

FESTO

LifeTech – technology for life sciences

Components for medical technology and laboratory automation

LifeTech
Technology for life sciences

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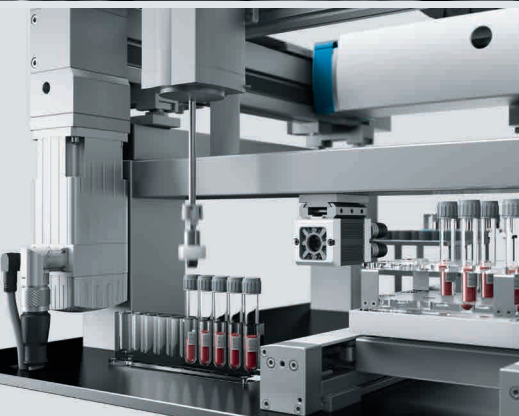
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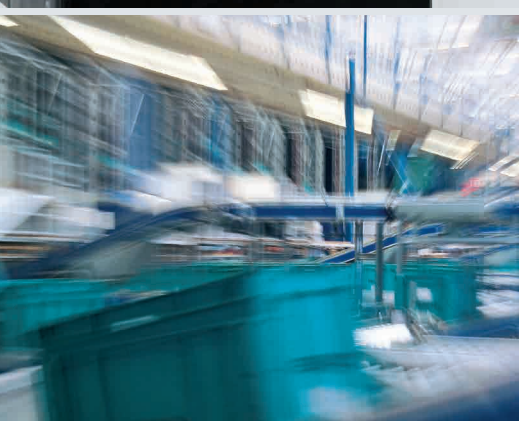
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Life Sciences – smart solutions for medical technology and laboratory automation



You develop high-end medical technology.
You want highly efficient laboratory processes.
We deliver customised and value-adding solutions.

→ **WE ARE THE ENGINEERS
OF PRODUCTIVITY.**

The healthcare sector worldwide is facing ever greater challenges – challenges that can also be solved by industrial automation. The LifeTech division at Festo provides forward-looking answers – with innovative solutions for medical technology and laboratory automation. Festo supports systems and equipment manufacturers with components and customised solutions that combine top quality with maximum efficiency.

Growing and ageing populations, increasing risk of illness and global mobility call for cost-effective healthcare solutions. The demand for suitable preventative healthcare and diagnostic procedures is also on the rise.

ised automation solutions together with you to meet your requirements – cost-effectively, to fit the smallest possible space and in the best possible quality.

Technical developments such as miniaturisation, integration or dispensing ever smaller volumes of liquid are opening up new opportunities. Festo is supporting these trends with increasingly compact components, highly integrated modules and a focus on micro-fluid products for regulating gases and liquids. For the medical technology and laboratory automation segments, Festo offers standardised components and develops custom-

The benefits at a glance

- + Everything from a single source, from standard products to ready-to-install, customised subsystems
- + Collaborative engineering right from the initial planning stage
- + Transforming individual, validated process steps into automated process sequences
- + Easy to integrate into your overall system
- + Perfect interaction between liquid handling and kinematics



Laboratory automation: modular solutions for every task

Laboratory automation
01



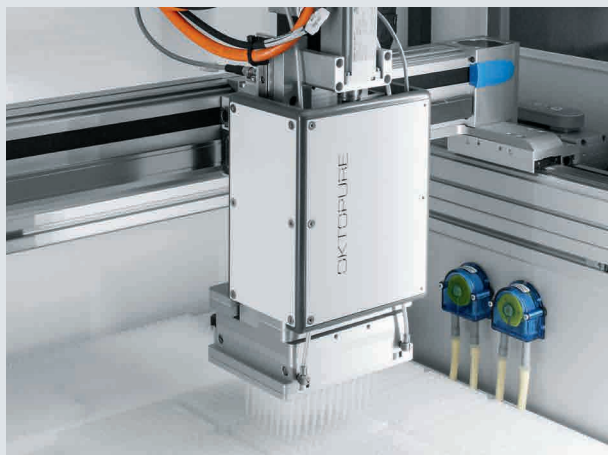
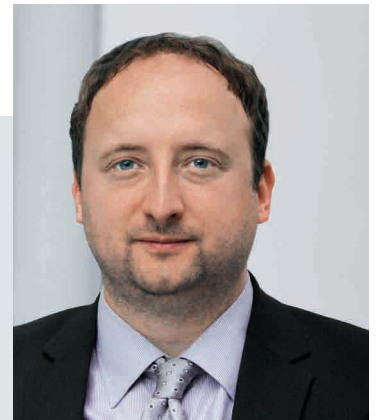
From identifying and checking the sample carriers to opening and closing sample vials and dispensing liquids in microwell plates, with Festo you can implement customised applications for sample preparation in the smallest of spaces.

The modular system solutions work quickly, precisely, consistently and efficiently, while the results of the automated processes are always reproducible and verifiable. The degree of automation can be flexibly adapted to your individual requirements, and thus everything from single process steps to linking complex individual processes can be automated. Festo provides you with everything from a single source: from conceptualisation and joint development to delivery of subsystems.



“The fact that Festo was able to offer us a complete package including hardware, software, consultation and services was the key to our decision.”

Dr. Dietrich Köster, Product Manager at LGC Genomics, England



oKtopure – fully automated DNA extraction

The DNA extraction robot from LGC Genomics, oKtopure, accelerates cultivation programmes and many other molecular biology processes thanks to standardised DNA extraction from plant, leaf and seed tissue, animal tissue, hair and blood. 8 x 96 deepwell plates can be purified at the same time and up to 5000 samples can be processed each day. To achieve this, Festo,

in close cooperation with LGC, developed a three-dimensional gantry for liquid handling with a pre-programmed actuator and controller package.

The benefits at a glance

- + The level of automation can be adapted flexibly
- + Clear interfaces for rapid integration
- + Pre-assembled, tested modules via a single order number
- + Perfectly matched components
- + Specially developed components with technical highlights

“Festo supplied us with a complete system solution including controllers. That was what actually enabled us to develop the system so quickly.”

Project Manager Dipl.-Ing. Markus Schöllauf of the automation and robotics division of Anton Paar GmbH, Austria

Modular sample processor – automated sample preparation

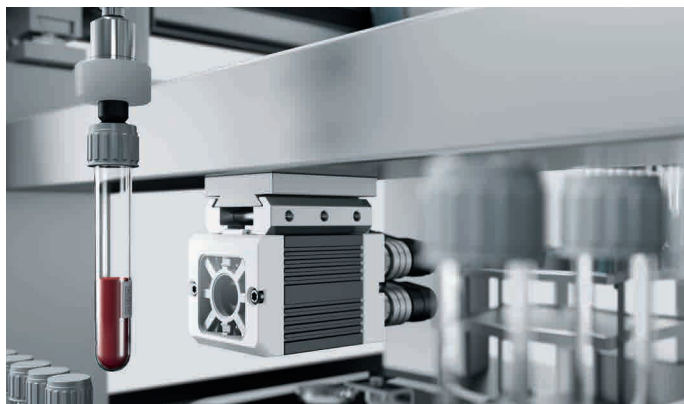
Anton Paar’s modular sample processor automates sample preparation for chromatographic analysis. The benchtop platform prepares samples from just a few to 100 millilitres, making it ideal for petrochemicals, food and fragrances. Compact


handling gantries with electric axes from Festo ensure precise pipetting processes. Integrated vision systems record the data matrix code to identify the samples. Cylinders discard used, disposable pipette tips. The dispense head was also developed by Festo.



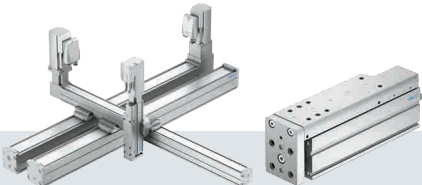
Sample preparation – complete process

Laboratory automation 01





Planar surface gantry
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Electric axes
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Rotary gripper module EHMD



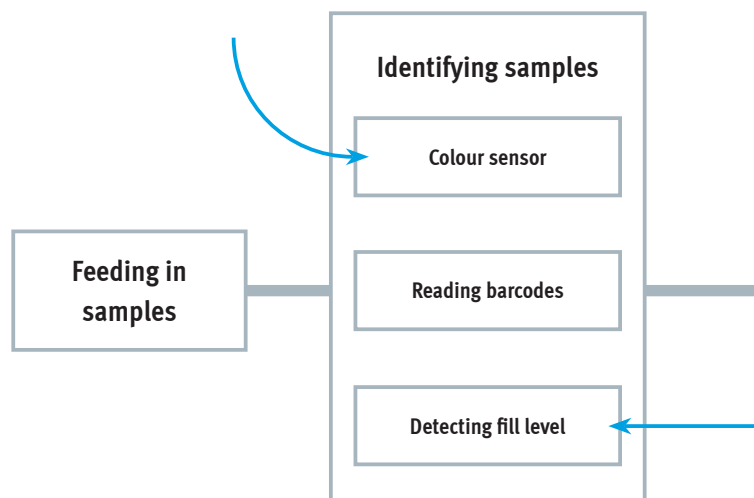
Infinite electrical rotation and electric or pneumatic gripping

The EHMD is ideal for use with small objects in laboratory automation. For universal handling of small sample containers. Or for gripping and rotating, as well as opening and closing caps. The assembly module with Z compensation automatically adjusts to the thread pitch of the caps without moving the Z-axis. When powered by the motor controller CMMT-ST, it allows sample containers of unknown size to be gripped with variable levels of force.

- Infinite rotation: electric, with encoder for absolute positioning
- Maximum torque: 0.3 Nm; speed: up to 150 rpm at full torque
- Gripping: pneumatic or electric with encoder and gripping force backup in case of power failure
- Stroke: 2 x 5 mm; opening/closing time: < 0.4 s for 2 x 2 mm stroke
- Compact module for payload of up to 250 g



Colour sensor
SOEC
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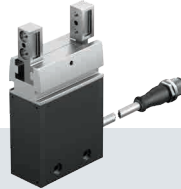




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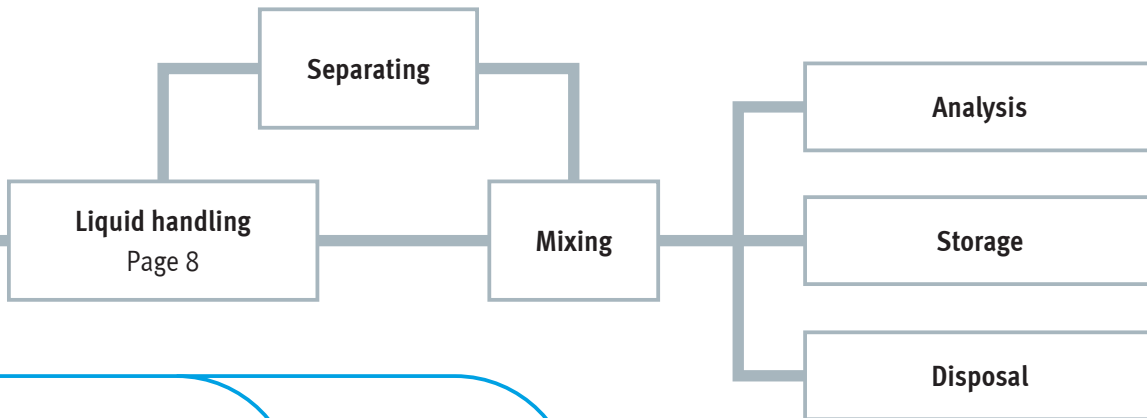
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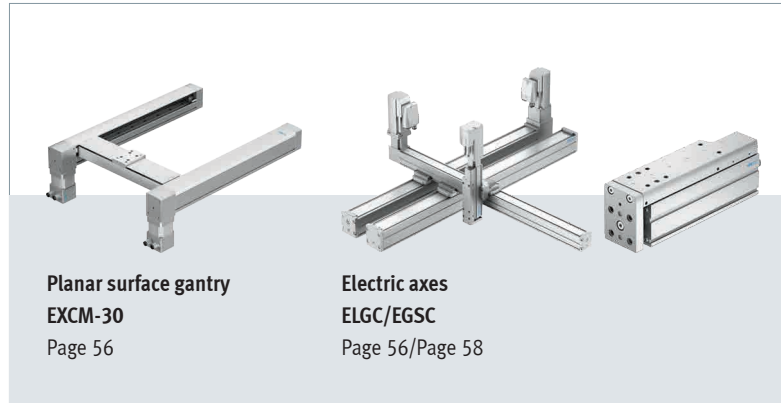
Fibre-optic cable
SOOC
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Fork light barrier
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Sample preparation – liquid handling

Laboratory automation



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Dispense head VTOE



The complete modular solution for perfection in rapid dispensing

Housed in a compact 9 mm grid, the high-precision dispense head VTOE has a modular configuration in terms of the number of dispensing channels, the internal diameter of the dispensing nozzles and the wetted materials used. The typical coefficient of variation (CV) of the dispensing volume is less than 1% in the range between 10 and 1000 µl with excellent linearity. The media separated solenoid valves prevent cross-contamination and ensure best possible rinsability.

