H-A4N-S1		
	0.06 6	542 228	VPPM-6L-L-1-G18-0L6H-V1N-S1	542 231	VPPM-6L-L-1-G18-0L6H-A4N-S1		
		554 039	VPPM-6L-L-1-G18-0L6H-V1P-S1	554 041	VPPM-6L-L-1-G18-0L6H-A4P-S1		
	0.1 10	542 229	VPPM-6L-L-1-G18-0L10H-V1N-S1	542 232	VPPM-6L-L-1-G18-0L10H-A4N-S1		
		554 040	VPPM-6L-L-1-G18-0L10H-V1P-S1	554 042	VPPM-6L-L-1-G18-0L10H-A4P-S1		
		558 335	VPPM-6L-L-1-G18-0L10H-V1P-S1-C1	558 336	VPPM-6L-L-1-G18-0L10H-A4P-S1-C1		
Sub-base	0.02 2	542 239	VPPM-6F-L-1-F-0L2H-V1N-S1	542 242	VPPM-6F-L-1-F-0L2H-A4N-S1		
	0.06 6	542 240	VPPM-6F-L-1-F-0L6H-V1N-S1	542 243	VPPM-6F-L-1-F-0L6H-A4N-S1		
	0.1 10	542 241	VPPM-6F-L-1-F-0L10H-V1N-S1	542 244	VPPM-6F-L-1-F-0L10H-A4N-S1		



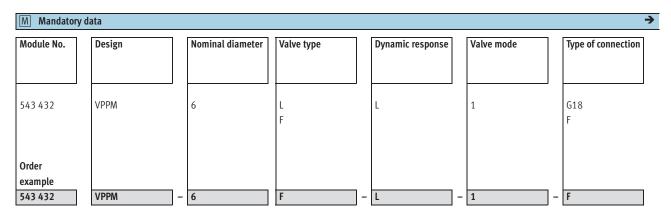
terminal.





### Proportional pressure regulators VPPM Ordering data – Modular products

**FESTO** 



0r	dering table				
Siz	e		Condi- tions	Code	Enter code
M	Module No.	543 432			
	Design	Modular pressure regulator		VPPM	VPPM
	Nominal diameter	6		-6	-6
	Valve type	In-line	1	L	
		Flanged valve	2	F	
	Dynamic response	Low dynamic response (pilot-actuated, soft-sealing)		-L	-L
	Valve mode	3/2-way valve, normally closed		-1	-1
	Type of connection	G½ thread		-G18	
Ψ		Flange/sub-base		-F	

Only with connection type F (flange/sub-base)



### **Proportional pressure regulators VPPM** Ordering data – Modular products

**FESTO** 

→ M Mandatory dat	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	0.1 10L	0.1 10H	V1 A4	P N	S1	C1
-	6.5L	7.1H -	- A4	P	- 51	C1

Or	dering table				
Siz	re	6	Condi- tions	Code	Enter code
Ψ	Pressure regulation range	0 2 bar		-0L2H	
M		0 6 bar		-0L6H	
		0 10 bar		-0L10H	
	Alternative lower pressure regulation range	0.1 10 bar	3	L	
	Alternative upper pressure regulation range	0.1 10 bar	4	Н	
	Setpoint specification	Voltage (standard 0 10 V)		-V1	
		Current (standard 4 20 mA)		-A4	
	Switching output	Positive switching		Р	
		Negative switching		N	
0	Overall accuracy	1%		-S1	
	Operator unit	With LCD, pressure unit variable		C1	

<sup>3 ...</sup>L Not with pressure regulation range (0L2H, 0L6H, 0L10H). Must always be less than alternative upper pressure regulation range H

	Transfer order code							
-		Ī		-	ll	-		

<sup>4 ...</sup> H Not with pressure regulation range (0L2H, 0L6H, 0L10H). Must always be greater than alternative lower pressure regulation range  ${\sf L}$ 

## **Proportional pressure regulators MPPE/VPPE/MPPES**Accessories



### Setpoint module MPZ



### Function

- Generation of 6+1 analogue setpoint values for the proportional pressure regulators MPPE, MPPES and MPYE
- Digital controller
- Output voltage adjustable via spindle potentiometer



