Piezo valves VEMP

Key features

Innovative

- Piezo technology
- Very low power consumption
- High precision

Versatile

- When combined with pressure sensor and control electronics it can be used as a proportional pressure regulator
- When combined with a flow sensor and control electronics it can be used as a proportional flow control valve

Reliable

- No self-heating
- Long service life

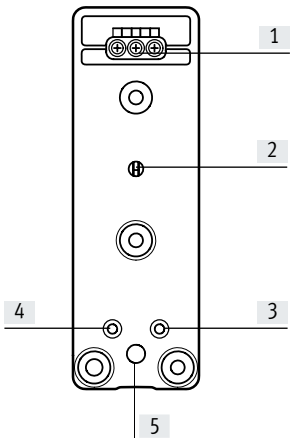
Easy to mount

- Can be mounted on a terminal strip
- Small installation space
- Light weight

Key features

Mode of operation

Description



[1] Electrical connection
[2] Port for pressure sensor
[3] Port 1 (pressure supply port)
[4] Port 3 (exhaust port)
[5] Port 2 (working port)

The VEMP is a proportional 3/3-way valve in which a split piezo actuator (piezo actuator 1 and 2) is controlled electrically. The valve also has a connection for a pressure sensor.

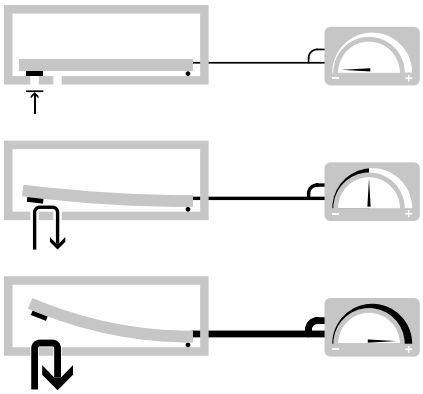
When combined with a pressure sensor and control electronics, the 3/3-way proportional valve can be used as a proportional pressure regulator.

Alternatively, the flow can also be controlled using a closed loop circuit by integrating a flow sensor in the output line (operation as 2/2-way valve).

In the normal position, the valve is closed. The working and pressure sensor ports are connected and always open, regardless of the switching status.

The two piezo actuators can only be actuated separately; if they are activated simultaneously, safe and reliable operation cannot be ensured.

Control response



No voltage
No flow rate

Medium voltage
Medium flow rate

High voltage
High flow rate

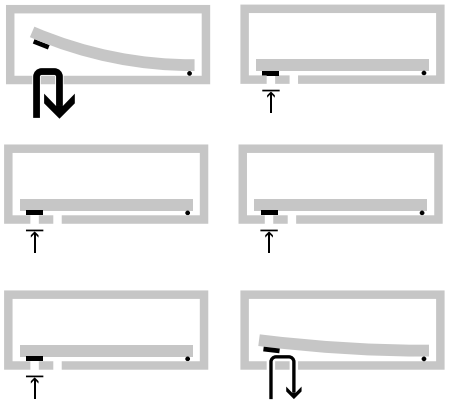
The piezo actuators are actuated using variable voltage to give proportional control.

This allows either the pressure or flow rate to be controlled, depending on the design.

The pressure or flow behaviour is controlled by integrating a sensor in the output line of the closed-loop control circuit.

The piezo valve VEMP exhibits the typical hysteresis behaviour of a proportional valve. Linear behaviour can be achieved by combining control electronics with a flow sensor.

Operation as a proportional 3/3-way valve



Pressure build-up

Maintaining pressure

Reducing pressure

Pressurisation, piezo actuator 1

Pressurisation, piezo actuator 2

The piezo actuators installed in the valve VEMP proportionally regulate both the pressure and flow rate for pressurisation and ensure proportional exhausting.