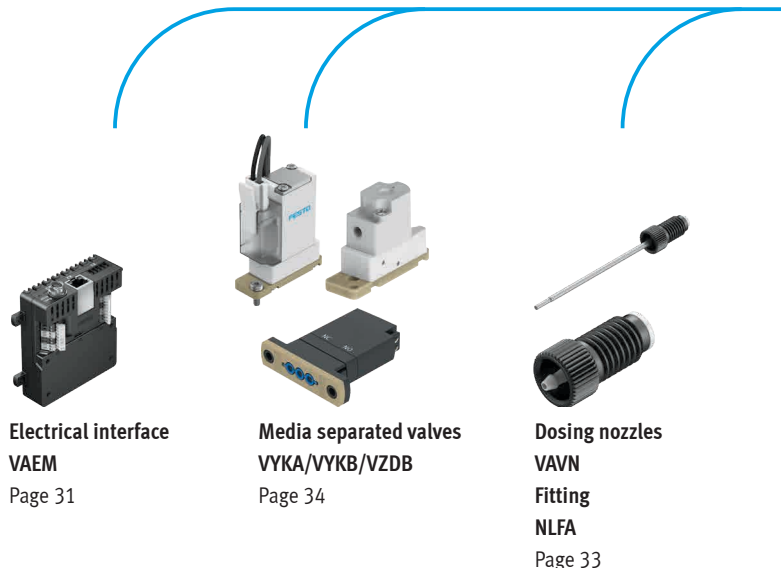
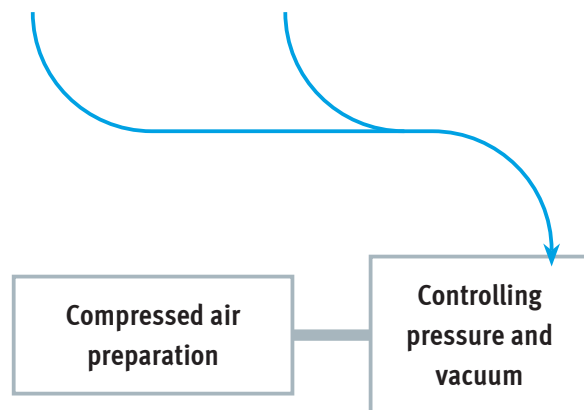
- Configurable complete solution consisting of manifold duct plate, dosing valves and nozzles
- Contactless dispensing of very small quantities
- Wetted materials: transparent polycarbonate with FPM seal or highly inert PEEK with FFPM seal, depending on the area of application



Proportional pressure regulator
VEAB
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Pressure vacuum generator
PGVA
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Media separated valves
VYKA/VYKB/VZDB
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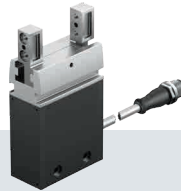
Dosing nozzles
VAVN
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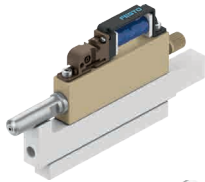


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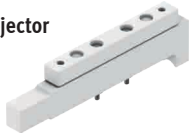
Pipetting unit
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Disposable tip
DHAP
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Disposable tip ejector
DHAO-EJ
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Pipetting

Dispensing

Process monitoring

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Flow rate

Volume

Filling level

Flow transmitter
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Flow sensor
SFAH
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Pressure sensor
SPAN
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Pressure transmitter
SPTW
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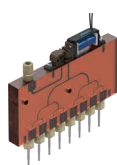
Analysis

Storage

Disposal



Dispense head
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Dispense head
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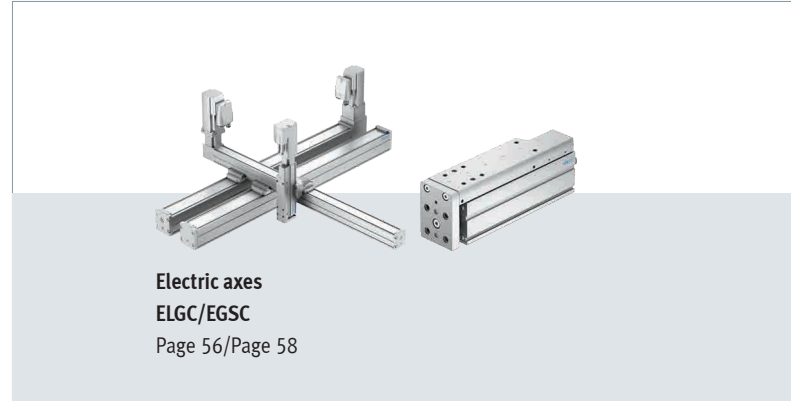
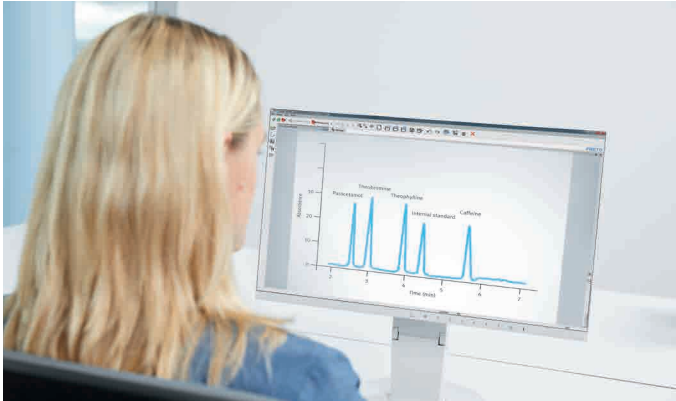
Fibre-optic cable
SOOC
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Fork light barrier
SOOF
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Flow cytometry

Laboratory automation 01



Electric axes
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Media separated valves VYKA/VYKB/VZDB



Maximum performance density and precision

With the media separated valves VYKA, VYKB and VZDB, all three operating modes of dosing, aspirating or continuous flow are possible. The compact, powerful valves dose and aspirate any quantity, right from the very smallest, with great precision. Their uniquely impressive pressure and nominal width specifications also make them perfect for flow control, for example in manifold duct plates.

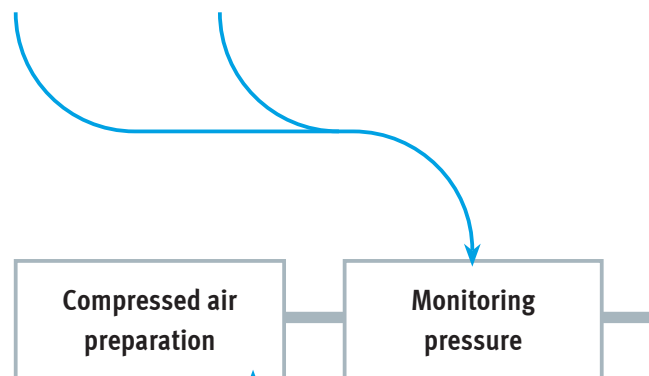
- Reliable media separation:
 - Including for aggressive liquids
 - Very easy to clean
- Flexible in use thanks to 3/2 and 2/2 (NC/NO)
- Various nominal widths for dosing, aspirating and for continuous flow applications



Proportional pressure regulator
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Pressure vacuum generator
PGVA
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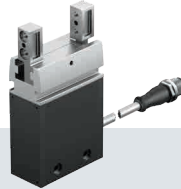
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Rotary gripper module
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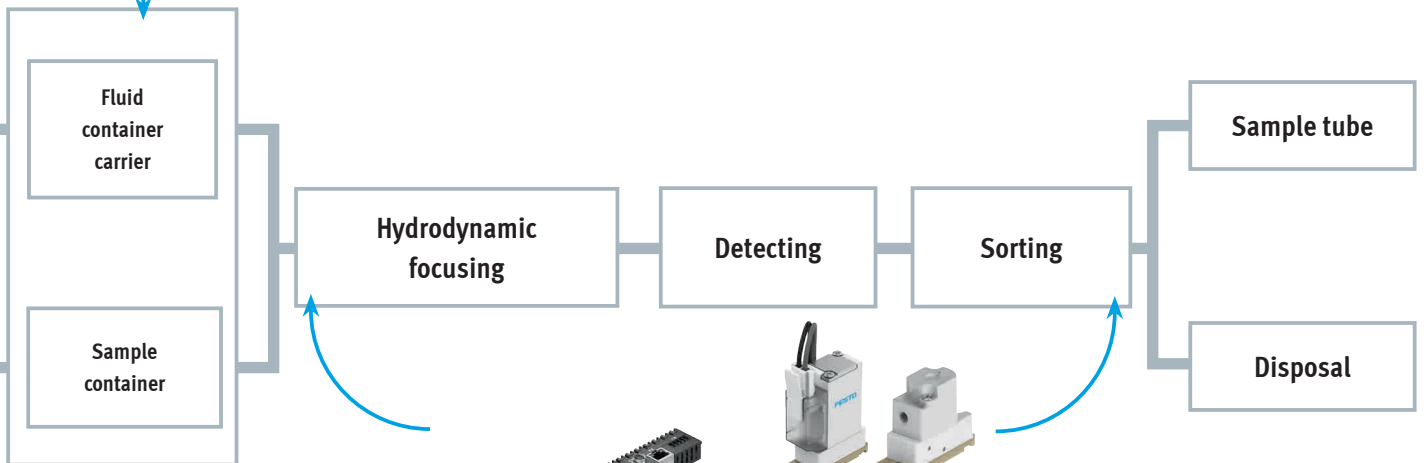
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Media separated valves
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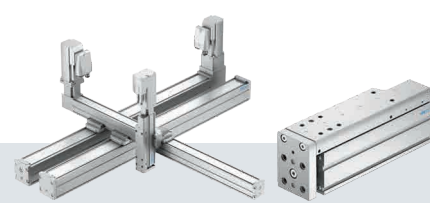
Analytical chromatography

Laboratory automation 01



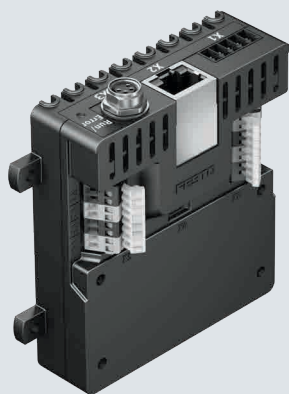


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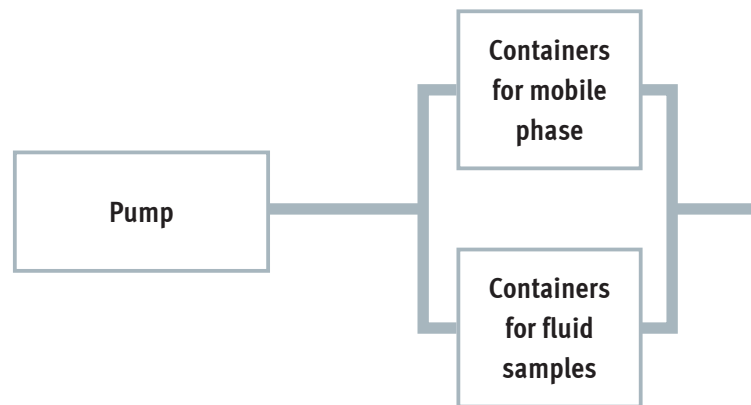
Valve control module VAEM



Easy actuation of valves with holding current reduction

The VAEM is ideal for high-precision dispensing applications. The digital interface simplifies the configuration and control of solenoid valves: the calibration factor between the individual channels, the opening time per valve and the pickup and holding current. The module improves the precision of the switching behaviour of the valves. It is a perfect fit for the media separated valve VYKA. The dispensing process is controlled via an external trigger signal or the communication interface.

- Very precise valve control with 0.2 ms time resolution
- For 1 to 8 valves, independently controllable
- Freely adjustable holding current reduction
- Interface for controlling and programming the parameters as well as for reading out the values or errors
- Graphical user interface (GUI) as the operator environment
- Communication interface: ASCII via RS232, Modbus® TCP via Ethernet

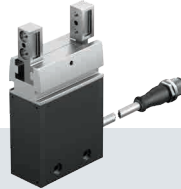




Stepper motor
EMMS-ST
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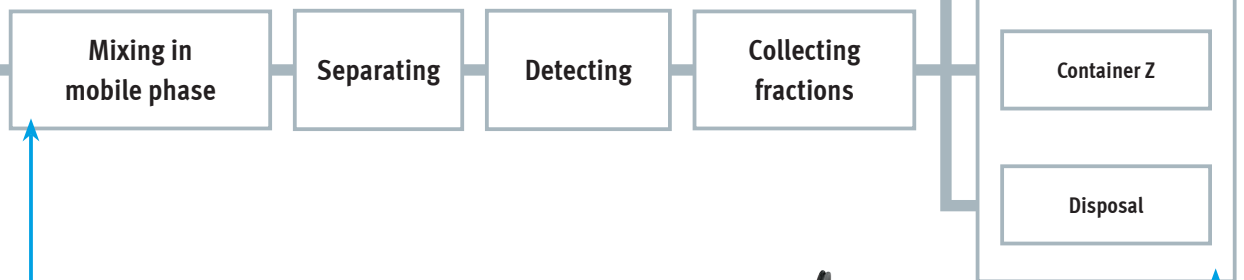
Controller
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Rotary gripper module
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Dosing nozzles
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In-vitro diagnostics – point of care

Laboratory automation 01



Miniature solenoid valve VOVK



Extremely narrow for many valves in a small space

With a width of only 5.9 mm, the VOVK is ideal for applications where many valves have to be fitted into a very small space and where flow rates of up to 6 l/min are sufficient.

For example, for small devices where the miniature valves actuate many diaphragms on a lab-on-a-chip (IVD PoC) cartridge.

