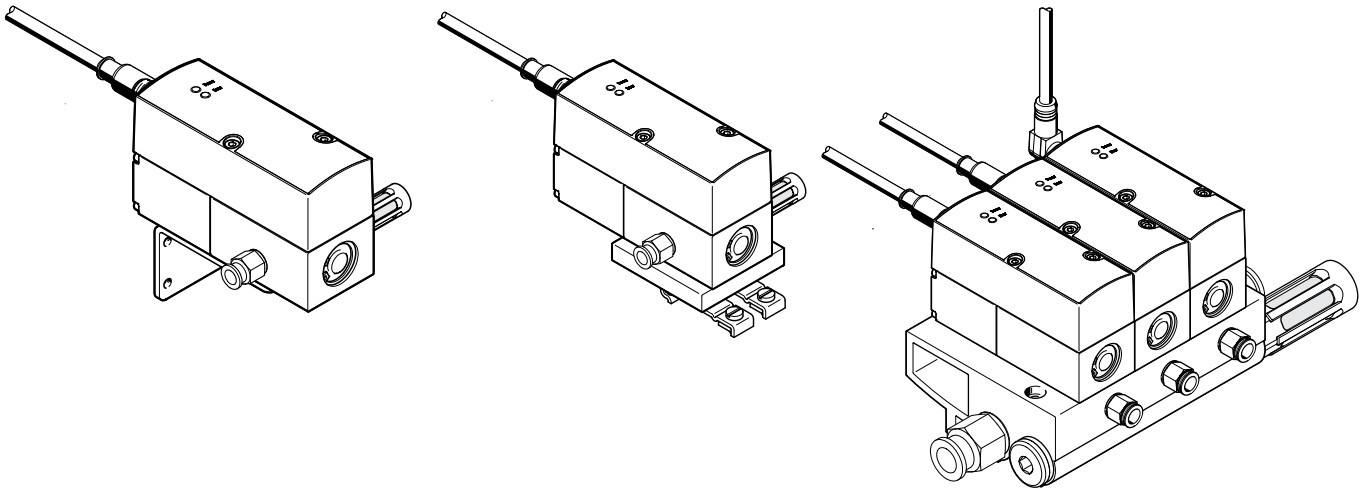
Proportional-pressure regulators VPPX

Key features – Design



Innovative

- Multi-sensor control (cascade control)
- Control characteristic adjustable via FCT
- Temperature compensated
- High dynamic response
- High repetition accuracy

Flexible

- Individual valves (in-line valve)
- Sub-base valves (manifold/flanged valve)
- Actual value input for external sensors
- Freely adjustable limit value
- Possible to control many physical variables
- Current or voltage can be set individually using FCT

Reliable

- Integrated pressure sensor with separate output
- Wire break monitoring
- Pressure is maintained if the control system fails
- LED display

Easy to install

- Manifold block (manifold)
- H-rail mounting
- Individually via mounting bracket
- QS fittings
- Mounting bracket can be installed in increments of 180°
- Compressed air supply/exhaust at both ends

Key features – Control

Overview of VPPX

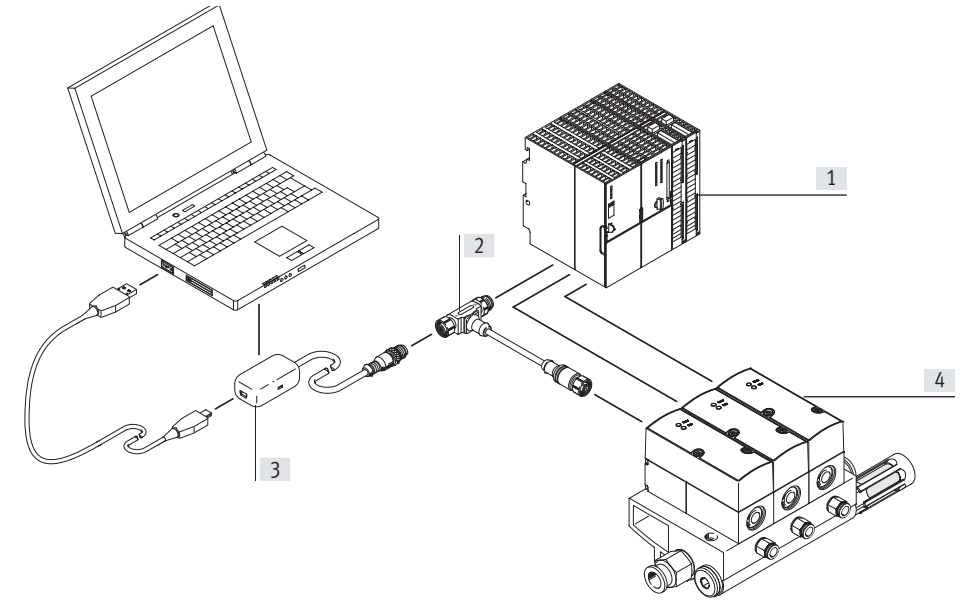
Parameterisation

Parameterisation of the proportional valve VPPX can be carried out using the Festo Configuration Tool.

The Festo Configuration Tool can be downloaded from the Support Portal.
➔ www.festo.com

The PC and the proportional valve VPPX are connected via a programming cable (VAVE) and the adapter (NEFC-M12G5-0.3-U1G5).

A standard USB connecting cable is used to connect the adapter to the PC.

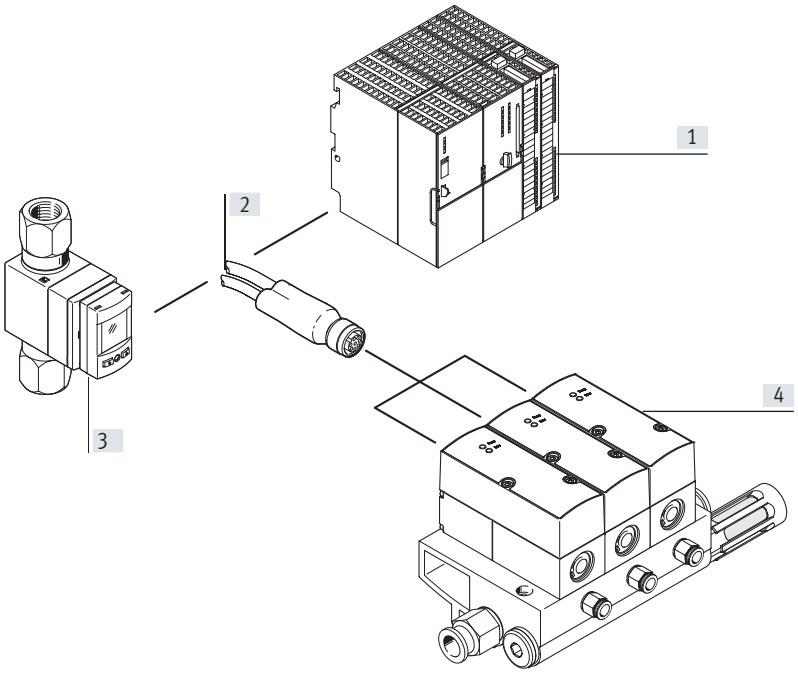


[1] PLC
[2] Programming cable VAVE
[3] Adapter NEFC
[4] Valve manifold assembly VPPX

Sensor connection

The DUO cable makes it easy to connect an external sensor to the VPPX.