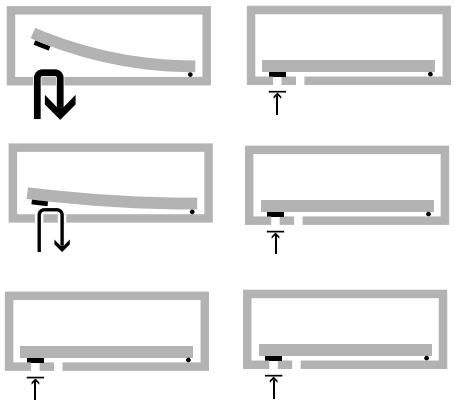
Pressurisation:
During pressurisation, piezo actuator 1 opens, enabling flow from port 1 (pressure supply port) to port 2 (working port). At the same time, piezo actuator 2 closes port 3 (exhaust).

Exhausting:
During exhausting, piezo actuator 2 opens, enabling flow from port 2 (working port) to port 3 (exhaust). At the same time, piezo actuator 1 closes port 1 (pressure supply port).

Key features

Mode of operation

Operation as a proportional 2/2-way valve

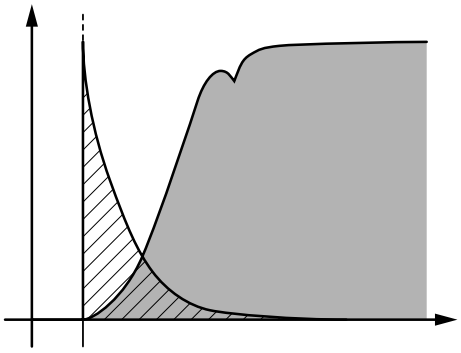


When used as a proportional 2/2-way valve, only piezo actuator 2 (exhaust) is switched; piezo actuator 1 (pressure supply port) must be electrically connected to earth (GND).

Flow takes place from port 2 (working port) to port 3 (exhaust). When used as a 2/2-way valve, port 1 (pressure supply port) is not used, and must be closed.

The flow behaviour is controlled by integrating a sensor in the supply or output line of the closed-loop control circuit.

Low energy consumption

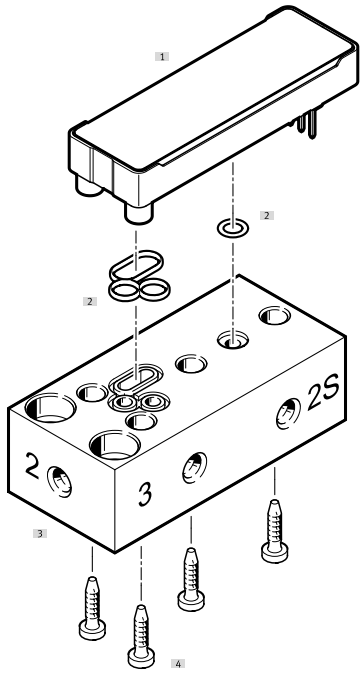


Compared with solenoid valves, proportional valves with piezo technology require virtually no energy to maintain an active state thanks to their capacitive principle. The piezo valve operates like a capacitor: it needs current only at the start in order to charge the piezoceramics.

No further energy is needed to maintain its state. The valves therefore generate no heat. They consume up to 95% less energy than solenoid valves, which permanently require an electrical current

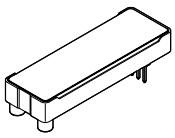
Peripherals overview

Example: VEMP with sub-base



Designation		→ Page/Internet
[1]	Piezo valve VEMP	14
[2]	Assortment of seals	14
[3]	Sub-base	14
[4]	Screw set	14

Product range overview

Function	Description		Nominal width	Flow rate [l/min]	Operating pressure [bar]	Operating voltage	
						0 ... 310 V	0 ... 250 V
Sub-base valve		3/3-way valve, normally closed, monostable					
		Flange	1.3 mm	19/20	0 ... 1.1	–	■
		3/3-way valve, normally closed, monostable					
		Flange	1.3 mm	28/30	0 ... 1.7	■	–
		3/3-way valve, normally closed, monostable					
		Flange	1.6 mm	18/19	0 ... 0.7	■	–
		3/3-way valve, normally closed, monostable					
		Flange	1.6 mm	28/27	0 ... 1.1	■	–