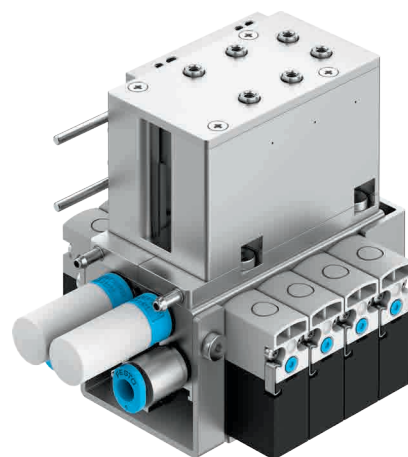
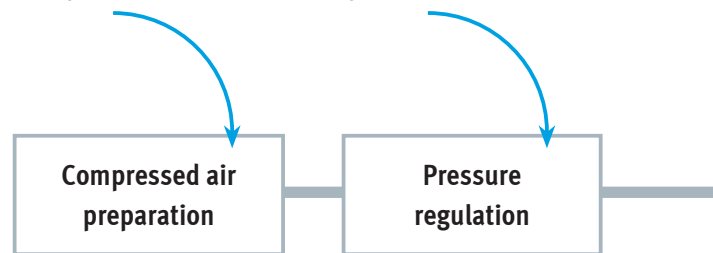
- Compact 3/2-way miniature solenoid valve that is only 5.9 mm wide (valve MHA = 10 mm)
- Pressure range vacuum -0.9 ... 7 bar gauge pressure
- Flow rate up to 6 l/min
- For air and inert gases



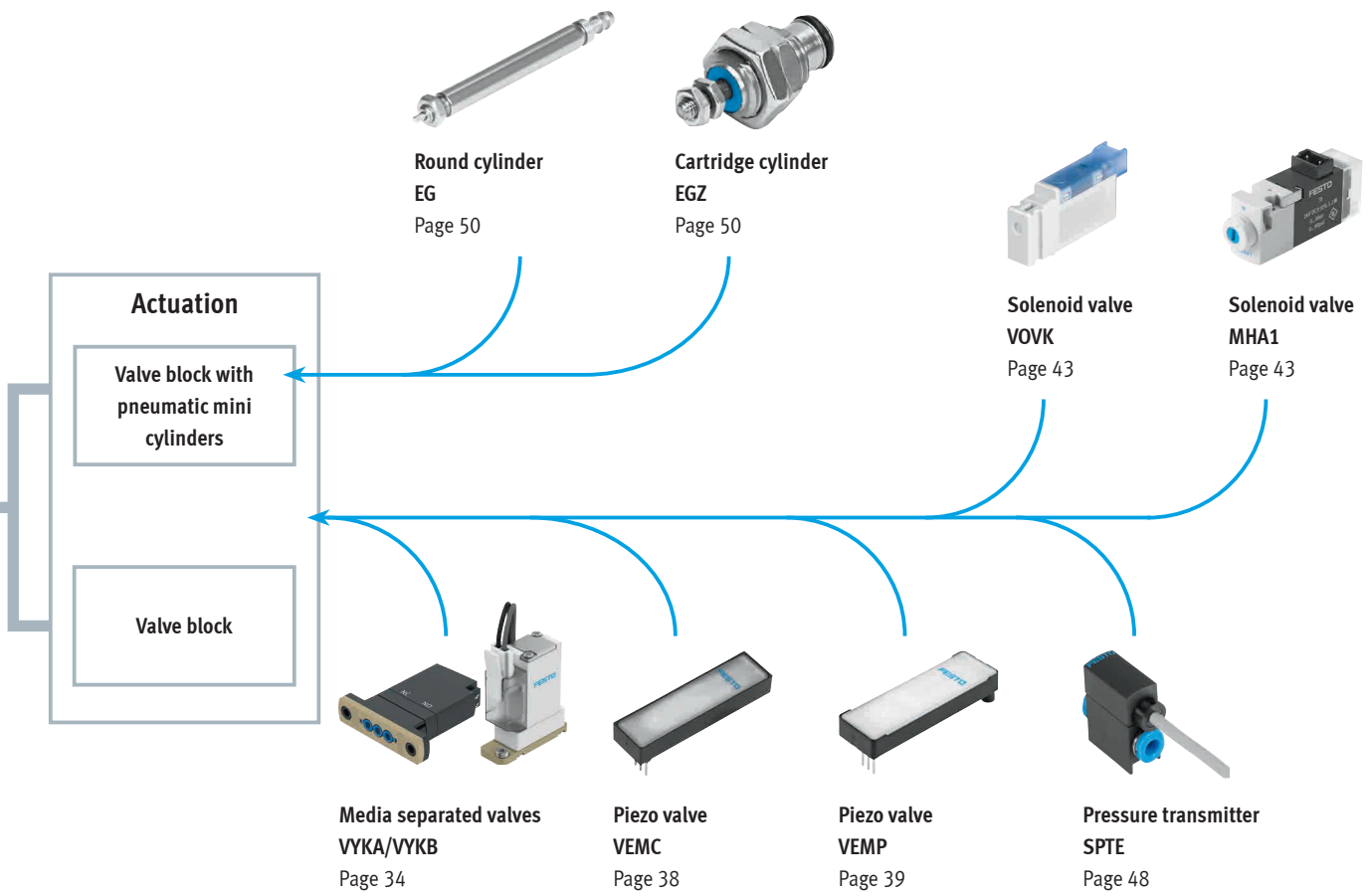
**Filter regulator
MS2-LFR-B**
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**Proportional pressure regulator
VEAB**
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Example of a customised valve block



Medical technology – customised safety



In medical technology safety comes first, for you as an equipment manufacturer and for Festo as your ISO-certified partner. Close and trusting cooperation simplifies the processes and defines the responsibilities for both parties.

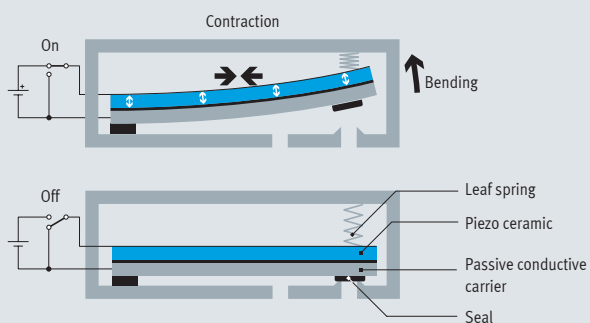
You can rest assured that with Festo the ISO 9001 standard is always complied with. Festo combines the world of industrial automation with medical technology by implementing medical risk management processes in product development in accordance with the standards ISO 13485 and ISO 14971.

Festo develops components as well as subsystems for medical devices. Solenoid valves as well as proportional valves with piezo technology are often used for regulating the pressure levels and flow rates of medical gases in mobile applications and in applications close to the patient. These are especially compact, silent and energy-saving. Thanks to the material prop-

erties of piezo ceramics, no energy is needed to maintain a steady flow, but only to change the state of the flow. The generation of heat is thus avoided and the valves are highly energy-efficient.



**Proportional valves with piezo technology:
Mode of operation**



Festo uses the piezoelectric characteristics of certain ceramics which are mechanically deformed when a voltage is applied.

2/2-way proportional valves



They control the flow rate, e.g. in mobile oxygen therapy devices, thus ensuring precise oxygen supply and dosing during inhalation.

3/3-way proportional valves



They are used to regulate the flow or pressure in oxygen therapy, ophthalmology and other therapies.

The benefits of piezo valves at a glance

- + Low power consumption: ideal for portable devices
- + No operating noise: for use close to the patient
- + Proportional characteristics
- + Safe by maintaining the current status in case of power failure
- + Lightweight
- + Compatible with oxygen
- + Sturdy and durable

“Festo’s piezo valves have played a significant role in enabling us to make our portable oxygen therapy devices lighter, smaller, quieter and more efficient.”

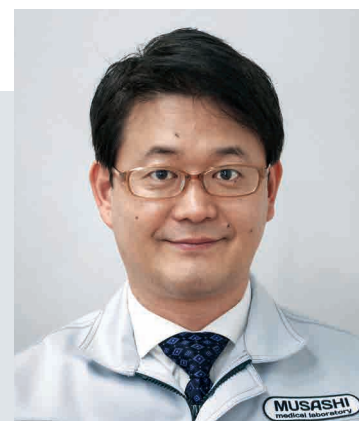
Satoru Tokuyama, President of Musashi Medical Laboratory, Japan

Greater comfort and efficiency for long-term oxygen therapy

Around 600 million people worldwide suffer from chronic obstructive pulmonary disease (COPD) and depend on a portable oxygen therapy device. Musashi Medical Laboratory has developed the convenient oxygen

consaver IVY with control block in smartphone format for these oxygen system devices. The consaver works with a compact, lightweight piezo valve from Festo. The switching operations of the proportional valve VEMR are completely silent. It is sensor-controlled and only opens during

inhalation. Less oxygen is consumed as a result, and the patient’s radius of activity is significantly increased.



Oxygen therapy

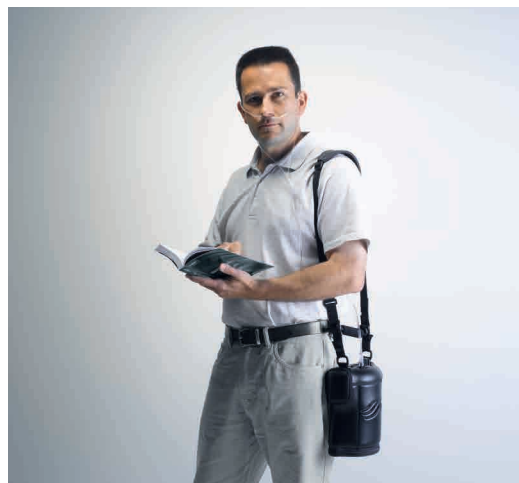
Proportional flow control valve VEMD



Quiet, precise and energy-saving – ideal for mobile devices

The lightweight and compact mass flow controller (MFC), which is designed specifically for medical applications, is very quiet and, thanks to its short response times, very precise. The module with 2/2-way piezo valve, flow sensor and control electronics doses and regulates inert gases such as oxygen or nitrogen proportionally. The integrated control circuit with sensor detects and regulates the current flow rate and forwards it to the master controller as an analogue signal. The volumetric flow rate at the system's output can be adjusted very simply by entering a setpoint between 0.2 and 10 V.

- Compact module with integrated control electronics
- Minimal power consumption thanks to piezo technology
- Silent: ideal for mobile applications and those close to the patient



Portable oxygen concentrator

Air compressor

Valve for feed waste dump

Oxygen storage tank

Portable oxygen conserver

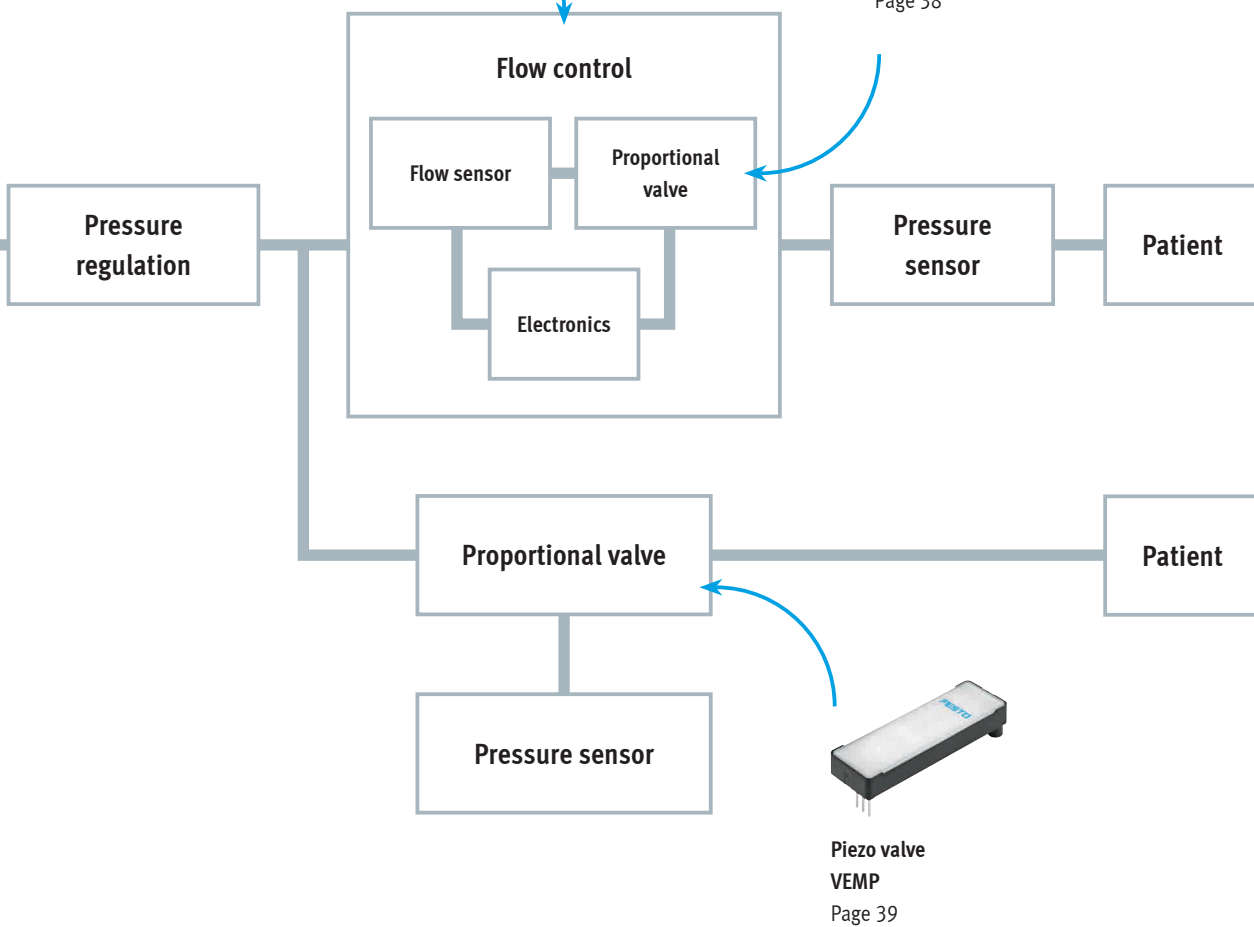




**Proportional flow control valve
VEMD**
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**Piezo valve
VEMR**
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Ventilator breathing devices