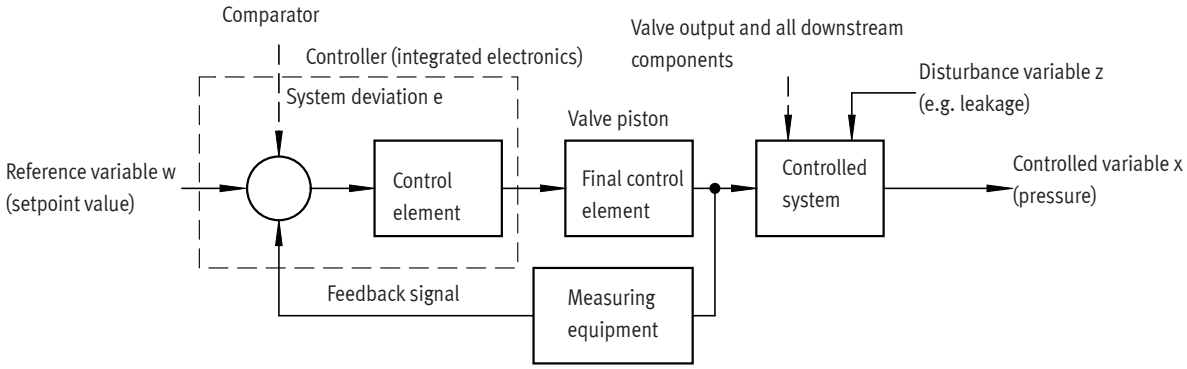
To ensure a secure connection, the sensor and valve signals are pre-assigned.



[1] PLC
[2] DUO cable NEDU
[3] Sensor SFAB
[4] Valve manifold assembly VPPX

Key features – Control circuit

Design of a control circuit



Design

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 equipment 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 occur 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 operation, 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 controller is attempting to correct the controlled variable x to the reference variable w.

Multi-sensor control (cascade control) of the VPPX

Cascade controller

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-sections that are easier to control for the specific task.

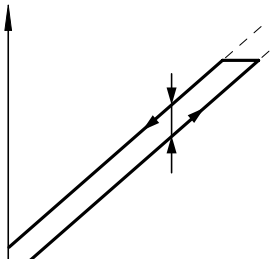
Control precision

Control accuracy and dynamic response are greatly improved with the multi-sensor control principle in comparison with a single-acting regulator.

Key features

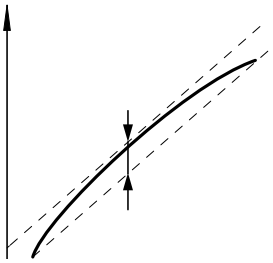
Terms related to the proportional-pressure regulator

Hysteresis



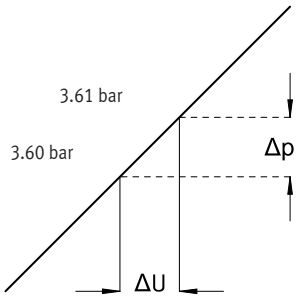
There is always a linear relationship within a certain tolerance between the setpoint value entered and the pressure output. Nevertheless, it makes a difference whether the setpoint value is entered as rising or falling. The difference between the maximum deviations is referred to as hysteresis.

Linearity error



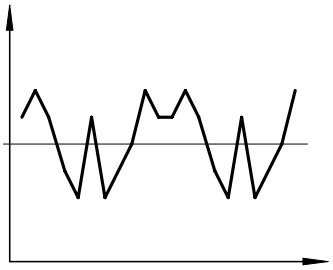
A perfectly linear progression of the control characteristic of the output pressure is theoretical. The maximum percentage deviation from this theoretical control characteristic is referred to as the linearity error. The percentage value refers to the maximum output pressure. (full scale)

Response sensitivity



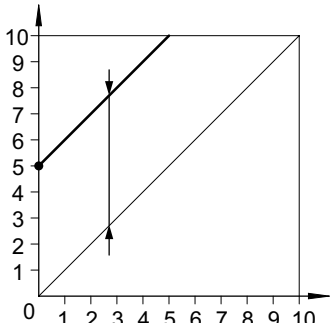
The response sensitivity of the device determines how sensitively one can change, i.e. adjust, a pressure.
The smallest setpoint value difference that results in a change in the output pressure is referred to as the response sensitivity.
In this case, 0.01 bar.

Repetition accuracy (reproducibility)



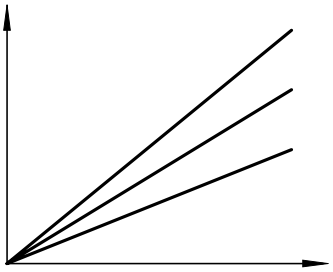
The repetition accuracy is the margin within which the fluid output variables are scattered when the same electrical input signal coming from the same direction is repeatedly adjusted. The repetition accuracy is expressed as a percentage of the maximum fluid output signal.

Zero offset



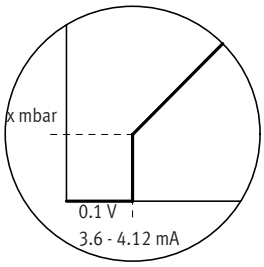
If, for example, a VPPX cannot be exhausted for safety reasons, the minimum pressure can be increased from the zero point. The smallest setpoint value is then assigned an output pressure of 5 bar, for example, and the largest setpoint value an output pressure of 10 bar. Zero point suppression is automatically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

Pressure range adaptation



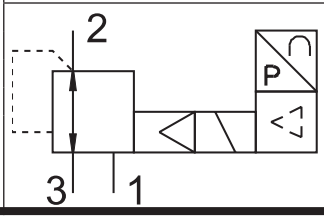
In the delivery status, 100% setpoint value corresponds to 100% of the fluid output signal. By adapting or adjusting the pressure range the fluid output variable can be matched to the setpoint value.