Type codes

001	Series	
VEMP	Piezo valve	

002	Directional control valve type	
B	Sub-base valve	

003	Design principle	
S	Bending actuator	

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

005	Nominal width [mm]	
1.3	1.3	
1.6	1.6	

006	Pressure range [bar]	
D5	0 ... 0.5	
D7	0 ... 1	
D19	0 ... 1.7	

007	Pneumatic connection	
F	Flange/sub-base	

008	Nominal operating voltage	
22	250 V DC	
28	310 V DC	

009	Electrical connection	
T1	Pin	

010	Package unit quantity	
	Standard	
P30	30	

Data sheet

- Flow rate
  19 ... 29 l/min

- Voltage
  0 ... 250 V DC
  0 ... 310 V DC

- Operating pressure
  0 ... 1.7 bar

General technical data

		VEMP-BS-3-13-D7-...	VEMP-BS-3-13-D19-...	VEMP-BS-3-16-D5-...	VEMP-BS-3-16-D7-...
Valve function		3/3-way valve, monostable	3/3-way valve or 2/2-way valve, monostable	3/3-way valve, monostable	3/3-way valve, monostable
Normal position		Closed			
Standard nominal flow rate 1➔ 2	[l/min]	19	28	18	27
Standard nominal flow rate 2➔ 3	[l/min]	20	29	19	28
Dimensions W x L x H	[mm]	17.2 x 52.1 x 7.2			
Nominal width	[mm]	1.3	1.3	1.6	1.6
Grid dimension	[mm]	17.2			
Pneumatic connection 1, 2, 3		Flange			
Actuation type		Electrical			
Type of mounting		On manifold rail			
Mounting position		Any			
Flow direction		1 ➔ 2 and 2 ➔ 3			
Product weight	[g]	8			
Special characteristics		Oxygen-compatible to DIN EN 1797			

Electrical data

		VEMP-BS-3-13-D7-...	VEMP-BS-3-13-D19-...	VEMP-BS-3-16-D5-...	VEMP-BS-3-16-D7-...
Nominal operating voltage	[V DC]	250	310	310	310
Operating voltage range	[V DC]	0 ... 250	0 ... 310	0 ... 310	0 ... 310
Max. electrical power consumption	[mW]	1			
Max. current consumption	[mA]	5			
Max. switching frequency	[Hz]	5			
Degree of protection		Depending on the manifold block			

1) If the charging current of 5 mA is exceeded, there is the risk of an ignition hazard for the piezo actuators both in an oxygen-enriched environment and in air.

Data sheet

Operating and environmental conditions					
		VEMP-BS-3-13-D7-...	VEMP-BS-3-13-D19-...	VEMP-BS-3-16-D5-...	VEMP-BS-3-16-D7-...
Operating pressure	[bar]	0 ... 1.1	0 ... 1.7	0 ... 0.7	0 ... 1.1
Nominal operating pressure	[bar]	1	1.7	0.5	1
Operating medium		• Inert gases • Air • Oxygen (oxygen applications to IEC 60601-1 only on request) • Nitrogen			
Note on the operating/pilot medium		Operation with lubricated medium not possible			
Air quality	[µm]	≤ 5			
Ambient temperature	[°C]	–20 ... 70			
		0 ... 50 in operation as 2/2-way valve			
Temperature of medium	[°C]	–20 ... 60			
		0 ... 50 in operation as 2/2-way valve			
Corrosion resistance class CRC		2[1]			

1) More information: www.festo.com/x/topic/kbk

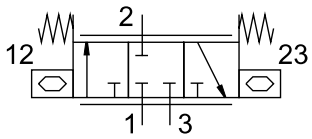
Safety characteristics	
CE marking (see declaration of conformity)	To EU Low Voltage Directive[1]
Shock resistance	Shock test with severity level 2, to EN 60068-2-27
Vibration resistance	Transport application test with severity level 2, to EN 60068-2-6

1) More information: www.festo.com/catalogue/... → Support/Downloads.

