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Food and Packaging

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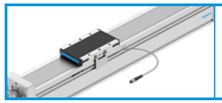

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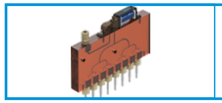

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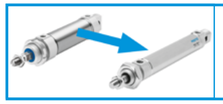

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FESTO

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Dear Customers,

Your top priority in the food industry is safety. Safety not just for systems and system operators, but also safety that ensures the food and beverages you produce are of the highest quality. In addition, issues such as flexibility, future viability and sustainability are playing an increasingly important role, as these are all key factors for efficient production.

This is where automation can be extremely helpful. In my experience, automation is always most successful when you involve a competent partner with specialist knowledge and smart solutions in the planning process at an early stage. Discussions with our experts will give you ideas and answers for the optimum equipment for your systems. At the same time, we support you with suitable and future-oriented solutions.

With our portfolio of electric and pneumatic automation, we can draw on the full potential it offers and provide you with the perfect combination for reliable machines and cost-effective production. Our products, solutions and selected services are available worldwide, precisely where you need to develop and build the systems or manufacture your products.

In this document, we have compiled the most important topics, components and solutions especially for you.
Discover the added value of Festo!

Kind regards,

Alexander Wagner
Leitung Global KAM and ISM Food and Packaging



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At The Heart of Europe

Scharnhausen Technology Plant in Germany
Our main goal is fast, flexible, and reliable production using a smooth workflow.
This applies to both highly automated volume production and to the manufacture of complex, customized products.



A central position in the Midwest

Mason, Ohio, USA
70% of our customers who are supplied by Mason are located within a radius of 1000 kilometers.



In the region for the region

Jinan,China
Fast response times, outstanding flexibility, and proximity to customers also differentiates us on the Asian automation market.



Our Plants Are Ready for The Future

How can we make you even more productive?
We are constantly asking ourselves this question. Our 13 service centers around the world minimize the distance between you and us, ensuring our own production is especially future-proof. Examples are our plants in Scharnhausen, Germany, Mason, Ohio in the United States, and Jinan, China.

Applying the same standards worldwide
All Festo plants always exchange information and learn from each other. This so-called Festo Value Production concept is enhanced by continuously training and upskilling our employees, thus making sure that the highest possible standards are applied globally. This is so that you, the customer, can reap the benefit.

Always focusing on the Internet of Things
What sets Festo apart, is its comprehensive approach to the Internet of Things (IoT) and Industry 4.0.
We believe that customized products require plants that are completely networked, using intelligent automation components that provide intuitive interfaces between people and machines.
Another key to making IoT a success is providing people with the right training and competencies in planning and production. Furthermore, engineering processes must be implemented faster and more intuitively in the future.

Anticipating and targeting future trends
The main requirements that the Food and Packaging industry must meet to be successful are adaptability, maximum added value, the best possible quality, speed, delivery reliability, and short routes to the customer. This is the only way in which it can be and remain globally competitive in the long term.

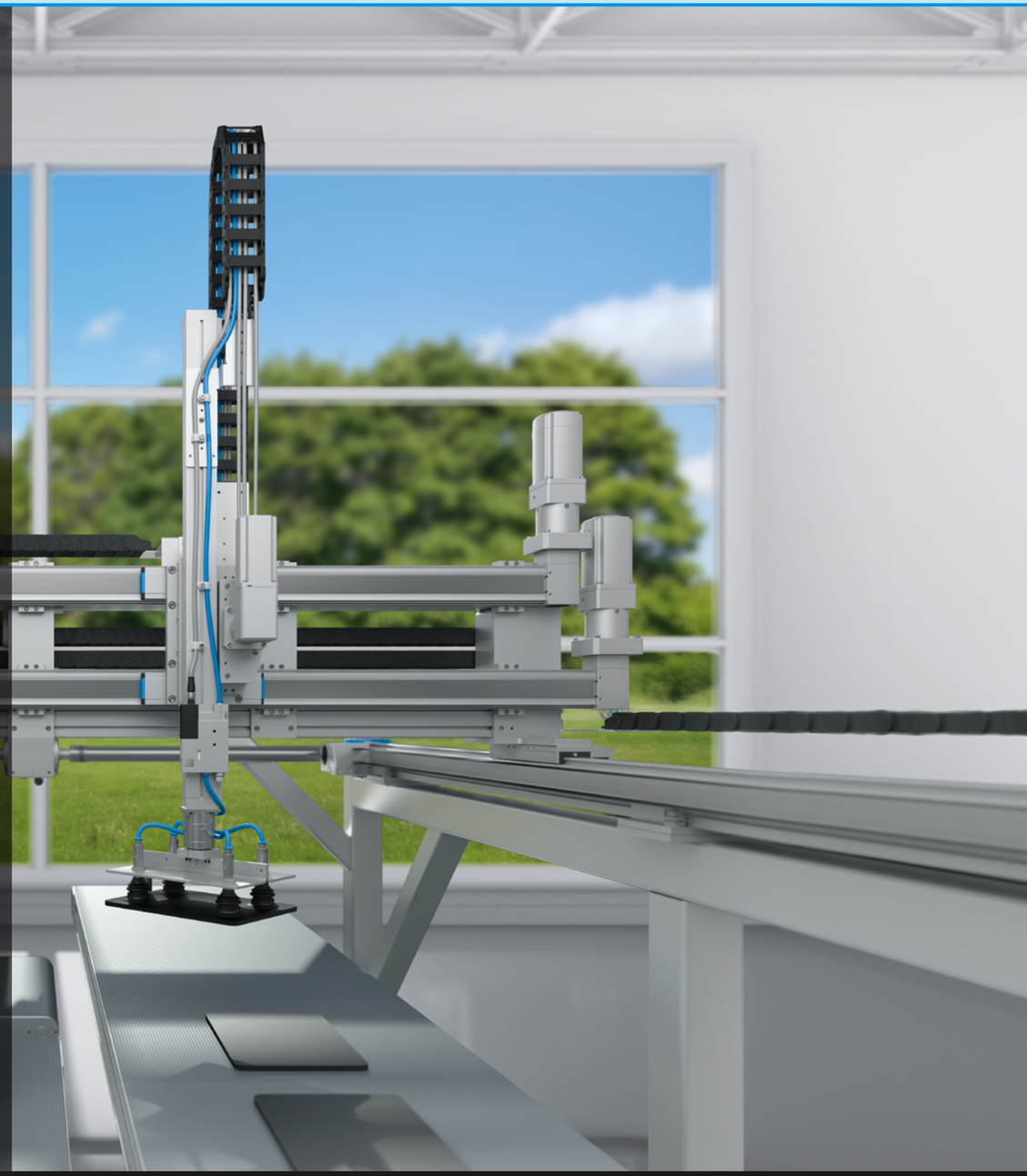
Responding flexibly to customer needs
Without making production more flexible, many future challenges such as changing orders, fluctuating batch sizes, ever more product variants, or the smooth integration of new products, will be nearly impossible to overcome. With Festo, you will definitely be well-equipped for this megatrend. Bottlenecks in the value stream can be avoided by implementing highly profitable and extremely process-reliable concepts as part of a continuous production system. The proximity of our plants to your production locations will be one of the factors that are sure to benefit you. Perfect for guaranteeing a quick delivery and a direct supply.

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Sustainability in Manufacturing

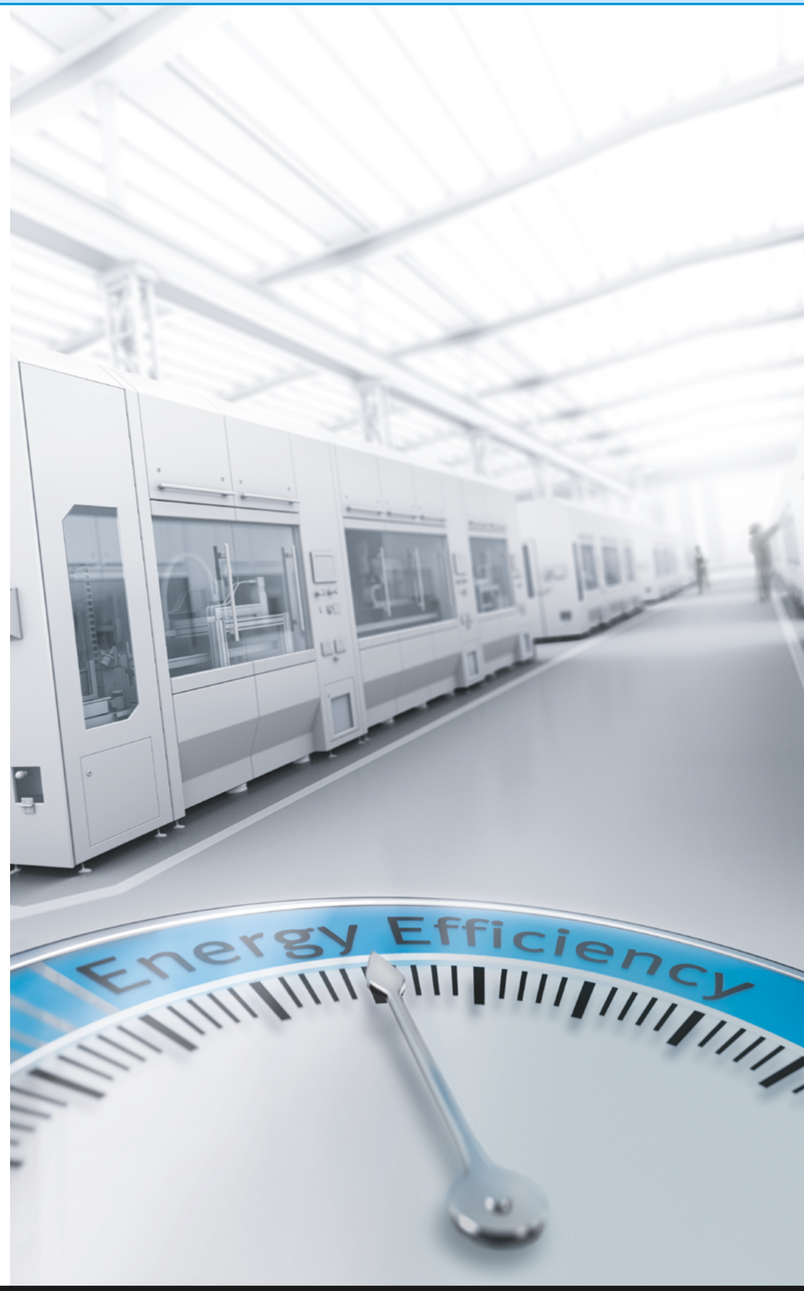
Climate-friendly production and energy savings?
Festo makes it easy for you! Take a quantum leap in automation technology. By using suitable components from Festo in an intelligent way, you can reduce the energy consumption of your systems and thus specifically lower your production's carbon emissions. To achieve this goal, we have chosen a comprehensive approach that is easy to use. The right engineering design, energy-efficient and production-efficient products, energy-saving services, and technical training and further education all contribute to improving your ecological footprint – all the way to carbon-neutral production:

+ It is the design of a machine or system that lays the foundation for the smallest possible CO_2 footprint. Festo supports the selection of the right components in the right size by offering free engineering tools.

+ It is also part of the Festo strategy to make product-specific assessments available that evaluate the CO_2 emissions produced by the products. The continuous further development of products with innovative solutions is seen by Festo as the key to a carbon-neutral future. In the operating phase of a product, it is all about keeping energy consumption at an optimum level in the long term and identifying deviations in good time.

+ The Festo Energy Saving Services as well as the digital solutions for energy monitoring help the manufacturing industry to do this. As a leading specialist in technical training, Festo Didactic provides the specialists of today and tomorrow with the knowledge and skills they need to identify potential savings in their work and systematically implement them.

Important:
Sustainability is an integral part of the corporate strategy of Festo
Combating climate change begins within our own four walls. That is why Festo pursues a sustainability strategy that is aligned with the development goals (SDGs) of the United Nations.
From 2023, all our buildings in Germany as well as our global production and logistics sites will be carbon neutral with regard to Scope 1 and 2. From 2026, the entire Festo Group will be CO2-neutral.
And even after that, Festo will continue to work on energy-saving measures to reduce offsetting measures that cannot be avoided.
With the decision to be carbon-neutral, Festo is taking responsibility as a family-owned company.
In addition to Scope 1 and 2 emissions, Scope 3 emissions also play an important role. This takes into account emissions from purchasing and logistics, product design and the use of the products by our customers.



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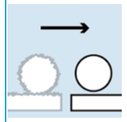
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12 different ways to successfully save energy

In the opinion of our experts, these tips make it quicker and easier to implement suitable optimization measures, for example as described in VDMA guideline 24581 (Pneumatic fluid power – Application notes for the optimization of the energy efficiency of pneumatic systems). The following examples are best-case scenarios that show how much each measure will help you to save.

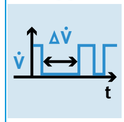
Our tip: Ask for advice from the experts at Festo. They are extremely knowledgeable about energy efficiency, and have mastered the implementation of this integrated approach.

-15%



Reduce friction
Use low-friction components
→ Mini slide DGSL

-60%



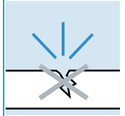
Use air-saving circuits
Vacuum handling with monitored switch-off
→ Vacuum generators OVEM

-22%



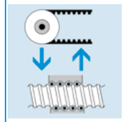
Reduce the pressure level
With a pressure regulator
Return stroke with reduced pressure 6 → 3 bar
→ MS series
→ VMPA

-20%



Reduce leakages
Regular leakage detection, condition monitoring
→ Energy Saving Services

-14%



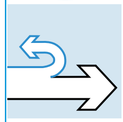
Choose the right components
Motor with holding brake for long standstills
→ Servo motors EMMS-ST

-18%



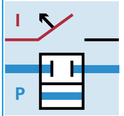
Reduce weight
Optimum technology mix
Electric handling unit with pneumatic Z-axis
→ Handling Guide Online

-10%



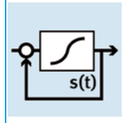
Recover energy
Save braking energy in the coupled intermediate circuits
→ Motor controllers CMMP

-20%



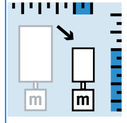
Switch off power
Leakage reduced by up to 10%
In this case for the entire compressed air system
→ Energy efficiency modules E2M

-70%



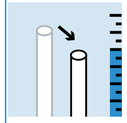
Efficient open- and closed-loop control
Adapt positioning profiles
Optimize the controller
→ Festo Configuration Tool FCT
→ Motion Terminal VTEM

-35%



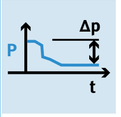
Size correctly
Optimum size
Choose one size smaller for pneumatic actuators
→ Festo Engineering Tools

-35%



Shorten tube lengths
Decentralized valve terminal
Optimal tubing installation
→ Pipe and tubing cutters ZRS
→ Festo Engineering Tools

-6%



Reduce pressure losses
Perfect tubing diameters, less resistance
Reduced network pressure from 8 → 7 bar
→ Festo Engineering Tools

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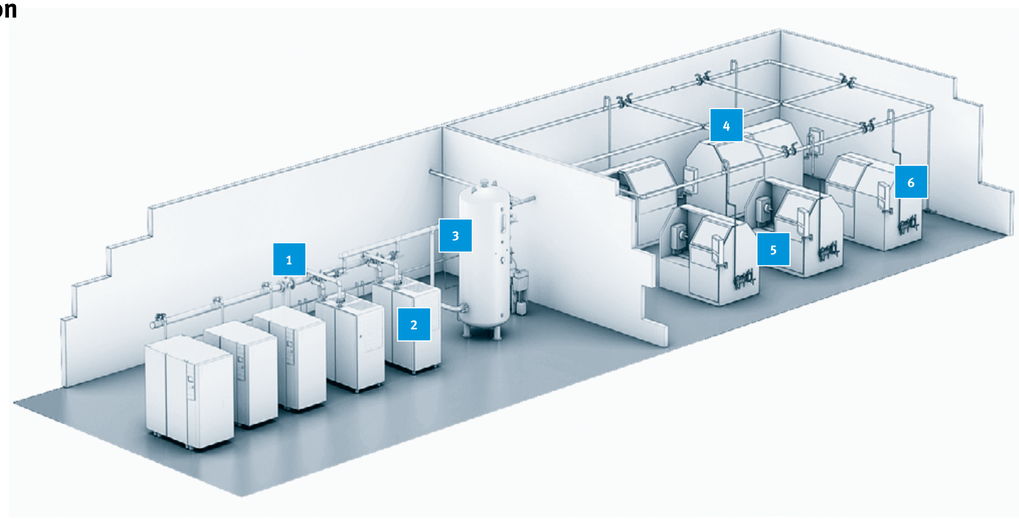
Services that pay for themselves

1 Energy analysis of compressed air generation



Monitoring the compressed air generation over several days, including during idle times and at the weekend, produces a clear consumption profile.
It documents the power and compressed air consumption requirements, including fluctuations in consumption at different operating times, from the base to the peak load.
The savings potentials are then set out in a report.

The benefits to you
- Manufacturer-independent measurement
- Measurement during operation
- Transparent energy consumption of the entire system
- Information about the capacity reserves of the system



5 Leakage detection and elimination



Systematically identifying leaks in compressed air systems, and professionally eliminating them considerably reduces compressed air costs, because leaking compressed air components waste a lot of energy and money. Our specialists check the entire compressed air system, from the compressor through to the pneumatic application.

The benefits to you
- No production downtime required
- Transparency of energy and money losses, as well as CO2 emissions
- Detecting leaks using ultrasound detector
- Assessing and classifying the individual leaks
- Detailed listing of required repair measures, including spare parts
- Online access to the prepared data via the Energy Saving Assessment Portal

2 Compressed air quality analysis



Oil, water, or particles in compressed air have negative effects on the service life of pneumatic components. Energy and operating costs rise, and in worst-case scenarios can lead to unexpected machine downtime.
Centralized and decentralized measurement of the compressed air quality includes an inspection of the service units, measurement of the water and oil content, air temperature and pressure as well as determining the pressure dew point.

The benefits to you
- Guaranteed optimum compressed air quality
- Increased service life of pneumatic components
- Minimization of unexpected production downtimes
- Adaptation of the compressed air preparation to the specific requirements

3 Pressure drop measurement



The pressure drop in the system can be recorded using several pressure sensors with data loggers that are installed at various points in the compressed air system. If the pressure can be reduced, up to 8% of the energy needed to generate compressed air can be saved.

The benefits to you
- Lower costs thanks to pressure reduction
- Reliable processes thanks to constant pressure level

4 Compressed air consumption analysis



When measuring the precise compressed air consumption at individual machines, at standstill and during operation, our team analyzes various characteristics such as consumption per machine cycle, average consumption per minute, average pressure, the maximum/minimum pressure, and air flow. These measurement results are documented in a report.

The benefits to you
- Determination of the actual compressed air consumption of individual machines
- No unwanted pressure drop due to undersupply
- No unnecessary energy consumption due to oversupply
- Determination of the compressed air loss through leakage
- Compressed air supply to the machine can be optimally configured

6 Machine analysis for energy efficiency



Stabilize your processes and reduce your costs by strategically designing your compressed air system for the future.
Based on the analysis, our experts define recommendations as to how you can realize potential energy optimizations in compressed air applications. This includes an estimation of the costs and savings, including the predicted amortization time.

The benefits to you
- Systematic review of the system for pneumatic energy efficiency
- Rapid identification of measures that are economically sensible and technically feasible
- Documentation of the analyzed compressed air applications
- The developed solutions can also be installed and commissioned, on request.

Energy-efficient products

Energy efficiency modules from the MSE6 series

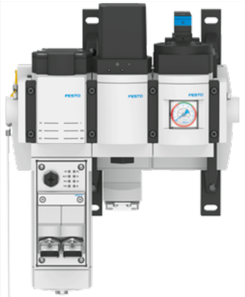
Avoid unnecessary compressed air consumption. In some work cycles, the energy supply can be temporarily stopped – right up to zero energy consumption and zero leakage.
That is why the intelligent energy efficiency modules of the MSE6 series constantly monitor the compressed air consumption and shut off the compressed air during non-production times after a certain amount of time.
The MSE6-C2M and MSE6-D2M also maintain the system pressure at a minimum standby pressure level.

→ **www.festo.com/catalogue/mse6**

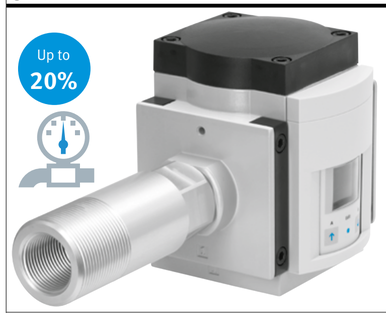
Up to 20%

The percentage values for the energy saving potential are based on calculations carried out at Festo for a sample application.
We will be happy to explain the details to you and to calculate your specific cost benefits.

It is not the use of the product itself that results in a saving, but rather the accompanying status detection and leakage monitoring.

	Air preparation unit MSE6-C2M	**Air preparation unit MSE6-E2M**	**Energy efficiency module MSE6-D2M**
	 Up to 20% **Pneumatic functions**: Flow measurement; Pressure control; Pressure switching; Pressure measurement	 Up to 20% **Pneumatic functions**: Flow measurement; Pressure switching; Pressure measurement	 Up to 20% **Pneumatic functions**: Flow measurement; Pressure switching; Pressure measurement
Control function (energy efficiency function)	• For regulation to the adjustable normal setpoint pressure as well as automatic shut-off, and then regulation to the adjustable setpoint for standby pressure if the flow rate drops below the limit value for a prolonged period • User-controlled shut-off and pressure regulation • Parameterizable up-rate limit for setpoint pressure	• Automatic shut-off if the flow rate drops below the limit value for an extended period • User-controlled shut-off and pressurization	• Automatic shut-off if the flow rate drops below the limit value for an extended period • User-controlled shut-off and pressurization
Recording and providing measurement data	• Output pressure • Pressure change (for pressure tightness monitoring) • Flow rate • Air consumption		
Limit monitoring	• Pressure, lower, and upper limit value	• Pressure, upper limit value	• Pressure, lower, and upper limit value
	• Pressure change in shut-off mode, upper limit value		
	• Flow rate, upper limit value		
Electrical inputs/ outputs	• 2 digital inputs • 2 digital outputs • Channel-based status indicator via LED • Parameterizable special functions		
Fieldbus connection	• PROFINET IO via integrated fieldbus node • EtherNet/IP via integrated fieldbus node • EtherCAT via integrated fieldbus node	• PROFIBUS DP via integrated fieldbus node • EtherNet/IP via integrated fieldbus node • EtherCAT via integrated fieldbus node	• PROFINET IO via the fieldbus node of the CPX terminal or MSE6-C2M-...-M actuated via a CPX extension
System extension/integration	• CPX extension interface row 1 for connecting an MSE6-D2M, or connecting digital and analog CPX IO modules (MSE6-C2M-...-M only	• CPX extension interface row 2 for connection to an MSE6-C2M-...-M, or to a CPX terminal with CPX extension interface row 1	
	→ **www.festo.com/catalogue/c2m**	→ **www.festo.com/catalogue/e2m**	→ **www.festo.com/catalogue/d2m**

Energy-efficient products

Flow sensor SFAM	**Flow sensor SFAB**	**Flow sensor SFAH**	**Flow transmitter SFTE**
			
Reliable and convenient SFAM supplies absolute flow rate data with threshold values and is always precise thanks to its extremely wide measuring range. The blue, high-contrast display allows the switching point to be conveniently adjusted. **The benefits to you:** No need to convert the flow rates. • Right or left? The flow of the unidirectional flow sensor can be set: from left to right or from right to left. • Flexible installation: The SFAM has a compact design and takes up little space. • Easy to combine with MS6/MS9 service units	Inline monitoring of individual processes The SFAB series supplies absolute flow or consumption data, with threshold values and convenient switching point adjustment via a display. • Systematically more reliable Even with fluctuating or uncertain flow conditions, the flow sensors supply precise data across a very wide measuring range • Convenient to operate Clear and rapid menu guidance and integrated QS fittings. Ultra-fast teach-in as with the pressure sensors and secure connections with extremely short installation times • Easy to install Thanks to the extremely compact design, an integrated flow-smoothing zone, with no need for an extra inlet and outlet zone.	• Flow measurement range 0.1 ... 200 l/min, IP40 • Medium: air, nitrogen • Bi-/unidirectional flow direction • Monitoring and setting a flow rate threshold, a flow rate range, or a change in flow rate • Pneumatic connection: QS4, QS6, QS8, G1/8 , G1/4 • Choice of PNP , NPN • 0 ... 10 V, 1 ... 5 V, 4 ... 20 mA • IO-Link • Integrated digital display	• Flow rate sensing range 1, 2, 5, 10 l/min • Pressure -0.9 ... 10 bar • Pneumatic connection Q3, Q4, M5 • Electrical connecting cable: 2.5 m, open end; cable 0.3 m with M8 plug • Analog output 1 ... 5 V; 0 ... 10 V • Operating medium: compressed air, nitrogen • IP40
→ **www.festo.com/catalogue/sfam**	→ **www.festo.com/catalogue/sfab**	→ **www.festo.com/catalogue/sfah**	→ **www.festo.com/catalogue/sfte**

Up to 20%

The percentage values for the energy saving potential are based on calculations carried out at Festo for a sample application. We will be happy to explain the details to you and to calculate your specific cost benefits.

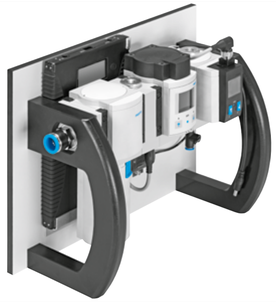
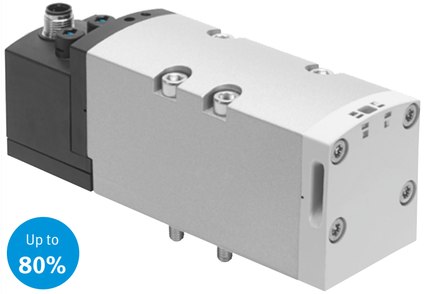
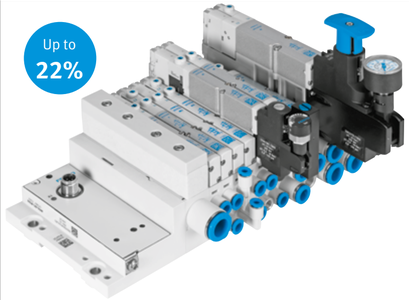
It is not the use of the product itself that results in a saving, but rather the accompanying status detection and leakage monitoring.

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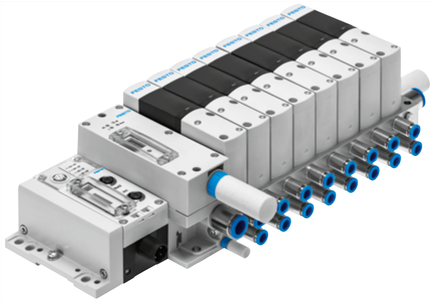
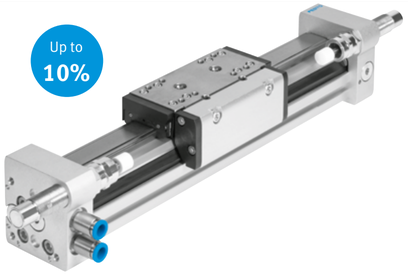
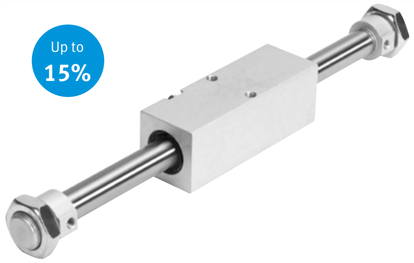
Energy-efficient products

Air-flow analyzer SFGA	**Double solenoid valve VSVA**	**Vertical pressure regulator plate VMPA1 or VABF**	**Vacuum generator OVEM**
 Up to 20%	 Up to 80%	 Up to 22%	 Up to 60%
The mobile air-flow analyzer and measuring device SFGA lets you measure the actual flow and pressure values at any time and anywhere, and compare them against historical data. Based on the flow measurement, you can quickly and easily identify deviations from the ideal state caused e.g., by leaks or unexpected pressure fluctuations and pressure losses. **Efficient measurement and analysis** The proven plug & work concept from Festo has also inspired the design of the air-flow analyzer. The ready-to-install analysis device can be used straight-away and includes everything you need for efficiently and flexibly measuring compressed air consumption and flow rates in your system.	Thanks to the built-in ejector pulse, the valve automatically lowers energy consumption when using blast air. This enables you to save a significant amount of compressed air during pauses. Another benefit is that the blast pulse is stronger than with a continuous air flow.	With the pressure regulator plate (vertical stacking), the working pressure for individual cylinders can be regulated directly on the valve terminal. You can check whether the maximum pressure level is actually necessary for each automation task, or whether you can reduce the pressure for a particular movement and thus save energy.	Reliably holding objects using vacuum does not necessarily require a constant vacuum pressure. In particular with smooth surfaces, you can avoid continuous air consumption with an air-saving circuit. The intelligent vacuum generator OVEM monitors the vacuum pressure, generates vacuum only when needed, and thus significantly reduces energy consumption.
→ **www.festo.com/catalogue/sfga**	→ **www.festo.com/catalogue/vsva**	→ **www.festo.com/catalogue/vmpa1** → **www.festo.com/catalogue/vabf**	→ **www.festo.com/catalogue/ovem**

Up to 20% The percentage values for the energy saving potential are based on calculations carried out at Festo for a sample application. We will be happy to explain the details to you and to calculate your specific cost benefits.

It is not the use of the product itself that results in a saving, but rather the accompanying status detection and leakage monitoring.

Energy-efficient products

Motion Terminal VTEM	**Pneumatic linear actuator DGC**	**Rodless linear actuator DGO**
 Up to 70%	 Up to 10%	 Up to 15%
Digitized pneumatics with Motion Terminal VTEM The Motion Terminal uses an integrated technological approach for the energy-efficient operation of pneumatic automation technology. It does this using piezo valves in the valve pilot stage that consume up to 90% less energy, as well as in-house developed Motion Apps. You choose the right pressure and speed for every stage of your application – even within a stroke – using the **Motion App** >Selectable **pressure level**<. This enables you to make significant compressed air savings, e.g., with a return stroke with reduced pressure. The **Motion App** >**ECO drive**< optimizes the pressure in the actuator during the movement to the minimum required and switches off the air supply completely in the end position. As a result, savings of up to 70% are possible with the **Motion App** >**Selectable pressure level**< and >**ECO drive**<. The **Motion App** >**Leakage diagnostics**< with its separate diagnostic cycles and defined threshold values enables reliable leakage monitoring for pneumatic systems connected to the Festo Motion Terminal, thus ensuring that leaks are detected early.	The patented sealing strip in the rodless actuator's sealing system really comes into its own with long strokes. The actuator is virtually leakage free, thus systematically reducing compressed air consumption.	The actuator has a design featuring magnetic power transmission without a mechanical connection. There is a hermetic seal between the cylinder chamber and the outer slide. This prevents leakage losses.
→ **www.festo.com/catalogue/vtem**	→ **www.festo.com/catalogue/dgc**	→ **www.festo.com/catalogue/dgo**

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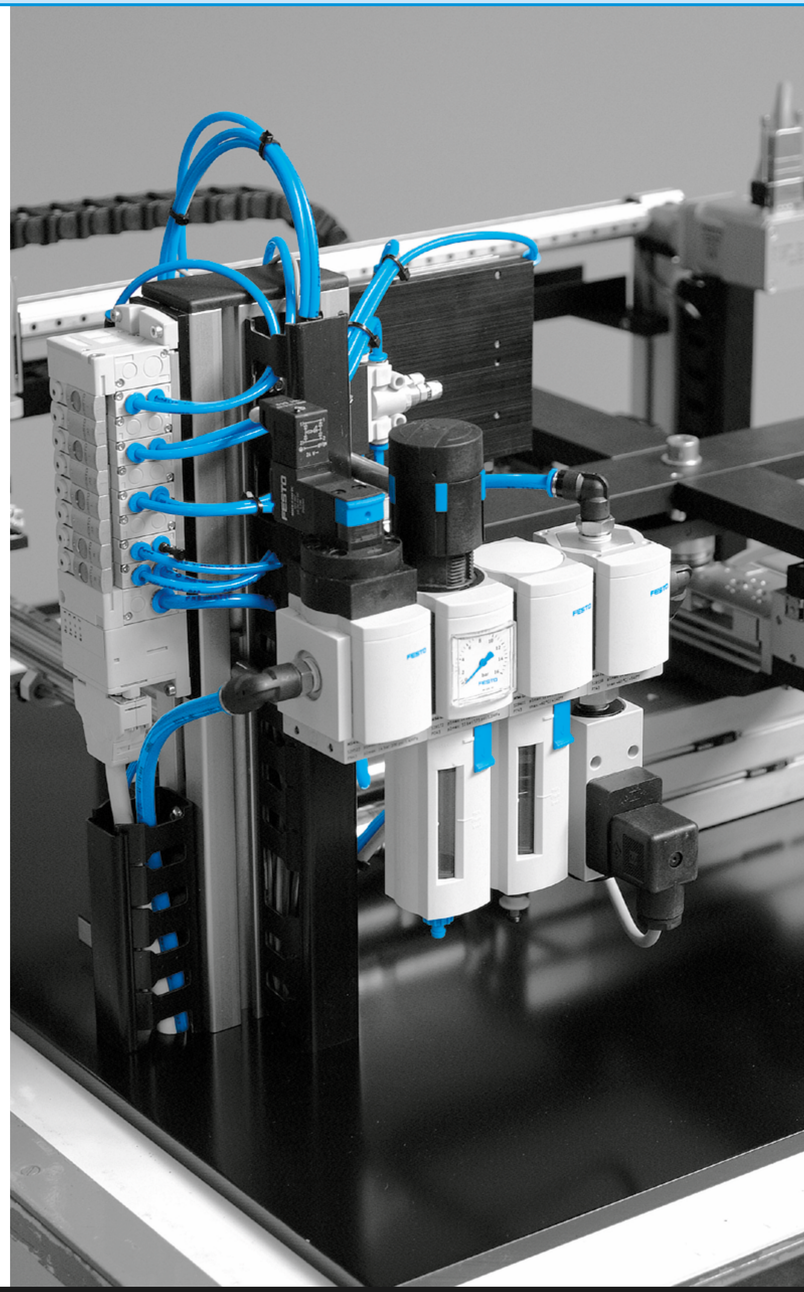
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Air Preparation

Great care must always be taken when compressed air comes into contact with food.
Because compressed air is not clean by nature. On the contrary, solids and particles create dust in various concentrations.

Moreover, water, in the form of natural atmospheric humidity, is released in large quantities when the compressed air cools down. This means that application-specific compressed air preparation provides the best possible safety for food, consumers, and food producers.



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Application-specific compressed air preparation

The demands made of the compressed air quality in the food and beverage industry are extremely strict. It is extremely important that they are adhered to in order to ensure the highest possible level of food safety, and thus reduce the risks for the consumer.

This is where international standards are helpful. For example, ISO 8573-1:2010 stipulates maximum permissible levels of contamination and particle sizes for the respective quality classes.