Zero point suppression



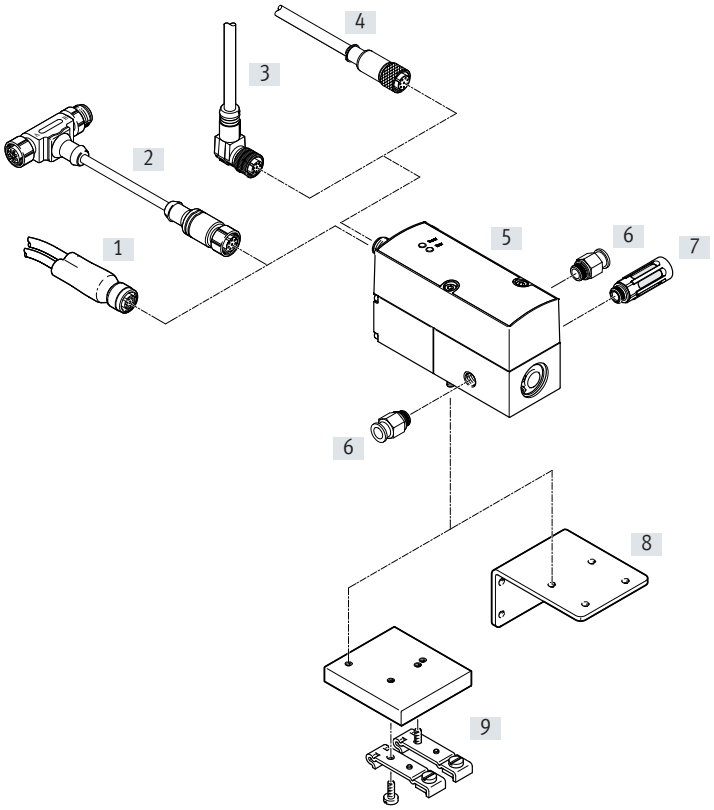
In practice there may be residual voltage or residual current at the setpoint input of the VPPX via the setpoint generator.
Zero point suppression is used so that the valve is reliably exhausted at a setpoint value of zero.

Product range overview

Function	Circuit symbol	Description	Pneumatic connection 1, 2, 3	Nominal width for pressurisation/exhaust [mm]	→ Page/ Internet
Pressure regulators	**LED operator unit (standard)**				
		• Piloted diaphragm valve • Pressure regulation range: 0.1 ... 10 bar • 0 ... 10 V DC, 0 ... 20 mA, 4 ... 20 mA (can be set using FCT)	G1/8	6/4.5	11
			Sub-base	6/4.5	
				8/7	
			G1/4	8/7	
			G1/2	1 2/12	

Peripherals overview

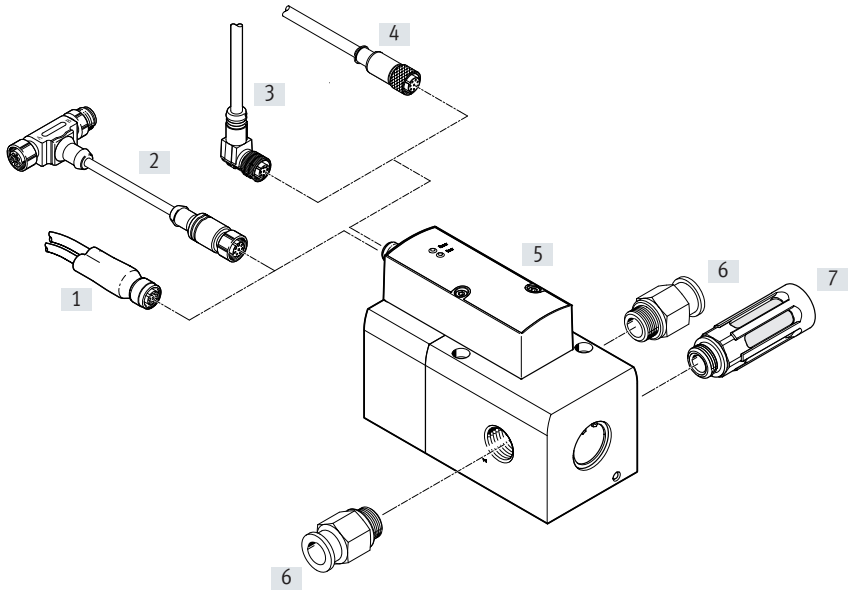
Individual valve VPPX-6L ..., VPPX-8L ...



Accessories			
		Description	→ Page/Internet
[1]	DUO cable	For connecting a sensor to the VPPX	23
[2]	Programming cable VAVE	For adapter NEFC, for the connection between the VPPX and PC	21
[3]	Plug socket with cable, angled NEBU-M12W8-...	–	21
[4]	Plug socket with cable, straight SIM-M12-8GD-...	–	21
[5]	Proportional-pressure regulator VPPX	Operator unit with LED	11
[6]	Push-in fitting QS	For connecting compressed air tubing with standard O.D.	qs
[7]	Silencer	For mounting in exhaust ports	u
[8]	Mounting bracket VAME-P1-A	For mounting the valve	19
[9]	H-rail mounting VAME-P1-T	For mounting on an H-rail	20

Peripherals overview

Individual valve VPPX-12L ...

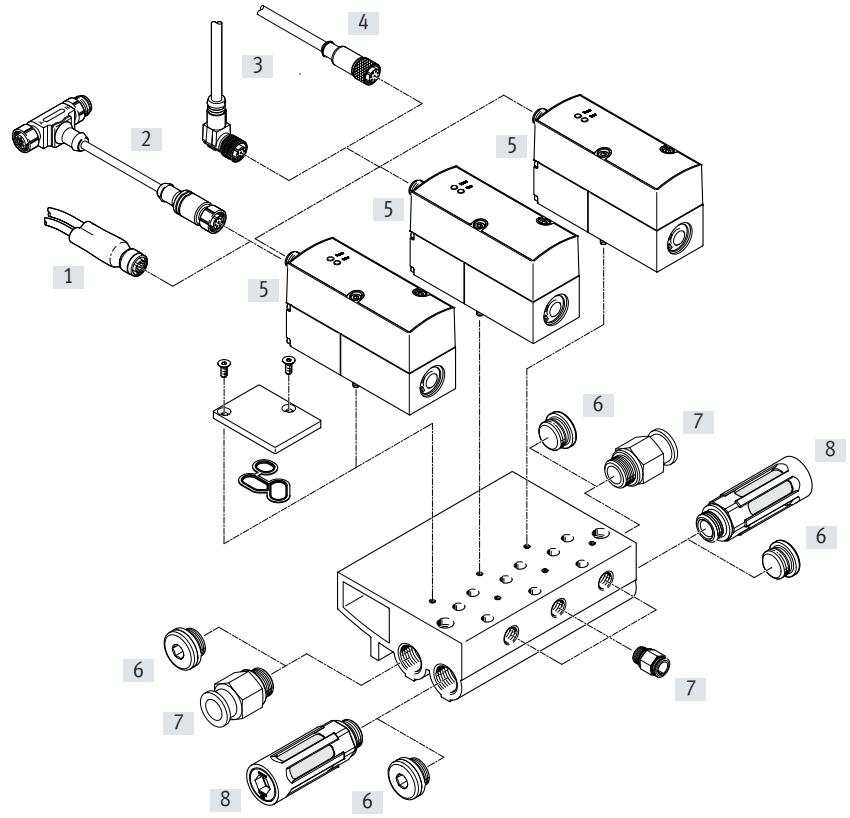


Accessories

		Description	→ Page/Internet
[1]	DUO cable	For connecting a sensor to the VPPX	23
[2]	Programming cable VAVE	For adapter NEFC, for the connection between the VPPX and PC	21
[3]	Plug socket with cable, angled NEBU-M12W8-...	–	21
[4]	Plug socket with cable, straight SIM-M12-8GD-...	–	21
[5]	Proportional-pressure regulator VPPX	Operator unit with LED	11
[6]	Push-in fitting QS	For connecting compressed air tubing with standard O.D.	qs
[7]	Silencer	For mounting in exhaust ports	u

Peripherals overview

Valve manifold assembly with VPPX-6F ..., VPPX-8F ...