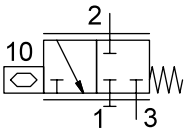
Materials	
Seals	EPDM
Housing	Reinforced PA
Cover	Reinforced PA
Note on materials	RoHS-compliant

Design

Circuit symbol



- 3/3-way valve, normally closed

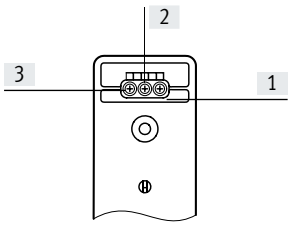


- 2/2-way valve, normally closed

Note on risk assessment when used in medical equipment

The product has no redundancy and no error detection. Malfunctions must be detected by measures in the customer product if required.

Pin allocation

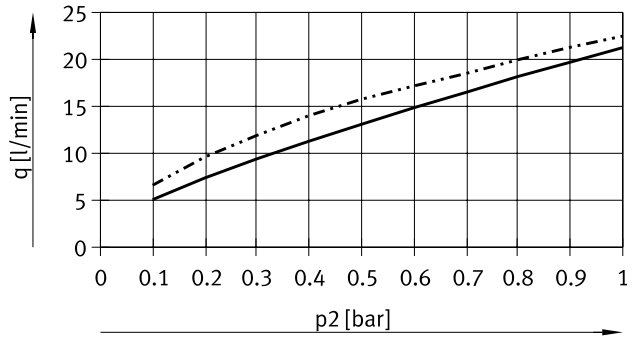


Pin	Function
1	GND
2	Pressurising
3	Exhausting

Data sheet

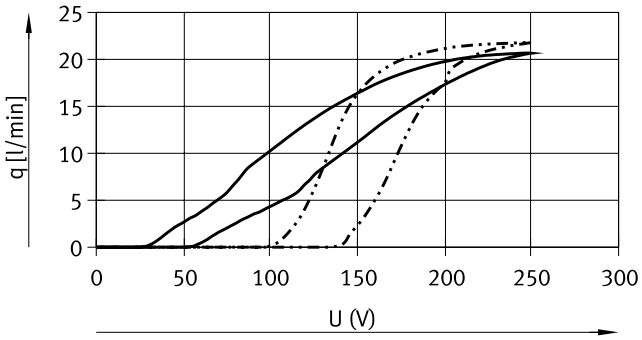
VEMP-BS-3-13-D7-F-22T1, 1.3 mm nominal width

Flow plotted against operating pressure at 250 V



Flow rate 1 ➔ 2
Flow rate 2 ➔ 3

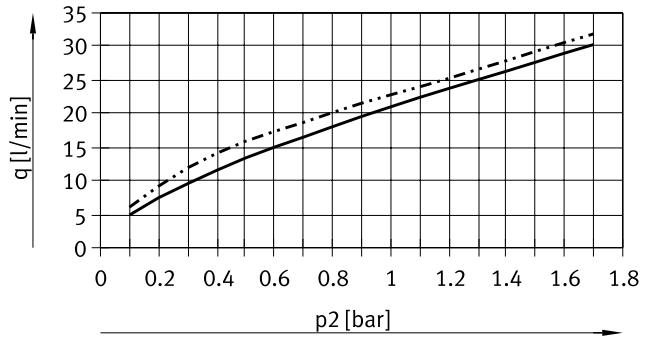
Flow plotted against voltage at room temperature, operating pressure 1 bar