Various parameters need to be taken into account to ensure that compressed air preparation for automation solutions complies with the standard and is energy efficient:
- Solid particles
- Water content
- Total oil content



Compressed air quality classes to ISO 8573-1:2010

ISO 8573–1:2010	**Solid particles**				**Water**		**Oil**
	Max. number of particles per m3			Mass concentration	Pressure dew point, vapor	Liquid	Total oil content (liquid, aerosol, and vapor)
	0.1 … 0.5 µm	0.5 … 1 µm	1 … 5 µm	mg/m³	°C	g/m³	mg/m³
0	Stricter requirements than Class 1, defined by the device user						
1	≤ 20,000	≤ 400	≤ 10	–	≤ -70	–	0.01
2	≤ 400,000	≤ 6,000	≤ 100	–	≤ -40	–	0.1
3	–	≤ 90,000	≤ 1,000	–	≤ -20	–	1
4	–	–	≤ 10,000	–	≤ +3	–	5
5	–	–	≤ 100,000	–	≤ +7	–	–
6	–	–	–	≤ 5	≤ +10	–	–
7	–	–	–	5 … 10	–	≤ 0.5	–
8	–	–	–	–	–	0.5 … 5	–
9	–	–	–	–	–	5 … 10	–
x	–	–	–	> 10	–	> 10	> 10

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Application-specific compressed air preparation

Success factors for correct compressed air preparation

Different compressed air qualities are required at different points within the production system. This requires a carefully thought-out concept for the efficient use of compressed air preparation.

→ Compressed air as pilot air
In most cases, compressed air is used as pilot air, for example to control cylinders and grippers via valves. For this type of application, contamination only needs to be removed from the compressed air in order to protect the pneumatic components against corrosion and excessive wear. Class 7:4:4 is therefore recommended.

→ Compressed air as process air
Significantly higher levels of purity are required when compressed air is used as process air, e. g., for blowing out molds or when it comes directly into contact with food. In this case, which is usually limited to specific locations, it is recommended to use decentralized compressed air preparation as close as possible to the consuming device. Only the required amount of air must be prepared to the higher purity level, which saves energy.

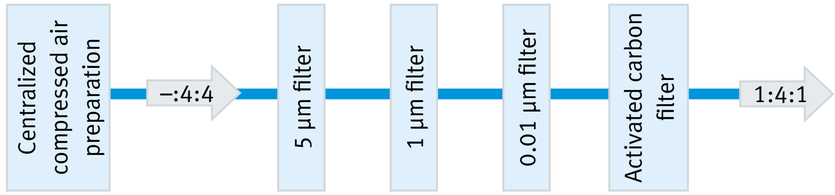
Filter cascades for typical applications

The sole purpose of ISO 8573-1:2010 is to define quality classes. It makes no recommendations about the degree of compressed air purity that should be specified in the food industry. Guidelines and recommendations, for example those issued by the VDMA and the BCAS, offer advice on suitable filter cascades.

→ Compressed air in direct contact with non-dry foods (e.g., vegetables)
The following compressed air quality classification in accordance with ISO 8573-1:2010 applies:
- Solid particles: Class 1
- Water content: Class 4
- Total oil content: Class 1

→ Compressed air in direct contact with dry foods (e.g., milk powder)
As these foods are dry, even stricter requirements apply with regard to atmospheric humidity.
The following compressed air quality classifications in accordance with ISO 8573-1:2010 therefore apply:
- Solid particles: Class 1
- Water content: Class 2
- Total oil content: Class 1

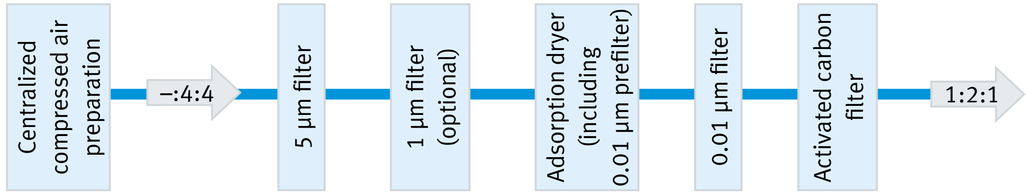
Filter cascade for achieving Class 1:4:1





Example:
Festo service unit MS for compliance with Class 1:4:1

Filter cascade for achieving Class 1:2:1





Example:
Festo adsorption dryer PDAD for specific, decentralized compressed air drying

Important:
In special cases it is advisable to also use a sterile filter, if possible in direct proximity to the consuming device.

Tip:
In packaging machines, the compressed air comes into direct contact with the packaging materials, which are subsequently filled with food. This makes the packaging material part of the food zone.

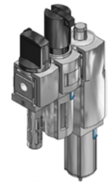
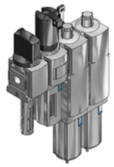
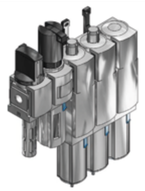
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Compressed air preparation designed for the application – preconfigured service unit components MSB from Festo

In the following overview, we have put together a number of service unit combinations that have proven their effectiveness in typical, real-life applications in the food and beverage industry. When you order the complete module with just a single part number directly from the Festo Online Shop or from your Festo contact, you will receive a fully assembled and tested unit. It requires no assembly, so you save valuable time by simply installing the unit in your system.

	Air quality class according to ISO 8573-1:2010		**Service unit**	**Flow rate** [l/min]	**Connection size** Metric [inch]	**Part number**	**Connection size** NPT [inch]	**Part number**
	**3:4:2**	**General pneumatic applications** • General air preparation unit for controlling valves and actuators • The compressed air and the associated exhaust air will not come into contact with food • For longer maintenance intervals use combination 1:4:2	**MSB4**	360	G1/4”	**8032468**	NPT 1/4”	**611761**
			MSB6	2500	G1/2”	**8032469**	NPT 1/2”	**611765**
							NPT 3/4”	**611766**
			MSB9	7800	G1”	**8032467**	NPT 1”	**611758**
							NPT 1 1/2”	**611759**
			MSB12	23300			NPT 2”	**23485453**
	**1:4:2**	**General pneumatic applications** • General air preparation unit for controlling valves and actuators • The compressed air and the associated exhaust air will not come into contact with food • A 1-µm filter is used between the 5-µm and 0.01-µm filters to extend the maintenance intervals. A quality class with fewer particles is the result.	**MSB4**	360	G1/4”	**8031370**		
			MSB6	2500	G1/2”	**8031373**		
			MSB9	7800	G1”	**8031368**		
	**1:4:1**	**Applications with possible food contact** • Minimum compressed air quality for possible contact with food or primary packaging, except for special applications (special applications see page 11, 17, and 18 of this catalog or GI 00.905)	**MSB4**	360	G1/4”	**8031372**	NPT 1/4”	**611762**
			MSB6	2500	G1/2”	**8031371**	NPT 1/2”	**611767**
								611768
			MSB9	6500				**611756**
				6500			NPT 1 1/2”	**611757**
				7800	G1”	**8031374**		
			MSB12	23300			NPT 2”	**23485449**
	**1:3:1**	**Special applications with possible food contact** • **Breakfast cereals** – All direct food contact • **Dairy** – Powders and creamers, when compressed air is directly injected into product • **Nutrition** – All baby food applications, and all applications where compressed air is directly injected into product	**MSB4**	100	G1/4”	**8031367**		
			MSB6	400	G1/2”	**8031369**		
	**1:2:1**	**Special applications with possible food contact** • **Food** – Direct contact with hygroscopic products • **Pet food** – Class 2 moisture is required in some cases in unheated parts of the factory, dependent on outdoor temperatures.	**MSB6**	506	G1/2”	**8031365**	NPT 1/2”	**23485435**
							NPT 3/4”	**23487419**
				994 l/min	G1/2”	**8031366**	NPT 1/2”	**23485445**
							NPT 3/4”	**23487421**
			MSB6 – Flow from right to left					**23481504**

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Pre-configured service units from Festo

Reliable

Lockable on/off valve MS-EM1 with lockout/ tagout option (LOTO)



Lockout: The flow rate is interrupted by turning the rotary knob.

Tagout: When the valve is closed, the rotary knob can be secured against a restart with a padlock.

Tamper-proof

Protection against accidental adjustment with the lockable filter regulator MS-LFR



Protection against accidental adjustment with the lockable filter regulator MS-LFR

Simple

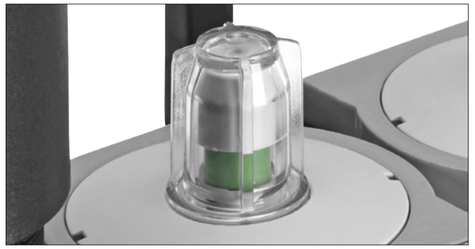
Pressure gauge with red/green scale



For monitoring operating pressure
Adjustable red/green range in bar (0 ... 12) and psi (0 ... 175)

Clear and straightforward

Visual indicator for changing the filter cartridge



Fine and micro filters MS-LFM-A and MS-LFM-B with red/green differential pressure display

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Digitalization and Predictive Maintenance

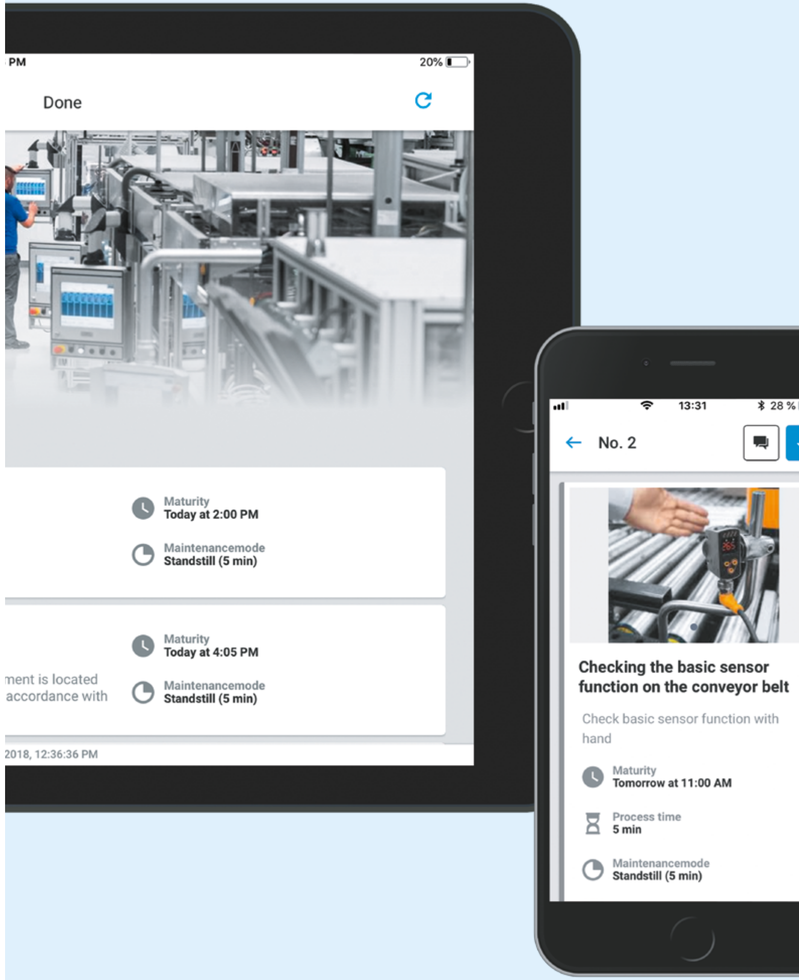
Transforming businesses with interconnected systems

The ongoing development of digitalization is significantly transforming the way businesses operate. As companies strive to stay competitive in today's rapidly evolving landscape, embracing digital technologies has become essential. This chapter explores the impact that digitalization has on businesses. Companies can unlock new levels of efficiency and sustainability by integrating networked components, cloud services, IoT technologies, digital maintenance management, condition monitoring, and predictive maintenance.

The digital transformation of production has revolutionized various aspects, including work flows, processes, flexibility, and work habits. However, it is not limited to just these areas; maintenance, sustainability, and the entire supply chain have also been significantly affected. The increasing interconnection and interaction between machines, processes, departments, suppliers, partners, and crucial data is at the heart of this transformation.

By using state-of-the-art technologies and tools, organizations can effectively collect and interpret data, establish insights and actions to optimize processes, enhance transparency, and add value for both people and machines. Digital networks will be widespread. Intelligent, self-regulating components enable plug-and-produce capabilities, facilitating seamless integration within a system. Companies now find themselves operating in an era where data-driven decision-making, predictive analytics, and real-time insights are crucial in gaining a competitive advantage.

Throughout this chapter, we will dive into the various aspects of digitalization and predictive maintenance, exploring the integration of cloud services and IoT technologies, the benefits of digital maintenance management, the importance of condition monitoring, and the significance of networked components. Additionally, we will explore topics such as predictive maintenance, predictive quality, and predictive energy, and illustrate how these predictive strategies can revolutionize businesses by minimizing failures and maximizing OEE.



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Internet of things (Industry 4.0) – always a finger on the pulse thanks to complete networking and partnerships

Many concepts from the past have been rendered obsolete by the fourth industrial revolution

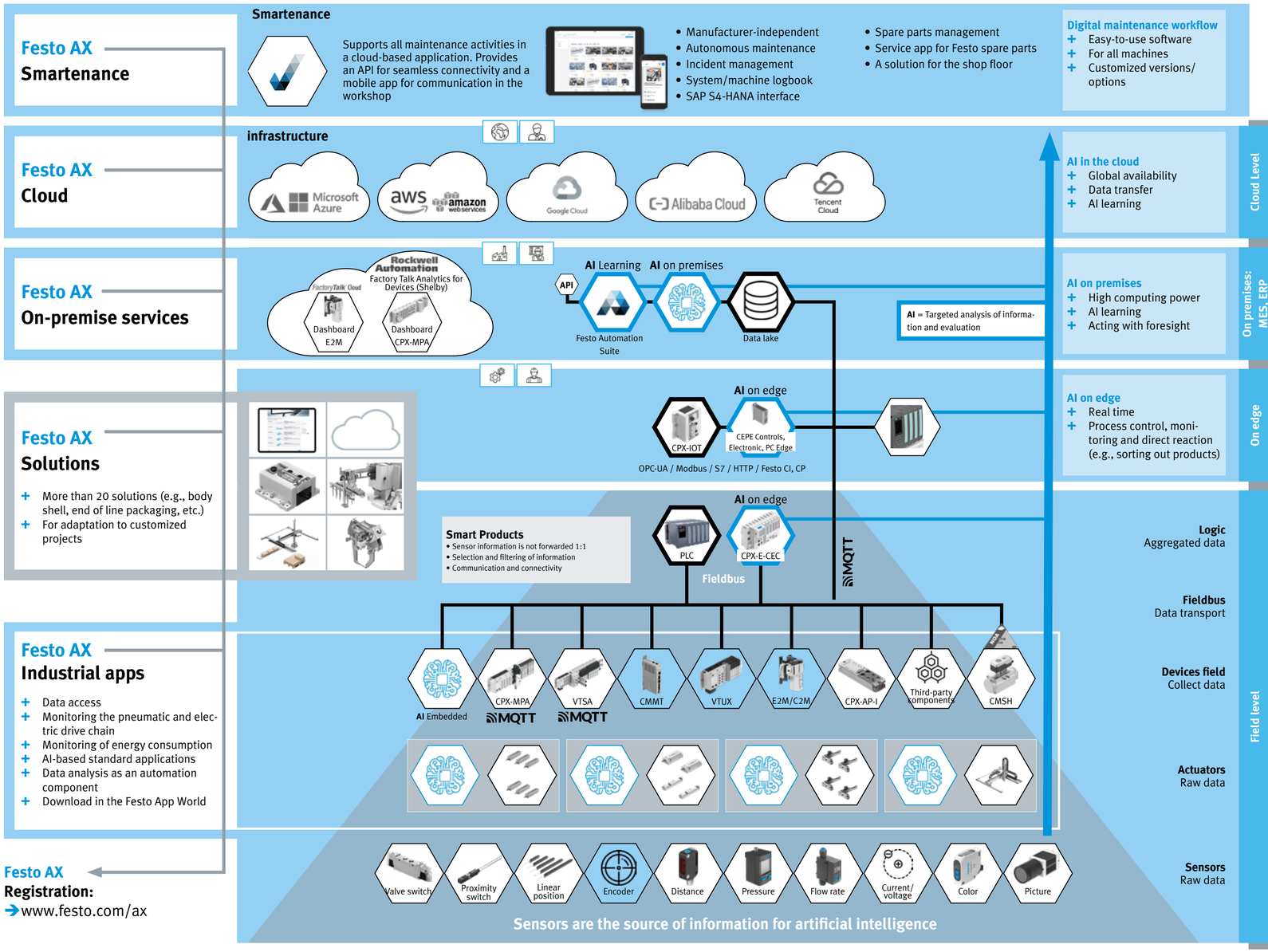
- Business models
- Partnerships
- Customer interfaces
- Value chains
- Even the classic automation pyramid – everything is in upheaval

As an innovator and trendsetter in fieldbus technology, Festo will make a major contribution to reshaping the future with new concepts for IoT/I4.0. This includes not only new smart products, cloud services and apps, but also a web shop with comprehensive integrated engineering tools and standardized AI apps.

IoT/I4.0: machines, devices and systems communicate with each other
Distinctive features of the fourth industrial revolution are more communication from controller to controller or subsystem to subsystem, horizontal and vertical connectivity with a uniform information model. The end result is often the evaluation of collected data on edge computers, servers or data lakes or in a cloud application.

Thanks to standardization to communication protocols such as OPC-UA, MQTT, AMQP and others, these advantages can also be used independently of the manufacturer. Smart products from Festo, complete subsystems and automation solutions can either evaluate data on site and make decisions – or forward them to third-party systems. Older components are integrated through IoT gateways such as CPX-IOT.

In cooperation with partners such as Siemens and Rockwell or in technology partnerships such as the Digital Twin Association (IDTA) or PLCnext from Phoenix Contact, open platforms are offered and data from Festo is integrated. Ensuring that data will be available consistently and globally in the medium term, including on all terminals.



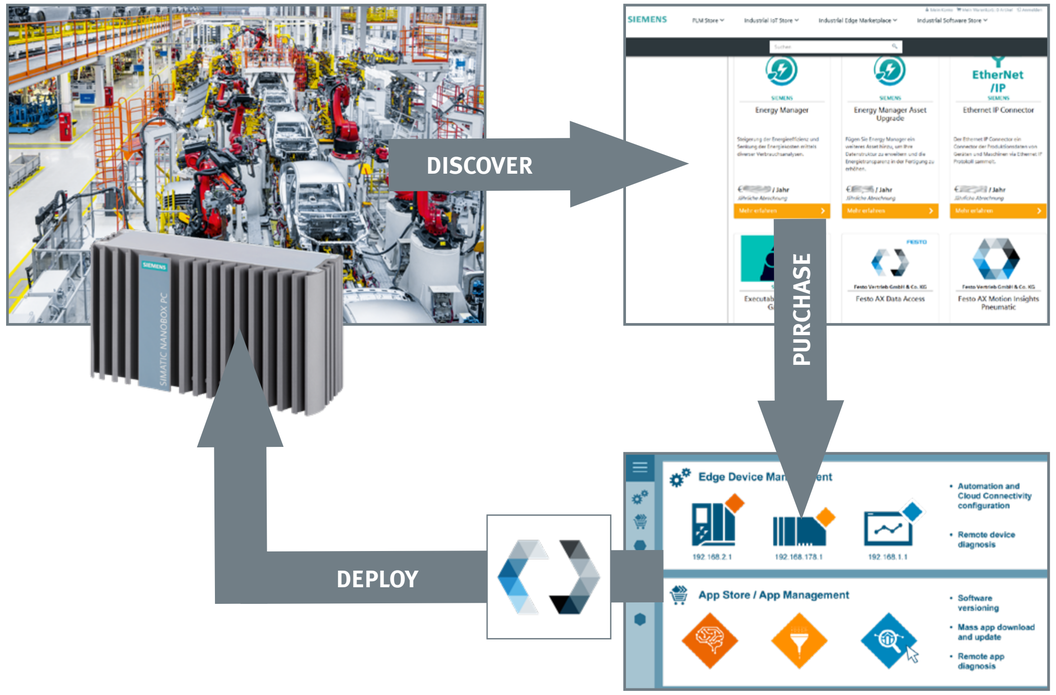
Festo IoT and Cloud Services – added focus. More transparency and added value!

Hardware for unlimited communication: IoT gateway CPX-IOT
The industrial Internet of Things gateway is based on the CPX module format. CPX-IOT collects information on Festo devices and their statuses through an Ethernet connection and a standardized communication protocol, such as OPC UA. It then sends that information to the cloud through the second Ethernet connection using IoT protocols, such as AMQP or MQTT. Suitable IT security mechanisms ensure data security.

Festo AX Data Access – the software IoT gateway
The IOT gateway software Festo AX Data Access retrieves data from Festo components and makes it available via MQTT. It is the easy way to build data-driven solutions with data from Festo components, e.g., for energy or condition monitoring. Flexible use from edge computer to cloud thanks to docker technology.

Integration into the IoT environment from Rockwell
Rockwell offers several approaches for networking industrial devices, machines and systems and utilizing the resulting data effectively: Festo AX is a reference product in the "Rockwell Technology Partner Program". The data from the Festo AI apps and other digital tools can be used and integrated by means of the standardized IoT interfaces. Older solutions such as Shelby, Team one and Factory Talk Edge Gateway are no longer available from Rockwell.

Siemens Industrial Edge
Festo apps suitable for the Siemens environment (e.g., Festo AX Data Access or Motion Insights Pneumatic) are also offered directly in the Siemens ecosystem and are continuously adapted. Formerly for Siemens Mindsphere, today in the Industrial Edge Ecosystem.



Smartenance – makes maintenance simple!

Smartenance is a manufacturer-independent maintenance software or CMMS (Computerized Maintenance Management System) that enables digital and paperless maintenance management. It is your simple and cost-effective entry into digitalization at your production level.

This cloud-based software combines efficient maintenance and repair management, fault and spare parts management, plus a machine logbook for production managers, maintenance technicians and machine operators. An API interface enables integration into existing IT/OT environments and ERP/MES systems. Festo already offers an interface to SAP 4/HANA maintenance management.



Smartenance Basis	Smartenance Advanced	Smartenance Premium
Autonomous maintenance with Festo service module and spare parts management	Autonomous maintenance **+ fault management + machine logbook**	Autonomous maintenance **+ fault management + machine logbook + data interface**
• Creation of maintenance tasks, including images, PDFs and videos • Mobile app with maintenance schedule and access to all documents • Feedback from the app, including images • Overview of maintenance status	• Report faults through the app • Process and close fault tickets • Documentation of measures and feedback on success • Intelligent search for existing knowledge • Complete system logbook	• Full read and write access through REST API • Comprehensive documentation on working with the API • Option to link to MES/ERP systems • Activate maintenance tasks based on events
The benefits: • You can downtimes thanks to intelligent maintenance routines • The maintenance task is sent to you as the user • You waste no time looking for tasks and documents/spare parts • The app is intuitive and easy to use	**The benefits:** • You can obtain an overview of maintenance from your office • You have no need to print out, distribute or collect lists and documents • You can achieve higher availability of your systems and improve their service life • A system logbook for audits is available	**The benefits:** • You have quick access to error messages • You can learn from existing knowledge and previously solved problems • A connection to ERP/MES/ Condition Monitoring System is possible, as well as SAP 4/ HANA
How does it work? • Download the Smartenance app now from the Google Play or Apple App Store.	• Create a new device access in your Smartenance web application.	• Scan the QR code with the Smartenance app and connect to your account.

Register here and test Smartenance free of charge for 60 days:

→ **signup.smartenance.festo.com**

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Smartenance – makes maintenance simple! - II



For machine operators
The Smartenance app gives machine operators access to maintenance tasks with detailed instructions and attachments such as videos, photos or PDF documents.
The integrated Festo Service Module already contains all data and documents relating to Festo products and spare parts.
You can tick off completed tasks, add comments and send clear feedback to your production manager, all directly on the shop floor.

The benefits to you:
+ Easy training of new employees
+ Identification of a machine by means of a QR code
+ Intuitive and easy-to-use app, less search effort and faster results



For production managers
The Smartenance web application provides you with an overview of all systems, machines and maintenance tasks – conveniently directly in your office.
Check the current maintenance status and receive direct feedback from your colleagues.
Maintenance tasks can be created, assigned and managed remotely thanks to global data access.
With the system logbook, you are perfectly prepared for audits.

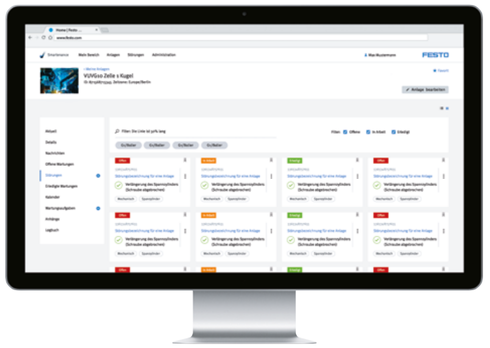
The benefits to you:
+ Detailed documentation for audits
+ Transparent and paperless maintenance documentation
+ Overview of all machines and their maintenance status from the office



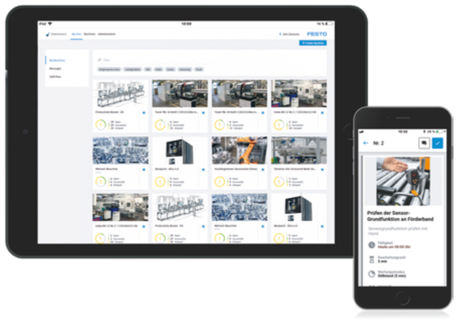
For maintenance personnel
With Smartenance, you can display, assign and report current malfunctions on a computer or on the move with a tablet.
The intelligent logbook search enables an efficient search for previous and similar malfunctions.
Use your existing knowledge database and solve problems systematically.
Images, PDFs and videos make it must faster to share knowledge.

The benefits to you:
+ Central machine logbook
+ Creation of an internal knowledge repository
+ E-mail notification of new malfunctions
+ All spare parts information on site

The integrated Festo Service Module already contains all data and documents relating to Festo products and spare parts. Documents from third-party providers can be integrated.



The web application gives you an overview of all maintenance activities and lets you manage fault tickets.



The mobile app gives you access to maintenance plans and attachments wherever you are.

Note regarding machine building companies/OEMs:
Smartenance can also be customized and therefore become an integral part of your machines/systems, enabling new, digital business models.

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Software solution Festo AX Industrial Intelligence – the automation industry needs AI

Software solution to improve OEE by optimizing the availability, performance and quality of machines

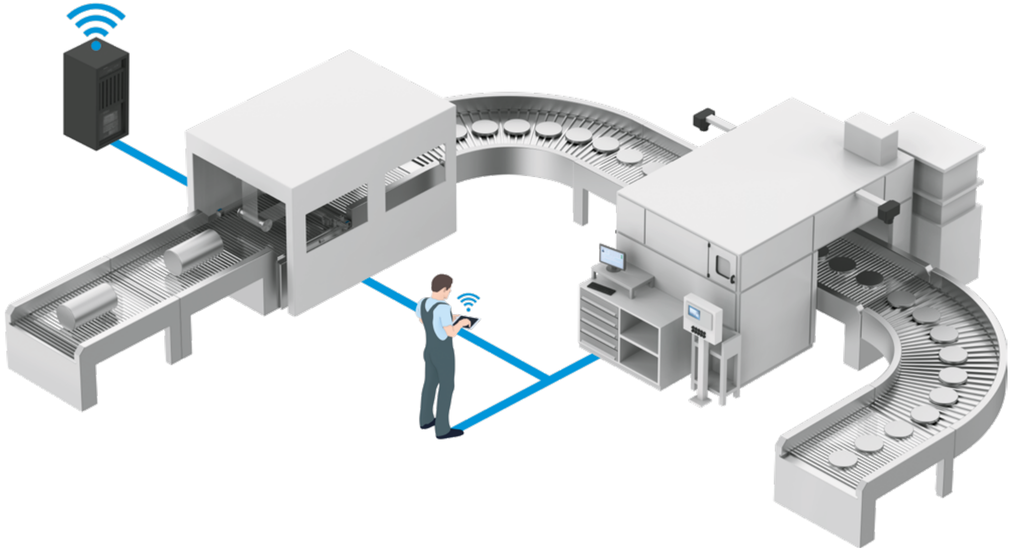
Predictive quality

Quality assurance and optimization with AI
Food and packaging systems must function safely. What is served on the table must be cleanly produced and packaged.

In order to **ensure consistent product quality** and minimize waste, all relevant parameters and data must be permanently monitored and analyzed.

With the help of AI algorithms, it is possible to **recognize and rectify quality problems before they lead to costly failures** – regardless of the manufacturer, from component level to complete machines and production lines.

Business case:
By analysing correlations between parameters, e.g., temperature and pressure, in real time, Festo AX proactively identifies quality losses and suggests solutions.



Predictive quality
Early detection of quality losses for each workpiece is possible

Automate quality inspections
E.g., through AI image recognition

Correlate with production data
Get information about the possible causes of poor quality

The benefits
+ Less waste and rework
+ Higher OEE
+ Process stability is guaranteed

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Software solution Festo AX Industrial Intelligence – The automation industry needs AI – II

Software solution to improve OEE by optimizing the availability, performance and quality of machines

Predictive energy

Intelligent energy management with AI

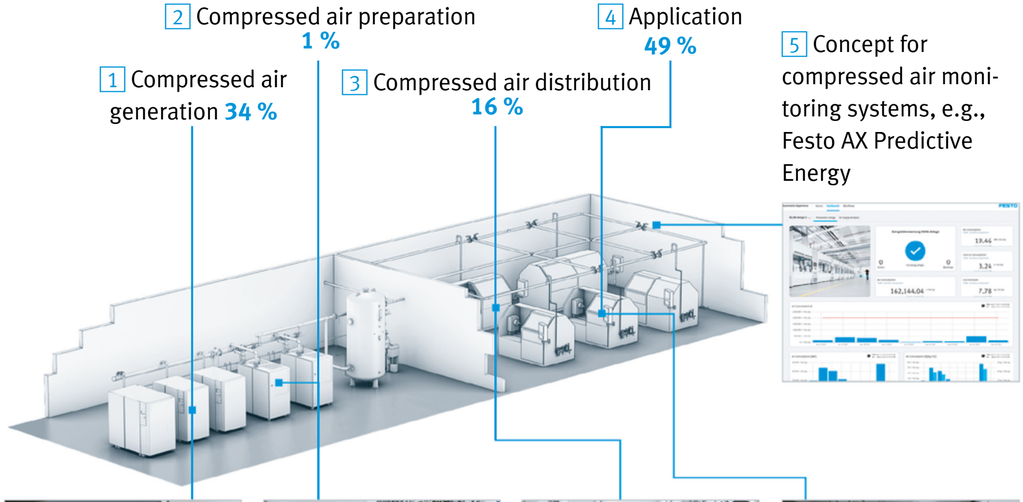
The demands on food production are increasing. Food must not only be produced safely and sustainably, but also energy-efficiently.

With Festo AX, you can to **keep energy consumption in production as low as possible** and therefore reduce costs and conserve resources. By monitoring energy consumption in production in real time and analysing the data using AI algorithms, **load peaks and energy wastage can be avoided and leaks can be detected at an early stage**.

Business case:

The energy flows are measured and analyzed in real time.

Festo AX generates a notification in the event of an abnormal increase or decrease in the energy requirement. In this way, energy consumption can be optimized, saving costs and resources.





1
Analysis of the compressed air generation



2
Analysis of compressed air preparation



3
Analysis of compressed air distribution



4
Analysis of pneumatic applications
- Analysis of the machine energy efficiency
- Leakage detection

Predictive energy
Continuous monitoring of energy consumption – From component level to complete machines and production lines

Energy efficiency audit and implementation

The benefits:
+ Optimization of energy consumption
+ Reduction of cost of goods
+ Avoidance of peak loads
+ Saving of resources
+ Leakage detection in real time

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Software solution Festo AX Industrial Intelligence – The automation industry needs AI – III

Software solution to improve OEE by optimizing the availability, performance and quality of machines

Predictive Maintenance

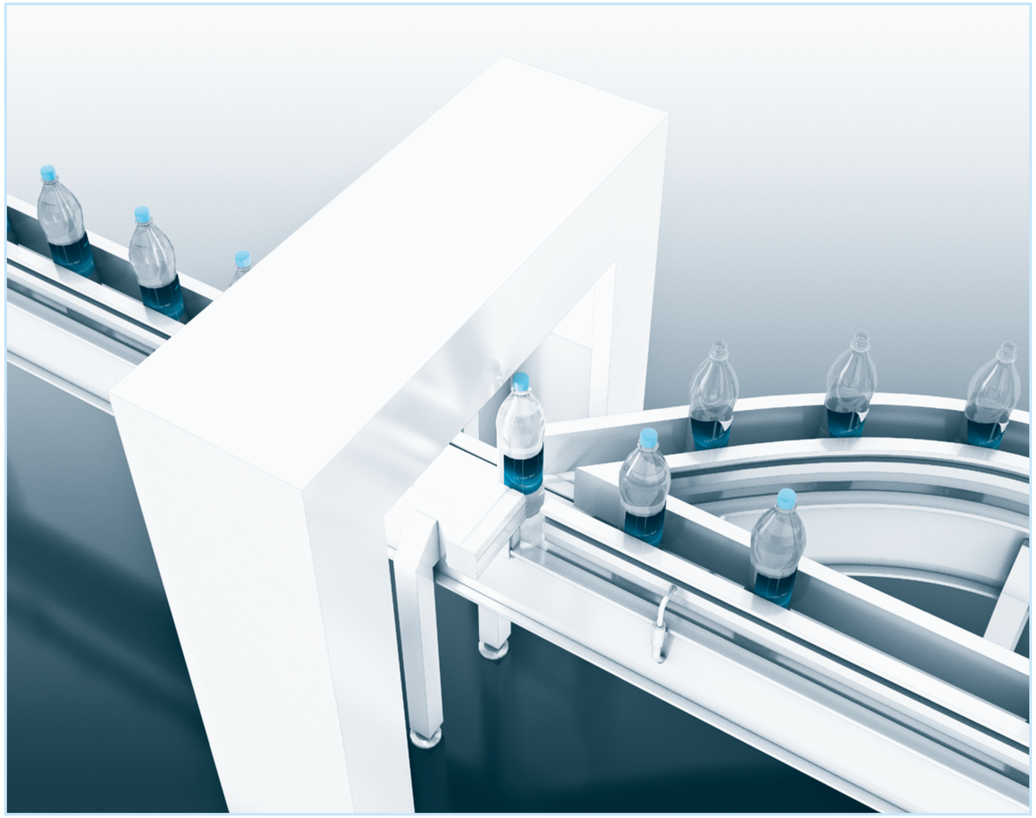
Unplanned becomes planned – Early detection of unplanned machine downtimes

Given the quantities, materials and sizes used in food and packaging production plants, any failure or malfunction is undesirable. Every minute of unplanned downtime can be expensive.

Festo AX monitors all relevant machine parameters and detects faults before they lead to costly down-times. **Maintenance can be planned, spare parts provided and unexpected downtimes avoided**.

Business case:

The data produced by the machine is sent directly to Festo AX and immediately processed by algorithms based on artificial intelligence and machine learning (Real Time Analytics).
You will be notified by Festo AX as soon as the data deviates from the “healthy state” of the machine (anomaly detection). The notification contains details of the affected sensors and even provides a recom-mendation for action.



Detect anomalies (deviations from the normal condition of your machines) at an early stage **to predict failures**.