Accessories			
		Description	→ Page/Internet
[1]	DUO cable	For connecting a sensor to the VPPX	23
[2]	Programming cable VAVE	For adapter NEFC, for the connection between the VPPX and PC	21
[3]	Plug socket with cable, angled NEBU-M12W8-...	–	21
[4]	Plug socket with cable, straight SIM-M12-8GD-...	–	21
[5]	Proportional-pressure regulator VPPX	Operator unit with LED	11
[6]	Blanking plug B	–	b
[7]	Push-in fitting QS	For connecting compressed air tubing with standard O.D.	qs
[8]	Silencer	For mounting in exhaust ports	u
[9]	Manifold block VABM	–	17
[10]	Cover plate VABB-P1	For vacant position; seal and countersunk screws included in the scope of delivery	18

Type codes

001	Nominal width [mm]	
6	6	
8	8	
12	12	

002	Directional control valve type	
F	Flanged valve	
L	In-line valve	

003	Dynamic response	
L	Low	

004	Valve function	
1	3/2-way valve, normally closed	

005	Pneumatic connection	
F	Flange/sub-base	
G18	G1/8	
G14	G1/4	
G12	G1/2	

006	Lower pressure value of control range	
0L	0 bar	

007	Upper pressure value of control range	
10H	10 bar	

008	Overall accuracy	
S1	1%	

Data sheet

- Flow rate
  1400 ... 7000 l/min

- Voltage
  21.6 ... 26.4 V DC

- Pressure regulation range
  0.02 ... 10 bar

Variants
- 0 ... 10 V, 0 ... 20 mA,
  4 ... 20 mA (can be set using FCT)
- External sensor input
- Actual value output can be set using
  FCT 0 ... 10 V, 0 ... 20 mA,
  4 ... 20 mA
- Programming interface

General technical data

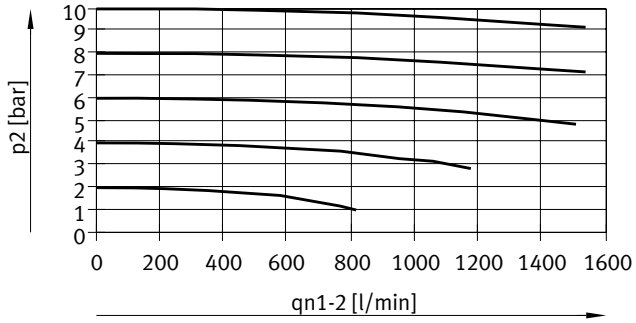
Connection			G1/8	G1/4	G1/2	Sub-base	
Valve function			3-way proportional-pressure regulator				
Design			Piloted diaphragm regulator				
Sealing principle			Soft				
Actuation type			Electrical				
Type of control			Piloted				
Reset method			Mechanical spring				
Type of mounting			Via through-hole, via accessories				
Mounting position			Any				
Nominal width	Pressurisation	[mm]	6	8	12	6	8
	Exhaust port	[mm]	4.5	7	12	4.5	7
Standard nominal flow rate		[l/min]	→ Graphs				
Product weight		[g]	400	560	2050	400	560

Electrical data

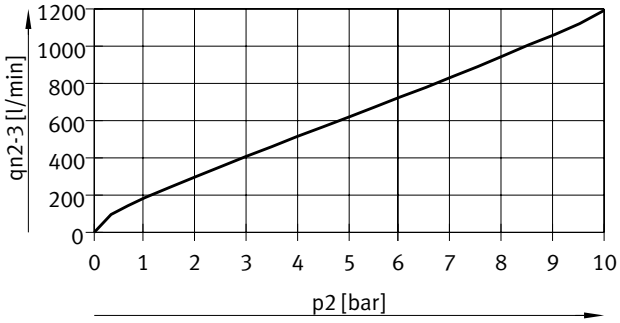
Type			VPPX-6	VPPX-8	VPPX-12
Electrical connection			Plug, round design, 8-pin, M12		
Operating voltage range		[V DC]	24 ± 10% = 21.6 ... 26.4		
Residual ripple		[%]	10		
Duty cycle		[%]	100		
Max. electrical power consumption		[W]	7	7	12
Setpoint input signal	Voltage	[V DC]	0 ... 10		
	Current	[mA]	0 ... 20, 4 ... 20		
Short circuit current rating			For all electrical connections		
Reverse polarity protection			For all electrical connections		
Degree of protection			IP65		

Data sheet

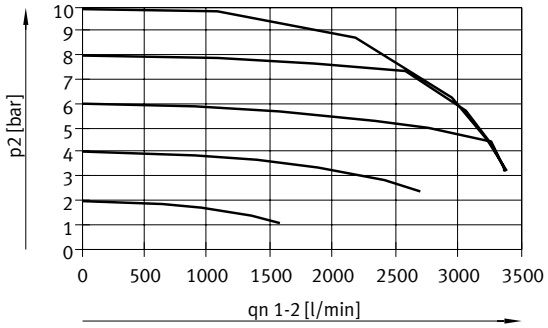
Flow rate qn from 1 › 2 as a function of output pressure p2
VPPX-6L/F-...-0L10H-... (10 bar)



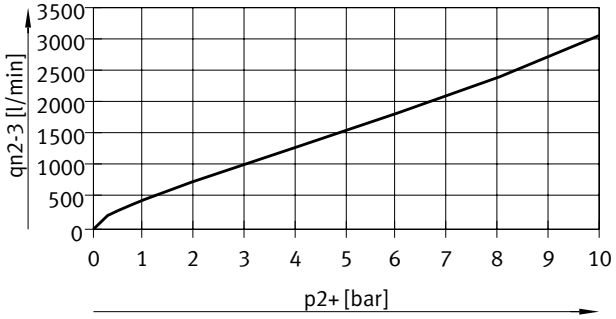
Flow rate qn from 2 › 3 as a function of output pressure p2
VPPX-6L/F-...-0L10H-... (10 bar)