Flow rate 1 ➔ 2
Flow rate 2 ➔ 3

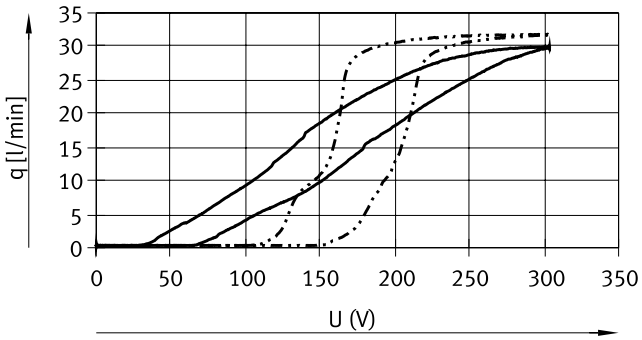
VEMP-BS-3-13-D19-F-28T1, 1.3 mm nominal width

Flow plotted against operating pressure at 310 V



Flow rate 1 ➔ 2
Flow rate 2 ➔ 3

Flow plotted against voltage at room temperature, operating pressure 1.7 bar

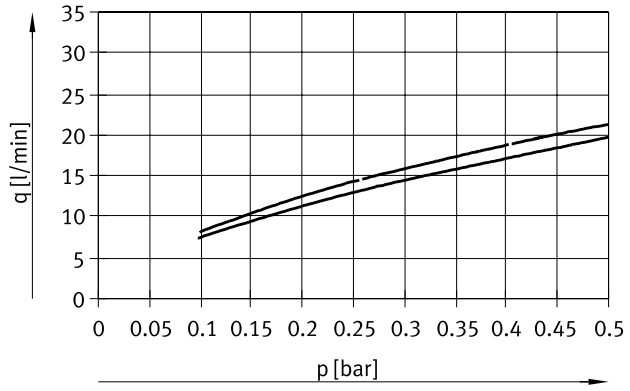


Flow rate 1 ➔ 2
Flow rate 2 ➔ 3

Data sheet

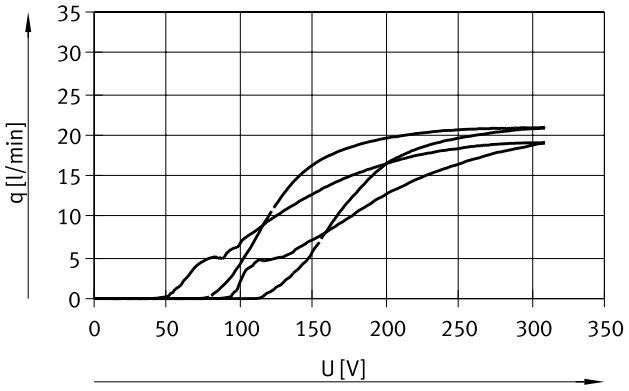
VEMP-BS-3-16-D5-F-28T1, 1.6 mm nominal width

Flow plotted against operating pressure at 310 V



Flow rate 1 → 2
Flow rate 2 → 3

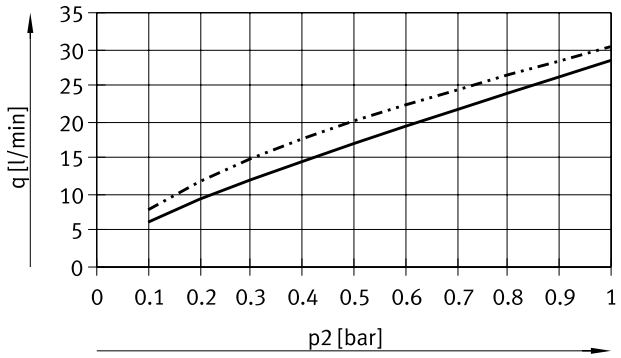
Flow plotted against voltage at room temperature, operating pressure 0.5 bar



