

Proportional valves with piezo technology in medical technology

FESTO



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Festo is opening up a host of options for you.

With a choice of various valve series with different working pressures, nominal widths, flow ranges and working temperatures, Festo offers you the optimal proportional valve for your needs. When you have special requirements, we can adapt the valves completely to your individual needs. Just ask us!

More information on piezo valves in medical technology and laboratory automation at:
www.festo.com/medtech

More information on proportional valves for factory and process automation at:
www.festo.com/proportional-valve

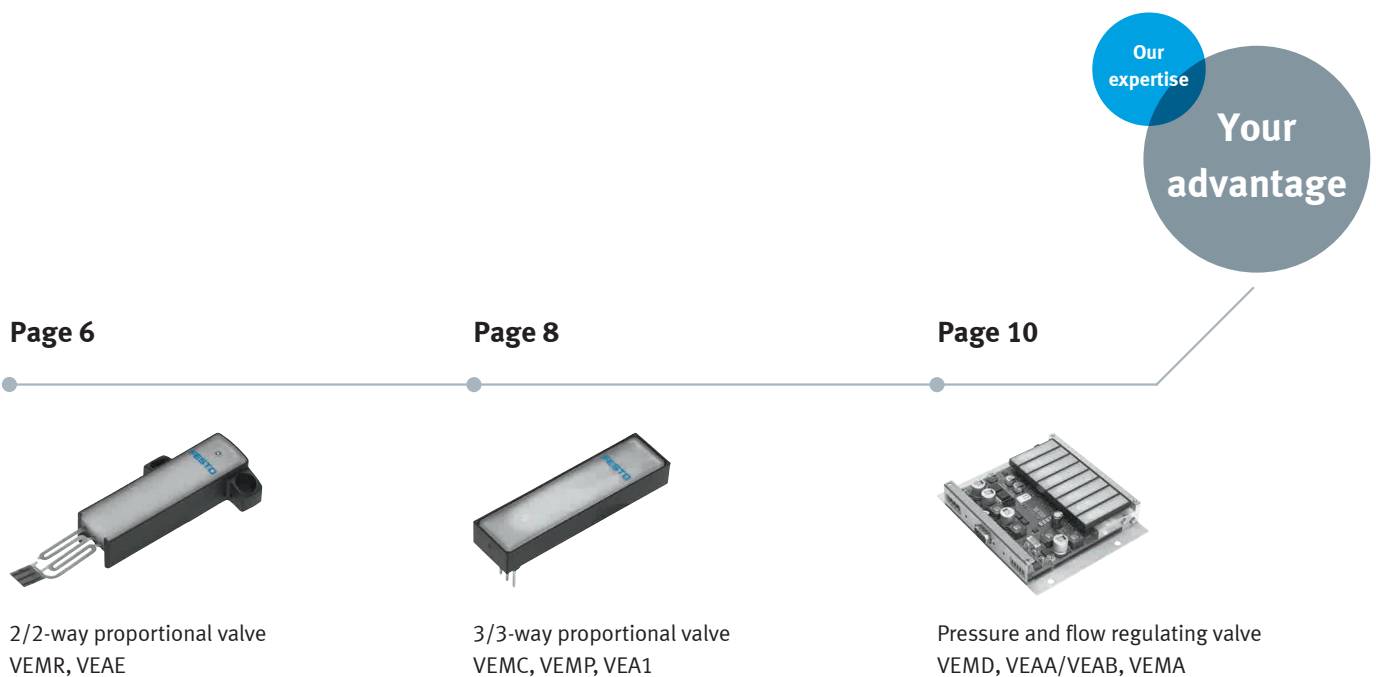
Your objective: a competitive edge thanks to innovation

Medical devices, too, are subjected to fierce and tough competition. The trends are moving towards ever smaller and lighter devices. At the same time, they have to be more cost-effective than previous models and withstand the stress of being used on a daily basis for long periods of time. The market also demands faster and more precise analytical devices as well as state-of-the-art medical equipment.

Our contribution: unique automation solutions with piezo technology

Festo is the world's leading supplier of electric and pneumatic automation technology. In close cooperation with customers, Festo automates motion and sequences for factory, process and laboratory automation as well as for medical devices. Piezo technology is one of several key technologies used by Festo for the efficient control of gas flows in medical devices.