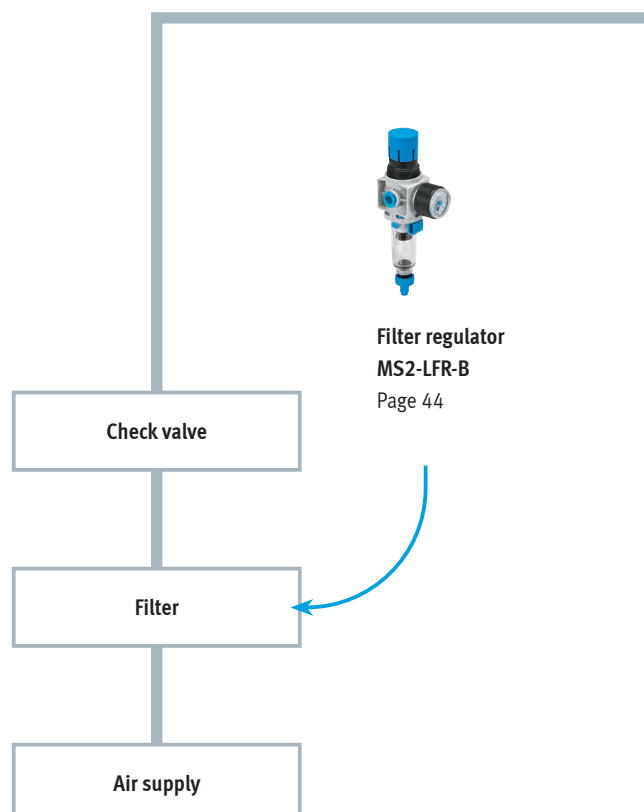
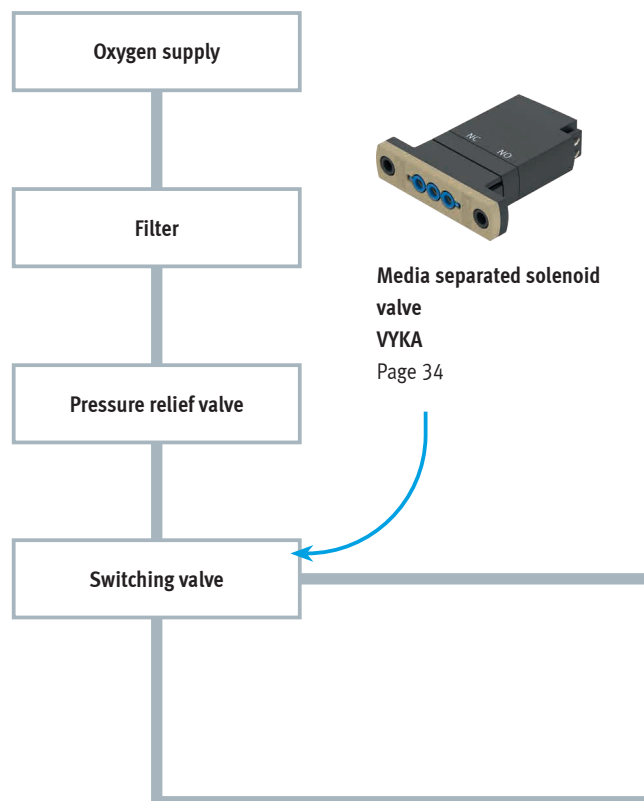
2/2-way proportional valve VEA E



Suitable for oxygen – small and quiet with high flow rate

The VEA E regulates gas flows, whether oxygen, air, nitrogen or inert gases, safely and precisely. Since the piezo ceramics also maintain their current status in case of a power failure, the valves offer outstanding process reliability. The high flow rate of up to 100 l/min makes the VEA E ideal for portable or stationary ventilator breathing devices. The compact valve is ideally suited for regulating the flow of air, and thus the speed of compressed air drills used in dentistry and surgery.

- Piezo proportional valve with high flow rate and for high pressure ranges
- Power consumption < 10 mW
- No self-heating
- Compatible with oxygen
- Small and lightweight
- Ideal for battery-powered, mobile applications

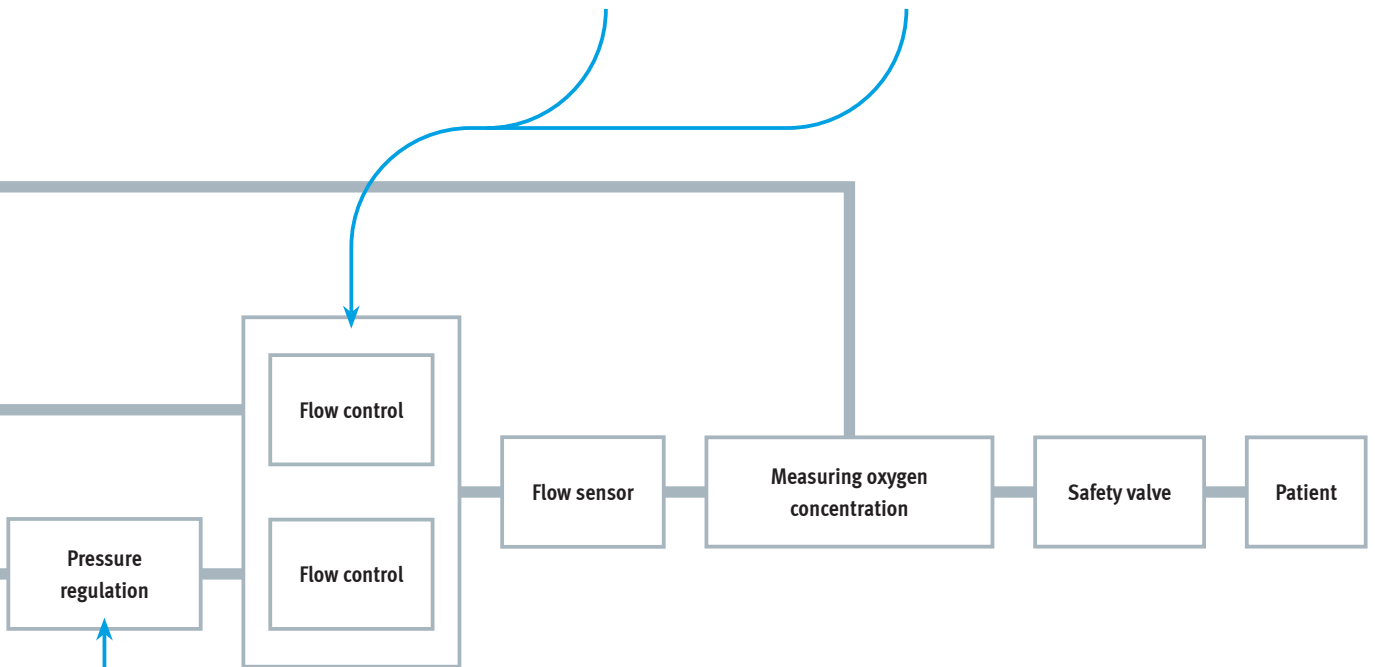




**Piezo valve
VEAE**
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**Proportional directional control valve
VPWS**
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**Proportional pressure
regulator
VEAB**
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**Proportional pressure
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VPPI**
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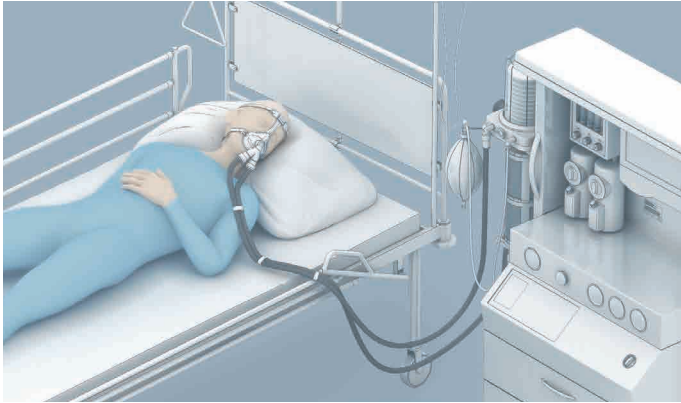


**Proportional pressure
regulator
VPPE**
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**Precision pressure
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LRP**
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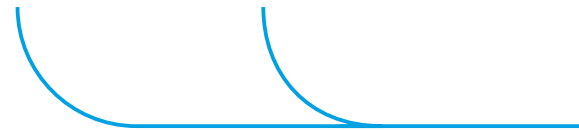
Anaesthesia



**Piezo valve
VEAE**
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**Proportional directional control valve
VPWS**
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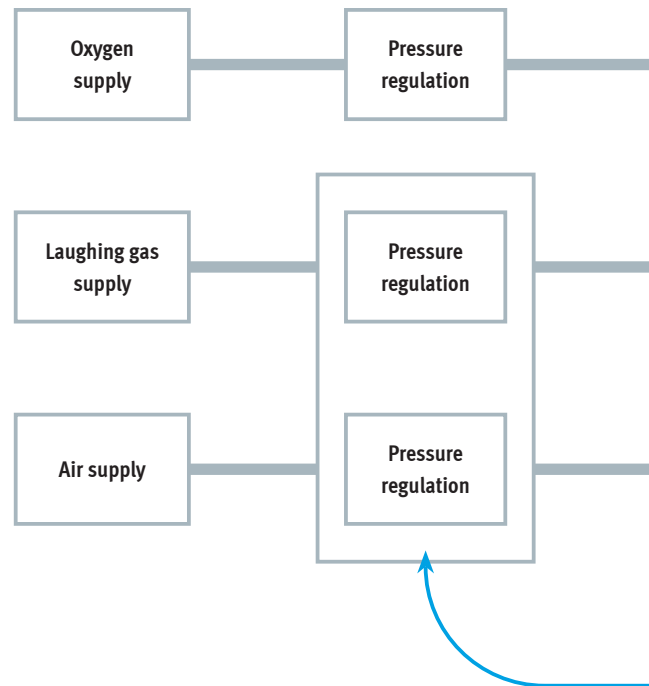
2/2-way proportional valve VPWS



Extremely compact with high flow rate

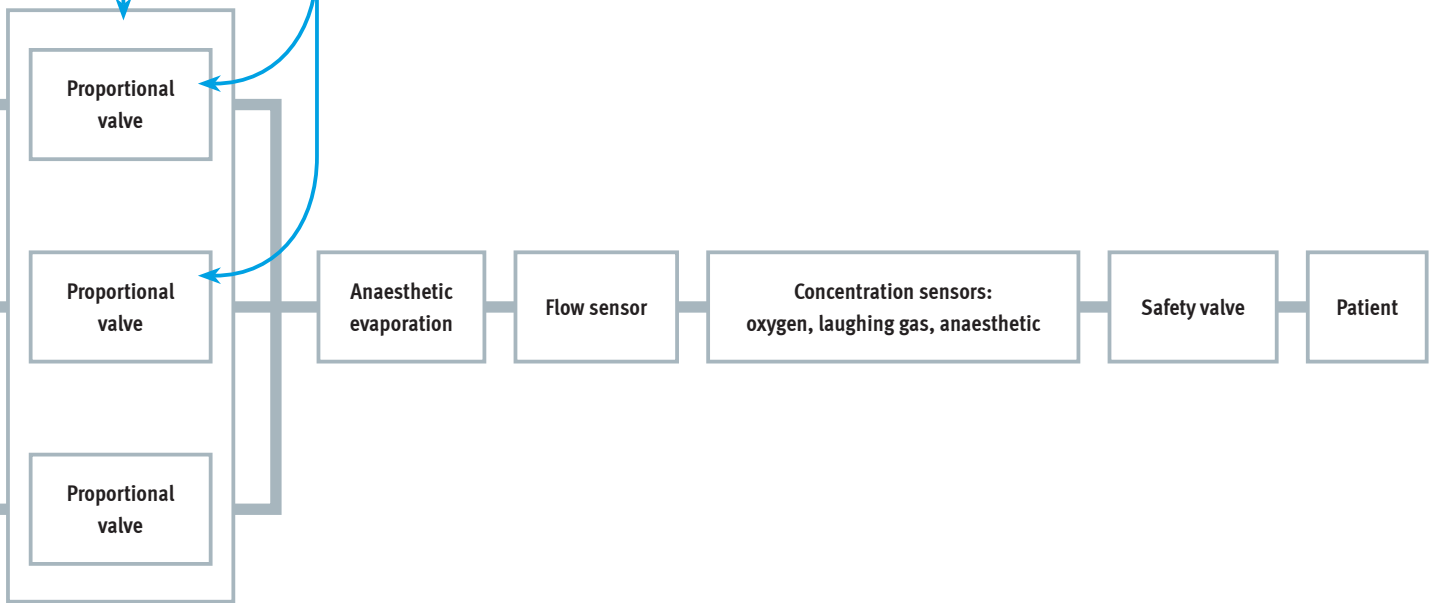
The VPWS is a lightweight, compact 15 mm cartridge valve with high flow rate. The proportional solenoid valve safely and accurately regulates the flow of gases, whether oxygen, carbon dioxide, air, nitrous oxide or inert gases. It is perfect for use in ventilator breathing and anaesthetic systems, for example where respiratory gases need to be mixed with oxygen. But it is also suitable for laparoscopes and colonoscopes, as well as other surgical instruments which are operated with compressed air.

- Extremely small cartridge valve: 15 mm diameter, 30 mm long
- Different variants with flow rates of 40 l/min at 2 bar, 90 l/min at 8 bar and 200 l/min at 2 bar
- Ideal for applications with minimal installation space





**Proportional flow control valve
VEMD**
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**Proportional pressure regulator
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**Proportional pressure regulator
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**Proportional pressure regulator
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**Precision pressure regulator
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**Filter regulator
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Dental drills and media handling



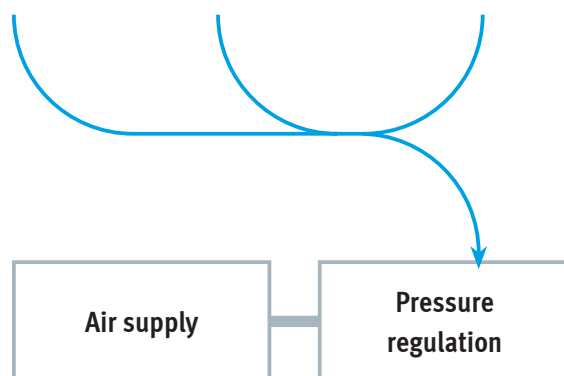
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VEAB
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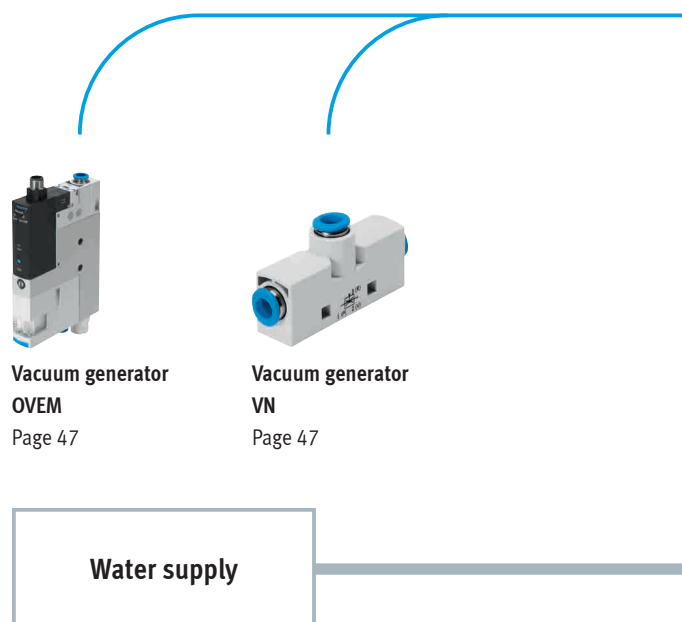
Proportional pressure regulators VEAA/VEAB



Highly precise and quiet – with a large pressure range

The extremely compact valves deliver top performance for the regulation of pressure and are highly economic for flow rates of up to 20 l/min. They also boast an extremely long service life. The VEAA and VEAB combine innovative piezo technology with digital closed-loop control technology. This makes the pressure regulators with their outstanding features interesting for laboratory automation applications where regulated pressure or vacuum is required for pressure-supported dosing and pipetting of fluids.