The benefits:

+ Avoidance of unplanned downtimes
+ Take proactive measures
+ Increased uptime and performance
+ Longer service life of the machines
+ Ensure process reliability
+ Manufacturer-independent
+ Reduce manufacturing and labor costs

Start your automation experience with our **Festo AX** packages and AI standard apps

Festo makes entry into the world of AI as easy and effective as possible:

- Standardized AI apps for monitoring an electrical or pneumatic control chain for anomalies. Utilize AI advantages and AI added value immediately. You don't need your own expertise. The Festo AI app and AI experience ensure that it works straight away.
- Analyze your machines and systems and their available data at a fixed price with Data Check and Connectivity Check: discover what is feasible and how much effort may still be required for a specific project objective.
- We implement individual requests for optimizing output, quality, energy consumption or maintenance with our team of experts and comprehensive mechatronic experience from practical applications, enabling you to realize a successful (pilot) project without risk

Are your machines ready for AI?

We check the possibilities of your machines

Festo AX Connectivity Check

We check your machines:
+ Create an inventory of all relevant components
+ Analyze the existing hardware by focusing on:
  - Logs
  - Technical/system requirements for using Festo AX
+ Development of a rough concept for the seamless connection of our AI software
+ Festo AX Recommendation for any additional hardware required (gateways, edge devices, sensors, etc.)

What is hidden in your data?

We analyze the data you have already collected and train an initial AI model

Festo AX Data Check

We check your data:
+ Create an inventory of historical data
+ If necessary, save the data permanently
+ Apply the data to our machine learning AI models
+ Train an initial model for:
  - Predictive maintenance
  - Predictive quality or
  - Predictive energy
+ Development of a rough concept for the extension/precision of the data model

We solve your challenge!

We apply the trained AI models and integrate them into your IT architecture

Festo AX pilot project

We will work with you to develop a Festo AX solution based on your individual application:
+ Plan and implement a connectivity concept; build on the Festo AX Connectivity check package, if necessary
+ Develop the AI model; if necessary, build on the Festo AX Data check package
+ Document the results
+ Train your employees in working with the Festo AX software and user interface
+ Payments already made for the Festo AX Data or Connectivity Check packages will be credited

Optional: Our Festo AX Evaluation Kit offers you a preconfigured environment for an easy entry into AI projects
+ for an easy start in AI projects (with a monthly rental fee)
+ Powerful, remotely managed industrial PC with Edge Runtime
+ Festo CPX-AP-I Remote I/O for integration of IO-Link and analogue sensors
+ LTE router with SIM card (with surcharge) for remote support (optional)
+ Fixed power supply and fan

AI plug-and-produce for all drives
The Festo AX standard AI apps Motion Insights Pneumatic and Motion Insights Electric monitor all control chains and can also be subsequently integrated into a running machine/production. Unplanned downtimes are massively reduced and quality problems are often recognized in advance. Thanks to the fixed price per drive, a short ROI is possible in most cases. For details see Festo OnlineShop/AppWorld.

Qualification: Learn more about digitalization
Festo Didactic offers training and qualification programs at all levels of basic and further training. From vocational school to university to lifelong learning. Digital online portals such as the Festo LX (for Learning Experience) represent a globally available, holistic concept, including topics such as digitalization, Industry 4.0 and AI.

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Festo AX
Intelligent products enable data-based analyzes

	Pressure and flow sensors with IO-Link		**Valve terminals with comprehensive diagnostic functionality**	**Centralized and decentralized I/O systems in IP65**		**Servo drives, motors and electric actuators**
						
Type	**Flow sensors SFAM**	**Pressure sensors SPAU**	**Valve terminals MPA**	**Remote IO-System CPX-AP-A**	**Remote IO-System CPX-AP-I**	**Servo drives CMMT**
	Many older machines have high consumption rates, even when they are not in operation – for very large companies, this means potential savings in the megawatt range. The SFAM flow sensor with IO-Link can be integrated into service units or operated as a stand-alone device. It provides flow rate, pressure and temperature values and air consumption measurements as absolute flow information and cumulated. Also suitable for shielding gases such as Ar, N2, C02.	Pressure sensor SPAU is an intelligent pressure sensor with a freely programmable threshold value or window comparator. It has a wide range of functions for non-corrosive gases, consisting of: Mains monitoring Regulator monitoring Vacuum monitoring Leak tests Object detection	Universal, modular valve terminals with three valve sizes, optional hygienic and easy-to-clean MPA-C shape. Maximum functional integration such as safety zones and electronic pressure control improve process reliability and production processes. A comprehensive diagnostics concept and an internal communication system allow full data access and diagnostics down to the individual valve. Together with all mechanical drives and axes, it enables comprehensive diagnostics: Festo AX Motion Insights Pneumatic in particular makes it easy to implement concepts for predictive maintenance and quality.	Modular remote I/O system CPX-AP-A in IP65/67, with maximum performance in real time, optionally stand-alone or with valve terminals. Integrates directly into Ethernet-based networks available worldwide. The pneumatics are adapted directly or integrated decentrally. With proportional technology and controlled pneumatics, the CPX-AP-A can be expanded into a scalable system topology.	Decentralized remote I/O system CPX-AP-I in IP65/67. Ultra-lightweight and compact, but still very sturdy. Versatile I/O modules, Ethernet interfaces and IO-Link master. Up to 80 modules per system and 50 metres of cable between the modules cover complex requirements in real time.	Compact servo drive for point-to-point and interpolating motion, suitable for various Ethernet-based bus systems and can be integrated directly into system environments of different control manufacturers. One of the most compact servo drives on the market. Precise force, speed and position control. Auto-tuning supports easy commissioning and automatically optimizes the control behaviour of rotary and linear motions. The latest generation of servo drive systems with optimized prices and sizes. Together with all mechanical drives and axes, it enables comprehensive diagnostics: Festo AX Motion Insights Electric in particular makes it easy to realize concepts for predictive maintenance and quality.
online: →	→ sfam	→ spau	→ mpa	→ cpx-ap-a	→ cpx-ap-i	→ cmmt

Festo AX

Intelligent products enable data-based analyzes

	Preprocessing, IoT Internet of Things, decentralized intelligence				**Energy efficiency modules**	**Digitized pneumatics**	
							
Type	**Control block CPX-CEC**	**Logic Motion Controller CEPE**	**Gateway CPX-IOT**	**Virtual IOT gateway Festo AX Data Access**	**Energy efficiency modules MSE6**	**Motion Terminal VTEM**	**Valve terminal VTUX**
	Module of the CPX family: Decentralized and networked intelligence, CODESYS controller with motion control functionality. Industry 4.0 thanks to OPC UA and MQTT.	Edge computer for IOT and advanced motion control. High-performance hardware/ IPC. Real-time platform with Festo AX OS, based on PLCnext technology. IOT data acquisition and analysis, remote monitoring and control.	Module of the CPX family: The product is intended as a gateway between industrial Ethernet networks and an on-premise MQTT broker.	Access to data from Festo fieldbus components via MQTT for setting up simple condition monitoring and energy monitoring solutions. Simplified asset management and reduced IT administration thanks to plug and play solution.	Integrated sensors and decentralized intelligence with a fieldbus connection enable the energy efficiency modules to analyze data and make their own decisions. Displays all consumption profiles for each production cycle, can report threshold values and interpret statuses: e.g., pressure switch-off during production downtime or messages in the event of increased leakage for preventive maintenance.	The Motion Terminal VTEM uses the world's first valve that has its functions defined, controlled and changed by apps. The intelligent technology The intelligent technology consisting of pneumatics, sensors, electronics and software enables many motion, control and monitoring tasks. With the Motion Terminal VTEM, you can make your system fit for Industry 4.0 and significantly improve your process reliability and quality.	New standard in terms of material, modularity and communication. Impresses with its high flow rate, compactness and flexibility and represents the new universal platform at Festo. With communication systems CPX-AP-I and CPX-AP-A, valve terminal VTUX provides an ideal basis for digitalized production, integrated smart functions and much more.
online: →	→ cpx-cec	→ cepe	→ cpx-iot	→ ax-data-access	→ mse6	→ vtem	→ vtux

Festo AX
Product portfolio

Festo AX Industrial Intelligence – The software and AI platform from Festo

Standard catalog products

EPLAN Schematic

Fluid Draw

Fluid Sim

Festo LX

AX Smartenance

AX Smartenance – The computerized maintenance management system CMMS from Festo
- Less unplanned downtime thanks to optimized maintenance
- All data is available on mobile devices and the web application
- Increased team efficiency and improved collaboration
- Reduced administrative effort
- Interface to SAP maintenance management (S4/HANA)
- Workflow for maintenance cases
- Documentation of maintenance and incident cases
- Creation of a knowledge database
- Integration with predictive maintenance
- Integrated spare parts management with all Festo products and third-party manufacturers on request or through an API interface.

Festo AX Industrial Apps

Main features and benefits of the Festo AI standard apps:
- Continuous monitoring of the drive chain for wear and anomalies
- Plug-and-play: no expertise in data science required
- A standard app that works with drives from all manufacturers
- Plan maintenance, reduce unplanned downtime
- Higher productivity (OEE, TPM) and performance
- Reduced production and labor costs
- Increased service life of your systems
- Fixed price per system helps with investment planning

Customized software solutions

Festo AX for welding processes

Festo AX for end of line packaging solutions

Festo AX – Solutions for the food and packaging sector:
Predictive maintenance for complete systems!
Calculates anomalies in the control chain of a complete subsystem of a machine. Available AI solutions:
- Toploader, sideloader
- Palletizers
- Cleaning nozzles
- Process valves
- Energy monitoring

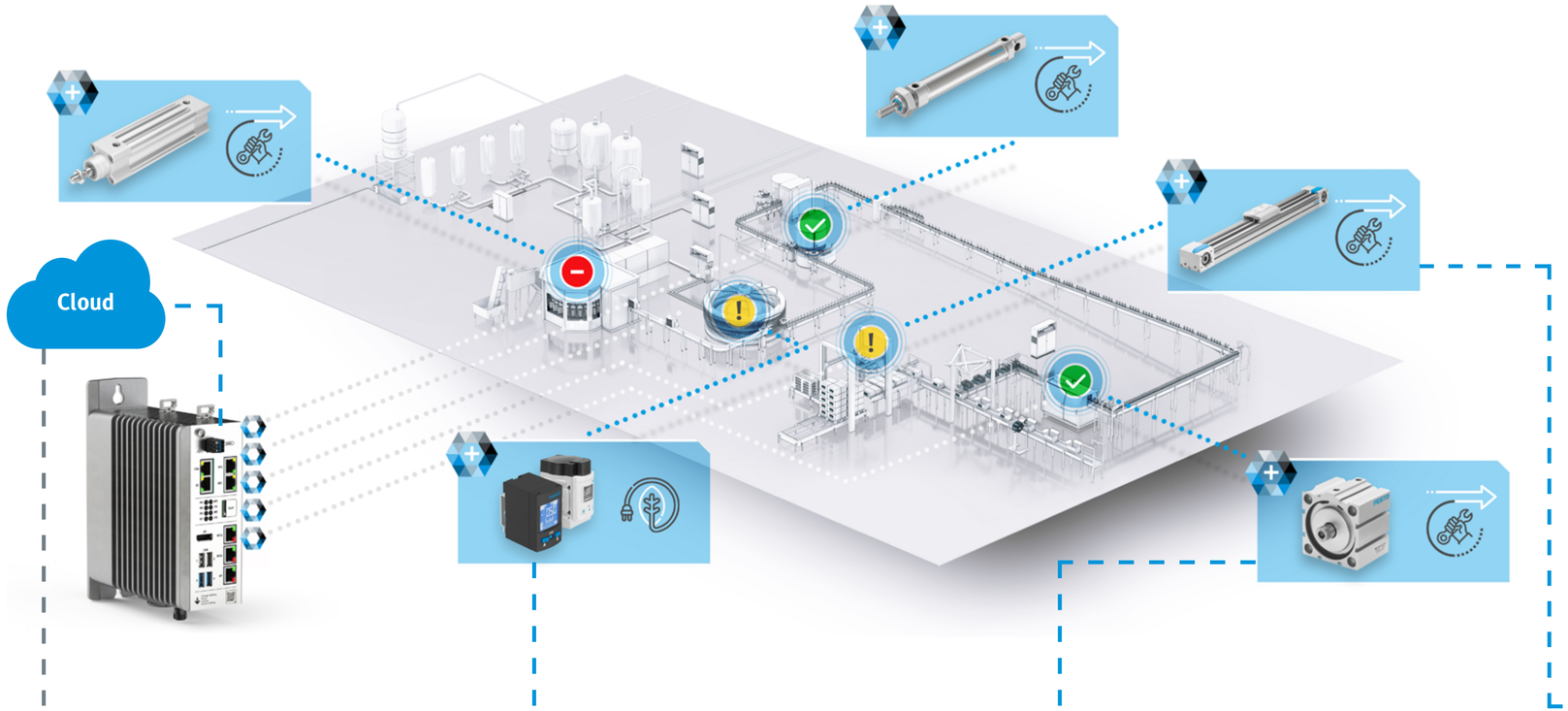
Reports them to the maintenance management system CMMS from Festo if desired.

Festo AX for special challenges

- **Further processes**
- **Individual customer requirements**
- **Projects**

Festo AX
Standard AI apps and AI solutions

Key features and benefits of Festo AI standard applications:
- Continuous monitoring of the pneumatic or electric drive chain for wear and anomalies
- Plug and play: no expertise in data science required
- A standard application that works with drives from all manufacturers
- Maintenance planning, reduction of unplanned downtimes
- Increase in productivity (OEE, TPM) and performance
- Reduction in production and labor costs
- Extend the service life of your systems
- Fixed price per system helps with investment planning



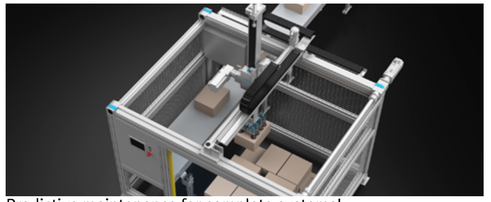
Connectivity alternatives from Festo:
- Edge computer: real-time evaluation of all data on site at the machine.
- On-premise connection through standardized MQTT or OPC UA data formats and, e.g., IOT gateways
- Cloud connection according to customer requirements: well-known standard providers, on-prem clouds, customer-specific digitalization platforms

Festo AX Predictive Energy as a standard app
- Calculates anomalies in the consumption of individual machines or production networks flexibly and depending on the production batches.
- Optionally on the basis of individual sensor data for pressure, flow rate, current and other process gases/media or by means of Festo's MSE6 energy efficiency modules.

Festo AX Motion Insigths Pneumatic:
- Predictive maintenance as standard!
- Calculates anomalies in the pneumatic control chain of all cylinders and valves in the process – regardless of the manufacturer. Reports them to the maintenance management system CMMS from Festo if desired.
- Can be used as a global standard AI app in all plants. Fixed price per cylinder.

AX Smartenance – The computerized maintenance management system from Festo
- Less unplanned downtime thanks to optimized maintenance
- All data is mobile and available in the web application
- Increased team efficiency and improved collaboration
- Reduced administrative effort
- Interface to SAP maintenance management (S4/HANA)
- Workflow for maintenance cases
- Documentation of maintenance and incident cases
- Creation of a knowledge database
- Integration with predictive maintenance
- Integrated spare parts management with all Festo products, third-party suppliers on request/via API interface.

Festo AX – Solutions for the food and packaging sector:



Predictive maintenance for complete systems!
Calculates anomalies in the control chain of a complete subsystem of a machine. Available AI solutions:

• Toploader, sideloader	• Welding guns
• Palletizers	• Spot weld quality
• Cleaning nozzles	• Bonding
• Process valves	• Riveting
• Energy monitoring	• Conveyors

Festo AX Motion Insigths Electric:
- Predictive maintenance for electric drives as standard!
- Calculates anomalies in the control chain of all electric drives in the process – regardless of the manufacturer. Reports them to the maintenance management system CMMS from Festo if desired.
- Together with the CMMT servo drive controllers from Festo as a plug-and-work solution, with third-party suppliers on request. Could be used as a global standard AI app in all plants. Fixed price per servo.

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Safety

Your route to a safe machine and system
In practice, you will not be able to avoid safety issues regarding pneumatic components, for example in technical documentation or risk assessment. Specifications such as the Machinery Directive, which applies in the European Economic Area as the basis for the functional safety of machinery, and the harmonized standard ISO 13849 are decisive. The good news: Festo is a competent partner in all cases, regardless of whether you opt for pneumatic or electric technology.

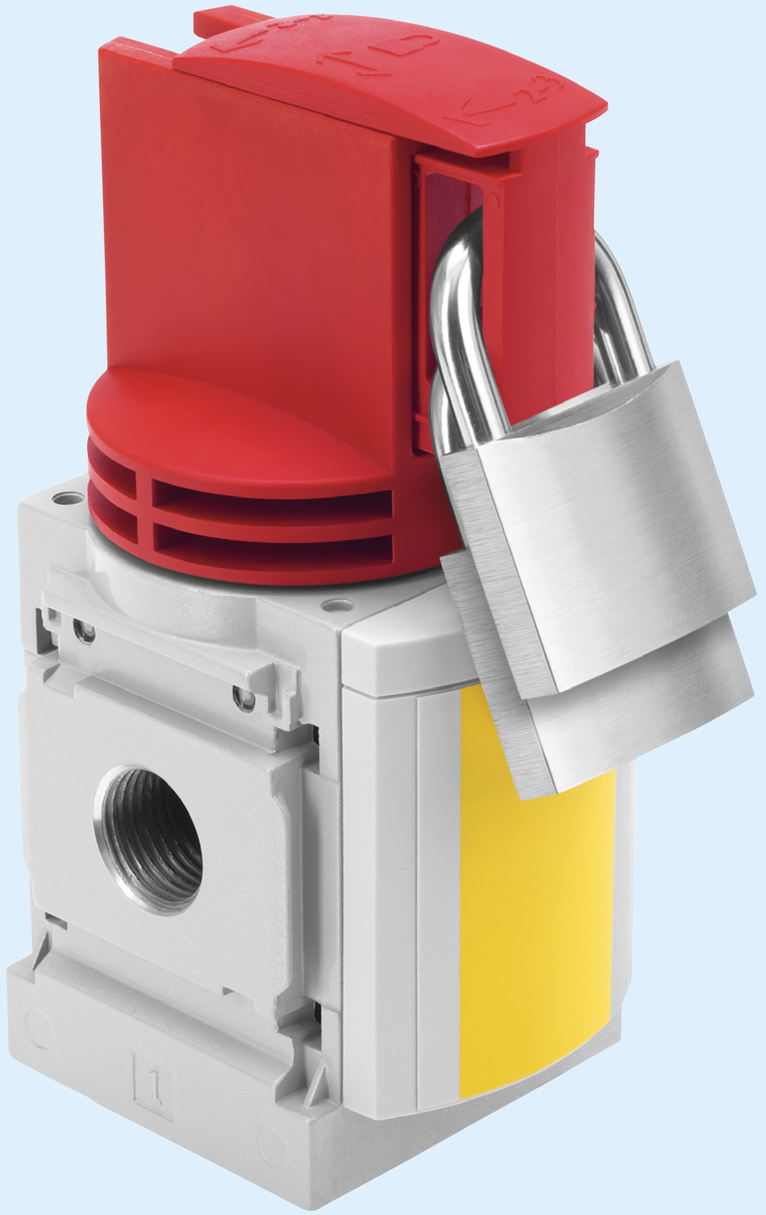
Safe pneumatics with the right wiring
Festo offers a number of safety components for various safety functions. In the vast majority of cases, the individual pneumatic components that are offered need to be assessed in the system. It is not like electrics where you work with certified components; instead, the functional safety of a specific pneumatic application usually needs to be designed and built with common hardware components. In this case, it is the machine manufacturer's responsibility to provide the safety-related evaluation and documentation.

Safe electric actuators
Functional safety for electric actuators is generally implemented with certified components and modules, whereas the electric safety functions are mostly implemented in the motor controllers or with external safety relay units. For example, all the motor controllers from Festo have an integrated STO (safe torque off).

Food safety
As your partner throughout the entire production process, Festo can help you to optimally implement food safety with clean design products and solutions. This ensures that both the consumer and your brand are protected.

When it comes to safety, choosing the right product is important, but it isn't the only consideration.
To help you meet your complex requirements, we not only offer the right products, but our project engineers are also happy to provide you with expert advice – for example, in order to work with you on the possible Failure Mode and Effects Analysis (FMEA). This means that you can ensure the safety of your planned systems much more quickly and cost-effectively.

We help you achieve a safe machine in factory automation as well as a safe system in the process industry.



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Machine safety – short and sweet

Tools

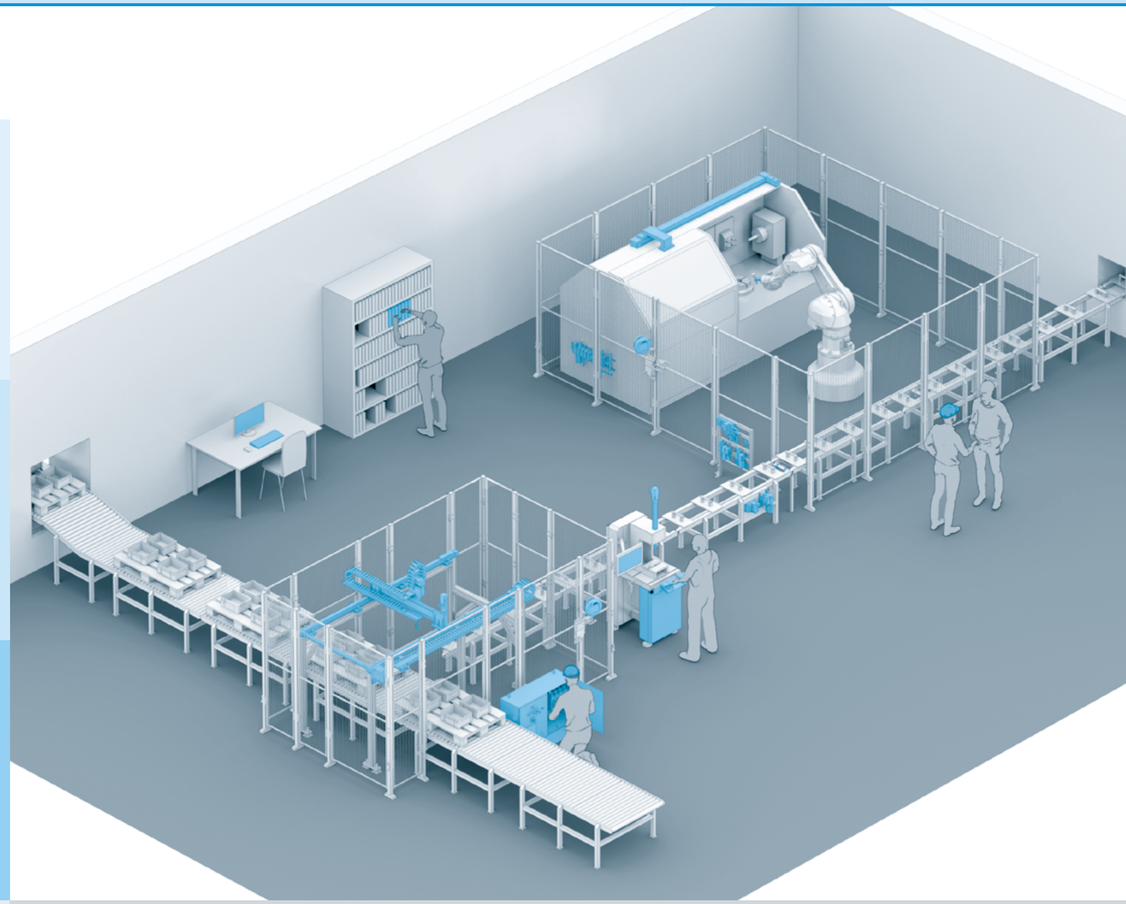
+ You can find all the safety-related characteristic values for our products in a VDMA database for the SISTEMA calculation tool.
+ All the relevant characteristic values can be found in the product reliability datasheet in the catalog.
+ Software and sizing tools help you with product selection.
+ Tools for sizing

Products

+ Products for machine safety for all areas of automation from a single source
+ Type tests in accordance with NE 95 for SIL-certified products
+ Our safety devices are certified according to all the current standards and thus reduce design time.
+ All characteristic values for standard products are also available online.
+ Quick and easy calculation of the risk reduction

Customized system solutions

+ We develop customer-specific solutions with you for safety-related applications.
+ This of course also includes the safety-related documentation.



Services/training

+ Our specialists in safety engineering will help you select the right products and safety functions worldwide.
+ In our 26 application centers worldwide, we can test the functions for your application
+ At Festo Didactic, you can find our range of technical safety seminars and online trainings around the world – making you fit to manage the topic of safety engineering.

Directives and standards

+ Our products are developed, tested, and certified in accordance with the relevant standards.
+ Technical reports help you to implement the safety functions in accordance with the standards.
+ We play an important role in the further development of standards. You, too, can benefit from this.
+ Further information about standards and regulations:

→ **www.festo.com/search/?tab=TOPICS&q=material+compliance**

Further information on machine safety can be found here:

→ **www.festo.com/search/?tab=TOPICS&q=machinery-safety**

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Food safety made easy

Standards and directives enable people to enjoy food without risk.
When implemented in production, they reduce the risks for the manufacturer and the consumer.
We are therefore guided by the following standards and guidelines:



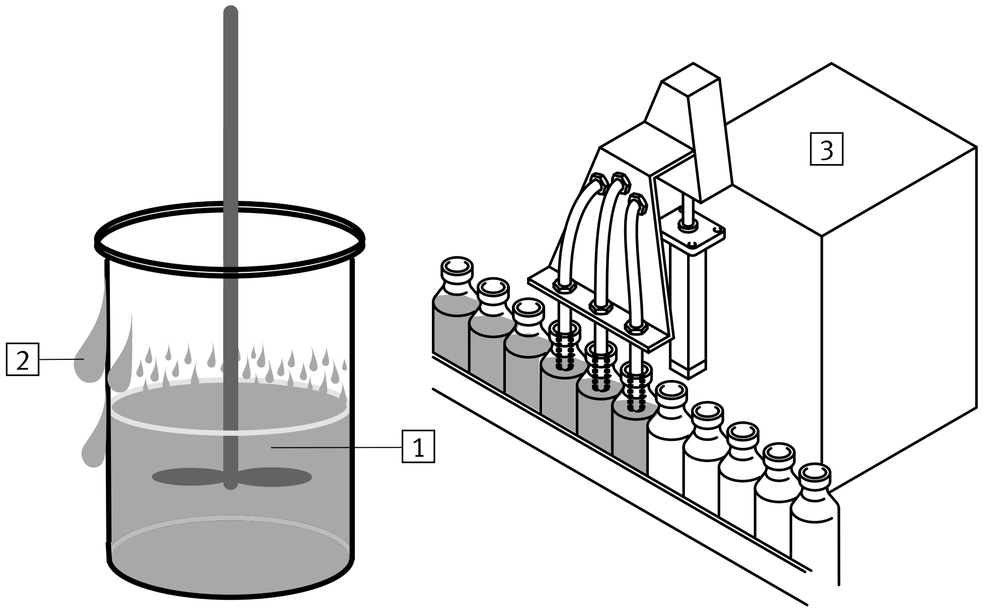
Food safety zones (EN 1672-2)

The European standard EN 1672-2, Hygiene requirements for food processing machinery, has defined three production zones:

1 Food zone
The surface of the machinery that comes into contact with food and from which food or other substances can enter back into the food stream or the food containers by draining, dripping, spilling or splashing back.

2 Splash zone
Surfaces exposed to food splashes or spills as per the intended conditions of use, but from which the food does not end up back in the product flow.

3 Non-food zone
All areas with the exception of those defined above.



What do we make available to you?

+ Standard-compliant products according to international standards
+ Advice on the right configuration for your desired product
+ Declarations of conformity/additional material information for selected products

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Corrosion resistance

Festo has defined corrosion resistance classes (CRC) in the internal standard FN 940070, for which our products have to undergo various tests, allowing them to be categorized in CRC classes:

Corrosion resistance class (CRC)	Comment	Product example
CRC 0/1 – No/light protection	Components without/with low corrosion stress	CPX
CRC 2 – Moderate protection	Externally visible parts with primarily decorative surface requirements. Direct contact with a normal industrial environment or media such as coolants or lubricants	DSBC
CRC 3 – High protection	External, visible parts in direct contact with a normal industrial environment or media such as solvents and cleaners Primarily functional surface requirements	DSBF
CRC 4 – Very high protection*	Parts exposed to aggressive media, e.g., in the food or chemical industry Outdoor exposure under extreme corrosive conditions	CRDSNU

* These applications should be supported with special tests with the media if required.

Design guidelines:

+ EN 1672-2 – Food processing machinery – Basic concepts
+ ISO 14159 – Hygiene requirements for machinery design
+ EHEDG Doc. 8, Doc. 13

Material specifications

ISO 21469 - NSF specifications for lubricating greases

+ NSF-H1 (direct contact between foodstuffs and lubricants possible) Festo products with NSF-H1-compliant greases:
  - Cylinders: CRHD, CDC, CRDSNU, CRDNG, DGRF, DSBF – see → Pneumatic cylinders
  - Push-in fitting NPQH, NPQR
  - Valve manifold MPA-C
  - Service unit components of the MS series
  - Optional electric cylinder ESBF
+ NSF-H2 (contact with food must be excluded)
+ Regulation (EC) No. 1935/2004 - Food contact materials
+ Regulation (EC) No. 10/2011 – Plastic materials and articles
+ FDA

Tip:
Only use NSF-H1 to avoid confusion!

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The Challenge of Cleaning

An effortless task

Cleaning is an absolute must for hygienic food production. The top priority is to prevent the spread of germs and eliminate foreign particles. Proper cleaning doesn't just protect the consumer; it also reduces your system downtimes, and protects your brand from expensive product recalls, reputational damage, and even lawsuits.

Everything you need for hygienic automation technology

Every manufacturer is liable for its products. Flawless product safety – especially from a microbiological standpoint – must be guaranteed in order to protect the consumer. Preventing the spread of germs and eliminating foreign particles is therefore top priority.

Suitable cleaning methods are defined in the operating instructions and are based on special applications, products, and processes. The effectiveness of these methods is influenced by factors such as temperature, time, mechanics/force, and chemicals (type and concentration).
The objective is to achieve an optimal, hygienic condition in the shortest space of time using minimal amounts of cleaning agent.



Selecting components for safe operation and optimum cleaning

Different types of cleaning agent are used depending on the areas/surfaces to be cleaned. Gel, foam, or liquid cleaning agents adhere to surfaces in varying degrees and should thus be applied differently. This creates the need for different cleaning processes.
The type of cleaning – normal or intensive foam cleaning – also determines the type of sealing material (e.g., the kind of cylinder seal) to be used. If, for example, there is a risk that the lubricating grease will be washed out, using unlubricated seals ensures that the cleaned machine components still function reliably.

Cleaning agents and disinfectants

Basic characteristics of cleaning agents (e.g., DIN 10516)
The cleaning agents suitable for the different food zones often differ widely from one another. However, several basic characteristics are crucial to ensure that their effectiveness remains predictable on a day-to-day basis:

+ Quickly and completely water-soluble
+ Fast soaking and removal of food residues or their main ingredients, i.e., fats, proteins, carbohydrates, yeast, fruit flesh, etc.
+ Absence of foaming or antifoaming power
+ Compatibility with surfaces to be cleaned, without causing corrosion
+ Good rinsability
+ Environmental compatibility
+ No risk for personnel

Since no single chemical has all these characteristics, a combination of chemicals is required so that each substance fulfils a specific task as part of the complex cleaning process.



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Degrees of protection

There are various test methods and standards to assess housings and enclosures that aim to protect people from electric components, or protect electrical components from damaging external influences.

IP degrees of protection

The IP degrees of protection are defined in the international standard IEC 60529. This standard defines the protection of electrical equipment using enclosures/housings.
It sets forth the following:
Protection of persons from accessing dangerous parts within the enclosure/housing (touch protection)
Protection of equipment inside the enclosure/housing against ingress of solid foreign matter, including dust (foreign matter protection)
Protection of electrical equipment against damage that would result if water were to enter the enclosure/housing (protection against water).

Typical IP degrees of protection in the food and beverage industry

Normally components with IP degree of protection 65, 66, 67, 68 and 69K are used directly and without further protection.

IP65

2nd digit: Protection against the ingress of water

1st digit: Protection against the ingress of solid foreign matter

Note:
The first digit includes the relevant secondary digits.
This also applies to the second digit, but only to digit 6

NEMA degrees of protection

The evaluation of electrical components according to the American NEMA (National Electrical Manufacturers Association) system is carried out in accordance with NEMA Standards Publications 250:2014-00 “Enclosures for Electrical Equipment (1000 Volts Maximum)”. NEMA 250 classifies enclosures for electric components with a rated voltage not exceeding 1000 volts by type. They can also be classified by operating environment (dangerous or not dangerous).

Type 1 Designed for internal use; protection against contact with the enclosed device.	**Type 6** For internal and external use; protection against the ingress of water during occasional or temporary submersion at a limited depth.
Type 3 For external use; protection against wind-borne dust, rain, sleet, and external ice formation.	**Type 6P** For internal and external use; protection against the ingress of water during prolonged submersion at a limited depth.
Type 4 For internal and external use; protection against wind-borne dust, rain, wind-borne splash water, and water jets.	**Type 12** For internal use; protection against dust, falling dirt and dropping non-corrosive liquids.
Type 4X For internal and external use; protection against corrosion, wind-borne dust, rain, wind-borne splash water, and water jets.	**Type 13** For internal use; protection against dust, splash water, oil, and non-corrosive coolants.

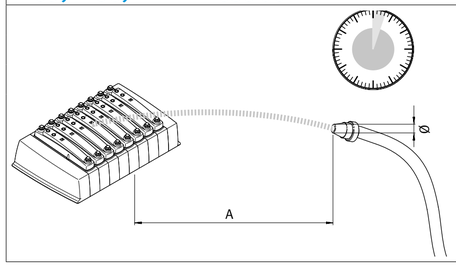
Typical NEMA degrees of protection in the food and beverage industry

Normally components with NEMA degree of protection 4, 4x, 6 and 6P are used directly without further protection.

Note:
The NEMA standards publication specifies tests for environmental conditions such as corrosion, rust, ice, oil, and coolants. DIN EN 60529, on the other hand, does not set out these environmental conditions; neither does it specify the degree of protection against mechanical equipment damage. In addition, the tests and evaluations differ in relation to other characteristic data, and therefore the IP degree of protection designations cannot be equated directly with the NEMA enclosure types.