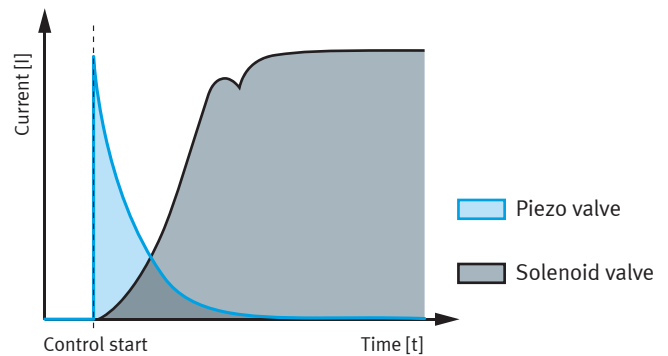
Individually adapted – proportional valves with piezo technology from Festo



Benefits of piezo technology

Low energy consumption – no heat generation

In comparison to 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 hold its state and it therefore generates no heat. Piezo valves consume up to 95% less energy than solenoid valves, which permanently require an electrical current.



No operating noise

Proportional valve with piezo technology are quieter than solenoid valves – the bender actuator moves freely, without any impact noise. In addition, there is no need for pulse-width modulation which controls the flow rate of a solenoid valve.

Long service life

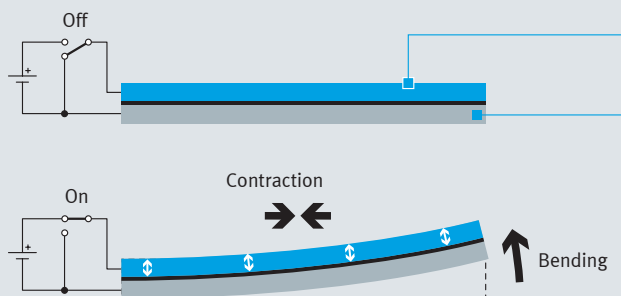
Gas flows can be regulated proportionately with proportional valves. Their design makes them wear resistant and capable of achieving an unusually high number of cycles.

Small installation space and light weight

As the piezo valve has no solenoids or electrical coils, its design is light. That, combined with its compact size, makes it ideal for installation in mobile devices.

High level of safety

Proportional valves with piezo technology are characterised by their high level of intrinsic safety, because they can maintain the current state even if there is a power failure.



Function of the bender actuator in piezo valves

This is how piezo technology works

Festo uses the piezoelectric characteristics of certain ceramics that mechanically deform when a voltage is applied.

Piezo technology in medical technology applications

Improved quality of life for patients and their surroundings

Proportional valves with piezo technology are suitable for a huge variety of applications in medical technology. Thanks to their compact design and low power consumption, they are ideal for installation in battery-operated devices.

Mobile ventilators

- Portable oxygen delivery devices (oxygen conserver and concentrator) for people with chronic respiratory ailments
- Home ventilators
- PAP devices for sleep apnoea patients

Oxygen/ventilation therapy

- Regulating gas flows and pressures

Ophthalmology

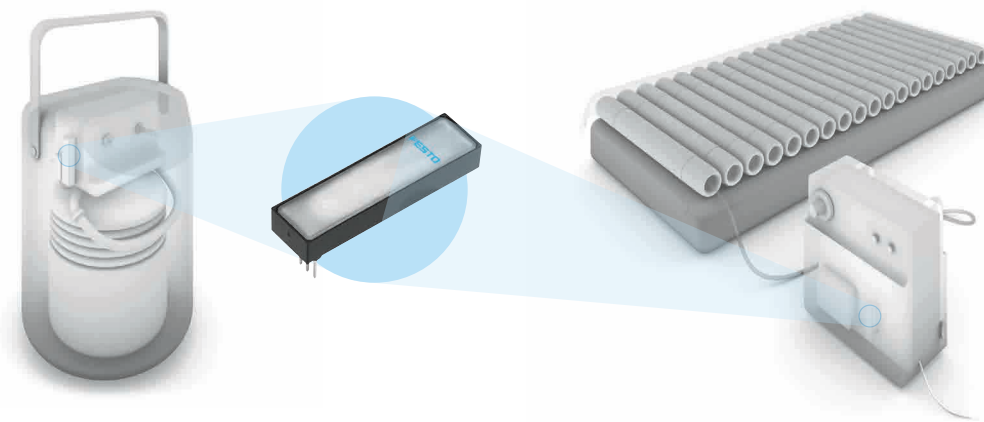
- Controlling pneumatically operated surgical tools for cataract surgery

Dialysis for kidney diseases

- Regulating pressure for controlling the flow of liquids

Medical mattresses and compression therapy

- Anti-decubitus mattresses against bed sores
- Devices for lymphatic drainage and compression applications



Laboratory automation: piezo valves help you achieve your objectives quicker, neatly and with greater precision.