- Compact module with 3/3-way valve, pressure sensor and integrated control electronics
- Excellent control precision
- High repetition accuracy
- Completely silent: ideal for use in laboratories and in medical technology
- Wide pressure range: -1 to 10 bar



Vacuum generator
OVEM
Page 47



Vacuum generator
VN
Page 47



Proportional flow control valve
VEMD
Page 40

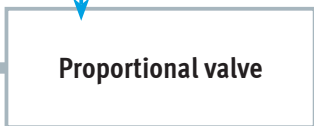


Piezo valve
VEAE
Page 39

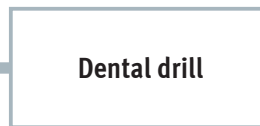


Proportional directional control valve
VPWS
Page 40

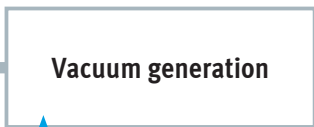
Gas handling



Proportional valve



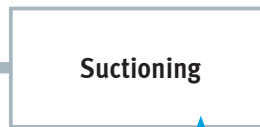
Dental drill



Vacuum generation



Pressure regulation



Suctioning



Dosing needle
VAVN
Fitting
NLFA
Page 32, Page 33



Electrical interface
VAEM
Page 31



Proportional pressure regulator
VEAB
Page 41

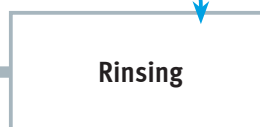


Media separated valves
VYKA/VYKB/VZDB
Page 34

Media handling



Pressure regulation



Rinsing

Compression therapy/medical mattresses

Piezo valve VEMP



Small, lightweight, affordable and energy-saving

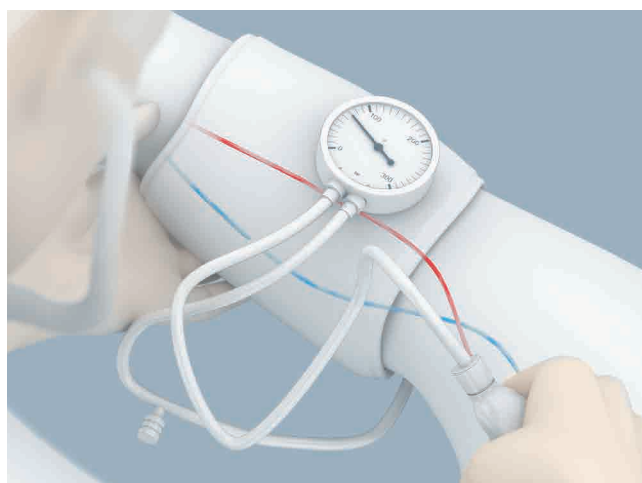
The extremely compact proportional valve VEMP with piezo technology requires only minimal energy of just 1 mW. At 20 g it is lightweight, making it ideal for use in mobile devices such as portable oxygen therapy devices. The VEMP enables extremely precise proportional control of gas flow rates from 0 to 30 l/min, as well as pressure. With a switching speed of 15 ms, it can react very quickly to setpoint changes. It is ideal for medical compression therapy, oxygen/ventilation therapy, ophthalmology and dialysis.

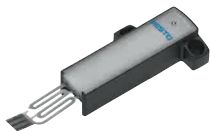
- Proportional air supply and exhaust
- Very precise
- Very low energy consumption
- Extremely compact design
- Minimal weight
- Low leakage
- No heat generation
- Long service life



Anti-decubitus mattress

Sleeve





**Piezo valve
VEMR**
Page 38



**Piezo valve
VEMP**
Page 39



**Solenoid valve
MHA1, MHA2/3/4**
Page 43



**Proportional pressure regulator
VEAB**
Page 41

Liquid handling



Extremely precise

We develop ready-to-install complete solutions with dosing technology and the matching kinematics in line with your requirements – for dosing and pipetting liquids, e.g. for dilutions, adding nutrient solutions or for dispensing reagents into microwell plates.

Dispense and pipette heads >

Pipette heads





Pipetting units
DHOE

Pipetting volume	2 ... 1000 µl (depending on the pipette tip, larger volumes on request)	
Max. pipetting throughput	3000 µl/s	
Pipetting accuracy	<5% CV for volumes under 5 µl <2% CV for volumes under 50 µl <1% CV for volumes under 500 µl <0.5% CV for volumes under 1000 µl	
Input pressure	-0.2 ... 0,65 bar	
Power supply	24 V DC (2.0 W)	
Electrical connection	2 pins, open end	
Liquid connection	¼-28 UNF female thread	
Dimensions (W x L x H)	8.1 mm x 76.2 mm x 30 mm	
Grid dimension	9 mm (perfect for microwell plate with 96 wells, also suitable for plates with 384 and 1536 wells)	
Pipette tip	Volume	20 µl, 300 µl, 1000 µl
	Key features	Filter, sterile
	Force	<10 N/pipette tip
Description	<ul style="list-style-type: none"> • Pipetting system with pipette head • Open pipetting system • Freely configurable • Flexible extension options • Media-resistant pipette head • With pipette tips • Easy integration • Complete solution from a single source 	
online: →	dhoe	


Dispense and pipette heads >

Accessories for pipetting units

	 <p>Pipette tip ejectors DHAO-EJ</p>	 <p>Disposable tips DHAP</p>
<p>Description</p>	<ul style="list-style-type: none"> Once the pipetting process is complete, the used pipette tips can be removed and disposed of completely mechanically using the pipette tip ejector DHAO-EJ 	<ul style="list-style-type: none"> Volume: 20, 300, 1000 µl Disposable tip material: polypropylene (clear, not coloured) Filter material: polyethylene (white) Optional: sterile packaging Delivered stacked or in racks Packaging unit: 960 pieces
<p>online: →</p>	<p>dhao-ej</p>	<p>dhap</p>

Dispense and pipette heads >

Compressed air generators

	 <p>Pressure vacuum generators PGVA</p>
<p>Pressure regulation range</p>	<p>-500 ... +500 mbar</p>
<p>Absolute accuracy</p>	<p>1% (FS)</p>
<p>Max. grade of filtration</p>	<p>0.01 µm</p>
<p>Pneumatic connection</p>	<p>4 mm (QS4)</p>
<p>Power supply</p>	<p>24 V DC</p>
<p>Digital output design</p>	<p>For integrated individual valve actuation</p>
<p>Electrical connection, connection technology</p>	<p>RJ45 Ethernet port for Modbus® TCP RS232 serial port for ASCII</p>
<p>Description</p>	<ul style="list-style-type: none"> Integrated compressor Proportional pressure/vacuum control Portable, therefore flexible in use Easy to integrate Dynamic and precise Easy to operate and configure with the GUI configuration tool, see www.festo.com/software/PGVA
<p>online: →</p>	<p>pgva</p>

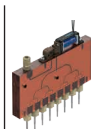
Liquid handling

Dispense and pipette heads >

Dispense heads



**Dispense heads
VTOE**



**Dispense heads
VTOI**

Basic function	Dosing	Dosing and aspirating
Valve function	2/2-way, single solenoid, closed	2/2-way, single solenoid, closed
Grid dimension	9 mm	9 mm
Operating pressure	0 ... 0.5 bar	0 ... 1 bar, -0.2 ... 0.65 bar
Internal volume	113 µl valve with fluid connections	10 µl fluid chamber valve, 178 µl distributor block with valve, needle and fittings
Fluid connection	8x UNF1/4-28, UNF1/4-28	Female thread 1/4-28 UNF-2B
Medium	Liquid media	Liquid media, gaseous media
Materials in contact with the media	ETFE, FFPM, FPM, PC, PEEK, PPS, high-alloy stainless steel	ETFE, FPM, PEI, PPS, high-alloy stainless steel
Water flow rate at max. operating pressure	370 µl/s, 2000 µl/s, 1300 µl/s	
Nominal width of dosing needle	0.32 mm, 0.6 mm, 1 mm	0.3 mm
Length of dosing needle	30 mm	30 mm
Min. dosing volume	1 µl	1 µl
Note on dosing volume	Depending on configuration, environment and application	Depending on configuration, environment and application
Typical dosing precision	<1% CV for volumes >5 µl, <2.5% CV for volumes between 1-5 µl	≤ 5% tip-to-tip CV, ≤ 3% intra-run CV
Note on dosing precision	Depending on configuration, environment and application	Depending on configuration, environment and application
Nominal operating voltage DC	24 V	24 V
Duty cycle	100% with individual mounting, 50% (max. switch-on time 1 s), 50% with block mounting (max. switch-on time 1 s)	100%
Degree of protection	IP30	IP30
Ambient temperature	5 ... 40°C	5 ... 40°C
Description	<ul style="list-style-type: none"> • Ready-to-install dosing solution saves time and costs • Compact 9 mm grid dimension • Suitable for sensitive and aggressive liquids • Ideally suited to non-contact dosing of liquid media • Maximum dosing precision down to the microlitre range • Small internal volume makes it easy to rinse • 1- or 8-channel dispense head • Typical coefficient variation (CV): < 1% at 10 to 1000 µl 	<ul style="list-style-type: none"> • Extremely precise • Compact 9 mm grid dimension • Ideal for microwell plates • 8-channel dispense head • Simple design with side-by-side mounting for increased throughput • High-quality materials, therefore also suitable for aggressive media • The complete dispensing system can be designed with just a few components • A 96-way dispense head can be realised using just 12 valves
online: →	vtoe	vtoi

Dispense and pipette heads > Accessories >

Control system for dispense heads



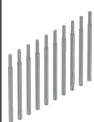
**Valve control modules
VAEM**

Dimensions (W x L x H)	92 mm x 100 mm x 28 mm
Parameterisation	Parameter setting per output
Max. number of outputs	8
Pickup current, per output	20 ... 1000 mA
Holding current, per output	20 ... 400 mA
Pickup current, total	4 A
Holding current, total	1.8 A
Trigger level	Level 14 ... 24 V
Time resolution	0.2 ms
Communication interface, protocol	ASCII via RS232
Ethernet interface, protocol	Modbus® TCP
Description	<ul style="list-style-type: none"> • Electronic control system with integrated, adjustable holding current reduction for controlling up to eight solenoid valves • Parameterisation, diagnostics and control via graphical user interface (GUI), Ethernet and RS232 interface as well as external 24 V trigger input • Graphical user interface (GUI) for extremely easy operation and clear visualisation • Very fast valve actuation with a time resolution of 0.2 ms • Easy setting of a calibration factor between the individual channels (opening times per valve)
online: →	vaem

Liquid handling

Dispense and pipette heads > Accessories >

Dosing elements



**Dosing needle sets
VAVN**

Design of dosing needle	With chamfer, with taper
Nominal width of dosing needle	0.3 mm, 0.6 mm, 1.2 mm
Outside diameter of dosing needle	1.6 mm
Length of dosing needle	30 mm, 60 mm
Operating pressure [MPa]	0 ... 0.4 MPa
Flow rate Kv	0.003 ... 0.039 m ³ /h
Medium	Liquid media, gaseous media
Materials in contact with the media	High-alloy stainless steel
Ambient temperature	5 ... 60°C
Description	<ul style="list-style-type: none"> • For dosing applications with extremely high precision • Length of dosing needle 30 mm or 60 mm • Outside diameter 1.6 mm • Nominal width 0.3 mm, 0.6 mm or 1.2 mm • High corrosion resistance (corrosion resistance class CRC 3 to Festo standard 940 070) and chemical resistance • Design with chamfer and/or with taper • Pack of 10
online: →	vavn

Individual valves > Accessories >

Fittings



Fittings
NLFA

Design	Tubing mounted via clamped connection, tubing mounted via barbed connector
Design	Straight design
Fluid connection	UNF1/4-28
Fluid connection 2	For tubing O.D. 3 mm, for tubing I.D. 1.2 mm, for tubing I.D. 2.1 mm, for tubing O.D. 1.6 mm (1/16"), for tubing O.D. 3.2 mm (1/8")
Operating pressure for full temperature range	-0.75 bar, 4 bar, 6 bar
Operating pressure [MPa] for full temperature range	-0.075 MPa, 0.4 MPa, 0.6 MPa
Operating pressure [psi] for full temperature range	-10.875 psi, 58 psi, 87 psi
Medium	Liquid media, gaseous media
Materials in contact with the media	PP
Ambient temperature	0 ... 50°C
Description	<ul style="list-style-type: none"> • For mounting in laboratory devices • Excellent rinsability thanks to connector without dead space • For liquid and gaseous media • Including for aggressive liquids • Materials in contact with the media: PP • For securing tubing and dosing needles • Straight design
online: →	nlfa