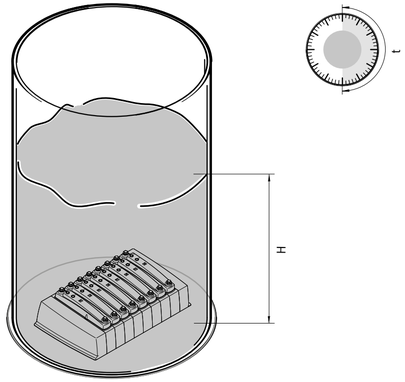
Test specifications to determine the IP and NEMA degrees of protection

IP65, IP66, NEMA Hose down



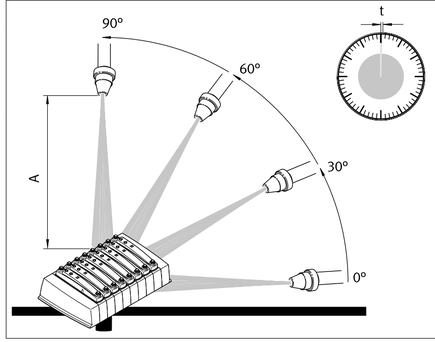
		IP65	IP66	NEMA Hose down (4, 4X, 6, 6P)
A	[mm]	2.500 ... 3.000	2.500 ... 3.000	3000 ... 3500
Ø	[mm]	6.3	12	–
t	[min]	3	3	5
p	[bar]	0.3	1	–
Q	[l/min]	12.5	100	240

IP67, IP68, NEMA Submersion



		IP67	IP68	NEMA Submersion (6, 6P)
H	[mm]	150 ... 1,000	**Note:** The test conditions must be agreed upon by the manufacturer and the user, but must be higher than IP67	1,800
t	[min]	30		30

IP69K



		IP68K
A	[mm]	100 ... 150
t	[sec/position]	30
p	[bar]	80 ... 100
Q	[l/min]	14 ... 16
T	[°C]	80

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Cleaning agents and disinfectants (according to typical ingredients, as an example)

Product	Cleaning agent type	Tubing						Cylinder			Seal				Valve	Fitting1)			
								Corrosion protection											
								Standard	Increased	High									
ECOLAB PROTECTING WHAT'S VITAL		PUN	PAN	PUN-H PUN-H-F	PLN	PFAN	PTFEN	E.g., DSBC DSNU	E.g., DSBF DSNU-R3	E.g., CRDSNU	PUR standard (TPE-U)	PUR media (TPE-U), FDA	FPM	PE	MPA-C	NPQH	NPQP	NPQR	NPCK
Topactive 200	Alkaline	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topactive 200 DK	Alkaline	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topactive 314	Alkaline-oxidative, with active chlorine	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topactive 500	Acidic	–	–	o	+	+	+	–	o	+	–	+	+	+	+	o	+	+	+
Topactive DES	Acidic-oxidative	–	–	+	+	+	+	–	o	+	–	+	o	+	+	+	o	+	+
Topactive LA	Neutral	–	+	+	+	+	+	o	o	+	–	+	+	+	+	+	+	+	+
Topactive OKTO	Acidic-oxidative	–	–	+	+	+	+	–	o	+	–	+	o	+	+	+	o	+	+
Topax 66	Alkaline, with active chlorine	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topax 91	Neutral	–	+	+	+	+	+	+	+	+	–	+	+	+	+	+	+	+	+
Topax 960	Alkaline	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topax 990	Neutral	–	+	+	+	+	+	+	+	+	–	+	+	+	+	+	+	+	+
Topaz AC1	Acidic	–	–	–	+	+	+	–	–	+	–	+	+	+	+	o	+	+	+
Topaz AC2	Acidic	–	–	o	+	+	+	–	–	+	–	+	+	+	+	o	+	+	+
Topaz AC3	Acidic	–	–	o	+	+	+	–	–	+	–	+	+	+	+	o	+	+	+
Topaz AC4	Acidic	–	–	o	+	+	+	–	–	+	–	+	+	+	+	o	+	+	+
Topaz AC5	Acidic	–	–	+	+	+	+	–	–	+	–	+	+	+	+	o	+	+	+
Topaz CL1	Alkaline, with active chlorine	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topaz CL2	Alkaline, with active chlorine	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topaz CL3	Alkaline, with active chlorine	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topaz CL4	Alkaline, with active chlorine	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topaz HD1	Alkaline	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topaz HD2	Alkaline	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topaz HD3	Alkaline	–	–	+	+	+	+	–	–	+	–	+	o	+	o	o	+	o	+
Topaz LD1	Neutral	–	+	+	+	+	+	o	o	+	–	+	+	+	+	+	+	+	+
Topaz LD2	Neutral	–	+	+	+	+	+	o	o	+	–	+	+	+	+	+	+	+	+
Topaz LD3	Neutral	–	–	+	+	+	+	–	–	+	–	+	+	+	o	+	+	+	+
Topaz MD1	Alkaline	–	–	o	+	+	+	–	–	+	–	+	+	+	o	+	+	+	+
Topaz MD2	Alkaline	–	–	+	+	+	+	–	–	+	–	+	+	+	o	+	+	+	+
Topaz MD3	Alkaline	–	–	o	+	+	+	–	–	+	–	+	o	+	o	+	+	+	+
Topaz MD4	Alkaline	–	–	o	+	+	+	–	–	+	–	+	o	+	o	+	+	+	+

+: Resistant; o: Limited resistance; –: Not resistant 1) Resistant, including inside seal. Higher resistance with purely external contact.

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Cleaning agents and disinfectants (according to typical ingredients, as an example)

Product	Cleaning agent type	Tubing						Cylinder			Seal				Valve	Fitting1)			
								Corrosion protection											
								Standard	Increased	High									
Diversey		PUN	PAN	PUN-H	PLN	PFAN	PTFEN	E.g., DSBC	E.g., DSBF	E.g., CRDSNU	PUR	MEDIA	FPM	PE	MPA-C	NPQH	NPQP	CRQS	NPCK
Acifoam VF10	Acidic foam cleaner	–	–	o	+	+	+	–	o	+	o	+	+	+	+	o	+	+	+
EnduroEco	Acidic gel cleaner	–	–	o	+	+	+	–	o	+	o	+	+	+	+	o	+	+	+
Aluwash VA03	Acidic cleaner	–	–	–	+	+	+	–	o	+	–	+	+	+	+	+	+	+	+
Cipsafe VC18	Alkaline cleaner	–	+	+	+	+	+	o	o	+	+	+	–	+	+	o	+	o	+
Complex VB13	Alkaline cleaning additive	–	+	+	+	+	+	o	o	+	+	+	o	+	+	o	+	o	+
Delladet VS02	Mildly alkaline disinfectant	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dicolube HCS VL 70	Belt lubricant	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dicolube RS 148 (new)	Belt lubricant	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Dicolube Sustain-1 VL108	Belt lubricant	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Diverfoam Active	Acidic disinfectant	–	–	o	+	+	+	o	o	+	–	+	+	+	+	+	o	+	+
Diverfoam SMS Chlor VF18	Alkaline foam cleaner with chlorine	–	–	+	+	+	+	–	o	+	+	+	o	+	+	o	+	o	+
Diverside PD VF49	Alkaline foam cleaner	–	–	+	+	+	+	+	+	+	+	+	o	+	+	o	+	o	+
Divo Peroxy VB70	Acidic cleaning additive	–	–	o	+	+	+	o	o	+	–	+	+	+	+	+	+	+	+
Divodes FG VT29	Alcohol-based disinfectant	–	o	–	+	+	+	+	+	+	–	+	+	+	+	+	+	+	+
Divosan Active VT05	Acidic disinfectant	–	–	o	+	+	+	o	o	+	–	+	+	+	+	+	o	+	+
Divosan Extra VT55	Neutral disinfectant	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Divosan Hypochlorite VT03	Alkaline disinfectant with chlorine	–	–	+	+	+	+	–	–	+	+	+	o	+	+	o	+	o	+
Divosan Sanibright VS59L	Alkaline foam disinfectant	–	+	+	+	+	+	–	–	+	+	+	–	+	+	o	+	o	+
EnduroChlor VE5	Mildly alkaline cleaner with chlorine	–	–	+	+	+	+	–	–	+	+	+	o	+	+	o	+	o	+
EnduroMax VE1	Highly alkaline cleaner	–	+	+	+	+	+	–	–	+	+	+	–	+	o	o	+	o	+
Fatsolve VF21	Alkaline foam cleaner	–	+	+	+	+	+	+	+	+	+	+	o	+	+	+	+	+	+
HD Plusfoam VF01	Highly alkaline foam cleaner	–	+	+	+	+	+	–	–	+	+	+	–	+	o	o	+	o	+
Highstar VC77	Highly alkaline cleaner	–	+	+	+	+	+	–	–	+	+	+	–	+	o	o	+	o	+
Hypofoam VF6	Foam and disinfectant cleaner with chlorine	–	–	+	+	+	+	–	–	+	+	+	o	+	o	o	+	o	+
Mach 5 VC10	Highly alkaline cleaner	–	+	+	+	+	+	–	–	+	+	+	–	+	o	o	+	o	+
NP Freefoam VF11	Acidic foam cleaner	–	–	–	+	+	+	o	o	+	o	+	+	+	+	+	+	+	+
Pascal VA05	Acidic cleaner	–	–	–	+	+	+	–	–	+	–	+	+	+	+	–	+	+	+
Safefoam VF09	Mildly alkaline foam cleaner	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Sanigel VG04	Alkaline gel cleaner	–	+	+	+	+	+	–	–	+	+	+	–	+	+	o	+	o	+
Shureclean Plus VK9	Strongly foaming neutral cleaner	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Superfoam VF03	Alkaline foam cleaner	–	+	+	+	+	+	–	–	+	+	+	–	+	+	o	+	o	+
Supergel VG03	Alkaline gel cleaner	–	+	+	+	+	+	–	–	+	+	+	–	+	+	o	+	o	+
Suredis VT01	Mildly alkaline disinfectant	–	+	+	+	+	+	o	+	+	+	+	o	+	+	+	+	+	+
Surefoam VF62	Alkaline disinfectant	–	+	+	+	+	+	–	–	+	+	+	–	+	+	o	+	o	+
Tego 2000 VT25	Mildly alkaline disinfectant	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Ultraclean VK03	Mildly alkaline cleaner	–	+	+	+	+	+	o	o	+	+	+	o	+	+	+	+	+	+

+: Resistant; o: Limited resistance; –: Not resistant 1) Resistant, including inside seal. Higher resistance with purely external contact.

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Pneumatic or Electric?

The Festo Automation Guide: your route to the right technology

Your advantage: advice and implementation expertise across all technologies.

One thing is clear: your application must be tailored to your individual requirements – only then will solutions become economical!

And that is why you should rely on the most varied product portfolio on the market: whether it's pneumatic, electric or a mix, you will always find the right technology.



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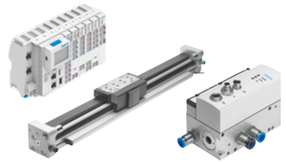
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Pneumatics

A success story
Pneumatics was the starting point for the success of Festo. This simple and low-cost technology with its strengths in moving between two end positions, for example in holding, tensioning, clamping, and pressing applications, is straightforward and sturdy. That is why it can be found in nearly all industry segments.

- Holding and pressing are where pneumatics comes into its own
- End position travel
- Wide range of versions – ISO cylinders, integrated guides, etc.
- Many variants for a broad range of applications: temperature, corrosion resistance, chemical resistance, food safety
- Sturdy and straightforward technology with low maintenance requirements
- Established in all segments of automation technology



Servo-pneumatics

Cost-effective positioning of heavy loads
If you need to position larger loads from 15 kg up to 300 kg, servo-pneumatics is very attractively priced. Drive packages based on this technology are characterized by fast switching from position control to force control and gentle travel to positions. It does require software and relevant programming experience. Path control is not possible.

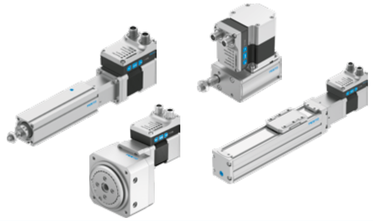
- Ideal for gentle movement and free positioning of workpieces
- Excellent for applications with force control
- Fast switching from position to force control
- For loads up to 300 kg horizontally or 100 kg vertically
- Stroke lengths up to 2000 mm



Digitized pneumatics

Multifunctional thanks to Motion Apps
Unique and only from Festo: digitized pneumatics, such as the Motion Terminal VTEM, a multifunctional platform controlled via Motion Apps and based on state-of-the-art piezo technology. Excellent function integration is combined with outstanding monitoring solutions, and amazingly compact multi-pressure and multi-flow control applications are combined with self-learning algorithms such as in the Motion App “Presetting of travel time”. This technology is only limited by the need for programming experience and a finite flow rate range.

- Software-controlled valve functions via Motion Apps
- Extremely flexible: numerous pneumatic functions in one piece of hardware
- Up to 16 independent channels for controlling pressure and flow rate on one platform
- High level of function integration via central fieldbus
- Controlled movement into the end positions in pneumatic systems with more than one axis
- Free positioning with and without motion planning
- Condition monitoring and process monitoring



Simplified Motion Series

Simple, low cost, precise
Only from Festo: a simple, low-cost, and precise range for linear or rotary movements between two end positions and an intermediate position with high process reliability thanks to defined and reliable speed and force control. Ideal for assembly, test, and desktop applications. In addition, integrated IO-Link permits diagnostics and an Industry 4.0 connection to the cloud. The series also includes extremely easy commissioning without the need for software, and state-of-the-art communication and control concepts. The only limit is the force range and the degree of protection of IP40.

- Suitable for simple electrical motion into end positions and to intermediate positions
- Software-free commissioning without the need for programming
- High process reliability thanks to defined speed and dynamic response
- Digital I/O and IO-Link integrated as standard
- IO-Link for flexible force and enhanced functionality
- Integrated, intelligent, electric valve actuators



Servo drive solutions

Traditional, modular servo drive solutions: electrical variety
You have the choice of millions of combinations for highly dynamic, linear, or rotary multi-axis movements in flexible configurations, including any number of intermediate positions. At the same time, they move very precisely, quickly, and dynamically and with great force. Synchronized movements across multiple axes or combinations with dynamic, flexible Cartesian robots are also possible. Relevant software and programming experience are required.

- Suitable for intermediate positions, precise speeds, and dynamic movements
- Good process reliability with guaranteed cycle times
- Toothed belt and screw actuators, as well as piston rod actuators with and without a guide, voltage ranges from 24 V to 415 V
- Servo drive and motor combinations enable synchronized movements of several axes
- Electric linear actuators can be combined with dynamic and flexible Cartesian robots

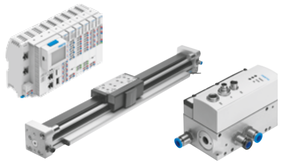
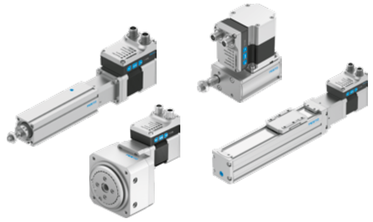
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The Festo Automation Guide: your route to the right technology

high | medium | low

		Key features/performance		Energy efficiency
	**Pneumatics**	**Compactness** **Simple commissioning** **Flexibility in operation**	**Accuracy** [mm] Defined by end positions **Force** F_{max} [kN] 48 **Speed** V_{max} [m/s] 3	**Dynamic movement** **Pressing/pulling** **Tensioning/clamping**
	**Servo-pneumatics**	**Compactness** **Simple commissioning** **Flexibility in operation**	**Accuracy** [mm] ± 0.5 **Force** F_{max} [kN] 5.5 **Speed** V_{max} [m/s] ~3	**Dynamic movement** **Pressing/pulling** **Tensioning/clamping**
	**Digitized pneumatics**	**Compactness** **Simple commissioning** **Flexibility in operation**	**Accuracy** [mm] ± 1.5 **Force** F_{max} [kN] 3 **Speed** V_{max} [m/s]	**Dynamic movement** **Pressing/pulling** **Tensioning/clamping**
	**Simplified Motion Series**	**Compactness** **Simple commissioning** **Flexibility in operation**	**Accuracy** [mm] ± 0.01 **Force** F_{max} [kN] 48 **Speed** V_{max} [m/s] 3	**Dynamic movement** **Pressing/pulling** **Tensioning/clamping**
	**Servo drive solutions**	**Compactness** **Simple commissioning** **Flexibility in operation**	**Accuracy** [mm] ± 0.01 **Force** F_{max} [kN] 48 **Speed** V_{max} [m/s] 3	**Dynamic movement** **Pressing/pulling** **Tensioning/clamping**

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Variety for the best solution: the Festo automation concept

Simple pneumatics, servo-pneumatics, digitized pneumatics, simple electric actuators, and modular servo drive solutions: the list of technologies that Festo masters is huge.

This is no surprise, as each technology has its own advantages and disadvantages. That is why Festo decided a long time ago to be actively involved in all fields and to build up a competitive portfolio along with the required expertise. So that you can always count on the best technology or a mix of technologies.
Our automation concept enables all components to be seamlessly connected, from the workpiece to the control level and even to the cloud.

With this concept, you can also integrate electromechanical servo controllers directly into third-party controllers. And all these technologies also allow you to implement decentralized automation systems when using Festo controllers.

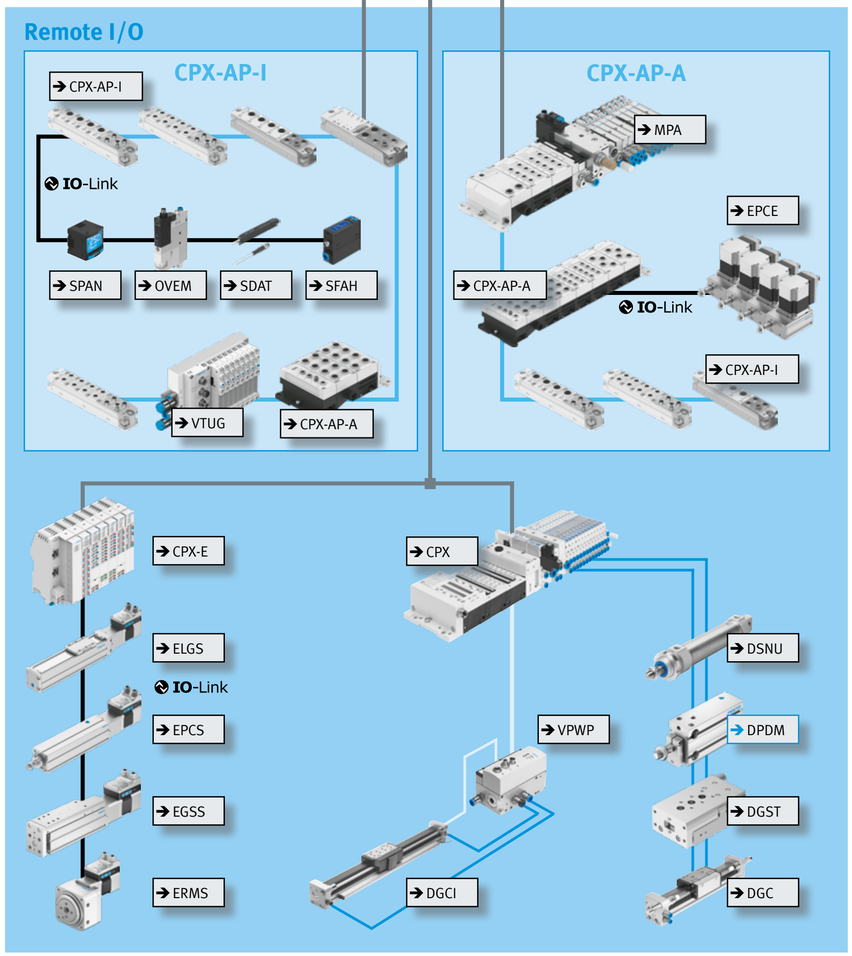


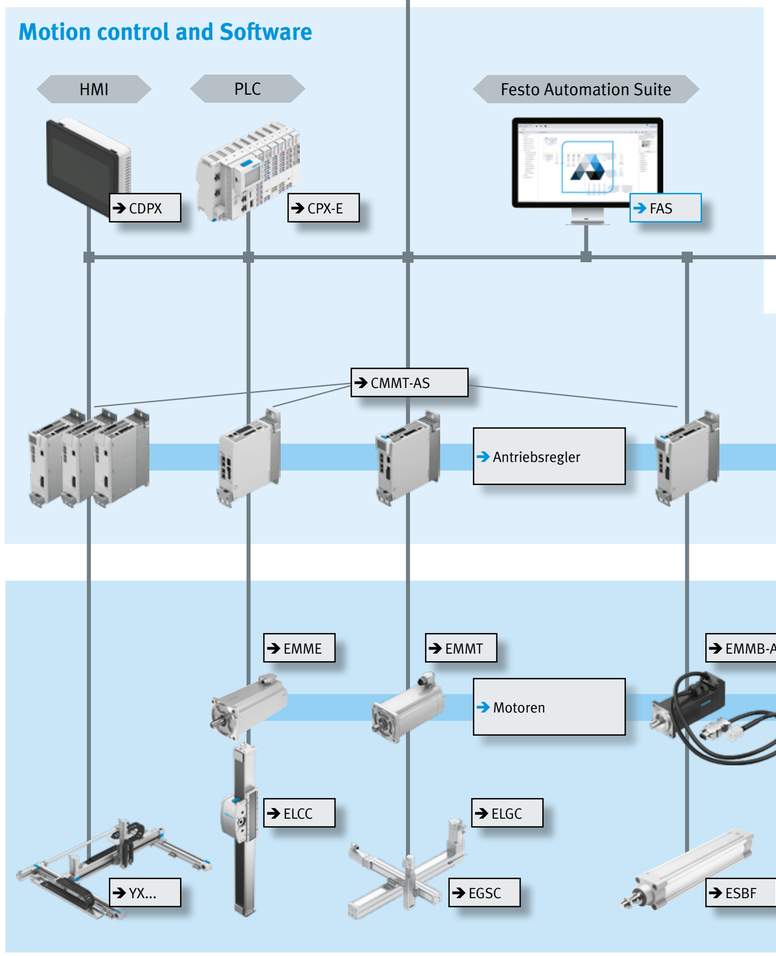
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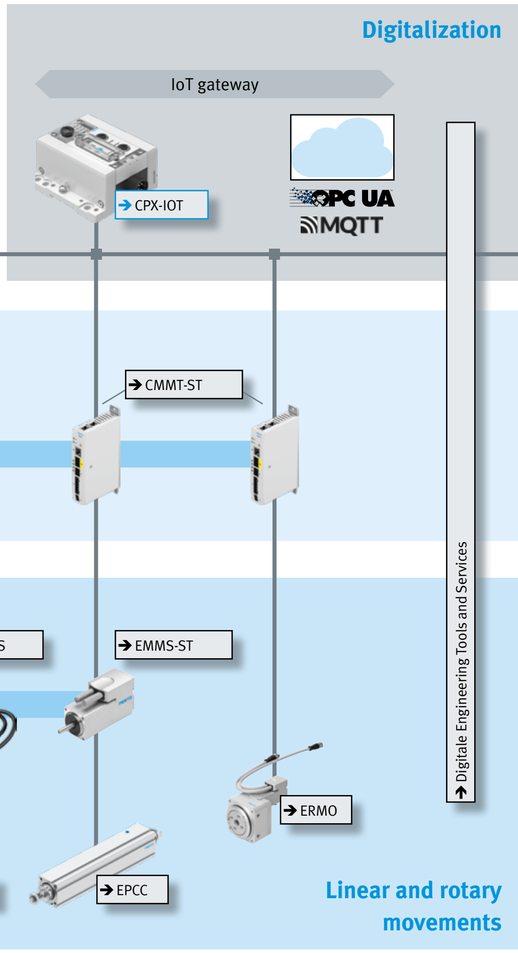
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→ Simplified Motion Series | → Servo-pneumatic systems | → Pneumatic actuators | → Handling systems | → Linear axes | → Electric actuators | → Rotary modules

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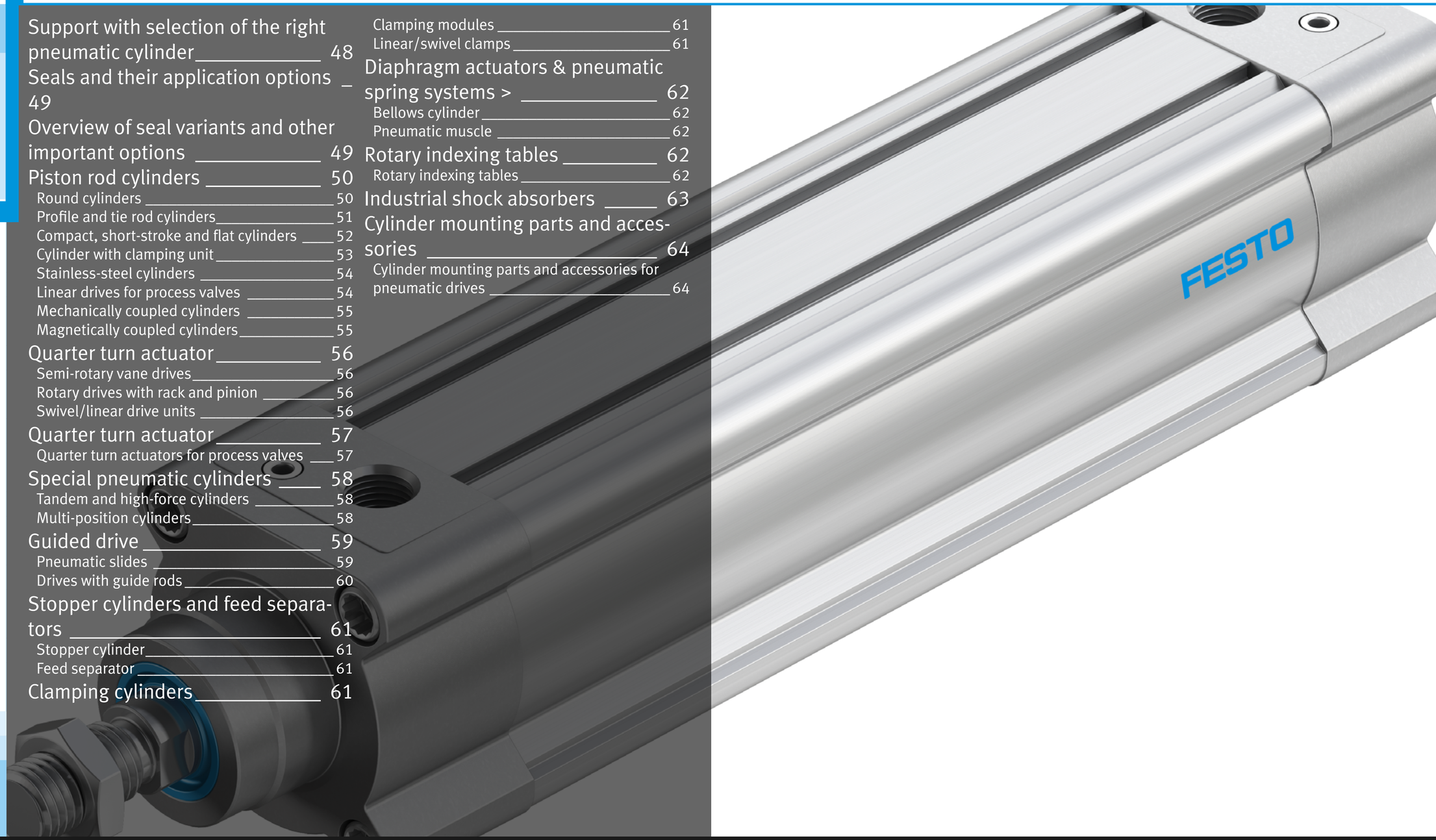
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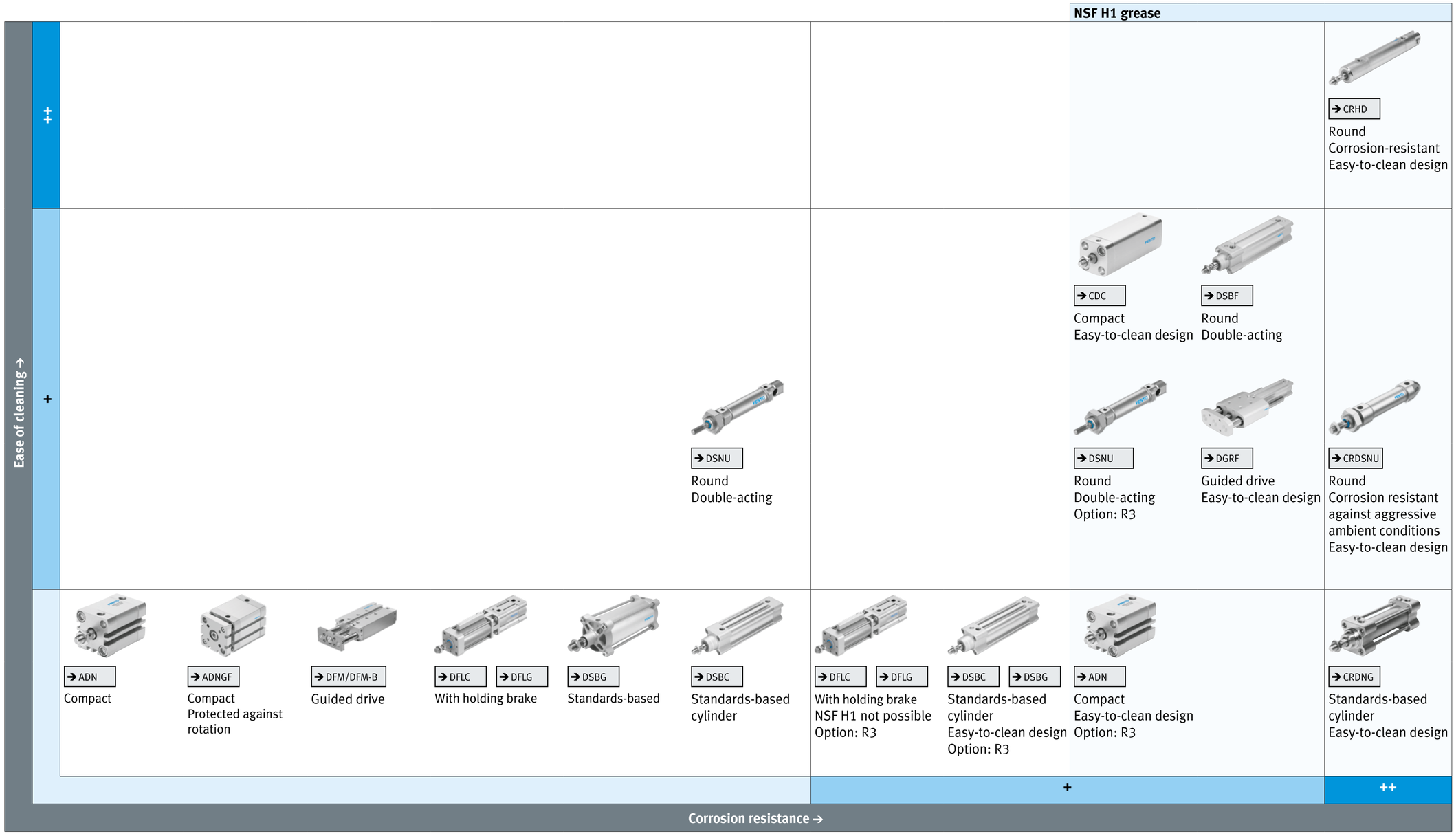


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Support with selection of the right pneumatic cylinder



Seals and their application options

Seal			Water	Acids	Alkalis	Unlubricated operation	Dust/adhesion	Temperatures high	...low (–40 °C)
Standard	**PUR - TPE-U**						+		
	PUR FDA-compliant		++	++	++		+		
A1	**FKM/FPM**	[Chemical resistance]	+	++	+				
A2		[Hard scraper]	+	+	+		++		
A3	**PE-UHMW**	[Unlubricated operation]	++	++	++	++			
A6		[Metal scraper]					++	(+S6/T1)	
S6, T1, T4	**FKM/FPM**	[Heat-resistant]	+	++	+			++	
TT, T3		[Low temperature]					++		++

Overview of seal variants and other important options

Legend for this table: **Variants in the catalogue**

Group	Cylinders	Standard		A1	A2	A3	A6	S6, T1, T4	TT, T3	R3	NSF H1
		PUR - TPE-U	**PUR FDA-compliant**	**FKM/FPM**		**PE-UHMW**		**FKM/FPM**			
				[Chemical resistance]	[Hard scraper]	[Unlubricated operation]	[Metal scraper]	[Heat-resistant]	[Low temperature]	[High corrosion protection]	[Greasing]
Compact ISO 21287	→ ADN	■						■	■	■	**w/R3**
	→ ADNGF	■						■			
	→ CDC		■					■			■
Round ISO 6432	→ DSNU	■		■			**From size 32**	■		■	**w/R3**
	→ CRDSNU		■	■	■	■		■	■		■
	→ CRHD		■					■			■
Profile ISO 15552	→ DSBC	■			■	■	■	■	■	■	
	→ DFLC → DFLG	■						■		■	
	→ DSBG	■		■	■	■	■	■	■	■	
	→ DSBF		■	■	■	■		■	■		■
	→ CRDNG		■					■			■
Guided cylinders	→ DFM/DFM-B	■						■			
	→ DGRF		■			■		■			■
Rodless	→ DGC-K	■									■

Piston rod cylinders
Round cylinders

	 Standards-based cylinder DSNU	 Round cylinder DSNU	 Round cylinder DSNU-S	 Standards-based cylinder CRDSNU, CRDSNU-B	 Round cylinder CRDSNU, CRDSNU-B	 Standards-based cylinder ESNU	 Round cylinder ESNU	 Round cylinder CRHD
Mode of operation	Double-acting	Double-acting	Double-acting	Double-acting	Double-acting	Pushing, single-acting	Pushing, single-acting	Double-acting
Piston diameter	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm	8 mm, 12 mm, 16 mm, 20 mm, 25 mm	12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	23 ... 295 N	482.5 ... 1870.3 N	30.2 ... 294.5 N	68 ... 295 N	483 ... 4712 N	19 ... 271 N	406 ... 1765 N	483 ... 4712 N
Stroke	1 ... 500 mm	1 ... 500 mm	1 ... 200 mm	1 ... 500 mm	1 ... 500 mm	1 ... 50 mm	1 ... 50 mm	10 ... 500 mm
Cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/pads at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends	Pneumatic cushioning adjustable at both ends
Description	• ISO 6432 • Wide range of variants for customised applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with female or male thread • For position sensing • Variants recommended for production systems for manufacturing Li-ion batteries	• Wide range of variants for customised applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with female or male thread • For position sensing • Variants recommended for production systems for manufacturing Li-ion batteries	• Compact variant of standards-based cylinder DSNU • Quick and easy installation, even in tight spaces • Lightweight • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with male thread • For position sensing • Variants recommended for production systems for manufacturing Li-ion batteries • Sustainable in production thanks to reduced use of materials	• ISO 6432 • Corrosion resistant against aggressive ambient conditions • Easy-to-clean design • Long service life thanks to optional unlubricated seal • Wide range of variants for customised applications • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • For position sensing	• Corrosion resistant against aggressive ambient conditions • Easy-to-clean design • Long service life thanks to optional unlubricated seal • Wide range of variants for customised applications • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • For position sensing	• ISO 6432 • Wide range of variants for customised applications • Good running performance and long service life • Piston rod with female or male thread • For position sensing	• Wide range of variants for customised applications • Good running performance and long service life • Piston rod with female or male thread • For position sensing	• Corrosion resistant against aggressive ambient conditions • Easy-to-clean design, optimised for the most exacting demands • Flexible design thanks to different end caps • Piston rod with male thread • For position sensing
online: →	→ dsnu	→ dsnu	→ dsnu	→ crdnsu	→ crdsnu	→ esnu	→ esnu	→ crhd