General technical data						
Mode of operation			Digital-analogue circuit with analogue output			
Electrical connection			Screw terminal			
Connection cross section		[mm²]	2.5			
Operating voltage range		[V DC]	20 30			
Adjustable output voltage		[V DC]	0 10			
Max. output current		[mA]	27			
Power consumption at 24 V DC		[W]	1.5			
Supply setpoint value adjustment	Voltage	[V]	10 10.6			
	Current	[mA]	6 6.36			
External setpoint input	Voltage	[V DC]	0 10			
	Potentiometer	[kΩ]	2.5 10			
Setpoint controller	Input resistance	[kΩ]	3			
Residual ripple		[%]	Max. 10			
Display	Ready		Green LED			
	Setpoint active		Yellow LED			
Type of mounting			On H-rail			
Assembly position			Any			
Product weight		[g]	80			

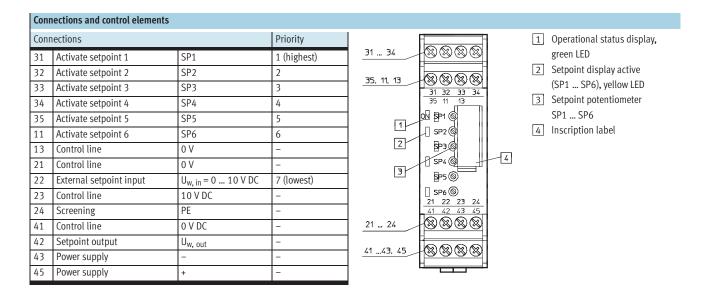
Operating and environmental conditions						
Ambient temperature [°C]	0 60					
Protection class	IP20					
CE symbol (declaration of conformity)	In accordance with EU EMC directive					
Corrosion resistance class CRC <sup>1)</sup>	2					

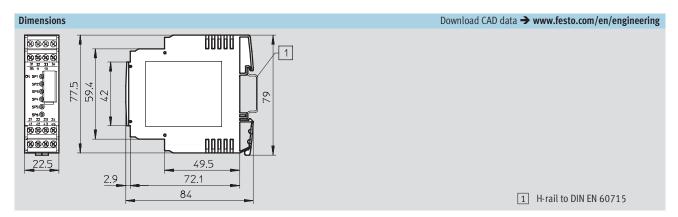
Corrosion resistance class 2 according to Festo standard 940 070 Components requiring moderate corrosion resistance. Externally visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment or media such as coolants or lubricating agents

### **Proportional pressure regulators MPPE/VPPE/MPPES**



Accessories





Ordering data			
	Description	Part No.	Туре
	Setpoint module for generating 6 + 1 analogue voltage signals	546 224	MPZ-1-24DC-SGH-6-SW

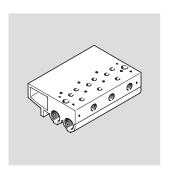


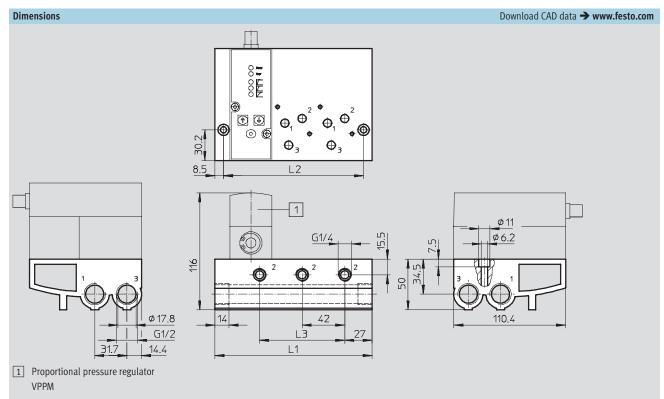
**FESTO** 

### Sub-base VABM-P1

Material:

Wrought aluminium alloy





Dimensions and o	Dimensions and ordering data										
Valve positions	L1	L2	L3	Weight	CRC <sup>1)</sup>	Part No.	Туре				
				[g]							
2	113	96	42	900	2	542 252	VABM-P1-SF-G18-2-P3				
3	155	138	84	1,230	2	542 253	VABM-P1-SF-G18-3-P3				
/-	197	180	126	1,565	2	542 254	VABM-P1-SF-G18-4-P3				