The spectrum of laboratory applications is becoming ever more varied, yet the challenges remain the same.

Piezo valves from Festo stand for precision and reproducibility

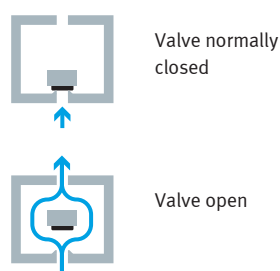
- In micro dosing
- Regulating pressure and vacuum for micro dosing and regulating the flow of liquids

2/2-way proportional valves with piezo technology

Flow control

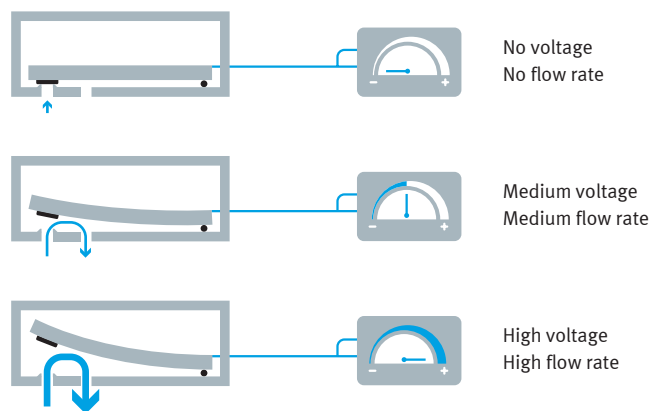
The 2/2-way proportional valve controls, for example, the precise supply and metering of oxygen in oxygen therapy devices during inhalation. In combination with a flow sensor and control electronics it turns into a proportional flow control valve.

Specific opening to feed in/dose gases or gas mixtures



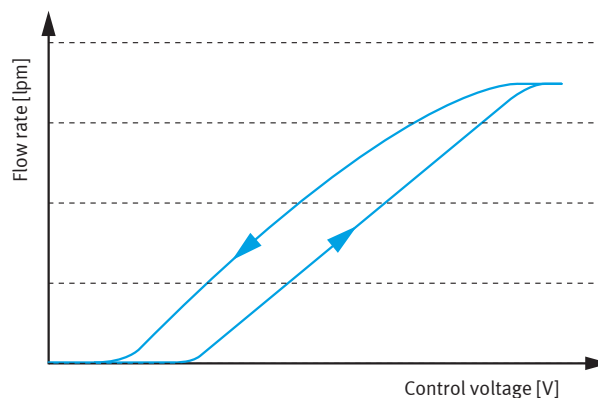
With a flow sensor and control electronics it becomes a proportional flow control valve

This makes piezo valves infinitely adjustable and simplifies the dosing of concentrations.

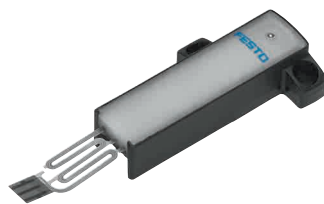


Characteristics of the 2/2-way proportional valve

A piezo valve is subject to hysteresis characteristics just like proportional solenoid valves. When combined with a flow sensor and control electronics, a linear characteristic can be achieved.