Piston rod cylinders
Profile and tie rod cylinders

	 Standards-based cylinder DSBC	 Standards-based cylinder CRDNG, CRDNGS	 Standards-based cylinders, clean design DSBF	 Standards-based cylinder DSBG	 Standards-based cylinder DSBG
Mode of operation	Double-acting	Double-acting	Double-acting	Double-acting	Double-acting
Piston diameter	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	160 mm, 200 mm, 250 mm, 320 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	415 ... 7363 N	483 ... 7363 N	415 ... 7363 N	415 ... 7363 N	11310 ... 48255 N
Stroke	1 ... 2800 mm	10 ... 2000 mm	1 ... 2800 mm	1 ... 2800 mm	1 ... 2700 mm
Cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Pneumatic cushioning adjustable at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, pneumatic cushioning adjustable at both ends
Description	• Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • ISO 15552 (ISO 6431, VDMA 24562) • Sustainable due to product lifecycle extended by ease of repair • Standard profile with two sensor slots • Wide range of variants for customised applications • Comprehensive range of mounting accessories for just about every type of installation • For position sensing • Variants recommended for production systems for manufacturing Li-ion batteries	• ISO 15552 (ISO 6431, VDMA 24562) • Corrosion resistant against aggressive ambient conditions • Easy-to-clean design • Variants: through piston rod, heat-resistant design • Threaded mounting, mounting via accessories • For position sensing	• ISO 15552 • Increased corrosion protection • Easy-to-clean design • FDA-approved lubrication and sealing on the basic design • Long service life thanks to optional dry-running seal • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • For position sensing • Sustainable due to product lifecycle extended by ease of repair	• ISO 15552 (ISO 6431, VDMA 24562) • Sturdy tie rod design • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Comprehensive range of mounting accessories for just about every type of installation • For position sensing • Variants to EU Explosion Protection Directive (ATEX)	• ISO 15552 (ISO 6431, VDMA 24562) • Sturdy tie rod design • Pneumatic end-position cushioning adjustable at both ends • Optionally without adjustable pneumatic cushioning at both ends, and position sensing, resulting in a price advantage • Optionally with spacer bolt attachment • For position sensing • Variants to EU Explosion Protection Directive (ATEX)
online: →	→ dsbc	→ crdng	→ dsbf	→ dsbg	→ dsbg

Piston rod cylinders
Compact, short-stroke and flat cylinders

	 Compact cylinder ADN-S	 Compact cylinder AEN-S	 Compact cylinder ADN	 Compact cylinder AEN	 Compact cylinder ADN-EL	 Compact cylinders, Clean Design CDC	 Flat cylinder DZF	 Flat cylinder DZH
Mode of operation	Double-acting	Pushing	Double-acting	Pushing, single-acting, pulling	Double-acting	Double-acting	Double-acting	Double-acting
Piston diameter	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm	Equivalent diameter, 12 mm, 18 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm	Equivalent diameter, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	17 ... 1870 N	13 ... 1780 N	51 ... 7363 N	54 ... 4416 N	188 ... 4712 N	141 ... 3016 N	51 ... 1870 N	104 ... 1870 N
Stroke	5 ... 50 mm	5 ... 25 mm	1 ... 500 mm	1 ... 25 mm	10 ... 500 mm	1 ... 500 mm	1 ... 320 mm	1 ... 1000 mm
Cushioning	Elastic cushioning rings/plates at both ends, no cushioning,	Elastic cushioning rings/plates at both ends, no cushioning,	Elastic cushioning rings/pads at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends	Pneumatic cushioning adjustable at both ends
Description	•Minimal installation space •Very lightweight •Ideal for small movements •Piston rod with female or male thread •For position sensing •Variants recommended for production systems for manufacturing Li-ion batteries •Sustainable in production thanks to reduced use of materials	•Minimal installation space •Very lightweight •Ideal for small movements •High forces in a compact size •Piston rod with female or male thread •For position sensing	•ISO 21287 •Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 •Good running performance and long service life •Wide range of variants for customised applications •For position sensing •Variants recommended for production systems for manufacturing Li-ion batteries •Sustainable due to product lifecycle extended by ease of repair	•ISO 21287 •Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 •Good running performance and long service life •Wide range of variants for customised applications •For position sensing	•ISO 21287 •With end-position locking at both ends, front or rear •Piston rod with female or male thread •For position sensing	•ISO 21287 •Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 •Easy-to-clean design •Increased corrosion protection •Wide range of variants for customised applications •Piston rod with female or male thread •For position sensing	•Extremely flat design •Protected against rotation thanks to special piston shape •Ideal for manifold assembly •Wide range of mounting and attachment options •Piston rod with female or male thread •For position sensing	•Flat design •Protected against rotation thanks to special piston shape •Ideal for manifold assembly •Wide range of mounting and attachment options •Piston rod with male thread •For position sensing
online: →	→ adn-s	→ aen-s	→ adn	→ aen	→ adn-el	→ cdc	→ dzf	→ dzh

Piston rod cylinders
Cylinder with clamping unit

	 Standards-based cylinders with clamping unit DSBC-C	 Round cylinders with clamping unit DSNU-KP	 Round cylinders with clamping unit DSNU-KP	 Compact cylinders with clamping unit ADN-KP	 Cylinder with holding brake DFLC	 Cylinder with holding brake DFLG
Mode of operation	Double-acting	Double-acting	Double-acting	Double-acting	Double-acting	Double-acting
Piston diameter	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm	20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	40 mm, 63 mm, 100 mm	160 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	415 ... 7363 N	23 ... 295 N	483 ... 1870 N	188 ... 4712 N	754 ... 4712 N	12064 N
Stroke	1 ... 2800 mm	1 ... 500 mm	1 ... 500 mm	10 ... 500 mm	10 ... 2000 mm	10 ... 2000 mm
Cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends	Pneumatic cushioning adjustable at both ends	Pneumatic cushioning adjustable at both ends
Performance level (PL)					Stopping, holding, blocking a movement/ category 1, Performance Level c	Stopping, holding, blocking a movement/ category 1, Performance Level c
Description	• Piston rod can be held in any position • Piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure or leaks in the system • Mounting hole pattern to ISO 15552 • Piston rod with female or male thread • For position sensing	• Based on ISO 6432 • Piston rod can be held in any position • Piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure in the system or loss of pressure • For position sensing	• Piston rod can be held in any position • Piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure in the system or loss of pressure • For position sensing	• Piston rod can be held in any position • Piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure in the system or loss of pressure • Mounting hole pattern to ISO 21287 • Piston rod with female or male thread • For position sensing	• Combination of holding brake and standards-based cylinder based on ISO 15552 • Holding function: retains the piston rod by clamping with frictional locking • Emergency braking function: the movement of the piston rod is stopped by clamping with frictional locking • With safety functions • Variants to EU Explosion Protection Directive (ATEX) • Optional: high level of corrosion protection • For position sensing	• Combination of holding brake and standards-based cylinder based on ISO 15552 • Holding function: retains the piston rod by clamping with frictional locking • Emergency braking function: the movement of the piston rod is stopped by clamping with frictional locking • With safety functions • Variants to EU Explosion Protection Directive (ATEX) • Optional: high level of corrosion protection • For position sensing
online: →	→ dsbc-c	→ dsnu-kp	→ dsnu-kp	→ adn-kp	→ dflc	→ dflg

Piston rod cylinders

Stainless-steel cylinders

	 Standards-based cylinder CRDSNU, CRDSNU-B	 Round cylinder CRDSNU, CRDSNU-B	 Standards-based cylinder CRDNG, CRDNGS	 Round cylinder CRHD
Mode of operation	Double-acting	Double-acting	Double-acting	Double-acting
Piston diameter	12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	68 ... 295 N	483 ... 4712 N	483 ... 7363 N	483 ... 4712 N
Stroke	1 ... 500 mm	1 ... 500 mm	10 ... 2000 mm	10 ... 500 mm
Cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Pneumatic cushioning adjustable at both ends	Pneumatic cushioning adjustable at both ends
Description	•ISO 6432 •Corrosion resistant against aggressive ambient conditions •Easy-to-clean design •Long service life thanks to optional unlubricated seal •Wide range of variants for customised applications •Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes •For position sensing	•Corrosion resistant against aggressive ambient conditions •Easy-to-clean design •Long service life thanks to optional unlubricated seal •Wide range of variants for customised applications •Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes •For position sensing	•ISO 15552 (ISO 6431, VDMA 24562) •Corrosion resistant against aggressive ambient conditions •Easy-to-clean design •Variants: through piston rod, heat-resistant design •Threaded mounting, mounting via accessories •For position sensing	•Corrosion resistant against aggressive ambient conditions •Easy-to-clean design, optimised for the most exacting demands •Flexible design thanks to different end caps •Piston rod with male thread •For position sensing
online: →	→ crdnsu	→ crdsnu	→ crdng	→ crhd

Linear drives for process valves

	 Linear drives DFPC	 Piston drives DFPK	 Linear drive with displacement encoder DFPI
Design	Piston, piston rod, tie rod, cylinder barrel		Piston, piston rod, tie rod, cylinder barrel
Operating mode	Double-acting		Double-acting
Size of valve actuator	80, 100, 125, 160, 200, 250, 320	46, 75	100, 125, 160, 200, 250, 320
Stroke	10 ... 1600 mm	17 ... 20 mm	40 ... 990 mm
Operating pressure [MPa]	0.2 ... 0.8 MPa	0.5 ... 1 MPa	0.3 ... 0.8 MPa
Operating pressure	2 ... 8 bar	5 ... 10 bar	3 ... 8 bar
Operating pressure [psi]	29 ... 116 psi	72.5 ... 145 psi	43.5 ... 116 psi
Ambient temperature	-20 ... 80 °C	0 ... 60 °C	-20 ... 80 °C
Description	•Robust and corrosion-resistant tie-rod design •Ideal for use in harsh ambient conditions •Numerous configuration options •Variants with mounting interface to ISO 5210 or ISO 15552 with extended tie rods	•Stainless steel design •Available as a valve actuator with angle seat valve VZXA and as a valve block solution •Linear actuating motion •High actuating forces •To EU Explosion Protection Directive (ATEX)	•Mounting interfaces to ISO 15552 on bearing and end caps •Sturdy tie rod design •Integrated air duct •Optionally with integrated displacement encoder or fully integrated positioner •IP65, IP67, IP69K, NEMA4 •To EU Explosion Protection Directive (ATEX)
online: →	→ dfpc	→ dfpk	→ dfpi

Rodless cylinders

Mechanically coupled cylinders

	 Linear drives DLGF	 Linear drives DGC-K	 Linear drives DGC-G, DGC-GF, DGC-KF	 Linear drives with heavy-duty guide DGC-HD	 Linear drives SLG
Mode of operation	Double-acting	Double-acting	Double-acting	Double-acting	Double-acting
Piston diameter	20 mm, 25 mm, 32 mm, 40 mm	18 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm	8 mm, 12 mm, 18 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm	18 mm, 25 mm, 40 mm	8 mm, 12 mm, 18 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	188 … 754 N	153 … 3016 N	30 … 1870 N	153 … 754 N	30 … 153 N
Stroke	50 … 1000 mm	1 … 8500 mm	1 … 8500 mm	1 … 5000 mm	100 … 900 mm
Cushioning	Self-adjusting pneumatic end-position cushioning	Pneumatic cushioning adjustable at both ends	Elastic cushioning rings/plates at both ends, pneumatic cushioning, adjustable at both ends, shock absorber, hard characteristic curve, shock absorber, soft characteristic curve	Shock absorber, hard characteristic curve, shock absorber, soft characteristic curve	Elastic cushioning rings/pads at both ends, shock absorber, hard characteristic curve
Position sensing	Via proximity switch	Via proximity sensor	Via proximity sensor	Via proximity sensor	Via proximity switch
Description	•Extremely flat design •Choice of two types of cushioning: self-adjusting pneumatic end-position cushioning or external hydraulic shock absorbers •Supply port on the left or right or at both ends or alternatively from below •Loads and machining jigs can be directly mounted on the slide •Basic design DLGF-G without external guide for simple drive functions in small installation spaces •Recirculating ball bearing guide DLGF-KF with standard recirculating ball bearing guide for high torques and heavy loads •Sustainable due to product lifecycle extended by ease of repair	•Compact design: 30% smaller than basic design DGC-G •Basic drive without guide, for simple drive functions •Low moving dead weight •Symmetrical design	•All settings accessible from one side •Available with variable end stops and intermediate position module •Sustainable due to product lifecycle extended by ease of repair •Optional: NSF-H1 lubricant for the food zone (see www.festo.com/certificates/DGC) •Optional: clamping unit for holding loads •Sustainable operation thanks to leakage reduction at sealing points	•For maximum loads and torques thanks to duo rail guide •Very good operating behaviour under torque load •Long service life •Ideal as a basic axis for linear gantries and cantilever axes •Wide range of adaptation options on the drives	•Extremely flat design •Highest precision thanks to integrated recirculating ball bearing guide •Adjustable end stops •Wide range of supply ports •Available with intermediate position module
online: →	→ dlgf	→ dgc-k	→ dgc	→ dgc-hd	→ slg

Magnetically coupled cylinders

	 Linear drives DGO	 Linear drive units SLM
Mode of operation	Double-acting	Double-acting
Piston diameter	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	68 … 754 N	68 … 754 N
Stroke	10 … 4000 mm	10 … 1500 mm
Cushioning	Elastic cushioning rings/plates at both ends, pneumatic cushioning adjustable at both ends	Elastic cushioning rings/pads at both ends, shock absorber, hard characteristic curve
Position sensing	Via proximity switch	Via proximity sensor, via inductive sensors
Description	•Magnetic power transmission •Pressure-tight and zero leakage •Dirt-proof and dust-proof •Sustainable operation thanks to leakage reduction at sealing points	•Magnetic power transmission •Recirculating ball bearing guide: combination of slide unit and rodless linear drive •Individual choice of end-position cushioning and sensing
online: →	→ dgo	→ slm

Quarter turn actuator

Semi-rotary vane drives

	 Quarter turn actuator DRVS	 Quarter turn actuator DSM	 Quarter turn actuator DSM-B, DSM-HD-B
Size	6, 8, 12, 16, 25, 32, 40	6, 8, 10	12, 16, 25, 32, 40, 63
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	0.15 ... 20 Nm	0.15 ... 1.7 Nm	1.25 ... 80 Nm
Permissible mass moment of inertia	6.5 ... 350 kgcm²	6.5 ... 26 kgcm²	50 ... 5000 kgcm²
Position sensing	Via proximity switch	Via proximity sensor, none	Via proximity switch
Swivel angle	0 ... 270 deg	0 ... 240 deg	0 ... 270 deg
Description	• Double-acting quarter turn actuator with rotary vanes • Lighter than other semi-rotary drives • Fixed swivel angle, adjustable swivel angle possible with accessories • Housing protected against splash water and dust • Sustainable in production thanks to reduced use of materials	• Double-acting semi-rotary drive with rotary vane or with tandem rotary vanes • Fixed swivel angle or infinitely adjustable swivel angle • With spigot shaft or hollow flange shaft • With elastic cushioning rings/plates at both ends	• Double-acting semi-rotary drive with rotary vane, with tandem rotary vanes or with heavy-duty bearing • Swivel angle is infinitely adjustable over the entire swivel range • With elastic cushioning rings/plates at both ends, adjustable or with shock absorbers at both ends, self-adjusting
online: →	→ drvs	→ dsm	→ dsm

Rotary drives with rack and pinion

	 Quarter turn actuator DRRS	 Quarter turn actuator DRRD
Size	12, 16, 20, 25	8, 10, 12, 16, 20, 25, 32, 35, 40, 50, 63
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	0.9 ... 6.6 Nm	0.2 ... 112 Nm
Permissible mass moment of inertia	50 ... 6000 kgcm²	15 ... 420000 kgcm²
Position sensing	Via proximity switch	Via proximity switch
Swivel angle	180 deg	180 deg
Description	• Twin-piston drive, power transmission via rack and pinion principle • Attractively priced quarter turn actuator for standard energy consumption (load capacity + speed) • For torque requirements up to 33 Nm at 0.6 MPa • Recommended for production plants for manufacturing Li-ion batteries • Sustainable in production thanks to reduced use of materials	• Twin-piston drive, power transmission via rack and pinion principle • Premium drive for very high energy absorption (load capacity and speed) • Very high precision and long service life • Many additional features such as centre position or air and energy through-feed can be adapted • Sustainable due to product lifecycle extended by ease of repair • Sustainable in production thanks to reduced use of materials
online: →	→ drrs	→ drrd

Swivel/linear drive units

	 Swivel/linear units DSL-B
Piston diameter	16 mm, 20 mm, 25 mm, 32 mm, 40 mm
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	1.25 ... 20 Nm
Permissible mass moment of inertia	0.35 ... 40 kgcm²
Position sensing	Via proximity switch
Swivel angle	0 ... 272 deg
Description	• Rotary and linear motion can be controlled individually or simultaneously • High repetition accuracy • With plain or recirculating ball bearing guide • Through piston rod
online: →	→ dsl

Quarter turn actuator

Quarter turn actuators for process valves

	 Quarter turn actuator units KDFP-DFPD	 Quarter turn actuator DFPD	 Quarter turn actuator DFPD-C	 Semi-rotary drives with heavy-duty guide DFPD-HD	 Quarter turn actuator DAPS
Design	Gear rack/pinion	Gear rack/pinion	Gear rack/pinion	Scotch yoke system	Scotch yoke system
Operating mode	Double-acting, single-acting	Double-acting, single-acting	Single-acting	Double-acting, single-acting	Double-acting, single-acting
Size of valve actuator	10, 20, 40, 80, 120, 160, 240, 300, 480, 700, 900, 1200, 2300	10, 20, 40, 60, 80, 120, 160, 240, 300, 480, 700, 900, 1200, 2300	20, 40, 80, 120, 160, 240, 300, 480, 700, 900, 1200, 2300	9000, 18000, 32000	0008, 0015, 0030, 0053, 0060, 0090, 0106, 0120, 0180, 0240, 0360, 0480, 0720, 0960, 1440, 1920, 2880, 3840, 4000, 5760, 8000
Flange hole pattern	F03, F04, F05, F07, F10, F12, F14, F16	F03, F04, F05, F07, F10, F12, F14, F16, F0507, F0710, F1012, F1216	F05, F07, F10, F12, F14, F16	F25, F30, F35	F03, F04, F05, F07, F10, F12, F14, F16, F25
Swivel angle	90 deg	90 deg, 120 deg, 135 deg, 180 deg	90 deg	90 deg	90 deg, 92 deg
Operating pressure [MPa]	0.2 ... 0.8 MPa	0.2 ... 0.8 MPa	0.2 ... 0.8 MPa	0.1 ... 0.85 MPa	0.1 ... 0.84 MPa
Operating pressure	2 ... 8 bar	2 ... 8 bar	2 ... 8 bar	1 ... 8.5 bar	1 ... 8.4 bar
Operating pressure [psi]	29 ... 116 psi	29 ... 116 psi	29 ... 116 psi	14.5 ... 123.25 psi	
Ambient temperature	-50 ... 150 °C	-50 ... 150 °C	-20 ... 80 °C	-20 ... 80 °C	-50 ... 150 °C
Safety function		The safety function consists of the actuator switching to the specified safety switching position. This switching movement is achieved by pressurising the corresponding pressure chamber with compressed air. The value of the torque generated depends on the pressure difference between the two pressure chambers separated by the piston. The safety function consists of the actuator switching to the defined safety switching position when the compressed air is shut off and the spring chamber is exhausted. This switching movement is achieved through the spring force of the spring assembly.	The safety function consists of the actuator switching to the specified safety switching position when the compressed air is switched off and the spring chamber is exhausted. This switching movement is achieved through the spring force of the spring assembly.		
Safety integrity level (SIL)		Up to SIL 2 Low Demand mode, up to SIL 3 in a redundant architecture, up to SIL 1 High Demand mode	Up to SIL 2 Low Demand mode, up to SIL 3 in a redundant architecture, up to SIL 1 High Demand mode		Up to SIL 2 High Demand mode, up to SIL 2 Low Demand mode
Description	• Quarter turn actuator unit comprising quarter turn actuator DFPD and accessories • Select, size and order quickly, easily and reliably with the configurator • Optionally with pilot valve • Optionally with positioner • Optional with position indicator • Optionally with end position feedback • Optionally with the necessary mounting adapters or reducing sleeves for mounting on the process valve	• Constant torque across the entire rotation angle range of 90° with the double-acting version • Process valve connection to ISO 5211 • Mounting hole pattern to VDI/VDE 3845 • Sturdy, non-slip and easy-to-clean aluminium housing • Long service life, low wear • Version with swivel angle 120°, 135°, 180° for the sizes 40, 120, 240, 480, double-acting • Variants with safety functions • To EU Explosion Protection Directive (ATEX)	• Suitable for process automation in the chemical and petrochemical industries • Extended NAMUR interface to VDI/VDE 3847 • Anti-blow-out screws for end-position adjustment • Hard anodised cover to prevent surface damage • Metal-free, non-ferrous spring cartridges • Version with compressed air ducts in the housing for direct attachment of positioner and pilot valve on the actuator, without extra barbed tubing connectors	• Ideal for applications with high torques up to max. 32,000 Nm • Extremely modular for a variety of uses: configurable spring forces, a choice between right or left direction of rotation and mechanical or hydraulic manual override • With safety functions • NAMUR connection pattern according to VDI/VDE 3845 • Variants to EU Explosion Protection Directive (ATEX)	• High breakaway torques • Sustainable due to product lifecycle extended by ease of repair • Flange hole pattern to ISO 5211 • Mounting hole pattern to VDI/VDE 3845 • Available with handwheel as a manual emergency override • Corrosion-resistant version made from stainless steel • To EU Explosion Protection Directive (ATEX) • With safety functions
online: →	→ kdfp	→ dfpd	→ dfpd	→ dfpd	→ daps

Special pneumatic cylinders

Tandem and high-force cylinders

	 High-force cylinders ADNH	 Tandem cylinders DNCT
Mode of operation	Double-acting	Double-acting
Piston diameter	25 mm, 40 mm, 63 mm, 100 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm
Stroke	5 ... 150 mm	2 ... 500 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	1036 ... 18281 N	898 ... 14244 N
Cushioning	Elastic cushioning rings/plates at both ends	Pneumatic cushioning adjustable at both ends
Description	•Max. 4 cylinders can be combined •Increased thrust force •Only 2 connections are required to pressurise all cylinders •Piston rod with female or male thread •For position sensing •Mounting hole pattern to ISO 21287	•Max. 2 cylinders can be combined •Thrust and return force increase •Piston rod with male thread •For position sensing •Mounting hole pattern to ISO 15552
online: →	→ adnh	→ dnct

Multi-position cylinders

	 Multi-position cylinders ADNM
Piston diameter	25 mm, 40 mm, 63 mm, 100 mm
Potential stroke of intermediate positions	1 ... 400 mm
Possible stroke of the last cylinder position	1 ... 2000 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	295 ... 4712 N
Max. total of all individual strokes	1000 mm, 2000 mm
Description	•Mounting hole pattern to ISO 21287 •Piston rod with female or male thread •2 ... 5 cylinders can be combined •Max. 5 positions can be approached •For position sensing
online: →	→ adnm

Guided drive
Pneumatic slides

	 Mini slide DGST	 Mini slide DGSL	 Mini slide SLF	 Mini slide SLS
Piston diameter	6 mm, 8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	6 mm, 8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm	6 mm, 10 mm, 16 mm	6 mm, 10 mm, 16 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	34 ... 589 N	17 ... 483 N	17 ... 121 N	17 ... 121 N
Stroke	10 ... 200 mm	10 ... 200 mm	10 ... 80 mm	5 ... 30 mm
Cushioning	Short elastic cushioning rings/bumpers on both sides, elastomer cushioning, on both sides, stroke not adjustable, elastic cushioning rings/plates on both sides, elastic cushioning rings/plates on both sides with fixed stop, external hydraulic cushioning	Short elastic cushioning rings/bumpers at both ends, no cushioning, elastic cushioning rings/plates at both ends, elastic cushioning rings/plates at both ends with fixed stop, shock absorber, self-adjusting, progressive, at both ends, with reducing sleeve, shock absorber, progressive, at both ends	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends
Position sensing	Via proximity switch	Via proximity sensor	Via proximity sensor	Via proximity switch
Description	• Powerful twin-piston drive • Shortest mini slide on the market • Precise recirculating ball bearing guide • Versatile mounting options • Version with mirrored supply port configuration and sensor slots for compact assembly available to order using the configurator • Variants recommended for production systems for manufacturing Li-ion batteries • Sustainable in production thanks to reduced use of materials	• High load capacity and positioning accuracy • Maximum movement precision with ground-in ball bearing cage guide • Maximum flexibility with 8 sizes and a large selection of cushioning variants • Variants with clamping unit or end-position locking for fixing the guide carriage • Wide range of mounting and attachment options • Compact design	• Flat design • Ball bearing cage guide • Versatile mounting options • Easy adjustment of end positions	• Slim design • Ball bearing cage guide • Versatile mounting options
online: →	→ dgst	→ dgsl	→ slf	→ sls

Drives with guide rods

	 Twin-piston cylinder DGTZ	 Guided drive DFM, DFM-B	 Guided drive, clean design DGRF	 Compact cylinder ADNGF	 Twin-piston cylinder DPZ	 Twin-piston cylinder DPZJ
Piston diameter	6 mm, 10 mm, 16 mm, 20 mm, 25 mm, 32 mm	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	10 mm, 16 mm, 20 mm, 25 mm, 32 mm	10 mm, 16 mm, 20 mm, 25 mm, 32 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	18.6 ... 966 N	17 ... 4712 N	189 ... 1870 N	68 ... 4712 N	60 ... 966 N	60 ... 724 N
Stroke	10 ... 200 mm	5 ... 400 mm	10 ... 400 mm	1 ... 400 mm	10 ... 100 mm	10 ... 100 mm
Cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/pads at both ends, pneumatic cushioning, adjustable at both ends, shock absorber, soft characteristic curve	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/pads at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends
Position sensing	Via proximity switch	Via proximity sensor	Via proximity sensor	Via proximity sensor	Via proximity sensor	Via proximity switch
Description	• Minimal space requirement • Minimal mounting time • High resistance to torques and lateral forces • High rigidity thanks to its guide rods with large diameter and two plain-bearing bushes • Wide range of mounting options • Drive and guide in a single housing • Plain-bearing guide	• Drive and guide in a single housing • Very high torque and transverse force absorption • Plain or recirculating ball bearing guide • Wide range of mounting and attachment options • Wide range of variants for customised applications • Variants recommended for production systems for manufacturing Li-ion batteries	• Easy-to-clean design • Increased corrosion protection • FDA-approved lubrication and sealing on the basic design • Hygienic mounting of the sensors possible • Compact design with high guide precision and load capacity • Long service life thanks to optional dry-running seal • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes	• ISO 21287 • Piston rod secured against rotation by a guide rod and yoke plate • Plain-bearing guide • Optionally with through piston rod • Higher load capacity with guide rod and yoke plate • For position sensing	• Twin pistons provide twice the force in half the space • Plain or recirculating ball bearing guide • Precision stroke adjustment in the end position	• With yoke plate on rear of cylinder for higher lateral forces and precision • Twin pistons provide twice the force in half the space • Plain or recirculating ball bearing guide • Precision stroke adjustment in the end position
online: →	→ dgtz	→ dfm	→ dgrf	→ adngf	→ dpz	→ dpzj

Stopper cylinders and feed separators

Stopper cylinder

	 Stopper cylinder DFSP	 Stopper cylinder DFST-G2
Piston diameter	16 mm, 20 mm, 32 mm, 40 mm, 50 mm	32 mm, 50 mm, 63 mm, 80 mm
Permissible impact force on the advanced piston rod	710 ... 6280 N	1000 ... 6000 N
Stroke	5 ... 30 mm	20 ... 40 mm
Position sensing	Via proximity switch	Via proximity switch
Cleanroom class	Class 6 to ISO 14644-1	
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364 zone III
Description	•Trunnion version with/ without female thread, with/ without protection against rotation •Roller version with protection against rotation •Compact design •Sensor slots on 3 sides •Long service life thanks to very good cushioning characteristics and sturdy piston rod guide •Workpiece carriers, pallets and packages weighing up to 90 kg can be safely stopped	•Toggle lever design •Integrated, adjustable shock absorber for smooth and adapted stopping •Up to 800 kg impact load •For position sensing on the piston •Adjustable active direction thanks to rotatable toggle lever set-up (90°, 180°, 270°) •Lever locking mechanism •Lever deactivating mechanism •Roller version polyamide or steel
online: →	→ dfsp	→ dfst

Feed separator

	 Feed separator HPVS
Mode of operation	Double-acting
Piston diameter	10 mm, 14 mm, 22 mm
Stroke	10 ... 60 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	45 ... 225 N
Description	•Version with one plunger •With non-rotating piston rod •Proximity sensor SME/SMT-8 can be integrated in the housing
online: →	→ hpvs

Clamping cylinders

Clamping modules

	 Clamping modules EV
Clamping area	10x30, 15x40, 15x63, 20x75, 20x120, 20x180, Ø16 mm, Ø20 mm, Ø25 mm, Ø32 mm, Ø40 mm, Ø50 mm, Ø63 mm, Ø12 mm
Stroke	3 ... 5 mm
Description	•Compact rodless cylinder with diaphragm •Single-acting, with reset function •Flat design •Hermetically sealed •Pressure plates and foot mounting as accessories
online: →	→ ev

Linear/swivel clamps

	 Linear/swivel clamps CLR
Piston diameter	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm
Theoretical clamping force at 0.6 MPa (6 bar, 87 psi)	51 ... 1682 N
Clamping stroke	10 ... 50 mm
Swivel angle	90° +/- 2°, 90° +/- 3°, 90° +/- 4°
Description	•Swivelling and clamping in one step •Adjustable swivel direction •Available with clamping fingers as accessories •Available with dust and welding spatter protection •Double-acting •For position sensing
online: →	→ clr

Diaphragm actuators & pneumatic spring systems >

Bellows cylinder



	Bellows cylinder EB
Size	80, 145, 165, 215, 250, 325, 385
Stroke	20 ... 230 mm
Description	• Use as a spring element or for reducing oscillations • Single-bellows or double-bellows cylinder • High forces with a short stroke • Frictionless movement: no stick-slip effect • Use in dusty environments or in water • Maintenance-free
online: →	→ eb

Pneumatic muscle



	Fluidic muscle DMSP
Size	5, 10, 20, 40
Theoretical force at 0.6 MPa (6 bar, 87 psi)	140 ... 6000 N
Nominal length	30 ... 9000 mm
Max. contraction	20% of nominal length, 25% of nominal length
Description	• Single-acting, pulling • 10 times the initial force of a comparable pneumatic cylinder • Frictionless movement: no stick-slip effect • Hermetically sealed design offers protection against dust, dirt and fluids • Outstanding power-to-weight ratio
online: →	→ dmsp

Rotary indexing tables

Rotary indexing tables



	Rotary indexing tables DHTG
Size	65, 90, 140, 220
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	2.1 ... 58.9 Nm
Cushioning	Adjustable shock absorber, hard characteristic curve
Position sensing	For inductive sensors
Pitch	2 ... 24
Description	• For swivelling or separating tasks • Sturdy mechanical system • Easy project planning and commissioning • Rotary table diameters: 65, 90, 140, 220 mm • Free control of rotational direction • Sustainable due to product lifecycle extended by ease of repair
online: →	→ dhtg

Industrial shock absorbers

	 Shock absorber DYSD	 Shock absorber DYSR	 Shock absorber YSR-C	 Shock absorber DYSC	 Shock absorber DYSW	 Hydraulic cushioning cylinders DYHR
Size	5, 7, 8, 12, 16, 20, 25, 32	8, 12, 16, 20, 25, 32	4, 5, 7, 8, 10, 12, 16, 20, 25, 32	4, 5, 7, 8, 12, 16, 20, 25	4, 5, 7, 8, 10, 12	16, 20, 25, 32
Stroke	5 ... 25 mm	8 ... 60 mm	4 ... 60 mm	4 ... 25 mm	6 ... 20 mm	20 ... 60 mm
Max. energy absorption per stroke	2 ... 270 J	4 ... 384 J	0.6 ... 380 J	0.6 ... 100 J	0.8 ... 12 J	32 ... 384 J
Cushioning	Self-adjusting	Adjustable	Self-adjusting	Self-adjusting	Self-adjusting, soft characteristic curve	Adjustable
Description	• Hydraulic shock absorber with path-controlled flow control function • Especially for applications in the pressure chamber • Short cushioning stroke • Suitable for rotary drives • Maintenance-free • Rapidly increasing cushioning force curve • Through mounting thread • With fixed stop on the housing and hexagon socket for stroke adjustment • With additional return spring for compensation in the pressure chamber	• Hydraulic shock absorber with spring return • Adjustable cushioning hardness	• Hydraulic shock absorber with path-controlled flow control function • Rapidly increasing cushioning force curve • Short cushioning stroke • Suitable for rotary drives	• Hydraulic shock absorber with path-controlled flow control function • Rapidly increasing cushioning force curve • Short cushioning stroke • Suitable for rotary drives • With metal fixed stop	• Hydraulic shock absorber with path-controlled flow control function • Gently increasing cushioning force curve • Long cushioning stroke • Suitable for low-vibration operation • Short cycle times possible • With metal fixed stop	• Hydraulic cushioning cylinder for constant, slow braking speeds across the entire stroke • Braking speed can be precisely adjusted • A built-in compression spring returns the piston rod to the initial position • Suitable for slow feed speeds in the range up to 0.1 m/s
online: →	→ dysd	→ dysr	→ ysr-c	→ dysc	→ dysw	→ dyhr