<sup>1)</sup> Corrosion resistance class 2 as per 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

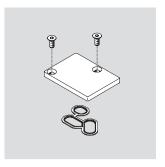


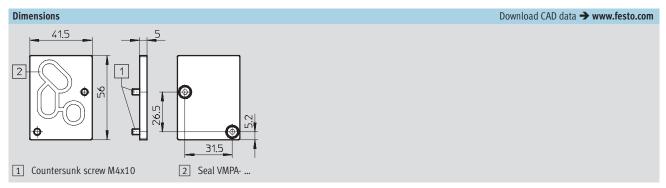
**FESTO** 

### Blanking plate VABB-P1

Material:

Wrought aluminium alloy, NBR, steel





Ordering data		
Weight	CRC	Part No. Type
[g]		
35	11)	558 350 VABB-P1

<sup>1)</sup> Corrosion resistance class 1 as per Festo standard 940 070 Components requiring low corrosion resistance. 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.

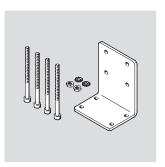


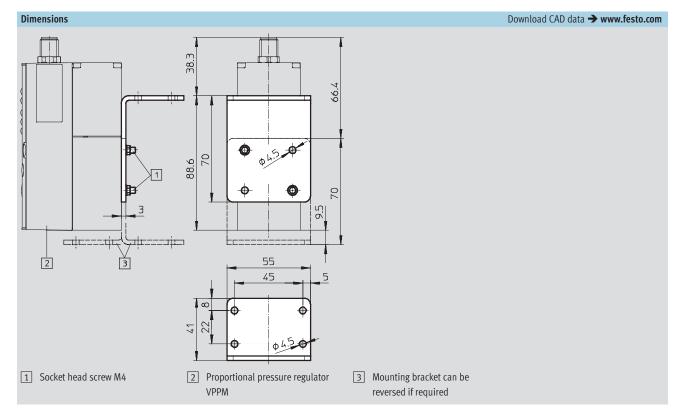
**FESTO** 

### Mounting bracket VAME-P1-A

Material:

Wrought aluminium alloy, steel





Ordering data			
Weight	CRC	Part No.	Туре
[g]			
71	1 <sup>1)</sup>	542 251	VAME-P1-A

<sup>1)</sup> Corrosion resistance class 1 as per Festo standard 940 070 Components requiring low corrosion resistance. 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.



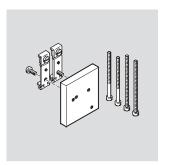
**FESTO** 

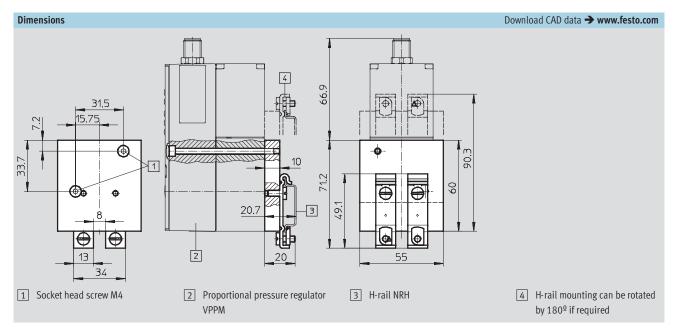
Accessorie

### H-rail mounting VAME-P1-T

Material:

Wrought aluminium alloy, steel





Ordering data			
Weight	CRC	Part No.	Туре
[g]			
150	1 <sup>1)</sup>	542 255	VAME-P1-T

<sup>1)</sup> Corrosion resistance class 1 as per Festo standard 940 070 Components requiring low corrosion resistance. 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.