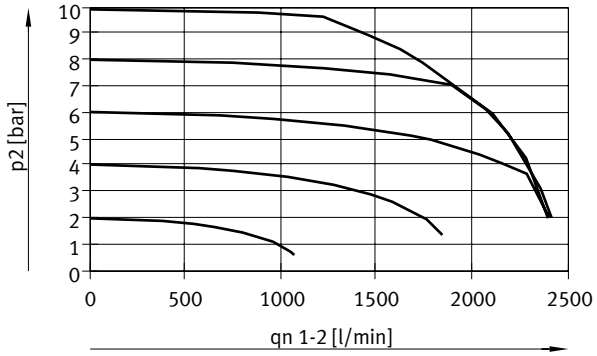
Flow rate qn from 1 › 2 as a function of output pressure p2
VPPX-8L-...-0L10H-... (10 bar)



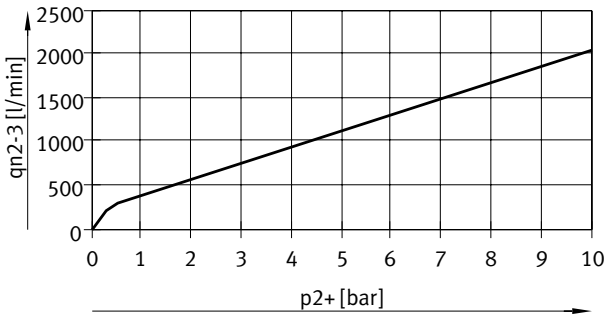
Flow rate qn from 2 › 3 as a function of output pressure p2
VPPX-8L-...-0L10H-... (10 bar)



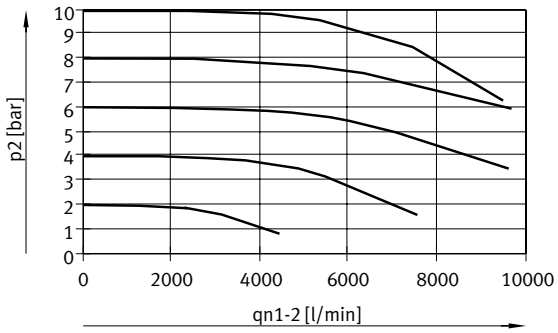
Flow rate qn from 1 › 2 as a function of output pressure p2
VPPX-8F-...-0L10H-... (10 bar)



Flow rate qn from 2 › 3 as a function of output pressure p2
VPPX-8F-...-0L10H-... (10 bar)



Flow rate qn from 1 › 2 as a function of output pressure p2
VPPX-12L-...-0L10H-... (10 bar)



Flow rate qn from 2 › 3 as a function of output pressure p2
VPPX-12L-...-0L10H-... (10 bar)

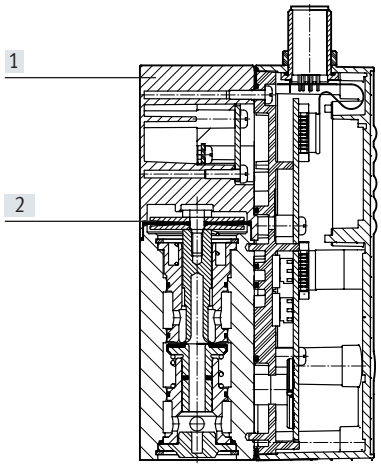
Data sheet

Operating and environmental conditions		
Operating medium		Compressed air to ISO 8573-1:2010 [7:4:4]
		Inert gases
Note on the operating/pilot medium		Lubricated operation not possible
Input pressure 1[1]	[bar]	0 ... 11
Pressure regulation range	[bar]	0.1 ... 10
Max. pressure hysteresis	[mbar]	50
Linearity error FS (full scale)	[%]	± 0.5
FS (full scale) repetition accuracy	[%]	0.5
Temperature coefficient	[%/K]	0.04
Ambient temperature, operator unit LED (standard)	[°C]	0 ... 60
Ambient temperature, operator unit with LCD	[°C]	0 ... 50
Temperature of medium	[°C]	10 ... 50
Note on materials		RoHS-compliant
Corrosion resistance class	[CRC]	2[2]
CE marking		To EU EMC Directive (see declaration of conformity)[3]
Certification		RCM
		c UL us listed (OL)

1) Supply pressure 1 should always be 1 bar greater than the maximum regulated output pressure.
2) Corrosion resistance class CRC 2 to Festo standard FN 940070
Moderate corrosion stress. Indoor applications in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.
3) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/... → Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

Materials

Sectional view of VPPX-6 ..., VPPX-8 ...

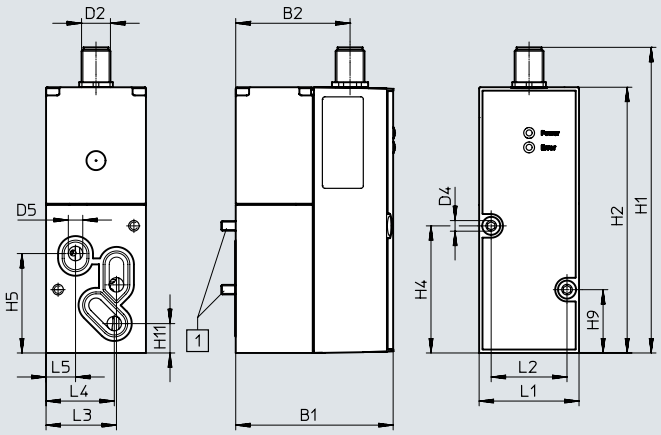


[1]	Housing	Wrought aluminium alloy
[2]	Diaphragm	NBR

Data sheet

Dimensions Download CAD data ➔ www.festo.com

VPPX-6F

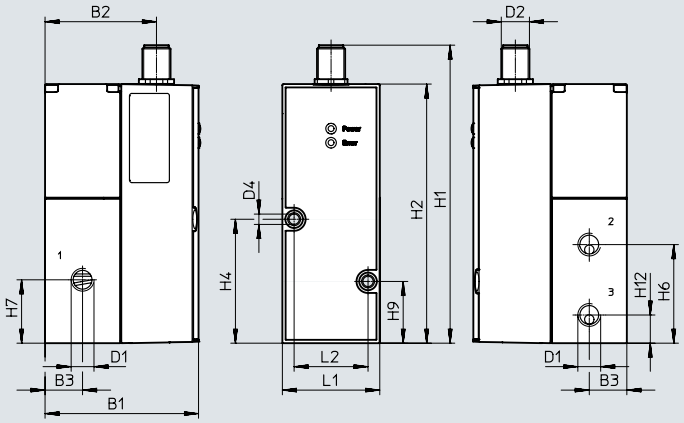


[1] Socket head screw M4x65

Type	B1	B2	D2	D4 ⌀	D5 ⌀	H1	H2	H4	H5	H8	H9	H11
VPPX-6F	65.4	47.5	M12	4.4	6	126.9	110.4	52.8	41.3	28.3	26.3	12.2

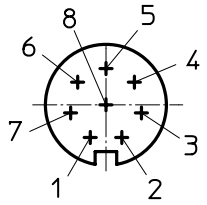
Type	L1	L2	L3	L4	L5
VPPX-6F	41.5	31.5	29.3	28.4	12.3