Flow rate 1 → 2
Flow rate 2 → 3

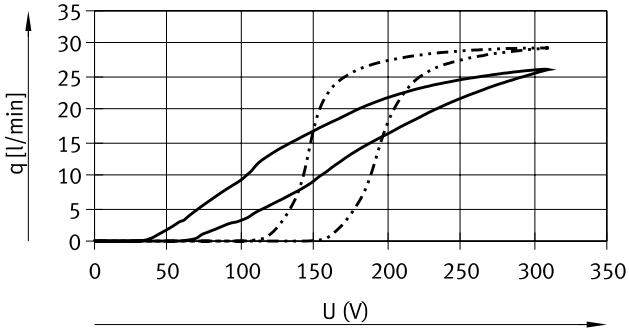
VEMP-BS-3-16-D7-F-28T1, 1.6 mm nominal width

Flow plotted against operating pressure at 310 V



Flow rate 1 → 2
Flow rate 2 → 3

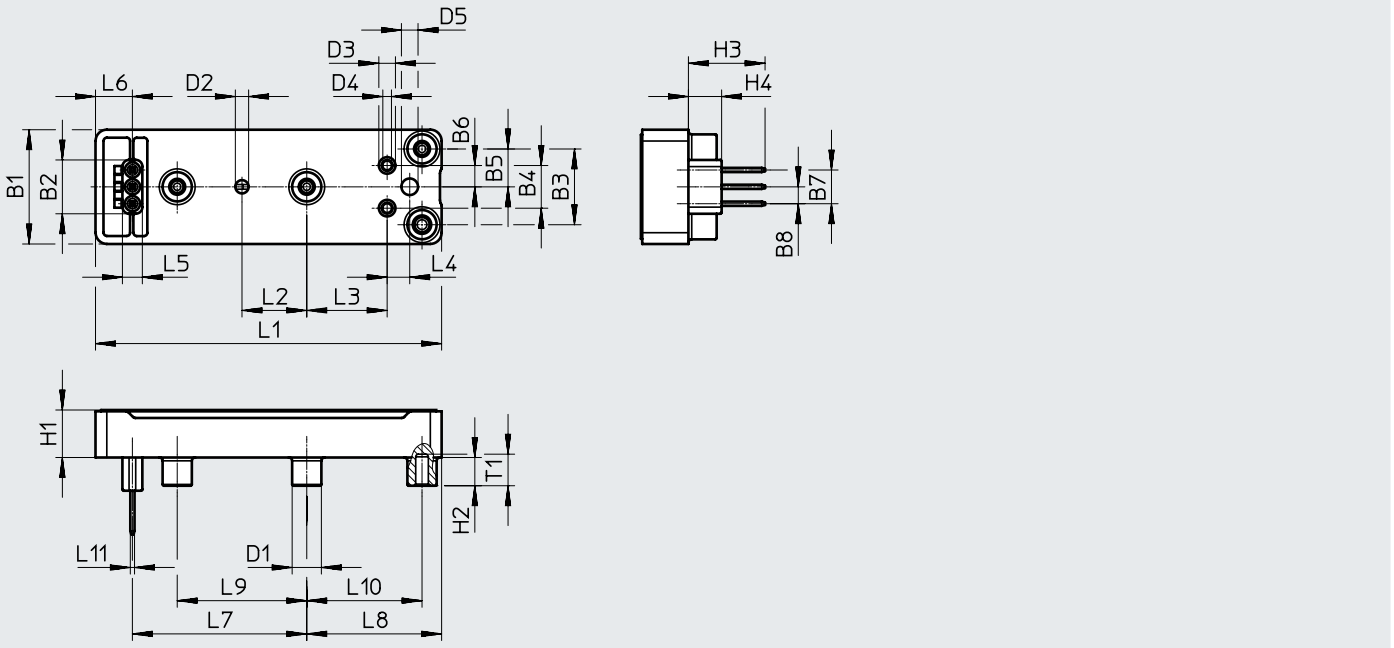
Flow plotted against voltage at room temperature, operating pressure 1 bar