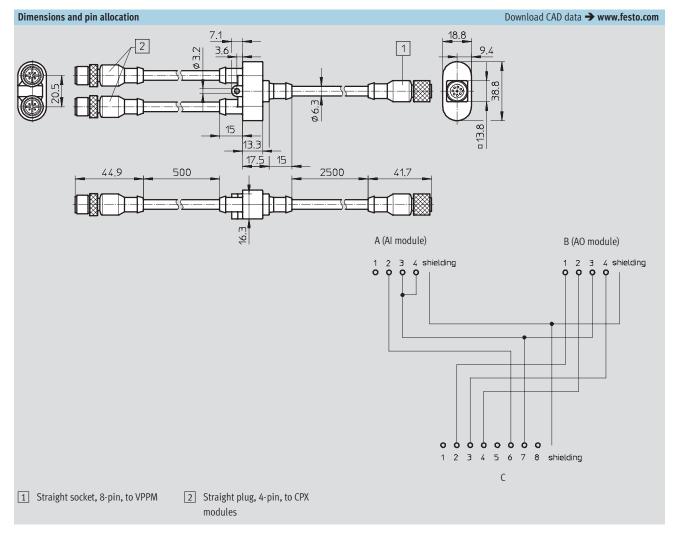
**FESTO** 

Accessories

Plug socket with cable NEBV-M12G8-KD-3-M12G4

For connecting the VPPM with the analogue input and output modules of the controller CPX.





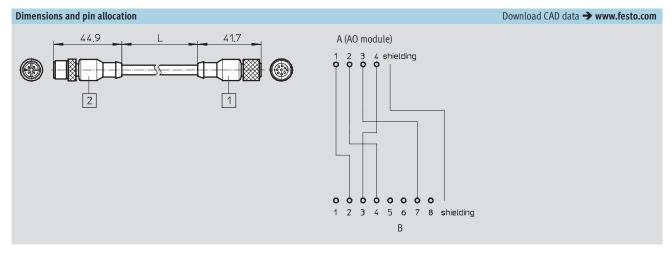


**FESTO** 

Plug socket with cable NEBV-M12G8-K-2-M12G4 NEBV-M12G8-K-5-M12G4

For connecting the VPPM with the analogue output modules of the controller CPX.





Туре	2	1	L1
NEBV-M12G8-K-2-M12G4	Straight socket, M12,	Straight plug, M12,	2 m
NEBV-M12G8-K-5-M12G4	8-pin to VPPM	4-pin to CPX module	5 m

Ordering data			
	Description	Cable length	Part No. Type
		[m]	
Plug socket with cable			Technical data → Internet: plug socket with cable
	Straight socket, 8-pin, M12	2	525 616 SIM-M12-8GD-2-PU
		5	525 618 SIM-M12-8GD-5-PU
	Angled socket, 8-pin, M12	2	542 256 NEBU-M12W8-2-N-LE8
		5	542 257 NEBU-M12W8-5-N-LE8
	One straight socket, 8-pin, and one straight plug, 4-pin	2	553 575 NEBV-M12G8-K-2-M12G4
DY DY		5	553 576 NEBV-M12G8-K-5-M12G4
A STATE OF THE STA	One straight socket, 8-pin, and two straight plugs, 4-pin	-	547 888 NEBV-M12G8-KD-3-M12G4

### **Product Range and Company Overview**

### **A Complete Suite of Automation Services**

Our experienced engineers provide complete support at every stage of your development process, including: conceptualization, analysis, engineering, design, assembly, documentation, validation, and production.



**Custom Automation Components**Complete custom engineered solutions



**Custom Control Cabinets**Comprehensive engineering support and on-site services



**Complete Systems**Shipment, stocking and storage services

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With a comprehensive line of more than 30,000 automation components, Festo is capable of solving the most complex automation requirements.



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**Pneumatics**Pneumatic linear and rotary actuators, valves, and air supply



PLC's and I/O Devices
PLC's, operator interfaces, sensors
and I/O devices

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Festo is a leading global manufacturer of pneumatic and electromechanical systems, components and controls for industrial automation, with more than 12,000 employees in 56 national headquarters serving more than 180 countries. For more than 80 years, Festo has continuously elevated the state of manufacturing with innovations and optimized motion control solutions that deliver higher performing, more profitable automated manufacturing and processing equipment. Our dedication to the advancement of automation extends beyond technology to the education and development of current and future automation and robotics designers with simulation tools, teaching programs, and on-site services.

#### Quality Assurance, ISO 9001 and ISO 14001 Certifications

Festo Corporation is committed to supply all Festo products and services that will meet or exceed our customers' requirements in product quality, delivery, customer service and satisfaction.

To meet this commitment, we strive to ensure a consistent, integrated, and systematic approach to management that will meet or exceed the requirements of the ISO 9001 standard for Quality Management and the ISO 14001 standard for Environmental Management.



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