Flow in relation to the control voltage (sample curve)



Proportional valve VEMR

Valve function	2/2-way valve (normally closed)
Connection type	Flange
Ambient temperature	5 ... 40 °C (41 ... 104 °F); 0 ... 60 °C (32 ... 140 °F)
Nominal width [mm]	0.7; 1.2; 1.3; 1.4
Pressure range [bar]	0 ... 1.7; 0 ... 2; 0 ... 3.8; 0 ... 6
Flow rate [l/min]	0 ... 30
Media	Air, inert gases, oxygen



Proportional valve VEA E

Valve function	2/2-way valve (normally closed)
Connection type	Flange
Ambient temperature	-10 ... +85 °C (14 ... 185 °F)
Nominal width [mm]	1.2
Pressure range [bar]	0 ... 8
Flow rate [l/min]	0 ... 55 at 6 bar
Media	Air, inert gases

Pressure range adaptation

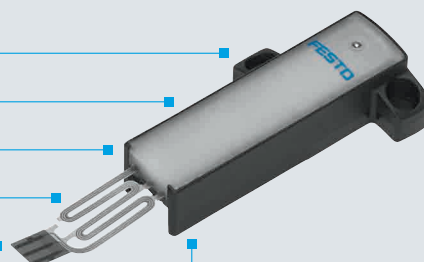
Change of the flow rate

Adjustment of the operating temperature

Appropriate electronics

Different contacts

Soft-sealing or hard-sealing valve variants



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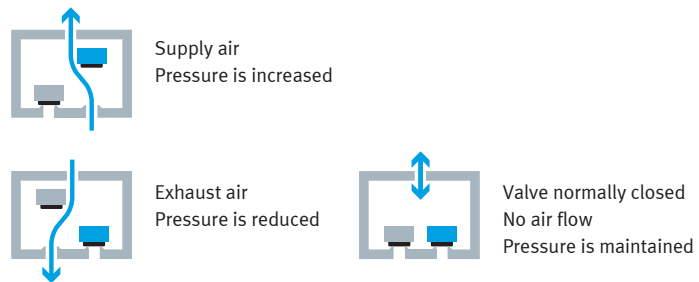
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3/3-way proportional valves with piezo technology

Pressure regulation

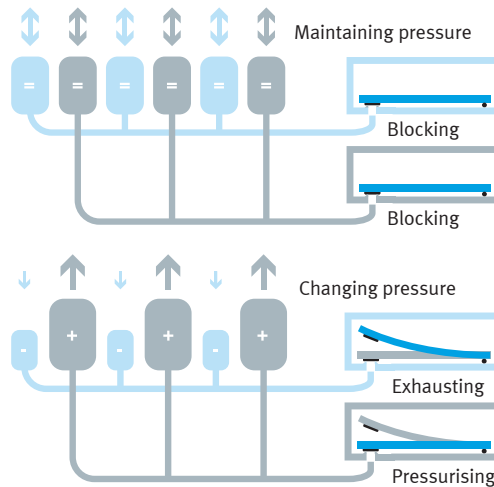
For controlling pressure, for example in lymph drainage devices. The special bender actuator works on the basis of differential movements and thus provides almost complete compensation for temperature-related errors. In combination with a pressure sensor and control electronics the 3/3-way proportional valve turns into a proportional pressure regulating valve.

Gap-type bending actuator:
three functions in one valve



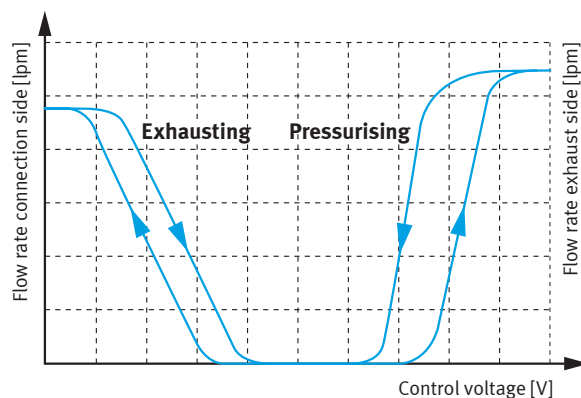
With pressure sensor and control electronics it becomes a proportional pressure regulating valve

Controlled pressure increase and decrease with soft-start function



Characteristics of the 3/3-way proportional valve

Flow in relation to the control voltage (sample curve)





Proportional valve VEMC	
Valve function	3/3-way valve (normally closed)
Connection type	Flange
Ambient temperature	5 ... 40 °C (41 ... 104 °F)
Nominal width [mm]	0.9
Pressure range [bar]	0 ... 2
Flow rate [l/min]	0 ... 16 at 2 bar
Media	Air, inert gases, oxygen