Liquid handling

Individual valves >

Media separated valves



Media separated solenoid valves
VYKA




Media separated solenoid valves
VYKB

Size	7	10, 12
Valve function	2/2-way, single solenoid, closed, 2/2-way, single solenoid, open, 3/2-way, single solenoid, open/closed	2/2-way, single solenoid, closed, 3/2-way, single solenoid, open/closed
Actuation type	Electrical	Electrical
Operating voltage range DC	12 ... 26 V	12 V, 24 V
Note on operating voltage range DC	With E-box VAVE-K1-...	
Characteristic coil data	12 - 26 V DC: low-current phase 0.06 W, high-current phase 2.2 W	12 V DC: low-current phase 1 W, high-current phase 3.7 W, 12 V DC: low-current phase 1 W, high-current phase 5.2 W, 24 V DC: low-current phase 1 W, high-current phase 5.2 W, 24 V DC: low-current phase 1 W, high-current phase 3.7 W
Fluid connection	Flange	Flange
Nominal width	1.2 mm	1.6 mm, 2 mm
Flow rate Kv	0.013 m ³ /h, 0.021 m ³ /h	0.034 m ³ /h, 0.056 m ³ /h
Medium	Liquid media, gaseous media	Liquid media, gaseous media
Medium pressure [MPa]	0 MPa, 0.2 MPa	-0.075 MPa, 0.1 MPa, 0.3 MPa
Materials in contact with the media	FFPM, FPM, PEEK	EPDM, FFPM, FPM, PEEK
Ambient temperature	0 ... 50°C	0 ... 50°C
Description	<ul style="list-style-type: none"> • Compact width of 7 mm • Maximum performance and precision in the smallest of spaces • High flow rate with small size • Very easy to clean thanks to media separation • Low media consumption thanks to small internal volume • FDA-listed materials • High-quality materials, therefore also suitable for aggressive media • High repetition accuracy, switching frequency and precision, therefore also suitable for extremely small volumes and dosing tasks • Very flexible in use thanks to 3/2-way and 2/2-way variants (NC/NO) as well as 12 ... 26 V DC actuation • Optionally with slide-on E-box VAVE-K1 with holding current reduction as accessory • Developed to ISO 13485 • Pressure and temperature ranges vary depending on the configuration 	<ul style="list-style-type: none"> • Compact width of 10 mm or 12 mm • Very easy to clean thanks to media separation • High-quality materials, therefore also suitable for aggressive media • Very flexible in use thanks to 3/2-way or 2/2-way variants as well as 12 or 24 V DC actuation • For dosing, aspirating and for continuous flow applications • Developed to ISO 13485
online: →	vyka	vykb



Individual valves > Accessories >

Electrical connection components

	E-boxes VAVE-K1
Electrical connection	2-pin, twin wire, open end
Operating voltage range DC	12 ... 26 V
Cable composition	2 x 0,08 mm ²
Cable length	0.5 m
Signal status indication	LED
Additional functions	Holding current reduction
Description	<ul style="list-style-type: none"> • For media separated solenoid valve VYKA • With holding current reduction
online: →	vave-k1

Individual valves > Accessories >

Sub-bases

	Sub-bases VABS-K1		Sub-bases VABS-K2
Fluid connection	Female thread 1/4-28 UNF-2B, female thread M5	Fluid connection	Female thread 1/4-28 UNF-2B, female thread M6
Nominal width	1.2 mm	Nominal width	1.6 mm, 2 mm
Operating medium	Liquid media, gaseous media	Operating medium	Liquid media, gaseous media
Note on the operating/pilot medium	Note resistance of materials in contact with the media	Note on the operating/pilot medium	Note resistance of materials in contact with the media
Description	<ul style="list-style-type: none"> • For media separated solenoid valve VYKA • Connections underneath 	Description	<ul style="list-style-type: none"> • For media separated solenoid valve VYKB and media separated pneumatic valve VZDB • Variants with connections underneath or on the side
online: →	vabs-k1	online: →	vabs-k2

Liquid handling

Individual valves > Accessories >

Connecting cables for valves



Connecting cables
NEBV-Q7G2



Connecting cables
NEBV-HPG2

Electrical connection 1, connection type	Socket	Cable with socket
Electrical connection 1, cable outlet	Straight	Straight
Electrical connection 1, number of pins/wires	2	2
Electrical connection 1, design	Rectangular	Rectangular
Electrical connection 2, connection type	Twin wire	2x single wires
Electrical connection 2, connection technology	Open end	Open end
Operating voltage range DC	0 ... 30 V	0 ... 24 V
Cable length	0.1 m, 0.5 m	0.3 m
Description	<ul style="list-style-type: none"> • For media separated solenoid valve VYKA 	<ul style="list-style-type: none"> • For media separated solenoid valve VYKB
online: →	nebv-q7g2	nebv-hpg2

Individual valves >

Media separated valves



**Media separated pneumatic valves
VZDB**

Size	10
Valve function	2/2-way, single solenoid, closed, 3/2-way, single solenoid, open/closed
Actuation type	Pneumatic
Operating medium	Liquid media, gaseous media
Note on the operating/pilot medium	Note resistance of materials in contact with the medium, maximum particle size 5 µm
Operating pressure [MPa]	-0.075 MPa, 0.1 MPa
Fluid connection	Flange
Nominal width	1.6 mm
Flow rate Kv	0.034 m³/h
Ambient temperature	0°C, 50°C
Description	<ul style="list-style-type: none"> • Compact width of 10 mm • Very easy to clean thanks to media separation • High-quality materials, therefore also suitable for aggressive media • For dosing, aspirating and for continuous flow applications • Developed to ISO 13485
online: →	vzdb

Gas handling





Festo, in close cooperation with you, develops products and subsystems for medical devices for the efficient regulation and control of medical gases – dosing with piezo valves, pressure regulation or pneumatic integration solutions.

Maximum efficiency

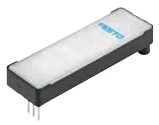

Individual valves >

Proportional valves, piezo valves

	 Piezo valves VEMR	 Piezo valves VEMC
Valve function	2/2-way, single solenoid, closed	3/3-way, single solenoid, closed
Standard nominal flow rate	0 ... 17 l/min	0 ... 16 l/min at 2 bar
Nominal width	0.7 mm, 1.2 mm, 1.3 mm, 1.4 mm	0.9 mm
Operating pressure	0 ... 1.7 bar, 0 ... 2 bar, 0 ... 3.8 bar, 0 ... 6 bar	0 ... 2 bar
Pneumatic connection 1	Flange	Flange
Medium	Air, oxygen, nitrogen, inert gases	Air, oxygen, nitrogen, inert gases
Ambient temperature	5 ... 40 °C (41 ... 104 °F), 0 ... 60 °C (32 ... 140 °F)	5 ... 40 °C (41 ... 104 °F)
Description	<ul style="list-style-type: none"> • Small, lightweight and energy-efficient • Control of gas and oxygen flow rates • Proportional characteristics thanks to piezo technology • Very low energy consumption • Extremely compact design • Minimal weight 	<ul style="list-style-type: none"> • Silent pressure regulation • Very low energy consumption • Compact design, minimal weight • No heat generation • Long service life
online: →	vemr	vemc




Individual valves >

Proportional valves, piezo valves

		
	Piezo valves VEMP	Piezo valves VEAE
Valve function	2/2-way, single solenoid, closed, 3/3-way, single solenoid, closed	2/2-way, single solenoid, closed
Standard nominal flow rate	18 l/min, 19 l/min, 27 l/min, 28 l/min	50 l/min, 53 l/min, 60 l/min, 61 l/min, 64 l/min, 81 l/min
Nominal width	1.3 mm, 1.6 mm	1.2 mm, 1.5 mm, 1.7 mm
Operating pressure	0 ... 1.7 bar, 0 ... 0.7 bar, 0 ... 1.1 bar	0 ... 6 bar, 0 ... 3 bar
Pneumatic connection 1	Flange	Flange
Medium	Air, oxygen (oxygen applications to IEC 60601-1 only on request), nitrogen, inert gases	Compressed air to ISO 8573-1:2010 [5:3:1], inert gases, oxygen (oxygen applications to IEC 60601-1 only on request)
Ambient temperature	-20 ... 70°C	-10 ... 60°C
Description	<ul style="list-style-type: none"> • Very low power consumption • No self-heating • Low leakage • Extremely precise • Operating medium: air, oxygen, inert gases, nitrogen • Integrated piezo technology • Long service life • Lightweight • Mounting: on sub-base, on manifold rail 	<ul style="list-style-type: none"> • Silent operation • Very low power consumption • No self-heating • Integrated piezo technology • Extremely long service life • Operating medium: air, oxygen, inert gases • Small and lightweight • High flow rates • Mounting via through-holes
online: →	vemp	veae

Individual valves >

Accessories for piezo valves

			
	Electronics modules VAVE-P12	Electronics modules VAVE-P17	Electrical plug-in base, adapter NEFV
Operating voltage range DC	12 ... 24 V	12 ... 24 V	0 ... 310 V
Adjustable output voltage	0 ... 310 V	0 ... 310 V	
Voltage of external setpoint input	0 ... 10 V	0 ... 10 V	
Max. output current	5 mA	5 mA	
Ambient temperature	-10 ... 60°C	-10 ... 60°C	-25 ... 80°C
Description	<ul style="list-style-type: none"> • 2-channel open loop piezo driver • For the electrical actuation of the piezo valve VEMP • For the electrical actuation of the piezo valves VEMR and VEAЕ via an adapter of the type NEFV-V13/NEFV-V14 • With protective circuit 	<ul style="list-style-type: none"> • 2-channel open loop piezo driver • For the electrical actuation of the piezo valve VEMC • With protective circuit 	<ul style="list-style-type: none"> • Adapter for connecting the piezo valves to the electronics module VAVE-P12
online: →	vave	vave	nefv

Gas handling

Individual valves >

Proportional valves, solenoid valves



**Proportional directional control valves
VPWS**

Design	Directly actuated poppet valve
Valve function	2/2-way proportional directional control valve, closed
Actuation type	Electrical
Operating pressure	0 bar, 3 bar, 8 bar
Standard flow rate pmax -> 0 bar	46 l/min, 56 l/min, 82 l/min, 98 l/min, 200 l/min, 220 l/min
Nominal width	1.5 mm, 2.2 mm, 6 mm
Current regulating range	0 ... 225 mA
Medium	Inert gases, air, oxygen
Ambient temperature	5 ... 50°C
Description	<ul style="list-style-type: none"> • Directly actuated poppet valve • Operating medium: air, oxygen, inert gases • Extremely small and lightweight • Compact and cost-effective • Mounting: on sub-base
online: →	vpws

Regulators >

Flow control valves






**Proportional flow control valves
VEMD**

Valve function	2-way proportional flow regulator
Operating pressure	0 ... 2.5 bar
Flow rate control range	0 ... 20 l/min
Nominal width	1.4 mm
Nominal operating voltage DC	12 V, 24 V
Reference value	0,2 - 10 V
Medium	Compressed air to ISO 8573-1:2010 [5:4:1], inert gases, oxygen (oxygen applications to IEC 60601-1 only on request), nitrogen
Ambient temperature	0 ... 50°C
Description	<ul style="list-style-type: none"> • Compact module with integrated control electronics • Dynamic regulation with short response time • Mass flow controller (MFC) • Operating medium: air, oxygen, inert gases, nitrogen • Minimal power consumption thanks to piezo technology • Silent: ideal for mobile applications and those close to the patient • Direct mounting via thread • Ideal for life sciences applications
online: →	vemd

Regulators >



Pressure regulators

	 Proportional pressure regulators VEAA	 Proportional pressure regulators VEAB	 Proportional pressure regulators VPPE
Valve function	3-way proportional pressure regulator	3-way proportional pressure regulator	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed
Standard nominal flow rate	7 l/min, 10 l/min, 13 l/min	4.5 l/min, 5 l/min, 13 l/min, 13.5 l/min, 16 l/min, 17 l/min, 20 l/min, 21 l/min	310 l/min, 800 l/min, 850 l/min, 1250 l/min
Operating pressure			8 bar
Pressure regulation range	0.01 ... 2 bar, 0.03 ... 6 bar, 0.05 ... 10 bar	-1 ... -0.005 bar, -1 ... 1 bar, -0,5 ... 0,5 bar, -1 ... 5 bar, 0,001 ... 0,2 bar, 0,005 ... 1 bar, 0,01 ... 2 bar, 0,025 ... 5 bar, 0,03 ... 6 bar	0.15 ... 6 bar, 0.1 ... 10 bar, 0.02 ... 2 bar, 0.06 ... 6 bar
Operating medium	Inert gases, compressed air to ISO 8573-1:2010 [7:4:4]	Inert gases, compressed air to ISO 8573-1:2010 [7:4:4]	Inert gases, compressed air to ISO 8573-1:2010 [7:4:4]
Nominal operating voltage DC	24 V	24 V	
Reference value	4 - 20 mA, 0 - 5 V, 0 - 10 V	4 - 20 mA, 0 - 5 V, 0 - 10 V	
Ambient temperature	0 ... 50°C	0 ... 50°C	0 ... 60°C
Description	<ul style="list-style-type: none"> • Silent operation • Very low power consumption • Extremely precise • Integrated piezo technology • Long service life • Mounting: via through-holes, H-rail mounting, on mounting plate or sub-base 	<ul style="list-style-type: none"> • Silent operation • Very low power consumption • Extremely precise • Integrated piezo technology • Short switching times • Mounting: via through-holes, H-rail mounting 	<ul style="list-style-type: none"> • Piloted pressure regulator • Setpoint input as analogue voltage signal (0 ... 10 V) • Electrical connection via M12x1 plug, 4- or 5-pin • Optionally with setpoint module • Variant with display with three retrievable presets and digital controller electronics • For simple control tasks
online: →	veaa	veab	vppe

Gas handling




Regulators >

Pressure regulators

	 Proportional pressure regulators VPPX	 Proportional pressure regulators VPPI
Valve function	3-way proportional pressure regulator	3-way proportional pressure regulator
Standard nominal flow rate	1400 l/min, 1650 l/min, 2750 l/min, 7000 l/min	150 l/min, 900 l/min, 1400 l/min, 1630 l/min
Operating pressure		0 bar, 1 bar, 2 bar, 6 bar, 8 bar, 10 bar, 12 bar, 13 bar
Pressure regulation range	0.1 ... 10 bar	-1 ... 12 bar, 0 ... 10 bar, 0 ... 12 bar, 0 ... 2 bar, 0 ... 6 bar, -1 ... 0 bar, -1 ... 1 bar, 0 ... 10 bar, 0 ... 6 bar
Operating medium	Inert gases, compressed air to ISO 8573-1:2010 [7:4:4]	Inert gases, compressed air to ISO 8573-1:2010 [7:4:4]
Nominal operating voltage DC		24 V
Reference value		
Ambient temperature	0 ... 60°C	0 ... 50°C
Description	<ul style="list-style-type: none"> • Pressure regulator with additional sensor input • Programmable, freely adjustable PID controller • Multi-sensor control (cascade control) • Control characteristic adjustable via FCT (Festo Configuration Tool) software • Integrated pressure sensor with separate output • Pressure is maintained if the controller fails 	<ul style="list-style-type: none"> • Select between three predefined and one customer-specific controller preset • With or without display • Low-noise, flexible and highly dynamic • Precise and stable changeover, rapid switching of setpoint by high-performance moving coil actuator • Control via analogue current or voltage signal, digital pattern for adjustable setpoint values or pulse-width modulation signal
online: →	vppx	vppl