VPPX-6L



Type	B1	B2	B3	D1	D2	D4 ⌀	H1	H2	H4	H6	H7	H9	H12	L1	L2
VPPX-6L	65.5	47.5	16	G1/8	M12	4.4	126.9	110.4	52.8	42	27	26.3	12	41.5	31.5

M12 – Pin allocation

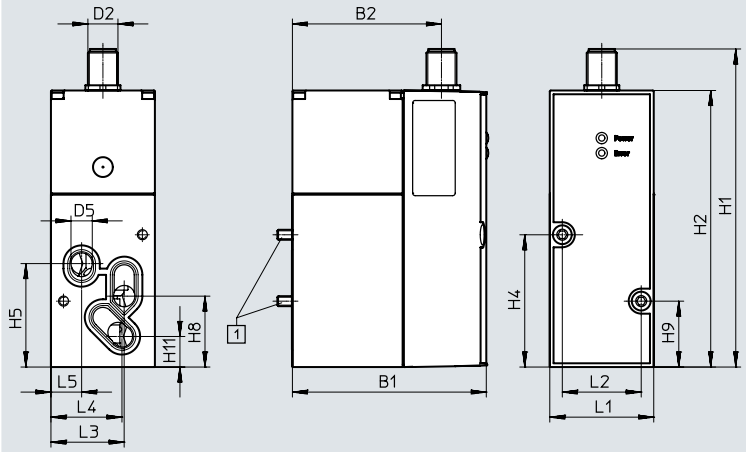


1 Do not connect Tx_PC
2 +24 V DC supply voltage
3 Analogue input W–
4 Analogue input W+
5 Do not connect Rx_PC
6 Analogue output X
7 0 V DC or GND
8 Input for ext. sensor signal +

Data sheet

Dimensions Download CAD data ➔ www.festo.com

VPPX-8F

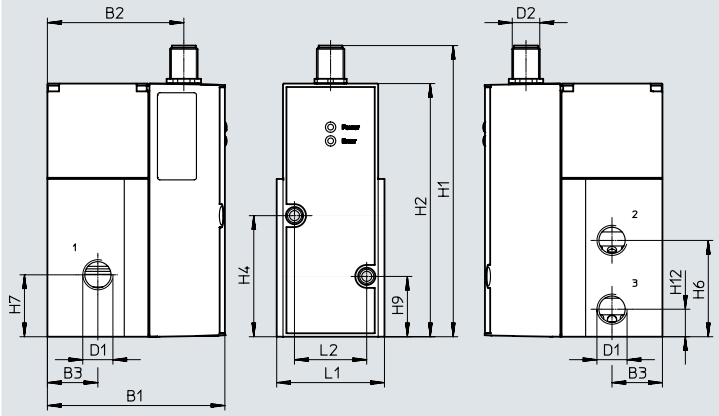


[1] Socket head screw M4x77

Type	B1	B2	D2	D5 ø	H1	H2	H4	H5	H8	H9	H11
VPPX-8F	77.4	59.5	M12	8.5	126.9	110.4	52.8	41.3	28.3	26.3	12.2

Type	L1	L2	L3	L4	L5
VPPX-8F	41.5	31.5	29.3	28.4	12.3

VPPX-8L

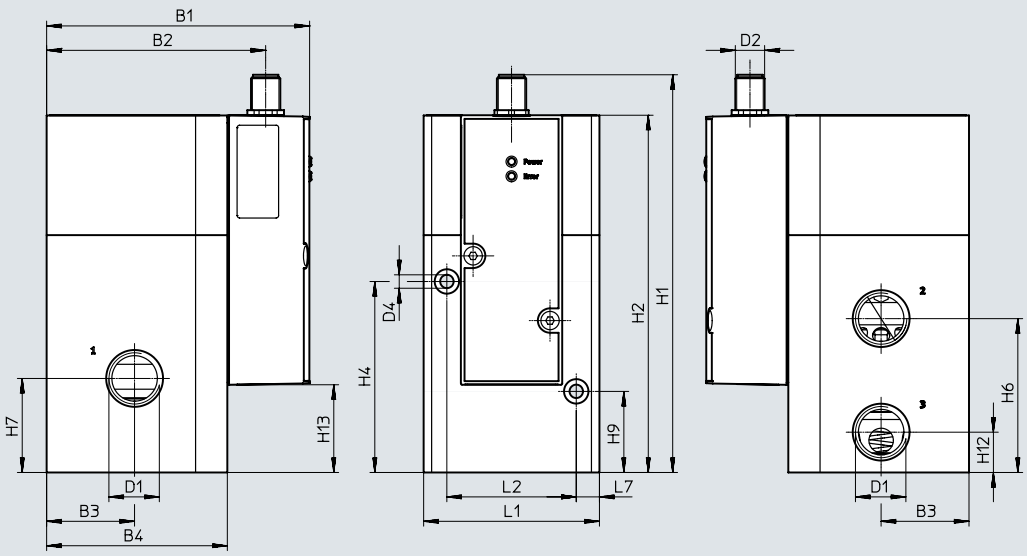


Type	B1	B2	B3	D1	D2	H1	H2	H4	H6	H7	H9	H12	L1	L2
VPPX-8L	77.4	59.5	22	G1/4	M12	126.9	110.4	52.8	42	27	26.3	12	47	31.5

Data sheet

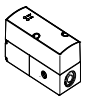
Dimensions Download CAD data ➔ www.festo.com

VPPX-12L



Type	B1	B2	B3	B4	D1	D2	H1	H2	H4	H6	H7	H9	H12	L1	L2	L7
VPPX-12L	107.3	89.4	36	74	G1/2	M12	162.8	146.3	78.2	63	38.5	33.2	16.5	72	53	9.5

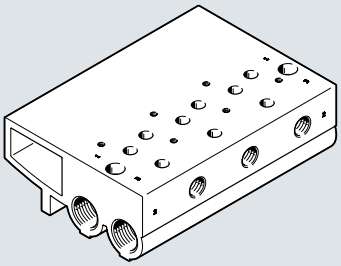
Ordering data

Proportional-pressure regulators VPPX	Pneumatic connection 1, 2, 3	Part no.	Type
	G1/8	**570967**	**VPPX-6L-L-1-G18-0L10H-S1**
	G1/4	**570969**	**VPPX-8L-L-1-G14-0L10H-S1**
	G1/2	**2448444**	**VPPX-12L-L-1-G12-0L10H-S1**
	Sub-base	**570968**	**VPPX-6F-L-1-F-0L10H-S1**
		570970	**VPPX-8F-L-1-F-0L10H-S1**