Cylinder mounting parts and accessories

Cylinder mounting parts and accessories for pneumatic drives

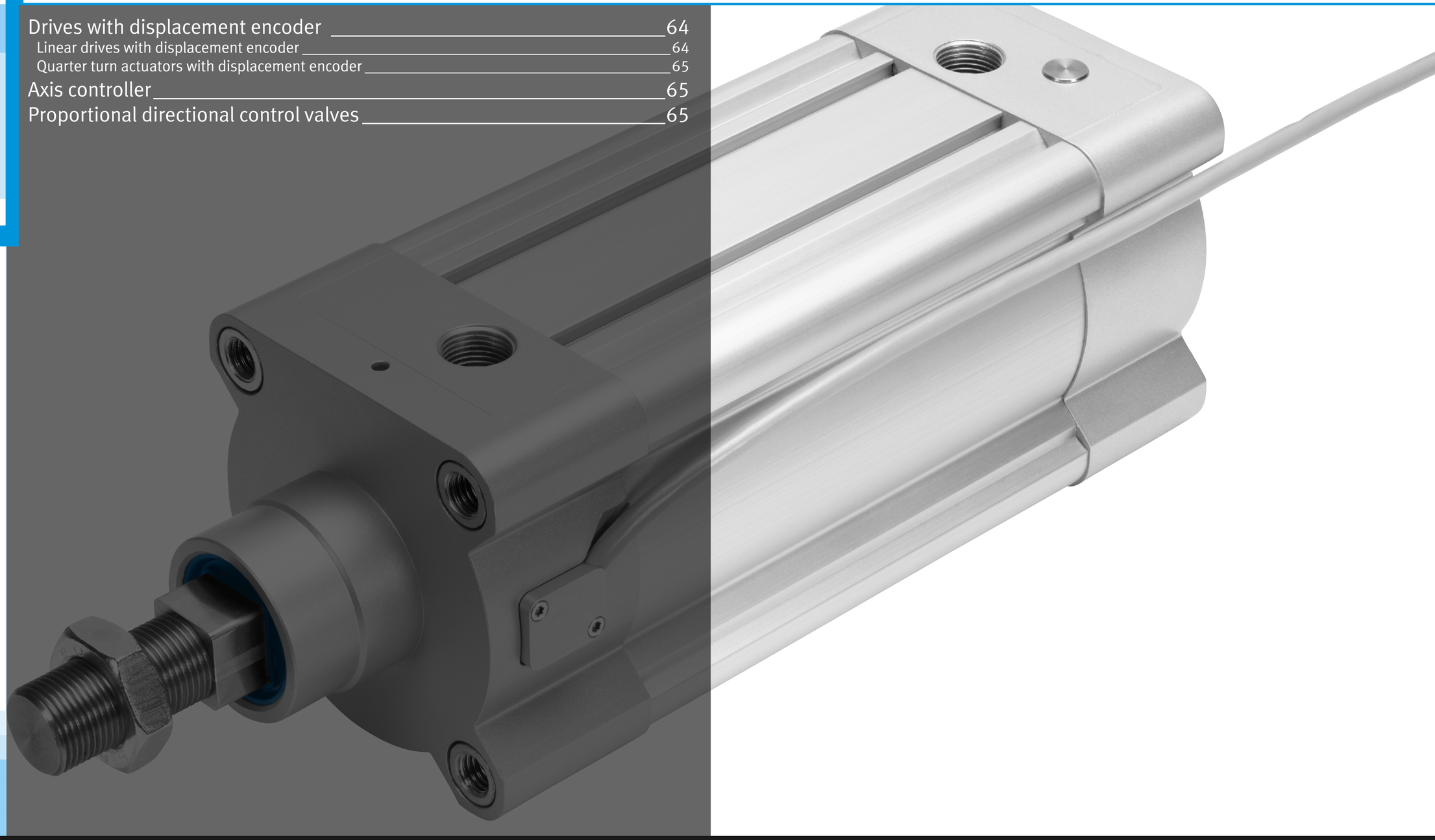
	 Guide axes DGC-FA	 Guide units FEN, FENG	 Clamping units KPE	 Holding brakes DACS
Size		20, 25, 32, 40, 50, 63, 80, 100, 12/16		
Stroke	1 ... 8500 mm	1 ... 500 mm		
Description	• Without drive • With recirculating ball bearing guide • With guide and freely movable slide unit • Increased torsional resistance • Reduced vibrations with dynamic loads • To absorb forces and torques in multi-axis applications	• For protecting standards-based cylinders against rotation at high torque loads • Plain or recirculating ball bearing guide • High guide precision for workpiece handling	• Ready-to-install combination of clamping cartridge KP and housing • Wide range of mounting options	• Holding function: retains the piston rod by clamping with frictional locking • Emergency braking function: the movement of the piston rod is stopped by clamping with frictional locking • With safety functions • Compact design • Optional: high level of corrosion protection • For position sensing
online: →	→ dgc-fa	→ fen	→ kpe	→ dacs

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Drives with displacement encoder

Linear drives with displacement encoder

	 Linear drives with displacement encoder DDLI	 Standards-based cylinder with displacement encoder DDPC	 Standards-based cylinder with displacement encoder DNCI	 Linear drives with displacement encoder DGCI	 Linear drives with displacement encoder DFPI
Piston diameter	25 mm, 32 mm, 40 mm, 63 mm	80 mm, 100 mm	32 mm, 40 mm, 50 mm, 63 mm	18 mm, 25 mm, 32 mm, 40 mm, 63 mm	100 mm, 125 mm, 160 mm, 200 mm, 250 mm, 320 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	295 ... 1870 N	3016 ... 4712 N	415 ... 1870 N	153 ... 1870 N	4712 ... 48255 N
Max. load, horizontal		300 ... 450 kg	45 ... 180 kg		
Max. load, vertical		100 ... 150 kg	15 ... 60 kg		
Stroke	100 ... 2000 mm	10 ... 2000 mm	10 ... 2000 mm	100 ... 2000 mm	40 ... 990 mm
Description	• Based on linear drive DGC-K • Without guide • With displacement encoder for contactless measurement • Suitable for positioning with axis controller CPX-CMAX • Suitable for end-position control with end-position controller CPX-CMPX or SPC11 • Measures absolute values • Can be used as a measuring cylinder • Degree of protection IP67 • For attachment to the customer's own guide • Supply ports on the end face	• Standards-based cylinder to ISO 15552 • With displacement encoder for contactless measurement • Suitable for positioning with axis controller CPX-CMAX • Suitable for end-position control with end-position controller CPX-CMPX or SPC11 • Can be used as a measuring cylinder • Piston rod variants • Fixed cushioning • Optionally with recirculating ball bearing guide, clamping unit	• Standards-based cylinder to ISO 15552 • With integrated displacement encoder for relative analogue, contactless measurement • Suitable for servo-pneumatic applications with axis controller CPX-CMAX, end-position controller CPX-CMPX or SPC11 and measuring module CPX-CMIX • Piston rod with male thread • Piston rod variants • Optionally with recirculating ball bearing guide, clamping unit	• With guide • With displacement encoder for absolute, contactless measurement • Suitable for servo-pneumatic applications with axis controller CPX-CMAX, end-position controller CPX-CMPX or SPC11 and measuring module CPX-CMIX • Supply ports optionally on the end face or at the front	• Mounting interfaces to ISO 15552 on bearing and end caps • Sturdy tie rod design • Integrated air duct • Optionally with integrated displacement encoder or fully integrated positioner • IP65, IP67, IP69K, NEMA4 • To EU Explosion Protection Directive (ATEX)
online: →	→ ddli	→ ddpc	→ dnci	→ dgci	→ dfpi

Drives with displacement encoder

Semi-rotary drives with displacement encoder



	Swivel modules with angular displacement encoder DSMI-B
Piston diameter	40 mm
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	20 Nm
Max. mass moment of inertia, horizontal	0.12 kgm²
Max. mass moment of inertia, vertical	0.12 kgm²
Position sensing	for proximity switches, with integrated rotary potentiometer
Swivel angle	0 ... 272 deg
Cushioning	Elastic cushioning rings/plates at both ends
Description	• With rotary vane • Integrated rotary potentiometer • Suitable for servo-pneumatic applications with axis controller CPX-CMAX, end-position controller CPX-CMPX or SPC11 and measuring module CPX-CMIX • Compact design
online: →	→ dsmi

Axis controller





	Axis controller CPX-CMAX	End-position controller CPX-CMPX
No. of axis strings	1	1
Axes per string	1	1
Description	• Axis controller as CPX module, supports pneumatic drives with piston rod, rodless drives and semi-rotary drives • Force and position control • Use with all fieldbus/EtherNet and controllers CEC available on CPX • Easy commissioning thanks to auto identification function • Rapid commissioning and comprehensive diagnostics with FCT configuration software (Festo Configuration Tool)	• Electronic end-position control for pneumatic drives • Soft Stop for smooth braking and quick acceleration • Use with all fieldbus/EtherNet available on CPX • Easy commissioning with Festo plug and work • Approx. 30% shorter travel times and 30% less air consumption than with comparable standard pneumatics • End positions with 2 additional, freely positionable intermediate positions
online: →	→ cpx-cmax	→ cpx-cmpx

Proportional directional control valves







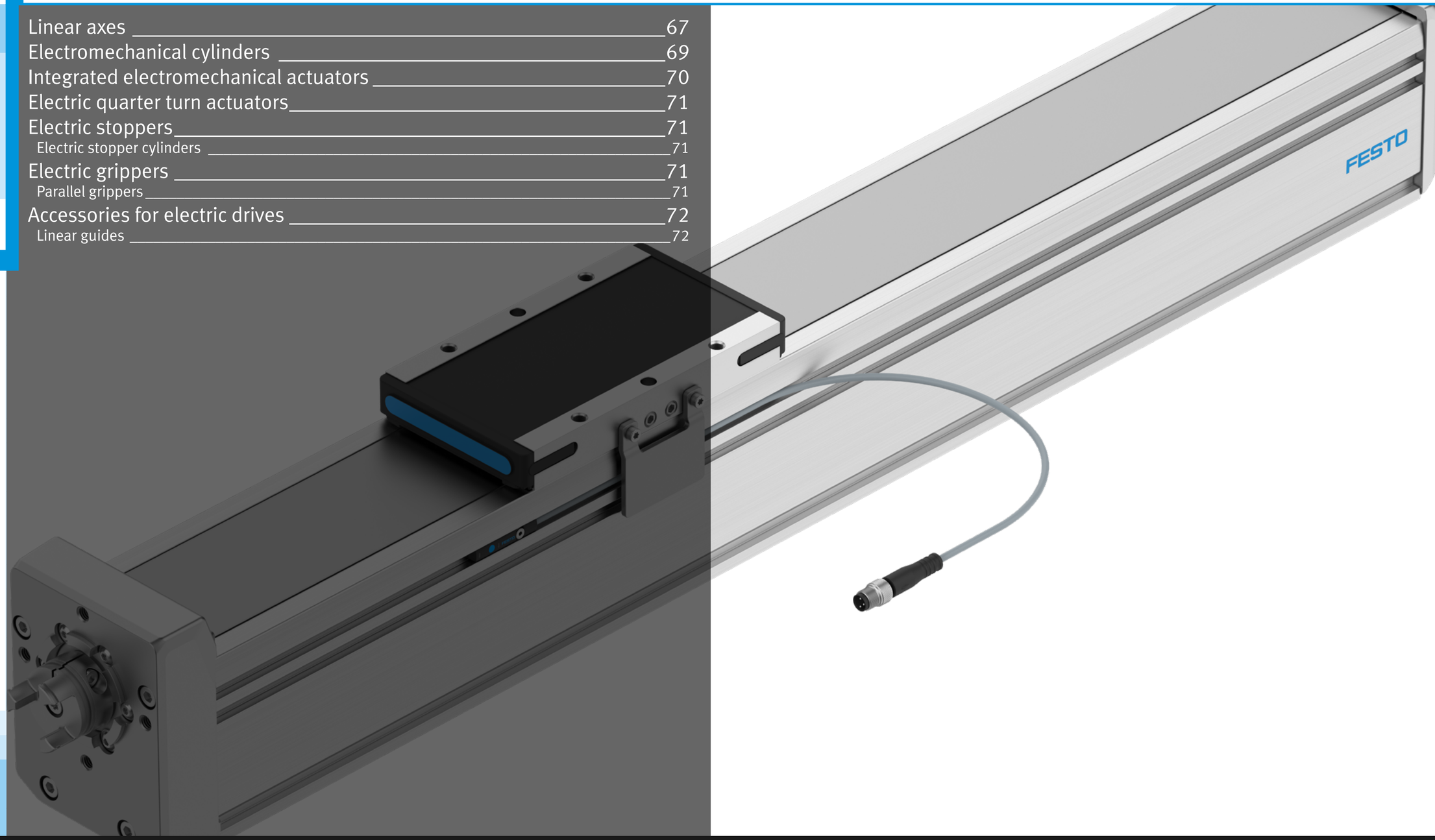
	Proportional directional control valves VPWI	Proportional directional control valves VPWP	Proportional directional control valves MPYE
Valve function	3-way proportional directional control valve	5/3 proportional directional control valve, closed	5/3-way, closed
Pneumatic connection 1	G1/8	G1/4, G1/8, G3/8	G1/4, G1/8, G3/8, M5
Operating pressure for positioning/Soft Stop		4 ... 8 bar	
Operating pressure [MPa]	0 ... 1.3 MPa	0 ... 1 MPa	0 ... 1 MPa
Operating pressure	0 ... 13 bar	0 ... 10 bar	0 ... 10 bar
Standard nominal flow rate	490 l/min	350 ... 2000 l/min	100 ... 2000 l/min
Description	• Dynamic range up to a maximum of 180 Hz • Full graphic display • Stroke limitation • Adjustable incline • Actual value in pressure or stroke • Food-safe grease NSFH1	• Controlled piston spool valve • Digitally actuated • Integrated pressure sensors for monitoring function and force control • With auto identification • Diagnostic function • Integrated digital output, e.g. for a clamping/brake unit • Suitable for servo-pneumatic applications with axis controller CPX-CMAX and end-position controller CPX-CMPX	• Controlled piston spool valve • Analogue actuation • Setpoint input as analogue voltage signal (0 ... 10 V) • Suitable for servo-pneumatic applications with end-position controller SPC11
online: →	→ vpwi	→ vpwp	→ mpye

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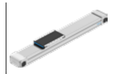
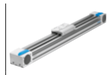
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Linear axes

	 Toothed belt axes ELGD-TB-KF	 Toothed belt axes, wide version ELGD-TB-KF-WD	 Ball screw axes ELGD-BS-KF	 Spindle axes, wide version ELGD-BS-KF-WD	 Toothed belt axes EGC-TB-KF	 Ball screw axes EGC-BS-KF	 Toothed belt axes EGC-HD-TB	 Ball screw axes EGC-HD-BS	 Toothed belt axes ELGC-TB-KF	 Ball screw axes ELGC-BS-KF
Size	60, 80	100	60, 80	100	50, 70, 80, 120, 185	70, 80, 120, 185	125, 160, 220	125, 160, 220	45, 60, 80	32, 45, 60, 80
Max. feed force Fx	350 … 800 N	240 N	1550 … 2650 N	1100 N	50 … 2500 N	400 … 3000 N	450 … 1800 N	400 … 1500 N	75 … 250 N	40 … 350 N
Repetition accuracy	±0.04 mm	±0.04 mm	+/-0.01 mm	+/-0.01 mm	+/-0.08 mm, +/-0.1 mm	+/-0.02 mm		+/-0.02 mm	+/-0.1 mm	+/-0.01 mm, +/-0.015 mm
Working stroke	50 … 5000 mm	50 … 5000 mm	50 … 2000 mm	50 … 1000 mm	50 … 8500 mm	50 … 3000 mm	50 … 5000 mm	50 … 2400 mm	200 … 2000 mm	100 … 1000 mm
Description	• For applications requiring a high dynamic response and short positioning times • For long strokes • Excellent rigidity and load capacity of the guide for greater loads in the same installation space	• Reduced profile heights offer smaller installation dimensions for handling systems and applications that do not require such high feed forces • For applications requiring a high dynamic response and short positioning times • For long strokes • 30% lighter, while rigidity and guide load capacity are still similar to the axis in the standard design	• For applications requiring precision • High reliability and long service life • For high loads • Excellent rigidity and load capacity of the guide for greater loads in the same installation space	• Reduced profile heights offer smaller installation dimensions for handling systems and applications that do not require such high feed forces • For applications requiring precision • High reliability and long service life • For high loads • 30% lighter, while rigidity and guide load capacity are still similar to the axis in the standard design	• 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 • The motor can be flexibly mounted on 4 sides • 22 types in stock with short delivery times and modular products for custom variants • Long strokes of up to 8.5 m possible	• 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 • The motor can be flexibly mounted on 2 sides • 34 types in stock with short delivery times and modular products for custom variants • Strokes of up to 3 m possible	• With heavy-duty guide • Axis for high speeds and acceleration • For maximum loads and torques, high feed forces • Precision DUO guide rail with high load capacity • Motor can be mounted on 4 sides • For maximum lateral load up to 900 Nm	• With heavy-duty guide • Axis for high repetition accuracy • With integrated ball screw • For maximum loads and torques • Precision DUO guide rail with high load capacity • For maximum lateral load up to 900 Nm • Ideal as a basic axis for linear gantries and cantilever axes • The optional spindle support enables maximum travel speed	• Precision guide rail with high load capacity • Internal guide and toothed belt • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants recommended for production systems for manufacturing Li-ion batteries	• Internal guide and ball screw • Space-saving position sensing • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants recommended for production systems for manufacturing Li-ion batteries
online: →	→ elgd-tb	→ elgd-tb-kf-wd	→ elgd-bs	→ elgd-bs-kf-wd	→ egc	→ egc	→ egc	→ egc	→ elgc-tb	→ elgc-bs

Linear axes

	 Ball screw axes ELGT-BS	 Toothed belt axes ELGA-TB-G	 Toothed belt axes ELGA-TB-KF	 Toothed belt axes ELGA-TB-RF	 Ball screw axes ELGA-BS-KF	 Toothed belt axis units ELGE-TB	 Toothed belt axes ELGG	 Toothed belt axes ELGR-TB	 Cantilever axes ELCC-TB-KF	 Electric slide EGSK
Size	90, 120, 160	70, 80, 120	70, 80, 120, 150	70, 80, 120	70, 80, 120, 150	35	35, 45, 55	35, 45, 55	60, 70, 90, 110	15, 20, 26, 33, 46
Max. feed force Fx	805 ... 1575 N	350 ... 1300 N	260 ... 2000 N		650 ... 6400 N	50 N	50 ... 350 N	50 ... 350 N	300 ... 2500 N	19 ... 392 N
Repetition accuracy	+/-0.02 mm	+/-0.08 mm	+/-0.08 mm	+/-0.08 mm	+/-0.02 mm	+/-0.1 mm	+/-0.1 mm	+/-0.1 mm	+/-0.05 mm	+/-0.003 - +/-0.004 mm, +/-0.003 - +/-0.01 mm, +/-0.01 mm
Working stroke	50 ... 1400 mm	50 ... 8500 mm	50 ... 8500 mm	50 ... 7400 mm	50 ... 3000 mm	50 ... 800 mm	50 ... 1200 mm	50 ... 1500 mm	50 ... 2000 mm	25 ... 840 mm
Description	• Great resilience and rigidity due to double-acting guide • Compact design • With ball screw • Optimal ratio between installation space and working space due to the optimised axis design • Simple integration of motors with mounting kits • Optimised for use in the electronics and automotive industry	• Integrated plain-bearing guide • For small and medium loads • Low guide backlash • Drive component for external guides • Speeds up to 5 m/s with high acceleration up to 50 m/s² • Flexible motor mounting • Motor mounting possible on 4 sides	• Recirculating ball bearing guide for high loads and torques • High feed forces • Precision guide rail with high load capacity • Speeds up to 5 m/s with high acceleration up to 50 m/s² • Optional: Food-safe (for further information, see www.festo.com/certificates/ELGA_KF) • The motor can be flexibly mounted on 4 sides • Guide and toothed belt protected by cover strip • 22 types in stock with short delivery times and modular products for custom variants • Long strokes of up to 8.5 m possible	• Integrated roller bearing guide • High speeds up to 10 m/s with high acceleration up to 50 m/s² • Guide backlash = 0 mm • Very good operating performance under torque load • Sturdy alternative to the recirculating ball bearing guide • Drive component for external guides, particularly at high speeds • Motor mounting possible on 4 sides	• Internal, precision recirculating ball bearing guide with high load capacity for high torque loads • Axis for high repetition accuracy • For extremely high requirements in terms of feed force and accuracy • Guide and ball screw protected by cover strip • Speeds up to 2 m/s with high acceleration up to 15 m/s² • Space-saving position sensing • Flexible motor mounting • 34 preconfigured types and modular product system for custom variants • Strokes of up to 3 m possible	• Complete solution consisting of drive mechanics, motor and servo drive • Cost-optimised design for simple moving and positioning tasks • Ready-to-install unit for quick and easy installation • Product of the Simplified Motion Series: doesn't need any external servo drive or any control cabinet for installation • Two control options integrated as standard: digital I/O and IO-Link®	• Toothed belt axis with two opposing slides • With low-cost plain bearing and precise ball bearing guide • Optional central support improves the rigidity • Motor can be mounted on 4 sides	• Optimum price/performance ratio • Ready-to-install unit for quick and easy installation • With plain or recirculating ball bearing guide • Motor can be mounted on 4 sides	• Axis for high speeds and acceleration • Very low moving mass due to fixed drive head • High rigidity thanks to the innovative design principle • Toothed belt drive with recirculating ball bearing guide • Able to move high loads of up to 100 kg vertically • Long strokes of up to 2 m possible • Sustainable due to product lifecycle extended by ease of repair	• 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
online: →	→ elgt	→ elga	→ elga	→ elga	→ elga	→ elge-tb	→ elgg	→ elgr	→ elcc	→ egsk

Electromechanical cylinders

	 Electric cylinder EPCC-BS	 Electric cylinder ESBF	 Mini slide EGSC-BS-KF	 Mini slide EGSL-BS
Size	25, 32, 45, 60	32, 40, 50, 63, 80, 100	25, 32, 45, 60	35, 45, 55, 75
Max. feed force Fx	75 ... 1000 N	600 ... 17000 N	20 ... 250 N	75 ... 450 N
Repetition accuracy	+/-0.02 mm	+/-0.01 mm, +/-0.015 mm, +/-0.05 mm	+/-0.015 mm	+/-0.015 mm
Stroke	25 ... 500 mm	30 ... 1500 mm	25 ... 200 mm	50 ... 300 mm
Description	•Low-cost: best price-performance ratio •Flexible: wide range of mounting options for the motor •Dynamic: lower internal friction •Non-rotating piston rod with plain-bearing guide, stroke up to 500 mm •Weight-optimised design – ideal for handling systems •Unique: “one-size-down” mounting system for best use of space in combination with toothed belt/ball screw axis ELGC •Variants recommended for production systems for manufacturing Li-ion batteries	•Available with ball screw (size 32 ... 100) or lead screw (size 32 ... 50) •Ball screw: with three spindle pitches for selecting the optimal force-speed ratio •Optional: high corrosion protection, degree of protection IP65, food-safe (see www.festo.com/certificates/ESBF), piston rod extension •Axial or parallel motor mounting •68 types in stock with short delivery times and modular products for custom variants •Variants recommended for production systems for manufacturing Li-ion batteries	•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 recommended for production systems for manufacturing Li-ion batteries	•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
online: →	→ epcc	→ esbf	→ egsc-bs	→ egsl

Integrated electromechanical actuators

	 Mini slide units EGSS-BS-KF	 Toothed belt axis units ELGS-TB-KF	 Spindle axis units ELGS-BS-KF	 Rotary drive units ERMS	 Electric cylinder units EPCS-BS	 Electric cylinder units EPCE-TB
Size	32, 45, 60	45, 60	32, 45, 60	25, 32	32, 45, 60	45, 60
Max. feed force Fx	60 ... 250 N	65 ... 75 N	40 ... 200 N		150 ... 900 N	85 ... 150 N
Repetition accuracy	+/-0.015 mm	+/-0.1 mm	+/-0.01 mm, +/-0.015 mm	+/-0.05 °C, +/-0.1 deg	+/-0.02 mm	+/-0.05 mm
Working stroke	25 mm, 50 mm, 75 mm, 100 mm, 125 mm, 150 mm, 200 mm	50 mm, 200 mm, 300 mm, 500 mm, 600 mm, 800 mm, 1000 mm, 1200 mm, 1500 mm, 1800 mm, 2000 mm	100 mm, 200 mm, 300 mm, 400 mm, 500 mm, 600 mm, 800 mm			
Max. speed				100 ... 150 1/min		
Rotation angle				90°, 180°		
Description	• Complete solution consisting of drive mechanics, motor and servo drive • Increased protection against rotation and absorption of lateral forces thanks to rigid, resilient and precise linear guide • Precise positioning thanks to smoothly running ball screw drive • Product of the Simplified Motion Series: doesn't need any external servo drive or any control cabinet for installation • Two control options integrated as standard: digital I/O and IO-Link®	• Complete solution consisting of drive mechanics, motor and servo drive • Dynamic XY movements thanks to the slide with resilient toothed belt and recirculating ball bearing guide • Protected against external influences by internal guide • Product of the Simplified Motion Series: doesn't need any external servo drive or any control cabinet for installation • Two control options integrated as standard: digital I/O and IO-Link®	• Complete solution consisting of drive mechanics, motor and servo drive • Precise XY movements thanks to the slide with powerful ball screw and resilient recirculating ball bearing guide • Protected against external influences by internal guide • Product of the Simplified Motion Series: doesn't need any external servo drive or any control cabinet for installation • Two control options integrated as standard: digital I/O and IO-Link®	• Complete solution consisting of drive mechanics, motor and servo drive • Absorption of lateral forces and torques thanks to sturdy, backlash-free and precise ball bearings on the rotating plate • Integrated through-feed for cables and tubing through sealed hollow shaft • Product of the Simplified Motion Series: doesn't need any external servo drive or any control cabinet for installation • Two control options integrated as standard: digital I/O and IO-Link®	• Precise positioning thanks to smoothly running ball screw drive • Complete solution consisting of drive mechanics, motor and servo drive • Easy implementation of press and clamping applications for forces up to 900 N • Two control options integrated as standard: digital I/O and IO-Link® • Product of the Simplified Motion Series: doesn't need any external servo drive or any control cabinet for installation	• Complete solution consisting of drive mechanics, motor and servo drive • Innovative interpretation of toothed belt technology for maximum dynamic response and minimal positioning times • Perfect for use in applications where space is critical thanks to minimal zero stroke and extremely compact design • Product of the Simplified Motion Series: doesn't need any external servo drive or any control cabinet for installation • Two control options integrated as standard: digital I/O and IO-Link®
online: →	→ egss	→ elgs-tb	→ elgs-bs	→ erms	→ epcs	→ epce

Electric semi-rotary drives

	 rotary actuators ERMO	 Rotary modules ERMB
Size	12, 16, 25, 32	20, 25, 32
Max. driving torque	0.15 ... 5 Nm	0.7 ... 8.5 Nm
Max. input speed		900 ... 1350 rpm
Rotation angle	Infinite	Infinite
Description	•Integrated motor with gear stage for a compact design •Motor control with encoder for reaching high angular accuracy •Sturdy output bearings for absorbing high forces and torques •Backlash-free pre-stressed rotating plate with very good axial eccentricity and concentricity properties •Quick and accurate installation	•Electromechanical rotary module with toothed belt •Compact design •Mounting interfaces on all sides •Stable output shaft bearings •Unlimited and flexible rotation angle
online: →	→ ermo	→ ermb

Electric stoppers
Electric stopper cylinders

	 Stopper cylinders, electric EFSD
Design	Electric stopper cylinder
Size	20, 50, 100
Position sensing	Via Hall sensor
Cushioning length	11.5 ... 18.2 mm
Description	•Quick and easy set-up of transfer systems without compressed air •For stopping conveyed goods weighing between 0.25 kg and 100 kg •Status and error messages for visual error diagnostics •Controlled via digital I/O of a higher-order controller, e.g. terminal CPX, makes commissioning easier •Mounting interface for easy installation on transfer systems •Adjustable cushioning force
online: →	→ efsd

Electric grippers
Parallel gripper

	 Parallel grippers, electric EHPS
Size	16, 20, 25
Stroke per gripper jaw	10 ... 16 mm
Max. force on gripper jaw Fz, static	200 ... 450 N
Gripper repetition accuracy	0.01 mm, 0.03 mm
Position sensing	Via proximity switch, with Hall sensor, with displacement encoder integrated, via IO-Link interface
Description	•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 ratchet switch or via IO-Link® interface •RA1 version with robot connection, enables fast integration in lightweight robot environments
online: →	→ ehps

Accessories for electric drives
Linear guides

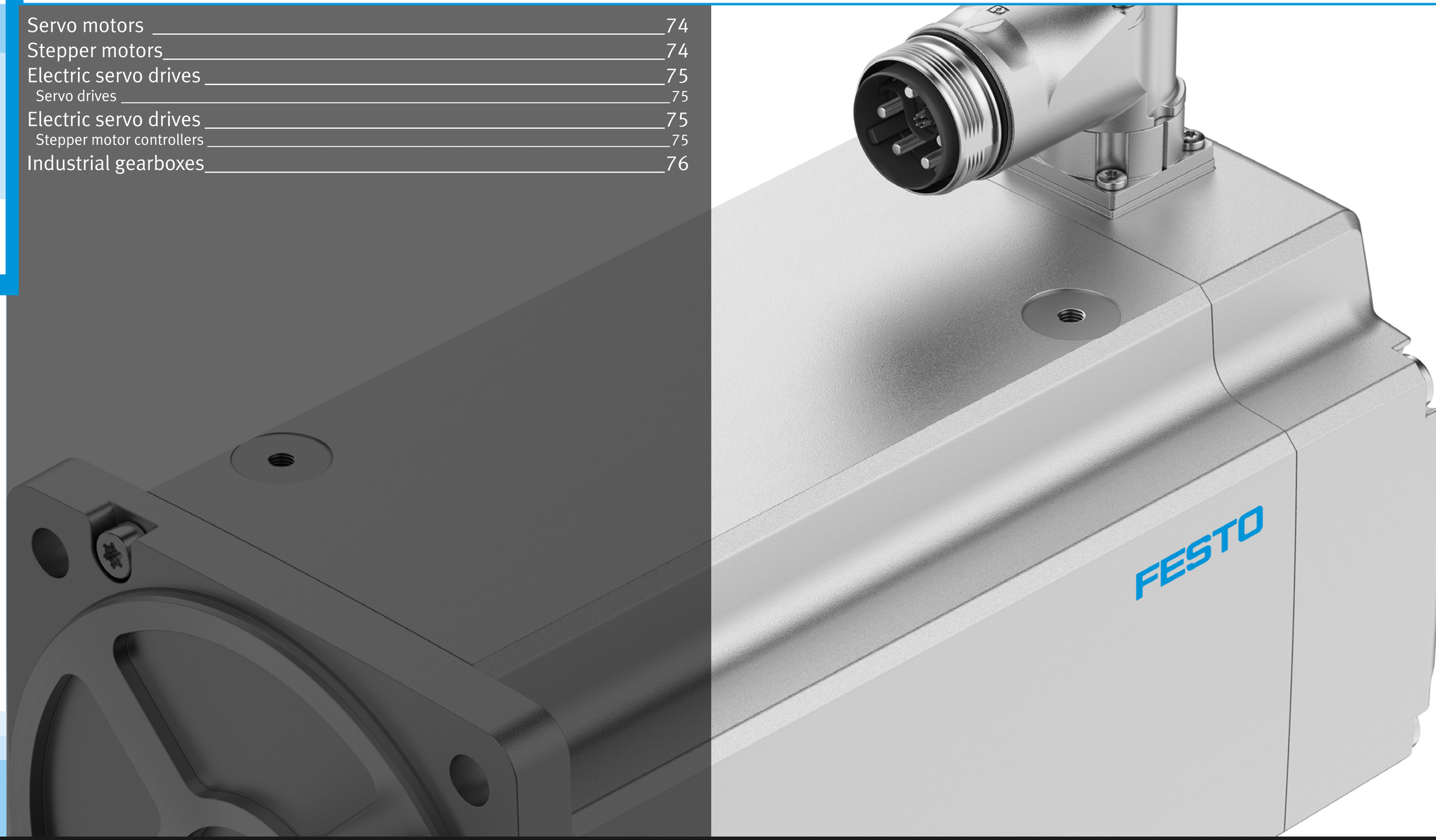
	 Guide axes ELFD	 Guide axes ELFC	 Guide units EAGF	 Guide axes ELFA-KF	 Guide axes ELFA-RF	 Guide axes EGC-FA
Size	60, 80	32, 45, 60, 80	32, 40, 45, 50, 60, 63, 80, 100	70, 80, 120	70, 80	70, 80, 120, 185
Stroke	50 ... 5000 mm	100 ... 2000 mm	1 ... 550 mm	50 ... 8500 mm	50 ... 7000 mm	50 ... 8500 mm
Guide	Recirculating ball bearing guide	Recirculating ball bearing guide	Recirculating ball bearing guide	Recirculating ball bearing guide	Roller bearing guide	Recirculating ball bearing guide
Description	• For spindle/toothed belt axes with recirculating ball bearing guide ELGD-BS-KF/ELGD-TB-KF (drive axes) • Driveless linear guide unit with guide and freely movable slide unit • To absorb forces and torques in multi-axis applications • Increased torsional resistance • Reduced vibrations with dynamic loads	• For spindle/toothed belt axes with recirculating ball bearing guide ELGA-BS-KF/ELGA-TB-KF (drive axes) • Driveless linear guide unit with guide and freely movable slide unit • To absorb forces and torques in multi-axis applications • Increased torsional resistance • Reduced vibrations with dynamic loads	• For electric cylinders EPCC, EPCO and ESBF • For absorbing high process forces and torques • High guide precision	• For spindle/toothed belt axes with recirculating ball bearing guide ELGA-BS-KF/ELGA-TB-KF (drive axes) • Driveless linear guide unit with guide and freely movable slide unit • To absorb forces and torques in multi-axis applications • Increased torsional resistance • Reduced vibrations with dynamic loads	• For toothed belt axis with roller bearing guide ELGA-TB-RF (drive axes) • Driveless linear guide unit with guide and freely movable slide unit • To absorb forces and torques in multi-axis applications • Increased torsional resistance • Reduced vibrations with dynamic loads	• For spindle/toothed belt axes ELGA (drive axes) • To absorb forces and torques in multi-axis applications • Increased torsional resistance
online: →	→ elfd	→ elfc	→ eagf	→ elfa	→ elfa	→ egc

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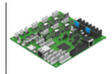
Servo motors

	 Servo motors EMMT-AS	 Servo motors EMMB-AS	 Servo motors EMME-AS
Nominal torque	0.56 ... 82.4 Nm	0.32 ... 2.39 Nm	0.12 ... 0.21 Nm
Nominal rotational speed	1000 ... 3500 rpm	3000 rpm	9000 rpm
Nominal motor power	180 ... 8629 W	100 ... 750 W	110 ... 200 W
Peak torque	1.6 ... 183.3 Nm	0.96 ... 7.17 Nm	0.7 ... 1.4 Nm
Max. rotational speed	1654 ... 15000 rpm	5000 ... 6000 rpm	10000 rpm
Description	•Technology series – for demanding positioning tasks •A selection of 6 motor sizes in up to 4 lengths •Brushless, permanently excited synchronous servo motor •Digital absolute displacement encoder, single-turn or multi-turn •Reliable, highly dynamic, extremely precise •Extremely low cogging torque – supports high synchronisation even at low rotational speeds •One motor connection (OCP: one cable plug) - one connecting cable for supply and encoder, with rotatable plug •Degree of protection IP67 (for motor housing and connection technology) and up to IP65 (on the motor shaft with shaft seal) •Optionally with holding brake •Optional with absolute safety encoder, multi-turn	•Basic series - for cost-sensitive, simple positioning tasks •A selection of 3 motor sizes in up to 2 lengths •Brushless, permanently excited synchronous servo motor •Digital absolute displacement encoder, single turn; multi-turn optional •Sturdy, dynamic, accurate •Optimised connection technology •Degree of protection IP65 (for motor housing and line connections (without plug connectors)) and up to IP54 (on the motor shaft with shaft seal) •Optionally with holding brake	•Brushless, permanently excited synchronous servo motor •Digital absolute displacement encoder, single-turn or multi-turn •Reliable, dynamic, precise •Optimised connection technology •Variants with absolute safety encoder, multi turn, HIPERFACE® •Degree of protection IP54 (on the motor shaft without radial shaft seal), IP65 (on the motor shaft with radial shaft seal), IP65 (for motor housing and power/encoder connections) •Optionally with holding brake
online: →	→ emmt	→ emmb	→ emme