Proportional valve VEMP	
Valve function	3/3-way valve (normally closed)
Connection type	Flange
Ambient temperature	-10 °C ... +60 °C (14 °F ... 140 °F)
Nominal width [mm]	1.3; 1.6
Pressure range [bar]	0 ... 0.7; 0 ... 1.1; 0 ... 1.7
Flow rate [l/min]	0 ... 27 at 1.5 bar
Media	Air, inert gases, oxygen

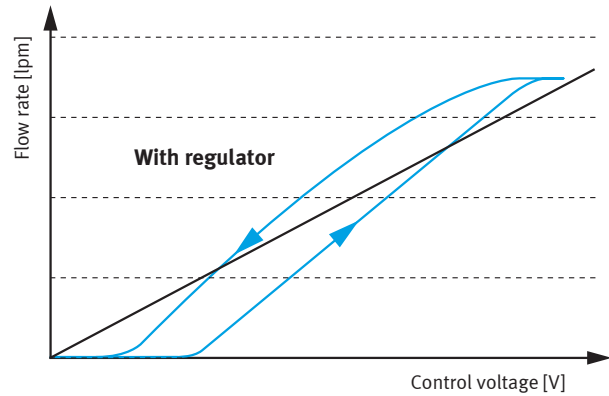


Proportional valve VEA1	
Valve function	3/3-way valve (normally closed)
Connection type	Flange
Ambient temperature	5 ... 40 °C (41 ... 104 °F); 0 ... 60 °C (32 ... 140 °F)
Nominal width [mm]	0.4
Pressure range [bar]	0 ... 10
Flow rate [l/min]	0 ... 14 at 10 bar
Media	Air, inert gases

Pressure/flow regulating valve

Linear characteristic curve

A proportional valve with piezo technology is subject to hysteresis – just like a proportional solenoid valve – and thus has a non-linear characteristic curve. If you add a sensor and control electronics, the result is a linear correlation between control voltage and the outlet pressure or flow rate.



Proportional flow control valve VEMD

Mass flow controller (MFC) specifically for medical applications such as dosing oxygen. It is very quiet and precise and has short response times. Compact module with 2/2-way valve, flow sensor and control electronics.

VEMD*	
Valve function	2/2-way valve (normally closed)
Connection type	UNF10-32, M5
Ambient temperature	0 ... 40 °C (32 ... 113 °F)
Nominal width [mm]	1.4
Pressure range [bar]	0 ... 2
Flow rate [l/min]	0 ... 20 at 2 bar
Media	Oxygen, air, inert gases

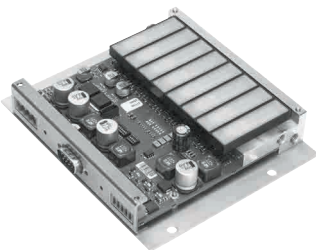
The product is currently in development. Subject to change.



Proportional pressure regulating valve VEAA/VEAB

3/3-way valve including pressure sensor and control electronics. Ideal for many applications with pressure regulation for vacuum supply pressure up to 6 bar. Its short response times of <10 ms are impressive, as is its highly precise pressure regulation and very low power consumption. Without switching noises!

VEAA/VEAB	
Valve function	3/3-way valve (normally closed)
Connection type	Plug connector for 4 mm tubing
Ambient temperature	0 ... 60 °C (32 ... 140 °F)
Nominal width [mm]	0.4; 0.7; 1.4
Pressure range [bar]	VEAA: 2; 6; 10 VEAB: -1; 0.2; 1; 2; 6
Flow rate [l/min]	VEAA: 0 ... 7 at 6 bar VEAB: 0 ... 20 at 6 bar
Media	Air, inert gases



Proportional pressure regulating valve VEMA

The valve terminal is equipped with an 8-channel pressure regulator and eight independent valves VEMC. Thanks to piezo technology, operation is energy efficient even in the smallest of installation spaces. The valve terminals are easy to install and to connect to each other or to other devices via CAN bus control.

VEMA	
Valve function	8x 3/3-way valve (normally closed)
Connection type	M3, M5
Ambient temperature	10 ... 40 °C (50 ... 104 °F)
Nominal width [mm]	0.9
Pressure range [bar]	0 ... 1; -0.5 ... 0.5
Flow rate [l/min]	0 ... 3 at 1 bar
Media	Air, inert gases



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