Flow rate 1 → 2
Flow rate 2 → 3

Data sheet

Dimensions Download CAD data ➔ www.festo.com



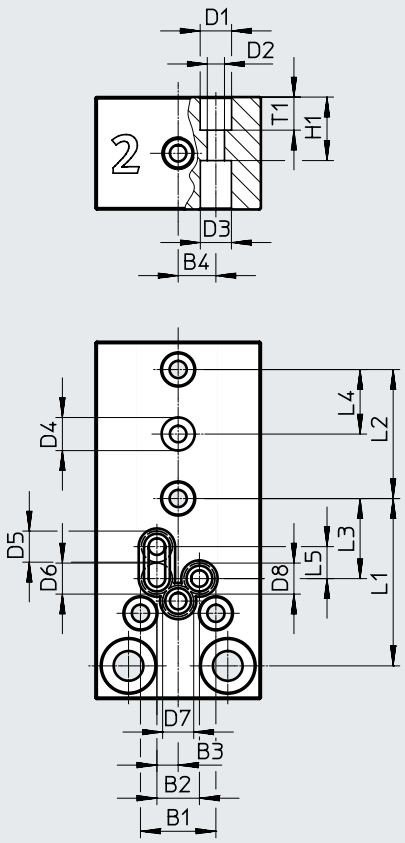
Type	B1	B2	B3	B4	B5	B6	B7	B8	D1 ø	D2 ø	D3 ø	D4 ø	D5 ø
VEMP	17.2	8.1	11.4	6.4	5.7	3.2	5.1	2.5	4.4	2	2.5	1.3/1.6	2.5

Type	H1	H2	H3	H4	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	T1
VEMP	7.2	4.3	11.6	5	52.1	9.8	12.1	3.4	3	5.6	26.3	20.3	19.5	17.4	0.6	4.8

Data sheet

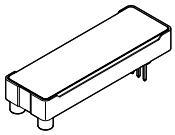
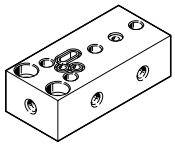
Dimensions Download CAD data ➔ www.festo.com

Example of manifold rail, seal



B1	B2	B3	B4	D1 ø	D2 ø	D3 ø	D4 ø	D5 ø	D6 ø	D7 ø	D8 ø	H1	L1	L2	L3	L4	L5	T1
11.4	6.4	3.2	5.7	4.8	2.6	4.7	5	4.7	4.7	4.7	4.7	9.6	25.3	19.5	12.1	9.8	4.8	5

Accessories

Ordering data	Description	Nominal width [mm]	Operating pressure [bar]	Part no.	Type
Sub-base valve					
	3/3-way valve (piezo valve), monostable, normally closed	1.3	0 ... 1.1	**8064292**	**VEMP-BS-3-13-D7-F-22T1**
				8064293	**VEMP-BS-3-13-D7-F-22T1-P30**
			0 ... 1.7	**8065734**	**VEMP-BS-3-13-D19-F-28T1**
				8065735	**VEMP-BS-3-13-D19-F-28T1-P30**
		1.6	0 ... 0.7	**8065738**	**VEMP-BS-3-16-D5-F-28T1**
				8065739	**VEMP-BS-3-16-D5-F-28T1-P30**
			0 ... 1.1	**8064294**	**VEMP-BS-3-16-D7-F-28T1**
				8064295	**VEMP-BS-3-16-D7-F-28T1-P30**
Sub-base					
	For 3/3-way valve, with 4 pneumatic connections M5 (pressure supply port, exhaust, working port, sensor connection). The sensor connection is connected to the working port.			**8068637**	**VABS-P12-S-M5-P3**
Assortment of seals					
	For 30 valves, comprising seal (30 units) and O-ring for sensor connection (30 units)			**8065525**	**VABD-P12-S-P30**
Screw set					
	120 screws for 30 valves (4 screws per valve VEMP)			**8065526**	**VAME-P12-MK**