Stepper motors

	 Stepper motors EMMS-ST	 Stepper motor EMMB-ST	 Stepper motor EMMT-ST
Nominal motor current	1.4 A	1.8 ... 7.5 A	1.8 ... 8.4 A
Max. speed	6000 rpm	600 ... 3200 rpm	430 ... 3200 rpm
Motor holding torque	0.09 Nm	0.25 ... 6.6 Nm	0.25 ... 9.4 Nm
Description	•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	•Motor in IP20 (IP40 for motor shaft) •Absolute encoder, single or multi-turn (without battery) •3 flange sizes MH: 0.22 Nm ... 6.6 Nm •Optionally with holding brake •Automatic motor detection via "electronic rating plate" with motor correction table •Can be operated down to -15 °C •OCP cable (one cable plug) with space-saving plug, front or rear alignment available •Length of cable up to 25 m	•Motor in IP65 (IP40 for motor shaft) and with UL certification •Absolute encoder, single or multi-turn (without battery) •3 flange sizes MH: 0.25 Nm ... 9.4 Nm •Optionally with holding brake •Automatic motor detection via "electronic rating plate" with motor correction table •Can be operated down to -15 °C •OCP cable (one cable plug) with solid M17 plug, can be rotated 310° •Length of cable up to 25 m
online: →	→ emms	→ emmb	→ emmt

Electric servo drives
Servo drives

	 Servo drive CMMT-AS	 Servo drive CMXL-ST6
Nominal current		
Nominal operating voltage AC	230 ... 400 V	
Operating voltage		20.4 - 30 V
Nominal operating voltage phases	1-phase, 3-phase	
Rated output controller	350 ... 12000 VA	
Fieldbus coupling	EtherCAT, EtherNet/IP, Modbus/TCP, PROFINET	Ethernet
Number of digital logic inputs		9
Number of digital logic outputs 24 V DC		19
Controller operating mode	Cascade control, P-position controller, PI speed controller, PI current regulator for F or M, profile mode with block and direct operation, interpolating operation via fieldbus, synchronous operating modes, homing, set-up mode, auto-tuning	Direct operation, homing, controlled operation
Safety function	Safe brake control (SBC), safe torque off (STO), safe stop 1 (SS1)	
Performance level (PL)	Safe brake control (SBC) / category 3, Performance Level e, safe torque off (STO)/category 4, Performance Level e	
Description	•One of the most compact servo drives on the market •Precise force, speed and position control •The new multiprotocol variant (CMMT-...-MP) has all fieldbuses (PROFINET, EtherCAT®, EtherNet/IP, Modbus) integrated in one servo drive hardware •Auto-tuning supports easy commissioning and automatically optimises the control behaviour of rotary and linear motions •The latest generation of servo drive systems with optimised prices and sizes •With safety functions •Configure standard safety functions without software •Optimised for use with servo motor EMMT-AS •Can be used universally •Sustainable operation thanks to energy recovery	•6-axis low-voltage servo drive for stepper motors, open-loop, no encoder inputs •Open circuit board for integration in desktop devices (without control cabinet) •Digital interface Ethernet, USB - positioning via G-code commands •Digital inputs for connecting the microswitches for homing
online: →	→ cmmt-as	→ cmxl-st6

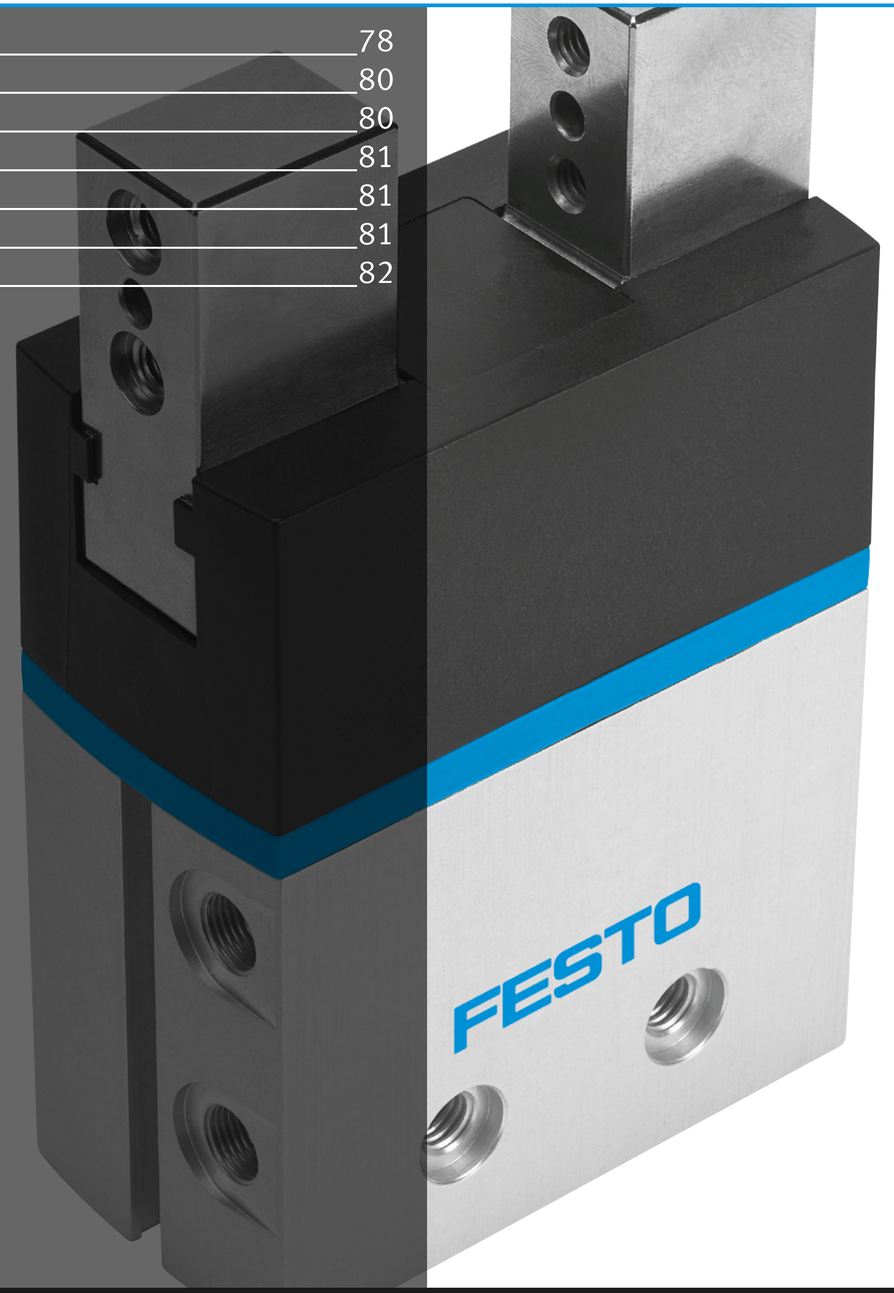
Electric servo drives
Stepper motor controllers

	 Servo drive CMMT-ST
Nominal current, load supply	8 A
Nominal voltage, load supply DC	24 V, 48 V
Fieldbus coupling	EtherCAT, EtherNet/IP, Modbus/TCP, PROFINET
Performance level (PL)	STO / cat. 3, PLd (EC motor without diagnostics), STO / cat. 3, PLe (stepper motor/EC motor with diagnostics)
Description	•Space-optimised servo drive for operating stepper motors, brushless direct current motors (BLDC motors) and EC motors •Ideal for positioning tasks and point-to-point and interpolating motion solutions •The new multiprotocol variant (CMMT-...-MP) has all fieldbuses (PROFINET, EtherCAT®, EtherNet/IP, Modbus) integrated in one servo drive hardware •A servo drive for direct fieldbus integration for controllers from the major manufacturers with associated function blocks •Integrated safety functions STO (SafeTorqueOff) - Cat 3, Ple / SIL 3 / SILCL 3 ensure safe operation •For extremely economical applications with low power requirements of 150 W at 24 V DC, 300 W at 48 V DC and a peak power of 800 W •Energy recovery and energy management ensure sustainable operation and increased efficiency •Auto-tuning makes commissioning of rotary and linear motions easier •Very efficient for tasks with low power requirements •50% more compact than the smallest servo drive CMMT-AS •Ideal for use with stepper motors such as the EMMB-ST and EMMT-ST, BLDC motors and EC motors
online: →	→ cmmt-st

Industrial gearboxes

	 Gear unit EMGA-A	 Gear unit EMGA-P-EAS	 Gear unit EMGA-P-SAS	 Gear unit EMGA-P-SST
Gear ratio	3:1, 5:1, 8:1, 12:1, 20:1	3:1, 5:1, 8:1, 12:1, 20:1	3:1, 5:1, 8:1, 12:1, 20:1	3:1, 5:1, 8:1, 12:1
Continuous output torque	4.5 ... 120 Nm	6 ... 120 Nm	22 ... 450 Nm	6 ... 120 Nm
Max. drive speed	7000 ... 18000 rpm	7000 ... 18000 rpm	6500 ... 13000 rpm	7000 ... 18000 rpm
Torsional rigidity	0.7 ... 5.1 Nm/arcmin	0.85 ... 10.4 Nm/arcmin	2.3 ... 38 Nm/arcmin	0.8 ... 10.4 Nm/arcmin
Torsional backlash	0.22 ... 0.41 deg	0.12 ... 0.31 deg	0.1 ... 0.17 deg	0.12 ... 0.31 deg
Mass moment of inertia, gear unit	0.032 ... 1,409 kgcm²	0.015 ... 0.77 kgcm²	0.078 ... 12.14 kgcm²	0.015 ... 0.77 kgcm²
Max. efficiency	92%, 93%, 94%, 95%	96%, 97%, 98%	96%, 97%, 98%	96%, 97%, 98%
Description	• Bevel gear set for servo motors EMME-AS, EMMT-AS • Life-time lubrication • Degree of protection IP54	• Planetary gear set, straight, for servo motors EMME-AS, EMMT-AS • Eco AC synchronous interface • Life-time lubrication • Degree of protection IP54	• Planetary gear set, straight, for servo motors EMME-AS • AC synchronous interface • Life-time lubrication • Degree of protection IP54	• Planetary gear set, straight, for stepper motors EMMS-ST • Life-time lubrication • Degree of protection IP54
online: →	→ emga	→ emga	→ emga	→ emga

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Parallel gripper

	 Parallel gripper HPPH	 Parallel gripper HEPP	 Parallel gripper HPPF	 Parallel gripper DHPL	 Parallel gripper DHPS	 Parallel gripper DHPC
Size	16	28, 36, 42	8, 12, 16, 20	10, 16, 20, 25, 32, 40	6, 10, 16, 20, 25, 35	6, 10, 16, 20, 25, 32, 40
Stroke per gripper jaw	8 mm	15 ... 28 mm	4 ... 40 mm	10 ... 100 mm	2 ... 12.5 mm	2 ... 15 mm
Total gripping force at 0.6 MPa (6 bar, 87 psi), closing	278 ... 302 N		54.44 ... 346.6 N	38 ... 992 N	25 ... 910 N	7.8 ... 717.2 N
Max. force on gripper jaw Fz, static	176 N	680 ... 1100 N	60 ... 320 N	40 ... 750 N	10 ... 450 N	22 ... 351.5 N
Gripping force backup	During closing		None	None	during opening, during closing, none	during opening, during closing, none
Gripper repetition accuracy	0.06 mm	0.02 mm, 0.04 mm	0.02 mm, 0.03 mm, 0.06 mm	0.03 mm	0.02 mm	0.02 mm
Position sensing	Via integrated displacement encoder	Motor encoder	Via proximity switch	Via proximity switch	Via Hall sensor, via proximity sensor	Via proximity switch
Description	• For safe human-robot collaboration up to 0.5 MPa • Gripper/valve combination with integrated sensors and low overall height • Reduces cycle times and saves up to 75% on compressed air compared to using individual components • TÜV certification for grippers with fingers to ISO 15066 • Can be used with many different cobots and robots thanks to the mechanical robot interface to ISO 9409-1-50-4-M6 • Gripping force backup for safe handling, even in emergency off mode • Versatile control via digital I/O (PNP/NPN) or IO-Link® • Sustainable in production thanks to reduced use of materials • Sustainable operation with integrated control	• Powerful and flexible • Dynamic motor for adjustable motion response • Easy, adjustable parameterisation • Compact with integrated controller • Cross-roller guide for high accuracy • Control via PROFINET®, EtherNet/IP® and EtherCat® • Sustainable in production thanks to reduced use of materials	• Optimal: compact and flat design • Durable: integrated guide and sturdy design • Economical: best value for money • Can be combined: available in many sizes and strokes • Sustainable thanks to reduced material use and maintenance-free over the entire service life.	• High torque resistance due to guided gripper jaw • Compact and sturdy design • Ideal for gripping larger parts • Double-acting piston drive • Suitable for external and internal gripping • Mounting: direct fastening via thread, with through-hole • For position sensing via proximity sensor for T-slot and for C-slot • Sustainable in production thanks to reduced use of materials	• Resilient and precise T-slot guidance of the gripper jaws • High gripping force with compact dimensions • Maximum repetition accuracy • Can be used as a double-acting and single-acting gripper • Single-acting variant or with gripping force locked, normally open (N/O) or normally closed (N/C) • Suitable for external and internal gripping • Wide range of adaptation options on the drives	• Heavy-duty and precise ball guide • High gripping force with compact dimensions • Maximum repetition accuracy • Can be used either as double-acting or single-acting gripper • Single-acting variant with gripping force backup, normally open (N/O) or normally closed (N/C) • Suitable for external and internal gripping • Wide range of mounting and attachment options • Sustainable in production thanks to reduced use of materials
online: →	→ hpph	→ hepp	→ hppf	→ dhpl	→ dhps	→ dhpc

Parallel gripper

	 Parallel gripper HGPD	 Parallel gripper HGPT-B	 Parallel gripper HGPL-B	 Parallel gripper HGPP	 Parallel grippers, electric EHPS
Size	16, 20, 25, 35, 40, 50, 63, 80	16, 20, 25, 35, 40, 50, 63, 80	14, 25, 40, 63	10, 12, 16, 20, 25, 32	16, 20, 25
Stroke per gripper jaw	3 ... 20 mm	1.5 ... 25 mm	20 ... 150 mm	2 ... 12.5 mm	10 ... 16 mm
Total gripping force at 0.6 MPa (6 bar, 87 psi), closing	94 ... 3716 N	106 ... 6300 N	158 ... 2742 N	80 ... 830 N	
Max. force on gripper jaw Fz, static	150 ... 6000 N	200 ... 7000 N	500 ... 9000 N	40 ... 720 N	200 ... 450 N
Gripping force backup	during opening, during closing, none	during opening, during closing, none	None	during opening, during closing, none	
Gripper repetition accuracy	0.03 mm, 0.04 mm, 0.05 mm	0.03 mm, 0.04 mm, 0.05 mm	0.03 mm	0.02 mm	0.01 mm, 0.03 mm
Position sensing	Via proximity switch	Via proximity sensor	Via proximity switch	Via Hall sensor, via inductive sensors	Via proximity switch, with Hall sensor, with displacement encoder integrated, via IO-Link interface
Description	•Ideal for very harsh environments •Precise gripping even at high torque load •Max. gripping force at optimum installation space/force ratio •8 sizes with total stroke of up to 40 mm •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force locked, normally open (N/O) or normally closed (N/C) •Suitable for external and internal gripping	•Sturdy and powerful •With T-slot guide •Gripper jaw guide protected by sealing air against dust •High-force variant available •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force locked, normally open (N/O) or normally closed (N/C) •Suitable for external and internal gripping	•Space-saving, high forces and torques •Controlled, precise and centred gripping •Long stroke: long guide length for the gripper jaws •Opening stroke can be adjusted to optimise time •Double-acting gripper with two pistons operating in parallel and in opposite directions •Suitable for external and internal gripping	•High-precision gripper jaw guide •Very flexible thanks to versatile attachment, mounting and application options •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force backup, normally open (NO) or normally closed (NC) •Sustainable due to product lifecycle extended by ease of repair •Suitable for external and internal gripping	•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 ratchet switch or via IO-Link® interface •RA1 version with robot connection, enables fast integration in lightweight robot environments
online: →	→ hgpd	→ hgpt	→ hgpl	→ hgpp	→ ehps

Three-point gripper

	 Three-point gripper DHDS	 Three-point gripper HGDD	 Three-point gripper HGDT
Size	16, 32, 50	35, 40, 50, 63, 80	25, 35, 40, 50, 63
Stroke per gripper jaw	2.5 ... 6 mm	4 ... 12 mm	1.5 ... 10 mm
Total gripping force at 0.6 MPa (6 bar, 87 psi), closing	87 ... 750 N	336 ... 2745 N	207 ... 2592 N
Gripping force backup	During closing	During opening, during closing	During opening, during closing
Gripper repetition accuracy	0.04 mm	0.03 mm, 0.05 mm	0.03 mm
Position sensing	Via Hall sensor, via proximity sensor	Via proximity switch	Via proximity switch
Description	•Resilient and precise T-slot guide for gripper jaws •High gripping force with compact dimensions •Maximum repetition accuracy •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force backup, normally closed (N/C) •Suitable for external and internal gripping •Wide range of adaptation options on the drives •Sustainable due to product life-cycle extended by ease of repair	•Precise gripping with centric movements despite high torque loads •Ideal for very harsh environments •5 sizes with stroke/jaw of up to 12 mm •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force locked, normally open (N/O) or normally closed (N/C) •Suitable for external and internal gripping	•Synchronous movement of the gripper jaws •Gripper jaw guide protected by sealing air against dust •High-force variant available •With T-slot guide •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force locked, normally open (N/O) or normally closed (N/C) •Suitable for external and internal gripping
online: →	→ dhds	→ hgdd	→ hgdt

Angle grippers

	 Angle grippers DHWC	 Angle grippers DHWS	 Angle grippers HGWM
Size	6, 10, 16, 20, 25, 32	10, 16, 25, 32, 40	8, 12
Total gripping torque at 0.6 MPa (6 bar, 87 psi), closing	5.4 ... 578.6 Ncm	30 ... 1362 Ncm	22 ... 64 Ncm
Max. opening angle	30 deg	40 deg	14 ... 18.5 deg
Gripping force backup	During opening, none	During closing	None
Gripper repetition accuracy	0.1 mm	0.04 mm	0.02 mm
Position sensing	Via proximity switch	Via Hall sensor, via proximity sensor	None
Description	•Lateral gripper jaw support for high torque loads •Maximum repetition accuracy •Can be used either as double-acting or single-acting gripper •Single-acting variant with gripping force backup, normally open (NO) •Suitable for external and internal gripping •Wide range of adaptation options on the drives •Sustainable in production thanks to reduced use of materials	•Improved gripper jaw guide •Internal fixed throttling, eliminates the need for external throttling in 80% of applications •Slotted guide •Maximum repetition accuracy •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force backup, normally closed (N/C) •Suitable for external and internal gripping •Wide range of adaptation options on the drives	•Micro gripper: compact, handy design •Versatile thanks to externally adaptable gripper fingers •Single-acting gripper, optionally with open (NO) or closed (NC) gripper jaws •Suitable for external and internal gripping •Mounting options with clamping spigot, with flange mounting, with Z stroke compensation
online: →	→ dhwc	→ dhws	→ hgwm

Radial grippers

	 Radial grippers DHRC	 Radial grippers DHRS	 Radial grippers HGRT
Size	6, 10, 16, 20, 25, 32	10, 16, 25, 32, 40	16, 20, 25, 32, 40, 50
Total gripping torque at 0.6 MPa (6 bar, 87 psi), closing	4.8 ... 600.1 Ncm	15 ... 660 Ncm	158 ... 7754 Ncm
Max. opening angle	180 deg	180 deg	180 deg
Gripping force backup	During opening, none	During closing	During closing
Gripper repetition accuracy	0.1 mm	0.1 mm	0.02 mm
Position sensing	Via proximity switch	Via Hall sensor, via proximity sensor	Via proximity sensor, via inductive sensors
Description	•Lateral gripper jaw support for high torque loads •Can be used either as double-acting or single-acting gripper •Single-acting variant with gripping force backup, normally open (NO) •Suitable for external and internal gripping •Wide range of adaptation options on the drives •Sustainable in production thanks to reduced use of materials	•Lateral gripper jaw support for high torque loads •Self-centring •Internal fixed throttling •Maximum repetition accuracy •Slotted guide •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force backup, normally closed (N/C) •Wide range of adaptation options on the drives	•Sturdy and precise kinematics for very high torque resistance and long service life •Secure gripping thanks to precise, polished plain-bearing guide •Slotted guide •Optimum cycle times thanks to a freely adjustable opening angle up to a maximum of 90° per gripper finger •Can be used as a double-acting and single-acting gripper •Single-acting variant or with gripping force backup, normally closed (N/C) •Suitable for external and internal gripping •Wide range of adaptation options on the drives
online: →	→ dhrc	→ dhrs	→ hgrt

Swivel gripping units

	 Swivel/gripper units HGDS
Size	12, 16, 20
Total gripping force at 0.6 MPa (6 bar, 87 psi), closing	74 ... 168 N
Stroke per gripper jaw	2.5 ... 7 mm
Swivel angle	210 deg
Position sensing, gripper	Via proximity sensor
Description	•Combination of parallel gripper and swivel module •Swivel angle infinitely adjustable •Precise end stop with elastic cushioning or integrated shock absorber
online: →	→ hgds

Bellows gripper

	 Adaptive shape gripper DHEF	 Bellows gripper DHEB
Size	20	8, 10, 12, 14, 18, 22, 27, 33, 41, 51, 63
Stroke	66 mm	
Bellows stroke		3.5 ... 25 mm
Max. operating frequency of gripper	1 Hz	≤4 Hz
Min. diameter to be gripped	12 mm	8 ... 66 mm
Max. diameter to be gripped	38 mm	11 ... 85 mm
Position sensing	Via proximity switch	Via proximity sensor, none
Description	•Gripping of parts with undefined positions and shapes •Positive gripping of products with different geometries •Positive gripping with suction cup effect •Gentle gripping of delicate products of varying sizes •RA1 version with robot connection, enables fast integration in lightweight robot environments •Sustainable due to product lifecycle extended by ease of repair	•11 sizes for gripping diameter from 8 to 85 mm •Direction of movement: bellows upwards or downwards •Different bellows materials: EPDM or silicone •Air connection on the side or from above •Optimised process sequence with increased quality: prevents the workpieces from being scratched •Additional reliability: optional sensing via proximity or position sensor •For gentle internal gripping of delicate workpieces
online: →	→ dhef	→ dheb

Accessories for grippers

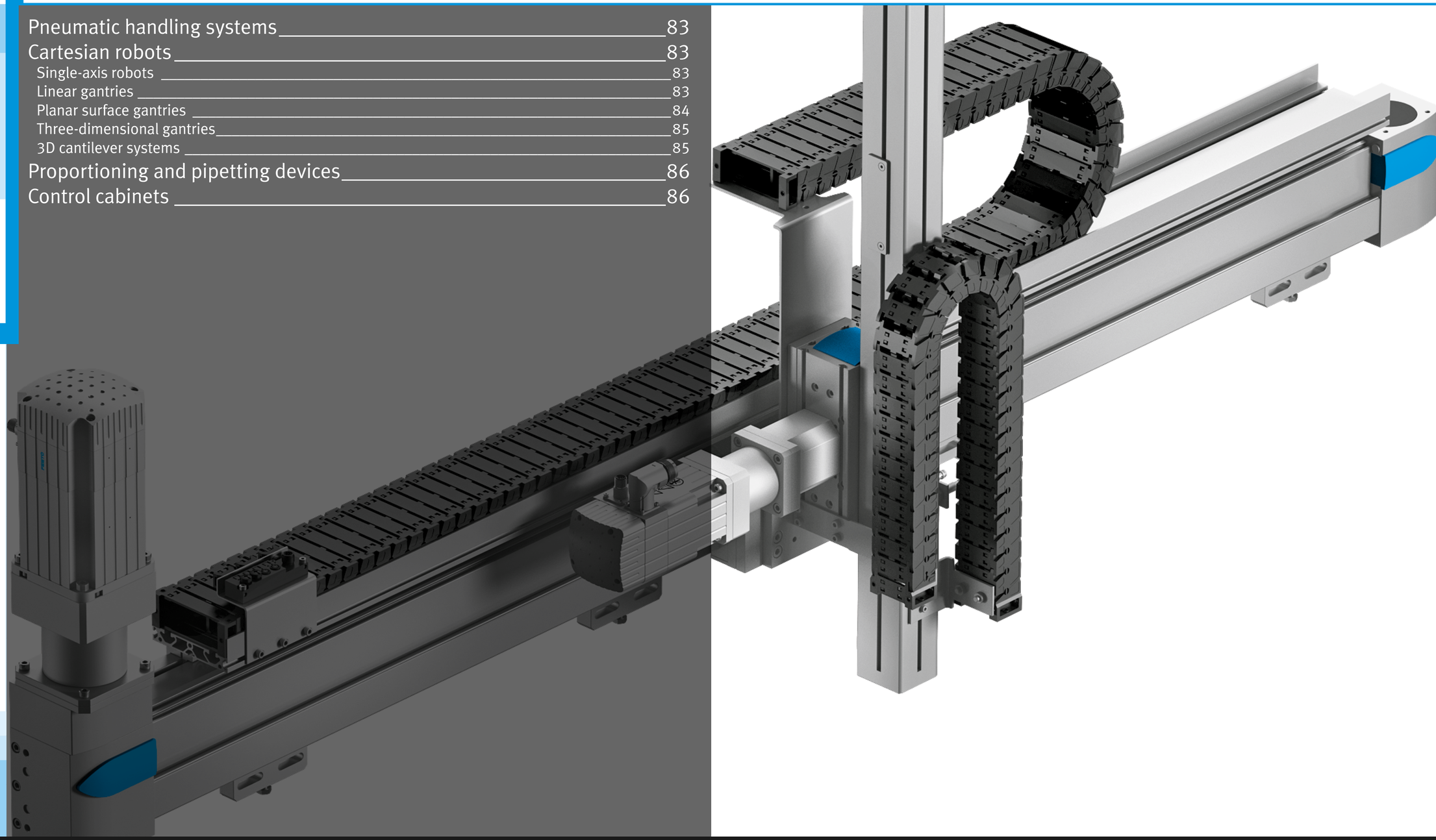
	 Adaptive gripper finger DHAS-GF	 Gripper jaws DHAS-GG
Size	60, 80, 120	16 mm
Suitable for the production of Li-ion batteries	Suitable for battery production in accordance with Festo internal definition in severity level F1A with restrictions regarding the use of Cu/Zn/Ni	
Description	• Self-adapting to different workpiece shapes • Adaptive gripper fingers for gentle and flexible gripping, using the Fin Ray Effect® modelled on a fish tail fin • For workpiece diameters from 6 to 120 mm	• Reliable gripping of microwell plates in life sciences • Easy to mount
online: →	→ dhas	→ dhas

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Pneumatic handling systems



Handling modules
HSP

Size	12, 16, 25
Y stroke	52 ... 170 mm
Z stroke	20 ... 70 mm
Repetition accuracy	+/-0.01 mm, +/-0.02 mm
Min. cycle time	0.6 ... 1 s
Theoretical force at 0.6 MPa (6 bar, 87 psi)	40 ... 65 N
Description	• Function module for automatically repositioning, feeding and removing small parts in extremely confined spaces • Guided vertical and horizontal motion sequence • High precision and rigidity • Compact design • Extremely short cycle times • Cost-optimised • Stroke adjustment along Y- and Z-axes
online: →	→ hsp

Cartesian robots

Single-axis robots



Single-axis systems
YXCS

Description	• Ready-to-install single-axis solution including energy chain for cables or tubing as well as suitable motor and servo drive package • For any single-axis movement • For horizontal mounting position • Based on the axis series EGC-TB (toothed belt axis) and EGC-HD-TB (toothed belt axis with heavy-duty guide) • High mechanical rigidity and sturdy design • Ideal for long gantry strokes and heavy loads
online: →	→ yxcs

Linear gantries



Linear gantries, highly dynamic
YXML

Description	• Parallel kinematic drive concept for maximum dynamic response • Ready-to-install complete system including energy chain for cables or tubing as well as suitable motor and servo drive package • Flexible working space through scalable strokes in the Y and Z direction • Based on linear gantry EXCT • Maximum dynamic response and efficient operation up to max. 95 picks/min • For rapid processes with high cycle rates like pick & place, feeding parts, stacking, packaging tasks
online: →	→ yxml



2D linear gantries
YXCL

Description	• Ready-to-install complete system including energy chain for cables or tubing as well as suitable motor and servo drive package • For two-dimensional movements in vertical working areas • Flexible working space through scalable strokes in the Y and Z direction • Serial kinematic drive concept based on toothed belt and spindle axes • Choice of vertical axis – pneumatic or electric • High mechanical rigidity and sturdy design • Ideal for long gantry strokes and heavy loads
online: →	→ yxcl



Linear gantries
EXCT

Description	• Axis mechanism based on parallel kinematic functional principle • Very high dynamic response enables extremely short cycle times • For two-dimensional movements in vertical working areas • Flat system design and low moving dead weight • The motor can be flexibly mounted on 4 sides
online: →	→ exct

Cartesian robots
Planar surface gantries

	 Planar surface gantries, compact YXMF	 Planar surface gantries, highly dynamic YXMF	 2D planar surface gantries YXCF	 2D planar surface gantries EXCM	 2D planar surface gantries EXCH
Description	• Parallel kinematic drive concept with minimal space requirements • Ready-to-install complete system including energy chain, suitable motors and dual servo drive • For two-dimensional movements in horizontal working areas • Flexible working area through scalable strokes in the X and Y direction • Based on the planar surface gantry EXCM • For extremely small working areas • For desktop applications in small parts assembly, electronics manufacturing and laboratory processes	• Parallel kinematic drive concept for maximum dynamic response • Ready-to-install complete system, including energy chain and suitable motor and servo drive package • For two-dimensional movements in horizontal working areas • Flexible working area through scalable strokes in the X and Y direction • Based on the planar surface gantry EXCH • Maximum dynamic response and efficient operation up to max. 100 picks/min • For rapid processes with high cycle rates like pick & place, feeding parts, stacking, packaging tasks • Cost-saving alternative to two Scara robots due to large working area and high dynamic response	• Ready-to-install complete system including energy chain for cables or tubing as well as suitable motor and servo drive package • For two-dimensional movements in horizontal working areas • Serial kinematic drive concept based on toothed belt and spindle axes • Flexible working area through scalable strokes in the X and Y direction • Particularly suitable for very long strokes and heavy payloads	• Axis mechanism based on parallel kinematic functional principle • Excellent functionality in confined spaces • Low moving dead weight and flat system design • Ideal in combination with stepper motors • With recirculating ball bearing guide • Sustainable operation due to weight-optimised axes	• Axis mechanism based on parallel kinematic functional principle • Optimal dynamic response when compared with other Cartesian gantry systems • Drive concept with low moving dead weight and large workspace • High accelerations in both axis directions in combination with servo motors • Sustainable operation due to weight-optimised axes • The motor can be flexibly mounted on 2 sides
online: →	→ yxmf	→ yxmf	→ yxcf	→ excm	→ exch

Cartesian robots

Three-dimensional gantries

	 Three-dimensional gantries, small design YXMR	 Three-dimensional gantries, highly dynamic YXMR	 3D gantries YXCR
Description	• Parallel kinematic drive concept with minimal space requirements • Ready-to-install complete system including energy chain, suitable motors and dual servo drive • For three-dimensional movements in horizontal working areas • Flexible working area through scalable strokes in the X and Y direction • Based on the planar surface gantry EXCM • Choice of vertical axis – pneumatic or electric • For extremely small working areas • For desktop applications in small parts assembly, electronics manufacturing and laboratory processes	• Parallel kinematic drive concept for maximum dynamic response • Ready-to-install complete system, including energy chain and suitable motor and servo drive package • For three-dimensional movements in horizontal working areas • Flexible working space due to scalable strokes in the Y and Z direction • Based on the planar surface gantry EXCH • Maximum dynamic response and efficient operation up to max. 100 picks/min • Choice of vertical axis – pneumatic or electric • For rapid processes and high cycle rates e.g. assembling, packaging and sorting	• Ready-to-install complete system including energy chain for cables or tubing as well as suitable motor and servo drive package • For three-dimensional movements in horizontal working areas • Flexible working space due to scalable strokes in the X, Y and Z directions • Serial kinematic drive concept based on toothed belt and spindle axes • Choice of vertical axis – pneumatic or electric • High mechanical rigidity and sturdy design • Can be used universally • Especially suitable for long strokes in all directions
online: →	→ yxmr	→ yxmr	→ yxcr

3D cantilever systems

	 Cantilever systems YXCA
Description	• Extremely space-saving 3D system with attractive price-performance ratio • Self-supporting Y-axis enables freely accessible working area with few interfering contours • Pneumatic and electric components can be freely combined • For horizontal installation position • For simple assembly tasks and small parts handling in the electronics industry • Ideal for use in line assembly processes or desktop applications
online: →	→ yxca

Proportioning and pipetting devices



	Dispense heads VTOI
Description	•One valve controller for distributing to 8 dispensing channels •9 mm grid dimension – ideal for microwell plates •Simple design with side-by-side mounting for increased throughput •Complete system using just a few components •Suitable for aggressive liquids
online: →	→ vtoi

Control cabinets



	Control systems CMCB
Design	Mounting plate, control cabinet, integrated safety relay unit
Electrical connection	Spring-loaded terminal, push-in
Mains frequency	50 ... 60 Hz
Performance level (PL)	Category B, Performance Level b, Category 3, Performance Level d
Description	•Ready-to-install control system •Available on a mounting plate with or without control cabinet housing •Variants with safety functions •Adapted for balancer kit YHBP •With connecting cables for balancer kit YHBP connected
online: →	→ cmcb

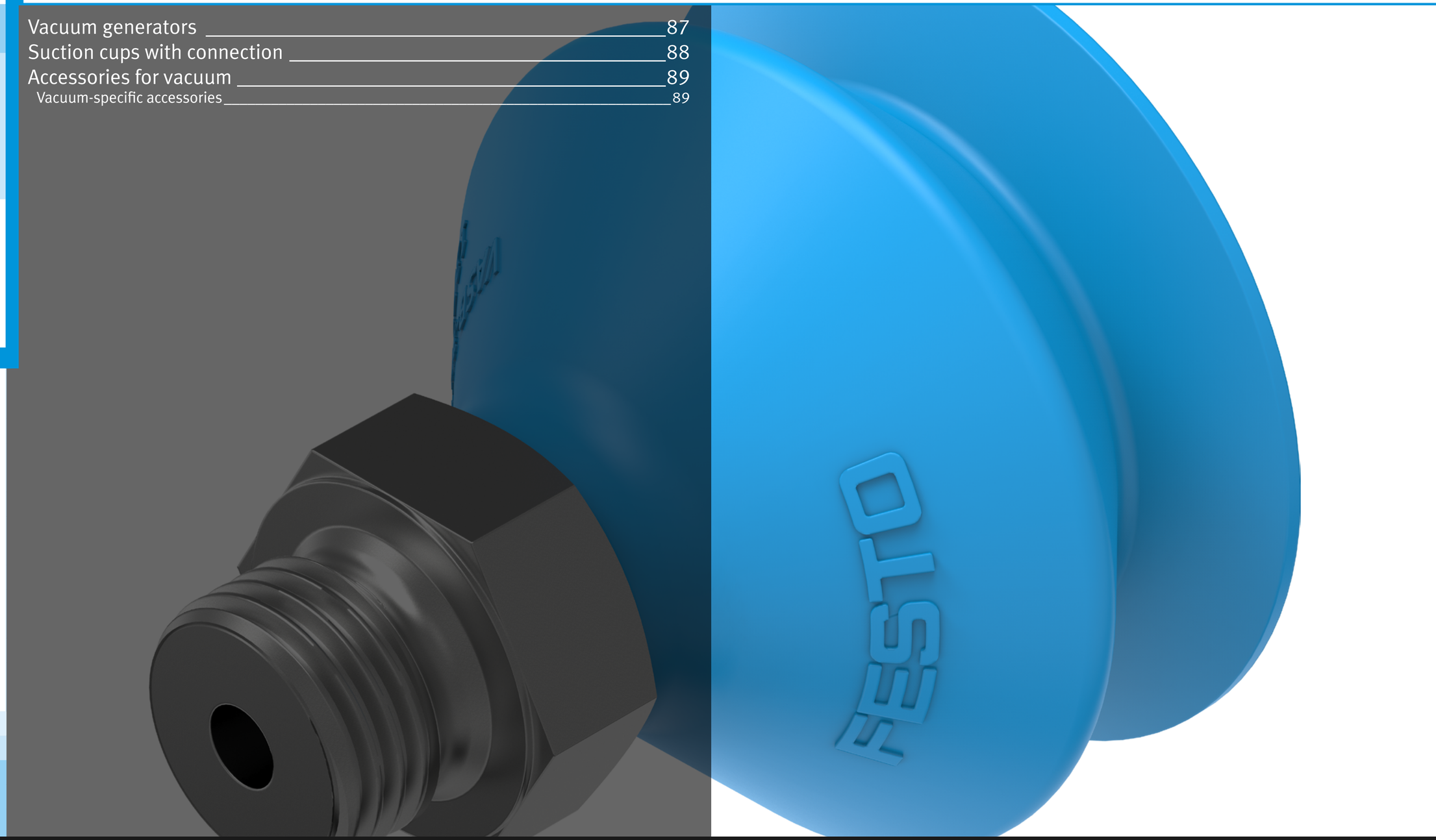
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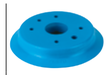
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Vacuum generators