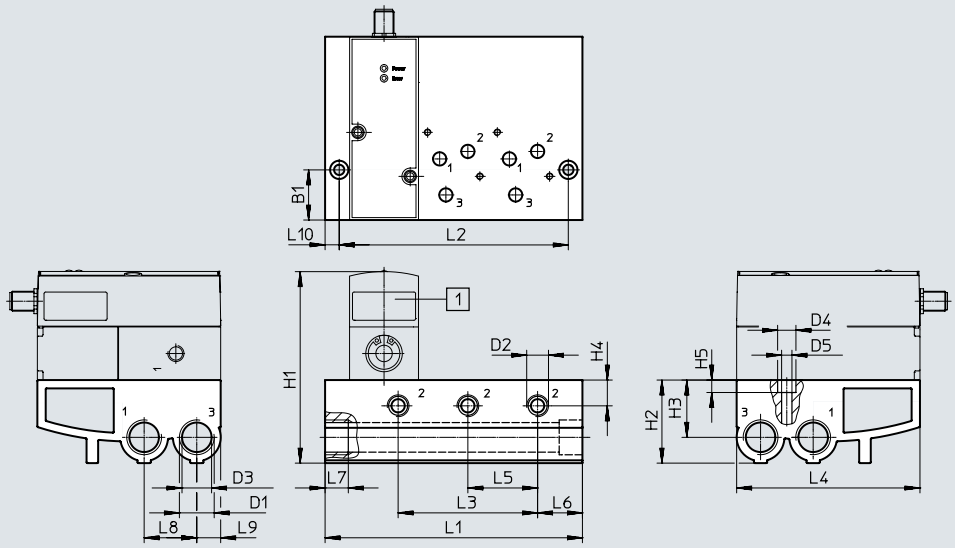
Accessories

Manifold block
VABM-P1

Material:
Wrought aluminium alloy



Dimensions Download CAD data ➔ www.festo.com



[1] Proportional pressure regulator VPPX

Dimensions and ordering data

Valve positions	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
2	113	96	42	110.4	42	27	14	31.7	14.4	8.5
3	155	138	84	110.4	42	27	14	31.7	14.4	8.5
4	197	180	126	110.4	42	27	14	31.7	14.4	8.5

Dimensions and ordering data

Valve positions	B1	D1	D2	D3 ø	D4	D5	H1	H2	H3	H4	H5	Part no.	Type
2	30.2	G1/2	G1/4	17.8	11	6.2	116	50	34.5	15.5	7.5	**542252**	**VABM-P1-SF-G14-2-P3**
3	30.2	G1/2	G1/4	17.8	11	6.2	116	50	34.5	15.5	7.5	**542253**	**VABM-P1-SF-G14-3-P3**
4	30.2	G1/2	G1/4	17.8	11	6.2	116	50	34.5	15.5	7.5	**542254**	**VABM-P1-SF-G14-4-P3**

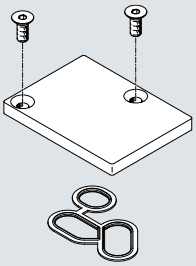
Note

In combination with manifold block VABM-P1- ..., sub-base valves VPPX-6F- ... and VPPX-8F- ... should be used.

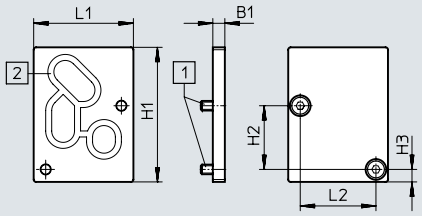
Accessories

Cover plate
VABB-P1

Material:
- Wrought aluminium alloy
- NBR
- Steel



Dimensions Download CAD data ➔ www.festo.com



[1] Countersunk screw M4x10

[2] Seal VMPA- ...

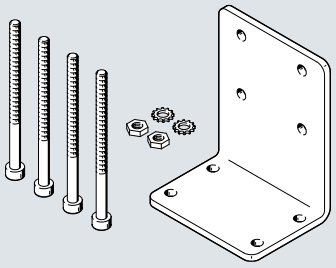
Dimensions and ordering data

B1	H1	H2	H3	L1	L2	Part no.	Type
5	56	26.5	5.2	41.5	31.5	**558350**	**VABB-P1**

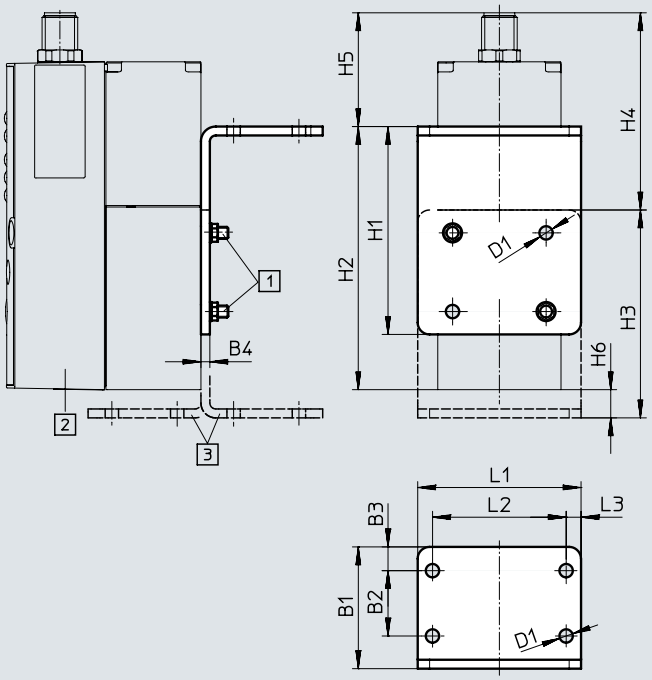
Accessories

Bracket
VAME-P1-A

Material:
- Wrought aluminium alloy
- Steel



Dimensions Download CAD data ➔ www.festo.com



[1] Socket head screw M4

[2] Proportional-pressure regulator VPPX

[3] Bracket can be reversed if required

Dimensions and ordering data

B1	B2	B3	B4	D1 ø	H1	H2	H3	H4	H5	H6	L1	L2	L3	Part no.	Type
41	22	8	3	4.5	70	88.6	70	66.4	38.3	9.5	55	45	5	**542251**	**VAME-P1-A**

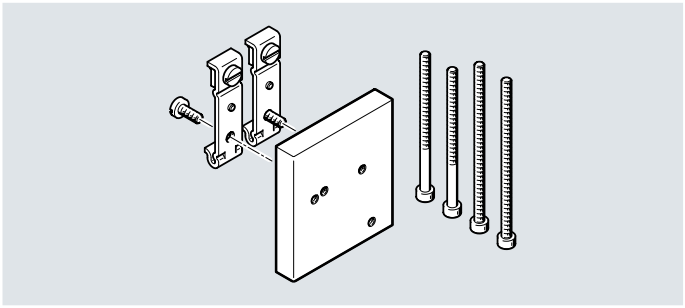
Note

In-line valves VPPX-6L- ... and VPPX-8L- ... must be used in combination with the bracket VAME-P1- A.