Individual valves >

Switching valves

	 Solenoid valves VOVK	 Solenoid valves MH1	 Solenoid valves MHE2, MHP2, MHA2, MHE3, MHP3, MHA3, MHE4, MHP4, MHA4
Design	Connection direction underneath, connection direction at the front, poppet valve with spring return	Poppet valve with spring return	Pressure relief poppet valve
Width	5.9 mm	10 mm	10 mm, 14 mm, 18 mm
Valve function	3/2-way, single solenoid, closed	2/2-way, single solenoid, closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open	3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, single solenoid
Actuation type	Electrical	Electrical	Electrical
Standard nominal flow rate	5.5 l/min	10 l/min, 14 l/min	90 l/min, 100 l/min, 200 l/min, 400 l/min
Nominal width	0.36 mm	0.9 mm	2 mm, 3 mm, 4 mm
Operating pressure	-1 bar, 7 bar	-0.9 bar, 8 bar	-0.9 bar, 8 bar
Operating pressure [MPa]	-0.1 MPa, 0.7 MPa		-0.09 MPa, 0.8 MPa
Operating medium	Compressed air to ISO 8573-1:2010 [6:4:1]	Compressed air to ISO 8573-1:2010 [7:4:4]	Compressed air to ISO 8573-1:2010 [7:4:4]
Nominal operating voltage DC	12 V, 24 V	5 V, 12 V, 24 V	
Ambient temperature	5 ... 50°C	-5 ... 40°C	-5 ... 60°C
Description	<ul style="list-style-type: none"> • Very narrow: 5.9 mm grid dimension • Extremely small and lightweight • Very low power consumption • Variable connection concepts: flanged connection underneath or at the front, barbed fitting connection at the front • Ideal for control of small air flows 	<ul style="list-style-type: none"> • Miniaturised poppet valves • Multi-pin or individual electrical connection 	<ul style="list-style-type: none"> • Directly actuated poppet valve • Fast-switching valve: switching times down to 2 ms • Direct mounting, individual sub-base, manifold assembly • Manifold block for 2 ... 10 valves
online: →	vovk	mh1	mh2

Gas handling

Compressed air preparation >

Filter regulators, MS Basic series



Filter regulators
MS2-LFR-B, MS4-LFR-B, MS6-LFR-B

Pneumatic connection 1	G1/2, G1/4, M5, QS-6
Standard nominal flow rate	140 ... 5300 l/min
Pressure regulation range	0.3 ... 7 bar
Operating pressure	1 ... 10 bar
Grade of filtration	5 µm, 40 µm
Ambient temperature	-5 ... 50°C
Description	<ul style="list-style-type: none"> • Directly actuated diaphragm control valve
online: →	ms2-lfr

Compressed air preparation >

Pressure regulators, MS Basic series



Pressure regulators
MS2-LR-B, MS4-LR-B, MS6-LR-B

Pneumatic connection 1	G1/2, G1/4, M5, QS-6
Standard nominal flow rate	170 ... 6000 l/min
Pressure regulation range	0.3 ... 7 bar
Operating pressure	1 ... 10 bar
Ambient temperature	-5 ... 50°C
Description	<ul style="list-style-type: none"> • Attractively priced basic component focused on the most important technical functions • Lightweight and sturdy thanks to modern polymer materials • Compatible with the MS series for the ideal combination of low-cost basic functionality and high-end functional requirements • Stable control response • With integrated secondary exhausting and primary exhausting with return flow function • Rotary knob with latch • Grid dimension 25, 40, 62 mm (sizes 2, 4, 6)
online: →	ms-lr-b

Compressed air preparation >

Pressure regulators, individual devices



Precision pressure regulators
LRP, LRPS

Pneumatic connection 1	For sub-base Ø 7 mm, G1/4, G1/8
Standard nominal flow rate	240 ... 2300 l/min
Pressure regulation range	0.05 ... 10 bar
Operating pressure	1 ... 12 bar
Ambient temperature	-10 ... 60°C
Description	<ul style="list-style-type: none"> • Lockable design • Good regulation characteristics with minimal pressure hysteresis and primary pressure compensation • High secondary exhausting
online: →	lrp

Individual valves >

Pressure regulators






Mini pressure regulating valves
LR

Design	Diaphragm regulator, with secondary exhausting
Operating pressure	10 bar
Standard nominal flow rate	150 l/min
Ambient temperature	-10 ... 60°C
Description	<ul style="list-style-type: none"> • Regulates the operating pressure independently of the fluctuating inlet pressure • Directly actuated diaphragm regulator • With secondary exhaust • Mounting on sub-base or for front panel mounting
online: →	lr

Gas handling



Individual valves > Accessories >

Silencers

	 Silencers U	 Silencers UC	 Silencers AMTE
Information on silencer insert materials	PE, bronze	PE	Bronze
Pneumatic connection	3/4 NPT, G1, G1/2, G1/4, G1/8, G3/4, G3/8, PK-3, PK-4	G1/4, G1/8, G3/8, M5, M7, QS-10, QS-3, QS-4, QS-6, QS-8	10-32 UNF-2A, 1/8 NPT, 1/4 NPT, 3/8 NPT, 1/2 NPT, G1, G1/2, G1/4, G1/8, G3/4, G3/8, M3, M5
Noise level	70 ... 90 dB(A)	58 ... 68 dB(A)	55 ... 95 dB(A)
Ambient temperature	-10 ... 70°C	-10 ... 70°C	-40 ... 80°C
Description	<ul style="list-style-type: none"> • Compact design, polymer or die-cast • Barbed connector or threaded connection • Operating medium compressed air 	<ul style="list-style-type: none"> • For noise reduction and prevention of contamination at exhaust ports of pneumatic components • Polymer design • Operating medium: compressed air • For solenoid valves CPE • Threaded connection or push-in sleeve for push-in fitting QS 	<ul style="list-style-type: none"> • Long or short design • Metal design • Operating medium: compressed air • High temperature resistance up to 80 °C • Slim overall width • Many different variants • Can be used universally
online: →	u	uc	amte

Vacuum technology >




Vacuum generators

	 Vacuum generators OVEM	 Vacuum generators, pneumatic VN
Nominal width of Laval nozzle	0.45 ... 3 mm	0.45 ... 3 mm
Ejector characteristics	High suction rate, high vacuum, standard	High suction rate, high vacuum, standard, inline, high vacuum, high suction rate
Integrated function	Electric ejector pulse valve, flow control valve, electric on/off valve, filter, electric air saving function, check valve, open silencer, vacuum switch	Pneumatic ejector pulse valve, open silencer, vacuum switch
Max. vacuum	93%	86 ... 93%
Max. suction rate with respect to atmosphere	6 ... 348 l/min	6.1 ... 339 l/min
Ambient temperature	0 ... 50°C	0 ... 60°C
Description	<ul style="list-style-type: none"> • Compact design • Monitoring with vacuum sensor with IO-Link® • Central electrical connection via an M12 plug • Maintenance-free operation and reduced noise level through an integrated, open silencer • Integrated filter with inspection window • Optionally with air-saving function and LCD display • Short switching times with integrated solenoid valves • Adjustable ejector pulse: precise and safe depositing of the workpiece 	<ul style="list-style-type: none"> • Can be used directly in the work space • Available as straight type (inline: vacuum port in line with the supply port) or T-shape (standard: vacuum port at 90° to the supply port) • Compact and cost-effective • Maintenance-free operation and reduced noise level through an integrated, open silencer
online: →	ovem	vn

Gas handling



Sensors >

Pressure and vacuum sensors

	 Pressure transmitters SPTW	 Pressure transmitters SPTe	 Pressure sensors SPAN
Pressure measuring range start value			-0.1 MPa, 0 MPa
Pressure measuring range end value	1 bar, 2 bar, 6 bar, 10 bar, 16 bar, 25 bar, 50 bar, 100 bar	-1 bar, 1 bar, 10 bar	-1 bar, 1 bar, 10 bar, 16 bar
Switching element function			N/C or N/O contact, switchable
Switching output			2 x PNP or 2 x NPN switchable, PNP/NPN switchable
Pneumatic connection	G1/4	Flange, cartridge 10, push-in sleeve QS-4, QS-6, QS-3, QS-4	Male thread 1/8 NPT, male thread G1/8, R1/8, female thread G1/8, M5, for tubing O.D. 4
Electrical connection	4-pin, plug, to EN 60947-5-2, round design, M12x1	3-wire, cable, open end	
Display type			Illuminated LCD
Ambient temperature	0 ... 80°C	0 ... 50°C	0 ... 50°C
Description	<ul style="list-style-type: none"> • Sensor versions: piezoresistive pressure sensor or metal thin-film pressure sensor • Measured variable: relative pressure • Operating medium: liquid media and gaseous media • Seal-free: pressure measuring cell and interfaces in stainless steel • Degree of protection IP67 	<ul style="list-style-type: none"> • Piezoresistive pressure sensor • Measured variable: relative pressure • Cable length 2.5 m • Compact: 8-bracket wall mount for manifold assembly 	<ul style="list-style-type: none"> • For monitoring compressed air and non-corrosive gases • For network monitoring, regulator monitoring, leak testing, object detection • Relative measurement method based on a piezoresistive measuring cell • Serial communication integrated using IO-Link® 1.1 • Compact design 30 x 30 mm • High-contrast, blue backlit display
online: →	sptw	spte	span

Sensors ›



Flow sensors

	 Flow sensors SFAH	 Flow transmitters SFTE
Flow measuring range end value	0.1 l/min, 0.5 l/min, 1 l/min, 5 l/min, 10 l/min, 50 l/min, 100 l/min, 200 l/min	1 l/min, 5 l/min, 10 l/min
Operating medium	Argon, nitrogen, compressed air to ISO 8573-1:2010 [6:4:4]	Nitrogen, compressed air to ISO 8573-1:2010 [6:4:4]
Operating pressure	-0.9 bar, 10 bar	-0.9 bar, 10 bar
Pneumatic connection	Female thread G1/4, G1/8, for tubing O.D. 4, 6, 8	Female thread M5, for push-in connector O.D. 3, 4
Switching output	2 x PNP or 2 x NPN switchable	
Electrical connection, connection type	Plug	Cable, cable with plug
Electrical connection, connection technology	Plug pattern L1J, M8x1 A-coded to EN 61076-2-104	M8x1 A-coded to EN 61076-2-104, open end
Ambient temperature	0 ... 50°C	0 ... 50°C
Description	<ul style="list-style-type: none"> • Process, compressed air, forming gas and pneumatic object monitoring, handling of ultra-small parts, leak test • Compact design 20 x 58 mm • Clear 2-line display • Mounting: H-rail mounting, wall or surface mounting, front panel mounting • Serial communication integrated using IO-Link® 1.1 	<ul style="list-style-type: none"> • Compact design • Universal flow detection • Easy installation • Reliable pick & place application for extremely small workpieces
online: →	sfah	sfte

Gas handling





Drives >

Piston rod cylinders

	 Round cylinders EG-PK	 Cartridge cylinders EGZ
Mode of operation	Single-acting, pushing	Single-acting, pushing
Piston diameter	2,5 mm, 4 mm, 6 mm	6 mm, 10 mm, 16 mm
Theoretical force at 6 bar, advancing	1.9 ... 11.8 N	13.9 ... 109 N
Stroke	5 ... 25 mm	5 ... 15 mm
Cushioning	At one end, non-adjustable, no cushioning	No cushioning
Description	<ul style="list-style-type: none"> • Micro cylinder • Barbed fitting for plastic tubing with standard I.D. • Without position sensing 	<ul style="list-style-type: none"> • Minimal installation space • Installation optionally via mounting components • Piston rod with male thread
online: →	eg-pk	egz

Connection technology >




Standard O.D. tubing

	 Plastic tubing PFAN	 Plastic tubing PTFEN	 Plastic tubing PLN	 Plastic tubing PUN-H, PUN-H-DUO
Outside diameter	3 ... 12 mm	4 ... 16 mm	4 ... 16 mm	2 ... 16 mm
Inside diameter	2.3 ... 8.4 mm	2.9 ... 11 mm	2.9 ... 12 mm	1.2 ... 11 mm
Temperature-dependent operating pressure	-0.95 ... 16 bar	-0.95 ... 15 bar	-0.95 ... 14 bar	-0.95 ... 10 bar
Ambient temperature	-20 ... 150°C	-20 ... 150°C	-30 ... 80°C	-35 ... 60°C
Description	<ul style="list-style-type: none"> • Perfluoroalkoxy alkane • Pneumatic tubing with resistance to high temperatures and chemicals • Food-safe, see www.festo.com/sp/pfan -> "Certificates" tab • High resistance to chemicals, microbes, UV radiation, hydrolysis and stress cracks • Operating medium: compressed air, vacuum, water 	<ul style="list-style-type: none"> • Polytetrafluoroethylene • Food-safe, see www.festo.com/sp/ptfen -> "Certificates" tab • High resistance to chemicals • High temperature resistance • Operating medium: compressed air, vacuum 	<ul style="list-style-type: none"> • Polyethylene • High resistance to chemicals, microbes and hydrolysis • Food-safe, see www.festo.com/sp/pln -> "Certificates" tab • Resistant to most cleaning agents and lubricants • Operating medium: compressed air, vacuum, water 	<ul style="list-style-type: none"> • Polyurethane • High resistance to microbes and hydrolysis • Food-safe, see www.festo.com/sp/pun-h -> "Certificates" tab • Suitable for energy chains • Also available as DUO tubing • Operating medium: compressed air, vacuum, water
online: →	pfan	ptfen	pln	pun-h

Gas handling

Connection technology >

Push-in fittings

	 Push-in fittings/connectors, media resistant NPQP	 Push-in fittings/connectors, standard series QS, QSC, QSF, QSH, QSL, QSS, QST, QSW, QSX, QSY	 Push-in fittings NPQR
Pneumatic connection 1	Push-in sleeve QS-10, QS-12, QS-4, QS-6, QS-8, for tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm, R1/2, R1/4, R1/8, R3/8	Male thread G1/2, G1/4, G1/8, G3/4, G3/8, M5, R1/2, R1/4, R1/8, R3/8, female thread G1/2, G1/4, G1/8, G3/8, push-in sleeve QS-10, QS-12, QS-16, QS-4, QS-6, QS-8, for tubing O.D. 10 mm, 12 mm, 16 mm, 4 mm, 6 mm, 8 mm	Male thread G1/2, G1/4, G1/8, G3/8, M5, M7, for tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm
Pneumatic connection 2	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	Female thread G1/2, G1/4, G1/8, G3/8, push-in sleeve QS-10, QS-12, QS-16, QS-4, QS-6, QS-8, for tubing O.D. 10 mm, 12 mm, 16 mm, 22 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm
Operating pressure for full temperature range	-0,95 ... 10 bar	-0.95 ... 14 bar	-0.95 ... 16 bar
Ambient temperature	-20 ... 60°C	-20 ... 80°C	-20 ... 150°C
Description	<ul style="list-style-type: none"> • Polypropylene • Low-cost alternative to stainless steel: resistant to most cleaning agents in combination with tubing PLN • For use with extreme media influences • Food-safe, see www.festo.com/sp/npqp -> "Certificates" tab • Operating medium: compressed air, vacuum 	<ul style="list-style-type: none"> • Standard series • Wide range of variants: large selection for maximum flexibility in standard applications • PBT and nickel-plated brass • Operating medium: compressed air, vacuum, (water) 	<ul style="list-style-type: none"> • Very easy to clean thanks to chamfered O-ring and fewer edges where dirt can accumulate • Optimal price/performance ratio ideal for applications from a single source • Maximum corrosion resistance (corrosion resistance class CRC 4 to Festo standard 940 070) and chemical resistance • High temperature resistance • Stainless steel • Operating medium: compressed air, vacuum, (water)
online: →	npqp	qs	npqr

Connection technology >

Threaded fittings



Threaded fittings
NPFC

Pneumatic connection 1	G1, G1/2, G1/4, G1/8, G3/4, G3/8, M3, M5, M7, R1, R1/2, R1/4, R1/8, R3/4, R3/8
Pneumatic connection 2	G1, G1/2, G1/4, G1/8, G3/4, G3/8, M3, M5, R1, R1/2, R1/4, R1/8, R3/4, R3/8
Operating pressure	-0.95 ... 50 bar
Ambient temperature	-20 ... 150°C
Description	<ul style="list-style-type: none"> • Nickel-plated brass • Sleeve • Extension • Double nipple • Reducing nipple • L-, T-, Y- or X-fitting • Operating medium: compressed air, vacuum
online: →	npfc

Kinematics



Compact handling systems from Festo enable you to implement analysis applications in very small spaces, from automated sample preparation to handling samples in medical diagnostics.

Everything from a single source

Drives >

Handling systems



Rotary gripper modules
EHMD

Design	Electric rotary drive, electric gripper, pneumatic gripper
Size	40
Stroke per gripper jaw	5 mm, 15 mm
Max. output torque	0.3 Nm
Gripping force per gripper jaw	3 ... 35 N
Rotation angle	Infinite
Motor type	Stepper motor
Nominal voltage DC	24 V
Ambient temperature	0 ... 40°C
Description	<ul style="list-style-type: none"> • Ideal for small objects in laboratory automation • Infinite electrical rotation and electric or pneumatic gripping • Gripping and turning to open and close covers on vials • Optional: mounting with Z compensation compensates for the thread pitch of covers on vials during opening and closing
online: →	ehmd

Drives >

Electric grippers



**Parallel grippers, electric
EHPS**

Design	Worm gear, T-shape, gear rack/pinion, electric gripper
Size	16, 20, 25
Stroke per gripper jaw	10 ... 16 mm
Max. force on gripper jaw F_z, static	200 ... 450 N
Gripper repetition accuracy	≤0.03 mm
Motor type	DC servo motor
Electrical connection	5-pin, cable with plug, M12x1
Nominal operating voltage DC	24 V
Protocol	IO-Link®
Ambient temperature	5 ... 60°C
Description	<ul style="list-style-type: none"> • Electric version of the pneumatically actuated parallel gripper DHPS • Ideal for use as a front-end actuator thanks to its low dead weight • Controller-free actuation using digital signals • Gripping force (4 settings) adjustable via latching switch or via IO-Link® interface • RA1 version with robot connection, enables fast integration in lightweight robot environments
online: →	ehps

Drives >

Accessories for grippers



**Gripper jaws
DHAS-GG**



**Gripper jaw mountings
EHAA-G1**

Size	16	16
Type of mounting	Via female thread M3	
Ambient temperature	0 ... 40°C	0 ... 40°C
Description	<ul style="list-style-type: none"> • Reliable gripping, e.g. for microwell plate in the life sciences sector • Easy to mount 	<ul style="list-style-type: none"> • Gripper fingers for horizontal or vertical mounting on the gripper jaws • Stainless steel design
online: →	dhas	ehaa-g1

Kinematic system

Drives > Handling systems >

Planar surface gantries

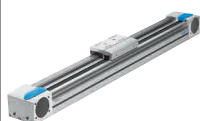


2D planar surface gantries
EXCM

Description	<ul style="list-style-type: none"> • Excellent functionality in confined spaces • Low moving dead weight • Actuation via two stepper motors with an integrated optical encoder and a two-axis controller • With recirculating ball bearing guide
online: →	excm

Drives >

Electric drives



Toothed belt axes
EGC-TB-KF



Spindle axes
EGC-BS-KF



Spindle axes
ELGC-BS-KF

	Toothed belt axes EGC-TB-KF	Spindle axes EGC-BS-KF	Spindle axes ELGC-BS-KF
Design	Electromechanical linear axis, with toothed belt	Electromechanical linear axis, with recirculating ball spindle	Electromechanical linear axis, with recirculating ball spindle
Size	50, 70, 80, 120, 185	70, 80, 120, 185	32, 45, 60, 80
Working stroke	50 ... 8500 mm	50 ... 3000 mm	100 ... 1000 mm
Max. acceleration	50 m/s ²	15 m/s ²	15 m/s ²
Max. speed	3 ... 5 m/s	0.5 ... 2 m/s	0.6 ... 1 m/s
Max. feed force F_x	50 ... 2500 N	400 ... 3000 N	40 ... 350 N
Max. force F_y	50 ... 2500 N	400 ... 3000 N	40 ... 350 N
Max. force F_z	650 ... 15200 N	1850 ... 15200 N	300 ... 2700 N
Motor type	Stepper motor, servo motor	Stepper motor, servo motor	Stepper motor, servo motor
Ambient temperature	-10 ... 60°C	-10 ... 60°C	0 ... 50°C
Description	<ul style="list-style-type: none"> • Axis for high speeds and acceleration • Recirculating ball bearing guide for high loads and torques • Optionally with clamping unit, at one or both ends • Profile with optimised rigidity • 22 types in stock with short delivery times and modular products for custom variants 	<ul style="list-style-type: none"> • Axis for high repetition accuracy • Recirculating ball bearing guide for high loads and torques • Optionally with clamping unit, at one or both ends • Profile with optimised rigidity • Various spindle pitches • The optional spindle support enables maximum travel speed • Axial or parallel motor mounting 	<ul style="list-style-type: none"> • Internal guide and ball screw • Space-saving position sensing • Flexible motor connection • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants with less than 1% copper and zinc content – recommended for production facilities for manufacturing lithium-ion batteries
online: →	egc	egc	elgc-bs

Drives >

Accessories for electric drives






**Guide axes
EGC-FA**

Design	Guide
Size	70, 80, 120, 185
Working stroke	50 ... 8500 mm
Max. acceleration	50 m/s ²
Max. speed	5 m/s
Max. force F_y	1850 ... 15200 N
Max. force F_z	1850 ... 15200 N
Pneumatic connection on clamping unit	M5
Ambient temperature	-10 ... 60°C
Description	<ul style="list-style-type: none"> • For spindle/toothed belt axes ELGA (drive axes) • To absorb forces and torques in multi-axis applications • Increased torsional resistance
online: →	egc

Kinematics

Drives >

Electric drives

	 Electric slides EGSK	 Mini slides EGSL-BS	 Mini slides EGSC-BS-KF
Design	Electromechanical linear axis, with ball screw	Electric mini slide, guide, with ball screw	Electric mini slide, with ball screw
Size	15, 20, 26, 33, 46	35, 45, 55, 75	25, 32, 45, 60
Working stroke	25 ... 840 mm	50 ... 300 mm	25 ... 200 mm
Max. acceleration	10 m/s ² , 20 m/s ²	25 m/s ²	15 m/s ²
Max. speed	0.16 ... 1.48 m/s	0.3 ... 1.3 m/s	0.4 ... 0.6 m/s
Max. feed force Fx	19 ... 392 N	75 ... 450 N	20 ... 250 N
Max. force Fy	19 ... 392 N	75 ... 450 N	20 ... 250 N
Max. force Fz	764 ... 4919 N	291 ... 1539 N	669 ... 4937 N
Motor type		Stepper motor, servo motor	Stepper motor, servo motor
Ambient temperature	0 ... 40°C	0 ... 60°C	0 ... 50°C
Description	<ul style="list-style-type: none"> • Electromechanical linear axis with ball screw • Recirculating ball bearing guide and ball screw without caged ball bearings • Standardised mounting interfaces • Compact design • High rigidity • 22 types in stock with short delivery times and modular products for custom variants 	<ul style="list-style-type: none"> • Very high rated slide load, ideal for vertical applications such as press-fitting or joining • Reliable: the completely closed spindle stops dirt or stray small parts getting into the guide area • Axial or parallel motor mounting 	<ul style="list-style-type: none"> • Precision guide and ball screw • Compact dimensions • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants with less than 1% copper and zinc content – recommended for production facilities for manufacturing lithium-ion batteries
online: →	egsk	egsl	egsc-bs

Motors and servo drives >

Stepper motors



Stepper motors
EMMS-ST

Nominal motor current	1.4 ... 9.5 A
Maximum speed	430 ... 6000 1/min
Motor holding torque	0.09 ... 9.3 Nm
Ambient temperature	-10 ... 50°C
Description	<ul style="list-style-type: none"> • Small increment and high driving torques thanks to 2-phase hybrid technology • Optimised connection technology • Four sizes with flange sizes 28, 42, 57 and 87 • 28 types in stock • With incremental encoder for closed-loop operation • Degree of protection IP40 (motor shaft), IP54 (sizes 42, 27, 87: motor housing and plug connection), IP65 (size 28: motor housing and plug connection) • Optionally with holding brake
online: →	emms

Motors and servo drives >

Electronic controllers



Controllers
CECC-D, CECC-LK, CECC-S

Operating voltage	19.2 - 30 V DC, 20.4 - 30 V DC
CPU data	400 MHz processor
Ambient temperature	0 ... 55°C
Description	<ul style="list-style-type: none"> • Compact programmable logic controller • Programming with CODESYS to IEC 61131-3 • 12 digital inputs, 8 digital outputs, additionally 2 high-speed counters up to 250 kHz • Ethernet 10/100 Mbit/s • USB interface for data transfer • CECC-LK with CANopen®, IO-Link®, I-Port and Modbus® TCP protocol
online: →	cecc

Kinematic system

Motors and servo drives >

Stepper motor controllers







Servo drives
CMMT-ST

Nominal current, load supply	8 A
Nominal voltage, load supply DC	24 V, 48 V
Fieldbus coupling	EtherCAT®, Ethernet, Modbus®/TCP, PROFINET®
Performance level (PL)	STO/Cat. 3, PLd (EC motor without diagnostics), STO/Cat. 3, PLe (stepper motor/EC motor with diagnostics)
Ambient temperature	0 ... 50°C
Description	<ul style="list-style-type: none"> • Very efficient for tasks with low power requirements • Ideal for positioning tasks and point-to-point and interpolating motion solutions • 50% more compact than the smallest servo drive CMMT-AS • 150 W at 24 V DC, 300 W at 48 V DC • Optimised for use with stepper motors like the tried-and-tested EMMS-ST
online: →	cmmt-st

Sensors >

Opto-electrical sensors

	 Colour sensors SOEC	 Retro-reflective sensors, diffuse sensors, distance sensor, light barriers SOOE	 Fork light barriers SOOF	 Fibre-optic cables SOEZ, SOOC
Measurement method	Colour sensor	Retro-reflective sensor, distance sensor, through-beam sensor, transmitter, receiver, diffuse sensor with background suppression, laser contrast sensor, retro-reflective sensor for transparent objects, diffuse sensor	Fork light barrier	Through-beam sensor, fixed focus, fork light barrier, fibre-optic cable, diffuse sensor
Working range	12 ... 32 mm	0 ... 20000 mm		2 ... 650 mm
Size	50x50x17 mm		Fork 120x60 mm, 30x35 mm, 50x55 mm, 80x55 mm	M4, M6
Setting options	Teach-in, teach-in via electrical connection	IO-Link®, potentiometer, teach-in	IO-Link®, potentiometer, teach-in	
Type of light	White	Laser, red, LED	Red	
Switching output	PNP	Push-pull	Push-pull, NPN, PNP	
Ambient temperature	-10 ... 55°C	-40 ... 60°C	-25 ... 60°C	-55 ... 160°C
Description	<ul style="list-style-type: none"> Diffuse sensor Block design Electrical connection via M12x1 plug, 8-pin Display via 7 LEDs 	<ul style="list-style-type: none"> Easy to operate Fast commissioning Reliable and stable sensing Attractive price/performance ratio 	<ul style="list-style-type: none"> Through-beam sensor with minimal installation effort Design: polymer or metal Sturdy housing: high shock and vibration resistance Degree of protection IP67 Electrical connection via M8x1 plug, 3-pin LED displays 	<ul style="list-style-type: none"> Cable connection, push-in connector
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