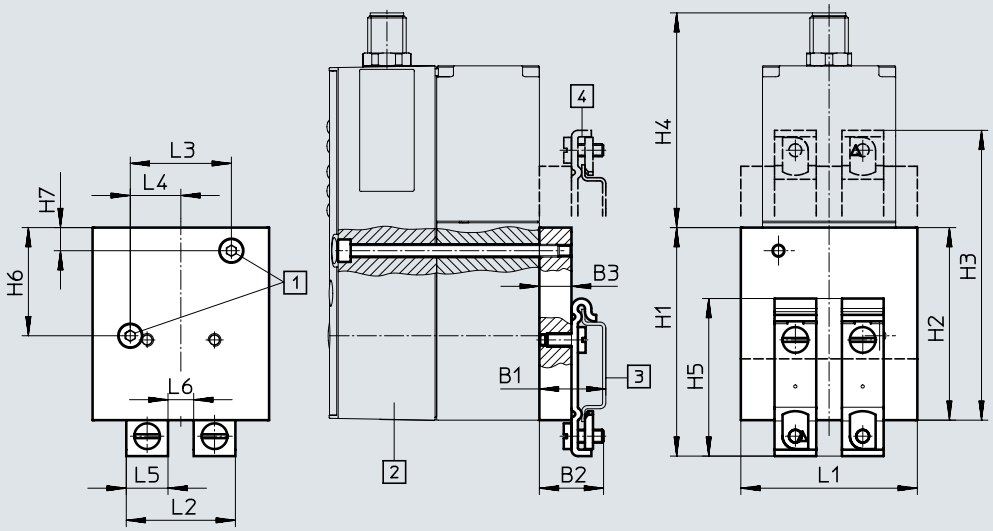
Accessories

H-rail mounting
VAME-P1-T

Material:
- Wrought aluminium alloy
- Steel



Dimensions Download CAD data ➔ www.festo.com



[1] Socket head screw M4

[2] Proportional-pressure regulator VPPX

[3] H-rail NRH

[4] H-rail mounting can be rotated by 180º if required

Dimensions and ordering data

B1	B2	B3	H1	H2	H3	H4	H5	H6	H7	L1	L2	L3	L4	L5	L6	Part no.	Type
20.7	20	10	71.2	60	90.3	66.9	49.1	33.7	7.2	55	34	31.5	15.8	13	8	**542255**	**VAME-P1-T**

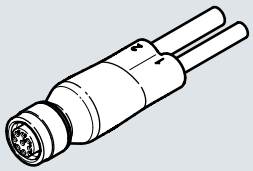
Note

In-line valves VPPX-6L- ... and VPPX-8L- ... must be used in combination with the H-rail VAME-P1- T.

Accessories

Programming cable
VAVE

Materials:
- Screw-type lock: Nickel-plated die-cast zinc
- Housing: TPE-U(PUR), colour: black
- Cable sheath: TPE-U(PUR), colour: grey
- Seals: NBR
- Contacts: Gold-plated brass



General technical data	
Design	T-distributor with cable on controller side
Type of distributor	1 to 2
Conforms to standard	DIN 47100
	EN 61076-2-101

Technical data – Electrical connection 1	
Function	Field device side
Design	Round
Connection type	Socket
Cable outlet	Straight
Connection technology	M12x1, A-coded to EN 61076-2-10
Number of pins/wires	8
Number of assigned pins/wires	8

Technical data – Electrical connection 2	
Function	Controller side
Design	Round
Connection type	Plug
Cable outlet	Straight
Connection technology	M12x1, A-coded to EN 61076-2-10
Number of pins/wires	8
Number of assigned pins/wires	8

Technical data – Electrical connection 3	
Function	Controller side
Design	Round
Connection type	Socket
Cable outlet	Straight
Connection technology	M12x1, A-coded to EN 61076-2-10
Number of pins/wires	5
Number of assigned pins/wires	4

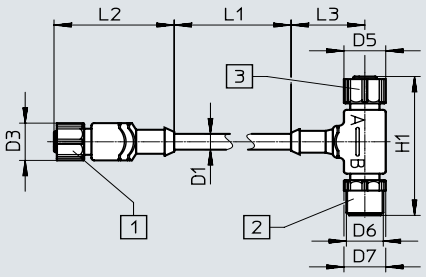
Electrical data		
Cable design		8x0.25
		Shielded
Cable diameter 1	[mm]	6.3
Cable length 1	[m]	0.15
Cable identification		Without inscription label holder

Operating and environmental conditions	
Note on materials	RoHS-compliant
	Halogen-free
CE marking (see declaration of conformity)	To EU EMC Directive[1)]
UKCA marking (see declaration of conformity)	To UK instructions for EMC[1)]

1) For information about the area of use, see the EC declaration of conformity at: www.festo.com/catalogue/... → Support/Downloads.
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

Accessories

Dimensions Download CAD data ➔ www.festo.com

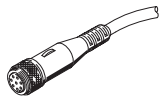
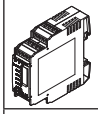
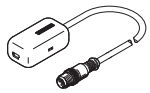


[1] Socket M12x1, 8-pin [2] Plug 12x1, 8-pin [3] Socket M12x1, 4-pin

Dimensions and ordering data

D1 ⌀	D3 ⌀	D5 ⌀	D6	D7 ⌀	H1	L1	L2	L3	Part no.	Type
6.2	14.5	14.5	M12x1	14.5	54	150	41.7	11.1	**570971**	**VAVE-P8-VPS**

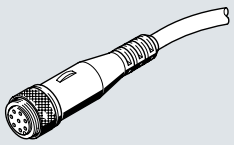
Ordering data

	Description		Part no.	Type
Plug socket with cable				Data sheets ➔ Internet: connecting 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-K-2-N-LE8**
		5 m	**542257**	**NEBU-M12W8-K-5-N-LE8**
		10 m	**570007**	**NEBU-M12W8-K-10-N-LE8**
Setpoint module				Data sheets ➔ Internet: mpz
	Setpoint module for generating 6 + 1 analogue voltage signals		**546224**	**MPZ-1-24DC-SGH-6-SW5**
Adapters				Data sheets ➔ Internet: nefc
	For connecting the interface on the VPPX valves/VPPX manifold to the PC. A standard USB cable with mini USB plug is also required		**547432**	**NEFC-M12G5-0.3-U1G5**

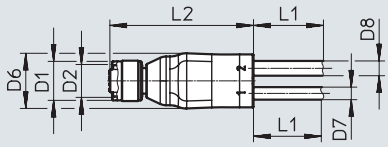
Accessories

DUO cable
NEDU-L1R2-V9-M12G8-E

Materials:
- Screw-type lock: Nickel-plated brass
- Seals: FPM
- Housing: TPE-U(PUR)
- Cable sheath: TPE-U(PUR)
- Insulating sheath: PVC
- Contacts: Gold-plated brass



Dimensions Download CAD data ➔ www.festo.com



Type	D1	D2	D6	D7	D8	L1	L2
NEDU-L1R2-V9	14.5	M12x1	20	4.5	54	5000 + 200	51.6

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