	 Vacuum generators OVEL	 Vacuum generators OVEM	 Vacuum generators, pneumatic VN	 Vacuum generators, electropneumatic VN	 Vacuum generator cartridges VN	 Vacuum generator OVPN
Nominal width of Laval nozzle	0.45 ... 0.95 mm	0.45 ... 3 mm	0.45 ... 3 mm	0.45 ... 3 mm	0.45 ... 2 mm	1.4 ... 2.6 mm
Ejector characteristics	High suction rate, high vacuum, standard	High suction rate, high vacuum, standard	High suction rate, high vacuum, standard, inline, high vacuum, high suction rate	Standard, high vacuum, high suction rate	Standard, high vacuum, high suction rate	High suction rate
Integrated function	Electrical ejector pulse, flow control valve, pressure sensor, pressure transmitter, electric on/off valve, filter, open silencer, closed silencer	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, pressure sensor, open silencer	Pneumatic ejector pulse valve, electric on/off valve, open silencer		Open silencer
Max. suction volume flow against atmosphere	4 ... 21 l/min	6 ... 348 l/min	6.1 ... 339 l/min	7.2 ... 186 l/min	7.2 ... 184.4 l/min	160 ... 960 l/min
Description	• Low-cost, compact vacuum generator • Low weight • Various performance levels and vacuum types • Short switching times thanks to integrated solenoid valves • Quick, precise and safe placing of the workpiece via ejector pulse • Easy to mount • Minimal installation costs • Sustainable operation thanks to reduced pressure level • RA1 version with robot connection, enables fast integration in lightweight robot environments	• 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 thanks to integrated solenoid valves • Adjustable ejector pulse: precise and safe depositing of the workpiece • Sustainable operation with air-saving circuit	• Can be used directly in the work space • Available as a 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 • Variants recommended for production systems for manufacturing Li-ion batteries	• Can be used directly in the work space • Cost effective • Maintenance-free operation and reduced noise level through an integrated, open silencer • With solenoid valve vacuum on/off	• For installation in customised housings for decentralised vacuum generation	• Vacuum generator with very high suction capacity ideal for porous materials • Nozzle technology with maximum energy efficiency • High initial suction rate • Reduced noise level with integrated, open silencer • Flexible application as centralised or decentralised vacuum generation • Very lightweight • Sustainable operation with optimised air consumption
online: →	→ ovel	→ ovem	→ vn	→ vn	→ vn	→ ovpn

Suction cup with connector

	 Suction cup with connector OGVM	 Bernoulli-gripper OGGB	 Suction gripper ESG	 Suction cup with connector ESS	 Suction cups ESV	 Suction cup with connector VAS, VASB	 Suction cup with connector OGVN
Suction cup size	16x55 mm, 20x65 mm, 30x65 mm, 30x80 mm, 30x95 mm, 40x85 mm, 40x90 mm, 50x105 mm, 55x115 mm, 60x125 mm, 70x145 mm, 20x60 mm		4x20 mm, 6x10 mm, 6x20 mm, 8x20 mm, 8x30 mm, 4x10 mm, 10x30 mm, 15x45 mm, 20x60 mm, 25x75 mm, 30x90 mm	4x20 mm, 6x10 mm, 6x20 mm, 8x20 mm, 8x30 mm, 4x10 mm, 10x30 mm, 15x45 mm, 20x60 mm, 25x75 mm, 30x90 mm			
Gripper diameter		60 ... 140 mm					
Suction cup diameter	20 ... 125 mm		2 ... 200 mm	2 ... 200 mm	20 ... 200 mm	2 ... 125 mm	20 ... 75 mm
Holding force at nominal operating pressure	15 ... 630 N	6 ... 10 N		0.1 ... 1610 N	8.2 ... 1610 N	0.14 ... 700 N	14.5 ... 173 N
Design			Vacuum port on top, vacuum port on the side, with height compensator, with long height compensator	Round, bell-shaped	Bell-shaped or round bellows		
Information on suction cup materials	NBR		BR, FPM, NBR, PUR, VMQ (silicone), Vulkollan®	FPM, NBR, PUR, VMQ (silicone), Vulkollan	FPM, NBR, PUR, VMQ (silicone), Vulkollan	NBR, PUR, TPE-U(PU), VMQ (silicone)	PUR
Spacer material		NBR, POM					
Description	• Extremely energy efficient, very high transverse forces, minimal suction times • Optimum suction ergonomics for maximum process reliability • Ideal for workpieces with complex contours • Accessories available for a wide range of applications • Suction cup shape round or oval, in various designs	• Ideally suited to transporting thin, extremely delicate and brittle workpieces • Minimised workpiece contact, gentle workpiece handling • Low energy costs thanks to minimised air consumption • The solution for low-contact, flexible, porous, brittle gripping tasks	• Modular system of suction cup holders and suction cups with over 2000 variants • Optionally with angle compensator, height compensator, filter • Suction cup shape round or oval, in various designs • 6 suction cup designs • 15 suction cup diameters • Suction cup volume: 0.002 ... 245 cm³ • Min. workpiece radius: 10 ... 680 mm • Vacuum port: push-in connector or barbed fitting for plastic tubing, threaded connection	• Suction cup consisting of the suction cup itself plus the support plate with mounting • Suction cup volume: 0.002 ... 245 cm³ • Min. workpiece radius: 10 ... 680 mm • Mounting for suction cup holder: female thread, male thread, push-in connector • Suction cup with mounting thread	• Wearing part for suction cup ESS • Easily interchangeable • Suction cup volume: 0.318 ... 245 cm³ • Min. workpiece radius: 10 ... 680 mm	• Sturdy and reliable • Suction cup with fixed connecting thread • 11 suction cup diameters • Round suction cup shape, bellows • Vacuum port on top, on the side • Screw-in thread	• ideal for workpieces with uneven surfaces • simple, tool-free replacement of the suction cup material • made from wear-resistant polyurethane • easy installation even with restricted installation space with the internal hex • Recommended for production plants for manufacturing Li-ion batteries
online: →	→ ogvm	→ oggb	→ esg	→ ess	→ esv	→ vas	→ ogvn

Accessories for vacuum

Vacuum-specific accessories

	 Length compensator VAL	 Vacuum gauge VAM, FVAM	 Silencer UO	 Silencer UOM, UOMS	 Inline filter OAFA
Vacuum connection	M5, G1/8, G1/4				
Pneumatic connection		G1/4, G1/8, R1/4, R1/8	G1/4, G1/8, M5, M7	G1/4, G3/8	for tubing O.D. 4, 6, 8
Type of mounting	with male thread M16x1, with external thread M22x1.5, with male thread M26x1.5	Front panel mounting, screw-in		snap-in, screw-in	Inline installation
Grade of filtration					10 µm, 40 µm
Description	• For suction cup with connection VAS/VASB • Vacuum port M5, G1/8, G1/4 • To compensate for a possible excess stroke of the handling device • To compensate for tolerance differences in the workpiece thickness	• Designs based on DIN EN 837-1, optionally with red-green range • Pneumatic connection via R or G thread • Double or single scale • Display units bar, inHg, psi	• Special open minimal resistance silencer • For vacuum generators • Facilitates trouble-free operation of the vacuum generator • Operating medium: compressed air	• Special open minimal resistance silencer • For vacuum generators • Facilitates trouble-free operation of the vacuum generator • Silencer extension for extending the silencer for further noise reduction • Operating medium: compressed air	• Inline filters for overpressure and vacuum applications • For tubing connections in various sizes • Grade of filtration: choice of 10 or 40 µm • Transparent housing to determine the level of contamination • Replaceable filter element • Recommended for production plants for manufacturing Li-ion batteries • Optional: OAMM mounting component
online: →	→ val	→ vam	→ uo	→ uom	→ oafa

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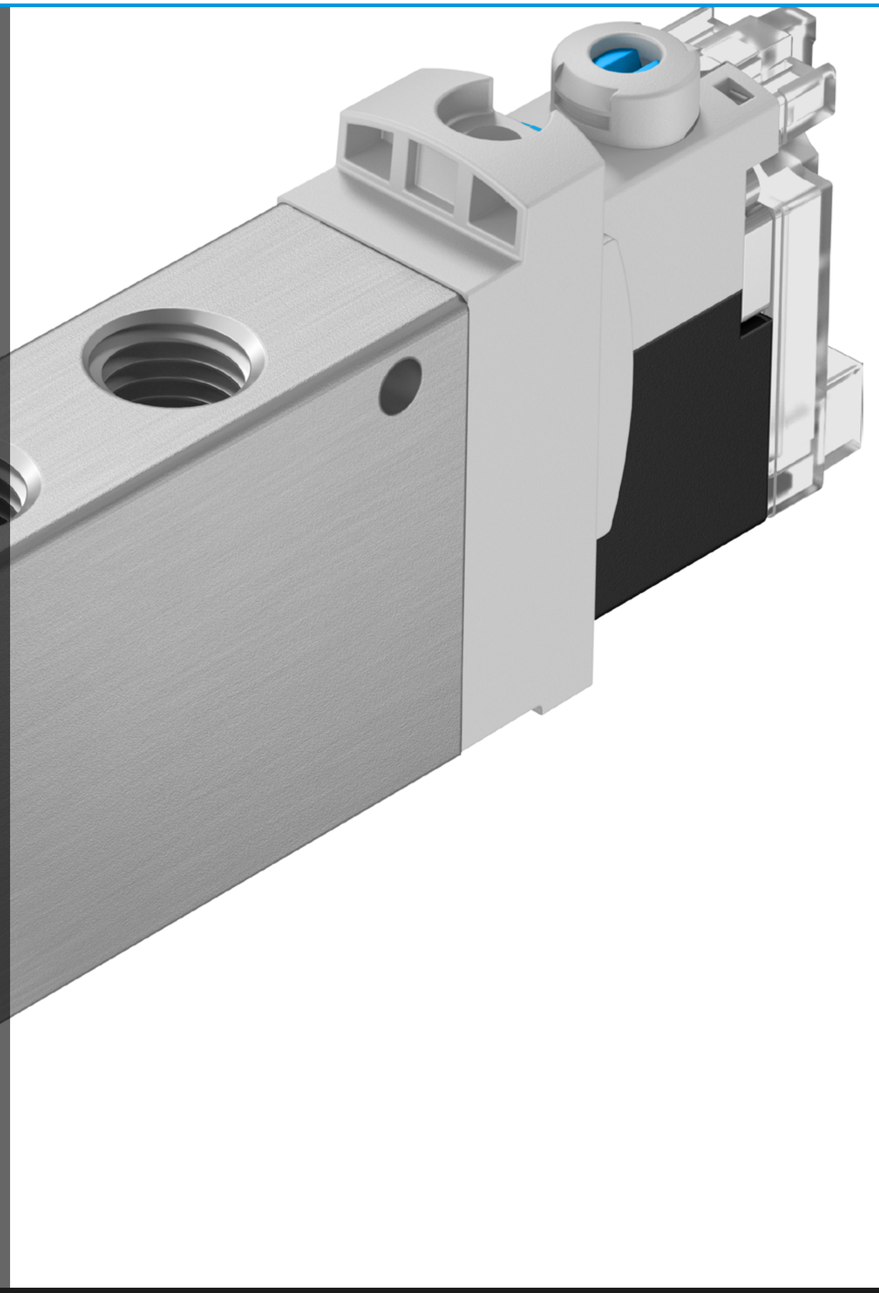
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Electrically and pneumatically actuated directional control valves

Standards-based directional control valves

	 Solenoid valves VSNC	 Solenoid valves VSNC-G1/8	 Standards-based valves with central plug VSVA-R5, VSVA-R2	 Standards-based valves with individual plug VSVA-C1, VSVA-P1	 Standards-based valves, plug-in VSVA-T1	 Pneumatic valves to ISO 15407-1 VSPA	 Standards-based valves to ISO 15218 (CNOMO) VSCS
Actuation type	Electrical	Electrical	Electrical	Electrical	Electrical	Pneumatic	Electrical
Pneumatic connection 1	1/4 NPT, G1/4, QS-1/4, QS-10, QS-3/8, QS-5/16, QS-6, QS-8	G1/8	Sub-base size 1 to ISO 5599-1, size 2 to ISO 5599-1	Sub-base size 1 ISO 5599-1, size 18 ISO 15407-1, size 26 ISO 15407-1	Sub-base size 1 to ISO 5599-2, size 2 to ISO 5599-2, size 18 to ISO 15407-2, size 26 to ISO 15407-2	Sub-base size 18 to ISO 15407-1, size 26 to ISO 15407-1	Sub-base
Operating pressure [MPa]	0.15 ... 1 MPa	0.25 ... 0.8 MPa	-0.09 ... 1.6 MPa	-0.09 ... 1.6 MPa	-0.09 ... 1 MPa		0 ... 1 MPa
Operating pressure	1.5 ... 10 bar	2.5 ... 8 bar	-0.9 ... 16 bar	-0.9 ... 16 bar	-0.9 ... 10 bar	-0.9 ... 16 bar	0 ... 10 bar
Standard nominal flow rate	800 ... 1350 l/min	400 l/min	400 ... 2800 l/min	400 ... 1400 l/min	125 ... 2900 l/min	400 ... 1100 l/min	13.5 ... 34 l/min
Valve function	5/2-way double solenoid, 5/2- or 3/2-way convertible, 5/3-way pressurised, 5/3-way exhausted, 5/3-way closed	3/2-way single solenoid, 5/2-way single solenoid, connections swapped	2x2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, double solenoid, dominant signal, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, double solenoid, dominant signal, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 5/2-way, double solenoid, 5/2-way, double solenoid, dominant signal, 5/2-way, single solenoid, 5/3-way, pressurised 1 to 2, 4 to 5 closed, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed, 5/3-way, port 2 pressurised, 4 exhausted, 5/3-way, port 4 pressurised, 2 exhausted	2x3/2-way, single solenoid/monostable, closed, 2x3/2-way, single solenoid/monostable, open, 2x3/2-way, single solenoid/monostable, open/closed, 5/2-way, double solenoid/bistable, 5/2-way, double solenoid/bistable, dominant, 5/2-way, single solenoid/monostable, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	3/2-way, closed, single solenoid, closed
Electrical connection	3-pin, type A, type B, cable connector M20x1.5, M12x1, A-coded as per EN 61076-2-101, plug, as per EN 175301-803, as per industrial standard (11 mm)	Type C	3-pin, 4-pin, central plug, round design, M8x1, M12x1	Type B, type C, with PE conductor, as per DIN EN 175301-803, as per EN 175301-803, as per industrial standard (11 mm), without PE conductor	2-pin, 4-pin, plug-in, plug, as per ISO 15407-2, as per ISO 5599-2		Type C, plug pattern type C as per industrial standard 9.4 mm, as per DIN EN 175301-803, as per IEC 61076-2-101, M12x1
Description	• NAMUR connection pattern to VDI/VDE 3845 • Rotatable seal for 3/2-way or 5/2-way valve • Wide choice of EX solenoid systems • Sturdy and powerful • Extended temperature range • Excellent price/performance ratio • All solenoid coils can be used on an armature tube • The variant VSNC-...FN achieves increased energy efficiency thanks to reduced power consumption	• NAMUR connection pattern according to VDI/VDE 3845 • Compact, cost-effective, powerful • Particularly suitable for quarter turn actuators DAPS and DFPD with connection pattern to VDI/VDE 3845 • Extended temperature range • Electrical connection with plug pattern type C, to EN 175301-803 • 24 V solenoid coil integrated • Excellent price/performance ratio	• Conforms to ISO 5599-1 • Electrical connection via central plug • Sturdy metal housing • Manifold assembly with mixture of sizes possible	• Conforms to ISO 15407-1 and to ISO 15218 for pilot valve with interface • Electrical connection via type C plug • Sturdy metal housing • Manifold assembly with mixture of sizes possible	• For valve terminal VTSA/VTSA-F • Sturdy metal housing	• Conforms to ISO 15407-1 • Pneumatic control • Manifold assembly with mixture of sizes possible	• Valve actuator for electrical actuation of valve bodies • CNOMO port pattern, to ISO 15218 • Detenting or non-detenting manual override
online: →	→ vsnc	→ vsnc	→ vsva	→ vsva	→ vsva	→ vspa	→ VSCS

Electrically and pneumatically actuated directional control valves

Universal directional control valves

	 Solenoid valves, for individual connection VUVG	 Solenoid valves, plug-in VUVX-T1	 Solenoid valves, plug-in VUVG-T1	 Solenoid valves, plug-in VUVG-B-F1A	 Solenoid valves VUVG-L-F1A	 Pneumatic valves VUWG	 Solenoid valves VUVS	 Pneumatic valves VUWS	 Solenoid valves VMPA1, VMPA14, VMPA2
Actuation type	Electrical	Electrical	Electrical	Electrical	Electrical	Pneumatic	Electrical	Pneumatic	Electrical
Pneumatic connection 1	G1/4, G1/8, M3, M5, M7	Sub-base			G1/4, G1/8, M5, M7	G1/4, G1/8, M3, M5, M7	1/8 NPT, 1/4 NPT, G1/4, G1/8, G3/8	G1/4, G1/8, G3/8	internal, G1/8, M7
Pneumatic working port	Flange, G1/4, G1/8, M3, M5, M7, QS-1/4, QS-1/8, QS-10, QS-3, QS-3/16, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8		Flange, G1/4, G1/8, M5, M7	Flange	G1/4, G1/8, M5, M7	G1/4, G1/8, M3, M5, M7, QS-1/4, QS-1/8, QS-10, QS-3, QS-3/16, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8	1/8 NPT, 1/4 NPT, 3/8 NPT, G1/4, G1/8, G3/8, QS-1/2, QS-1/4, QS-10, QS-12, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8	1/8 NPT, 1/4 NPT, 3/8 NPT, G1/4, G1/8, G3/8, QS-1/4, QS-10, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8	G1/8, M7
Operating pressure [MPa]	-0.09 ... 1 MPa	-0.09 ... 0.7 MPa	-0.09 ... 1 MPa	-0.09 ... 1 MPa	-0.09 ... 1 MPa		-0.09 ... 1 MPa	-0.09 ... 1 MPa	-0.09 ... 1 MPa
Operating pressure	-0.9 ... 10 bar	-0.9 ... 7 bar	-0.9 ... 10 bar	-0.9 ... 10 bar	-0.9 ... 10 bar	-0.9 ... 10 bar	-0.9 ... 10 bar	-0.9 ... 10 bar	-0.9 ... 10 bar
Standard nominal flow rate	80 ... 1380 l/min		130 ... 1200 l/min	130 ... 510 l/min	125 ... 1380 l/min	80 ... 1380 l/min	500 ... 2400 l/min	500 ... 2400 l/min	140 ... 870 l/min
Valve function	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2 closed, single solenoid, 2x3/2 open, single solenoid, 5/2 double solenoid, 5/2 single solenoid, 5/3 closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed
Electrical connection	2-pin, 3-pin, plug pattern H, horizontal connection, M8x1 A-coded to EN 61076-2-104, plug, via E-box, via electric pilot valve	Plug-in	Via E-box	Via E-box	2-pin, plug pattern H, horizontal connection, plug		3-pin, socket, type B, type C, screw terminal, as per EN 175301-803, as per industrial standard (11 mm)		4-pin, plug, as per EN 60947-5-2, M8x1
Description	•Compact valve •Connection technology via E-box •High flow rate relative to its size •In-line valves can be used as individual valves or manifold valves		•Sub-base valve, semi in-line valve •For valve terminal VTUG with multi-pin, fieldbus interface •Variants to EU Explosion Protection Directive (ATEX)	•Sub-base valve •For valve terminal VTUG with multi-pin, fieldbus interface •Recommended for production systems for manufacturing lithium-ion batteries	•Compact valve •Connection technology via E-box •High flow rate relative to its size •In-line valves can be used as individual valves or manifold valves •Recommended for production systems for manufacturing lithium-ion batteries	•Compact valve •Pneumatically actuated •High flow rate relative to its size •In-line valves can be used as individual valves or manifold valves •Can be combined with individual electric valves on terminal strip	•Universal valve, sturdy and durable •Low-cost, no limitations with regard to performance •Can be used as individual valves or manifold valves VTUS	•Universal valve, sturdy and durable •Pneumatically actuated •Can be used as individual valves or manifold valves VTUS	•For valve terminal MPA •As individual valve mounted on sub-base •Comprehensive range of valves
online: →	→ vuvg	→ vuvx	→ vuvg	→ vuvg_t1_f1a	→ vuvg_s_f1a	→ vuwg	→ vuvs	→ vuws	→ vmpa1

Electrically and pneumatically actuated directional control valves

Application-specific directional control valves

	 Control blocks VOFA	 Solenoid valves VOFC	 Solenoid valves VOFD	 Solenoid valves MHA1, MHP1	 Solenoid valves MHE2, MHP2, MHA2, MHE3, MHP3, MHA3, MHE4, MHP4, MHA4	 Fast switching valves MHJ9, MHJ10	 Pneumatic valves VOGM	 Pneumatic valves VOGI
Design	Piston spool	Piston spool, piloted poppet valve	Directly actuated poppet valve	Poppet valve with spring return	Pressure relief poppet valve	Poppet valve without spring return	Sub-base valve, diaphragm valve, pilot operated piston seat valve	Sub-base valve, pilot operated piston seat valve
Valve function	3/2-way closed monostable, 5/2-way monostable	3/2-way, single solenoid, closed, 5/2-way, double solenoid, 5/2-way, single solenoid	3/2-way, closed, single solenoid, semi-automatic, 3/2-way, closed, single solenoid	2/2-way, single-solenoid, closed, 2x2/2-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	2/2-way, single solenoid, closed	Proportional 3/3-way valve	4/2 single solenoid, fail safe
Operating pressure [MPa]	0 ... 1 MPa	0 ... 1 MPa	0 ... 1.2 MPa	-0.09 ... 0.8 MPa	-0.09 ... 0.8 MPa	0.05 ... 0.8 MPa	0.14 ... 0.8 MPa	0.33 ... 0.8 MPa
Operating pressure	0 ... 10 bar	0 ... 10 bar	0 ... 12 bar	-0.9 ... 8 bar	-0.9 ... 8 bar	0.5 ... 8 bar	1.4 ... 8 bar	3.3 ... 8 bar
Ambient temperature	-5 ... 50 °C	-25 ... 60 °C	-50 ... 60 °C	-5 ... 50 °C	-5 ... 60 °C	-5 ... 60 °C	-40 ... 80 °C	-20 ... 80°C
Pneumatic connection 1	G1/4	1/4 NPT, 1/2 NPT, NAMUR connection pattern, G1/2, G1/4, M5	1/4 NPT, NAMUR connection pattern, G1/4, M5	Sub-base, prepared for QSP10, QS-3, QS-4	Sub-base, G1/4, G1/8, M7, QS-4, QS-6, QS-8	Sub-base, QS-4, QS-6		G1/2
Standard nominal flow rate	950 ... 1050 l/min	595 ... 2794 l/min	52 ... 1900 l/min	10 ... 30 l/min	90 ... 400 l/min	50 ... 160 l/min	1240 l/min	1093 l/min
Description	• Redundantly designed valve block for safe reversal of a hazardous movement or for safe venting of pneumatic drives • Can be selected as a decentralised individual connection variant with electrical and pneumatic individual connection or as a feature integrated in the valve terminal VTSA/ VTSA-F • Equipped with valves VSVA • Switching position sensing by sensors • With safety functions • Suitable for use as a press safety valve in accordance with ISO 16092-4	• Suitable for process automation in the chemical and petrochemical industries • Suitable for outdoor use under harsh, dusty ambient conditions • Especially suitable for quarter turn actuators thanks to NAMUR flange pattern • Valve can switch between internal and external pilot air • Variants with safety functions • Variants to EU Explosion Protection Directive (ATEX)	• Suitable for process automation in the chemical and petrochemical industries • Suitable for outdoor use under harsh, dusty ambient conditions • Especially suitable for quarter turn actuators thanks to NAMUR flange pattern • Variants with safety functions • Variants to EU Explosion Protection Directive (ATEX)	• Directly actuated poppet valve • Miniature valve: grid dimension 10 mm • Switching times down to 4 ms • Sub-base valve • Manifold block for 2 ... 10 valves • Use as a pilot valve • UL certification; same connections and cables as for VUVG	• 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	• Directly actuated poppet valve • Identical basic valves for direct or battery assembly • Individual valve with integrated plug connection • Switching frequencies up to 1000 Hz • Very good reproducibility • MHJ9: Valve manifold assembly with individual outputs or with air nozzle output • MHJ9: Electrical connection via connecting cable MHJ9-KMH with integrated control electronics • MHJ10: Valve manifold assembly with individual outputs • MHJ10: Electrical connection via moulded-in cable, control electronics included in the valve	• Pneumatic extension module for valve terminal VTOP • Volume booster for reducing the actuating times of the process valve • Precise positioning of the pneumatic drive even with fast positioning times by direct integration into the control loop	• Pneumatic extension module for valve terminal VTOP • Fail-safe modules for approaching a defined end position in the event of pressure failure
online: →	→ vofa	→ vofc	→ vofd	→ mh1	→ mh2	→ mhj9	→ vogm	→ vogi

Manually actuated directional control valves

Swivel lever valves

	 Hand lever valves VHEF-H	 Hand lever valve VHER
Valve function	3/2-way bistable, 3/2-way open/closed monostable, 5/2-way bistable, 5/2-way monostable, 5/3-way exhausted, 5/3-way closed	4/3-way pressurised, 4/3-way exhausted, 4/3-way closed
Type of control	Direct	Direct
Standard nominal flow rate	530 … 1200 l/min	170 … 3800 l/min
Pneumatic working port	G1/4, G1/8	G1/2, G1/4, G1/8, M5
Operating pressure [MPa]	-0.095 … 1 MPa	
Operating pressure	-0.95 … 10 bar	0 … 10 bar
Description	•With hand lever on the side or on top •Durable thanks to tried-and-tested piston spool and disc seat valve technology •Sturdy metal housing •Attractively priced •Ergonomic and reliable operation •Low actuating forces •Modern design •Reverse operation possible	•Lever in metal or polymer design •Front panel mounting, through or mounting holes
online: →	→ vhef	→ vher

Pushbutton valves

	 Pushbutton valves VHEF-P
Valve function	3/2-way bistable, 3/2-way open/closed monostable, 5/2-way bistable, 5/2-way monostable
Type of actuation	Direct, piloted
Standard nominal flow rate	750 … 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure [MPa]	-0.095 … 1 MPa
Operating pressure	-0.95 … 10 bar
Description	•With button switch •Durable thanks to tried-and-tested piston spool and disc seat valve technology •Sturdy metal housing •Attractively priced •Ergonomic and reliable operation •Low actuating forces •Modern design •Reverse operation possible
online: →	→ vhef

Finger lever valves

	 Finger lever valves VHEF-L
Valve function	3/2-way open/closed monostable, 5/2-way monostable
Type of actuation	Direct
Standard nominal flow rate	750 … 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure [MPa]	-0.095 … 1 MPa
Operating pressure	-0.95 … 10 bar
Description	•With finger lever •Durable thanks to tried-and-tested piston spool and disc seat valve technology •Sturdy metal housing •Attractively priced •Ergonomic and reliable operation •Low actuating forces •Modern design •Reverse operation possible
online: →	→ vhef

Manually actuated directional control valves

Toggle lever valves



	Toggle lever valves VHEF-V
Valve function	3/2-way bistable, 3/2-way open/closed monostable, 5/2-way bistable, 5/2-way monostable
Type of control	Direct
Standard nominal flow rate	750 ... 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure [MPa]	-0.095 ... 1 MPa
Operating pressure	-0.95 ... 10 bar
Description	•With toggle lever •Durable thanks to tried-and-tested piston spool and disc seat valve technology •Sturdy metal housing •Attractively priced •Ergonomic and reliable operation •Low actuating forces •Modern design •Reverse operation possible
online: →	→ vhef

Selector switches



	Selector valves VHEF-ES
Valve function	3/2-way bistable, 3/2-way open/closed monostable, 5/2-way bistable, 5/2-way monostable, 5/3-way exhausted, 5/3-way closed
Type of actuation	Direct
Standard nominal flow rate	530 ... 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure [MPa]	-0.095 ... 1 MPa
Operating pressure	-0.95 ... 10 bar
Description	•With selector switch on the side or on top •Durable thanks to tried-and-tested piston spool and disc seat valve technology •Sturdy metal housing •Attractively priced •Ergonomic and reliable operation •Low actuating forces •Modern design •Reverse operation possible
online: →	→ vhef

Front panel valves



	Front panel valves SVS-3, SVS-4, SVOS-3
Valve function	3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 4/2-way, single solenoid
Type of control	Direct, piloted
Standard nominal flow rate	120 l/min
Pneumatic working port	G1/8
Operating pressure [MPa]	0.35 ... 0.8 MPa
Operating pressure	3.5 ... 8 bar
Description	•For actuator attachments such as pushbutton actuators, mushroom pushbuttons, selector switches, toggle switches, key actuators •Reliable coupling system for rapid assembly and dismantling
online: →	→ svos

Mechanically actuated directional control valves

Stem actuated valves

	 Stem actuated valves VMEF-S	 Limit switches with push-in connector SDK, SVK	 Limit stop signal generators with push-in connector SDV
Valve function	3/2-way closed monostable, 5/2-way monostable	3/2-way, closed, single solenoid, closed	
Type of control	Direct, piloted	Direct	
Standard nominal flow rate	750 ... 1200 l/min	16 ... 50 l/min	8 ... 16 l/min
Pneumatic working port	G1/4, G1/8	PK-3	PK-3
Operating pressure [MPa]	-0.095 ... 1 MPa		
Operating pressure	-0.95 ... 10 bar	-0.9 ... 8 bar	0 ... 8 bar
Description	• Durable thanks to tried-and-tested piston spool and disc seat valve technology • Sturdy metal housing • Outstanding pneumatic performance • Attractively priced • Ergonomic and reliable operation • Low actuating forces • Modern design • Reverse operation possible	• For end-position sensing and position control • High accuracy • Stainless steel design	• For end-position sensing and position control • High precision and low actuating forces • Sturdy design
online: →	→ vmef	→ sdk	→ sdv

Roller lever valves

	 Roller lever valves VMEF-R
Valve function	3/2-way monostable, 5/2-way monostable
Type of actuation	Direct
Standard nominal flow rate	750 ... 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure [MPa]	-0.095 ... 1 MPa
Operating pressure	-0.95 ... 10 bar
Description	• Durable thanks to tried-and-tested piston spool and disc seat valve technology • Sturdy metal housing • Outstanding pneumatic performance • Attractively priced • Ergonomic and reliable operation • Low actuating forces • Modern design • Reverse operation possible
online: →	→ vmef

Roller lever valves

	 Roller lever valves VMEF-K
Valve function	3/2-way monostable, 5/2-way monostable
Type of actuation	Direct
Standard nominal flow rate	750 ... 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure [MPa]	-0.095 ... 1 MPa
Operating pressure	-0.95 ... 10 bar
Description	• Durable thanks to tried-and-tested piston spool and disc seat valve technology • Sturdy metal housing • Outstanding pneumatic performance • Attractively priced • Ergonomic and reliable operation • Low actuating forces • Modern design • Reverse operation possible
online: →	→ vmef

Swivel lever valves

	 Swivel lever valves VMEF-V
Valve function	3/2-way monostable, 5/2-way monostable
Type of actuation	Direct
Standard nominal flow rate	750 ... 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure	-0.95 ... 10 bar
Description	• Variants with switching range on both sides, left or right • Compact design • Durable thanks to tried-and-tested piston spool and disc seat valve technology • Sturdy metal housing • Attractively priced • Ergonomic and reliable operation • Low actuating forces • Modern design • Reverse operation possible
online: →	→ vmef

Pneumatic shut-off valves

Check valves

	 Check valves, piloted HGL	 Check valves, piloted VBNF	 Check valves H, HA, HB
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8, M5, QS-10, QS-12, QS-4, QS-6, QS-8	QS-4, QS-6, QS-8	G1/2, G1/4, G1/8, G3/4, G3/8, M5, QS-10, QS-12, QS-4, QS-6, QS-8, R1/2, R1/4, R1/8, R3/8
Standard nominal flow rate		120 ... 260 l/min	115 ... 2230 l/min
Standard nominal flow rate 1->2 (0.6->0.5 MPa, 6->5 bar, 87->72.5 psi)	130 ... 1600 l/min	130 ... 620 l/min	1000 ... 5900 l/min
Operating pressure [MPa]	0.05 ... 1 MPa	0.02 ... 1 MPa	0.04 ... 1.2 MPa
Operating pressure	0.5 ... 10 bar	0.2 ... 10 bar	-1 ... 12 bar
Operating pressure for full temperature range		0.2 ... 10 bar	
Description	•Valve function: piloted non-return function •Screw-in via male thread •Pneumatically piloted •Pilot air connection: M5, G1/8, G1/4, G3/8, QS-4 •Manually operated exhaust with separate accessories possible	•Valve function: piloted non-return function •Minimal height • High flow rate •Can be rotated horizontally through 360° when mounted •Manually actuated exhaust possible	•Valve function: non-return function •Screw-in or in-line installation •With connecting thread at both ends, push-in connector at both ends, thread/ push-in connector
online: →	→ hgl	→ vbnf	→ h-qs

Quick exhaust valves

	 Quick exhaust valves VBQF	 Quick exhaust valves SE, SEU
Pneumatic connection 1	G1/4, G1/8, QS-6, QS-8	G1/2, G1/4, G1/8, G3/4, G3/8
Standard nominal flow rate, exhaust 0.6->0.5 MPa (6->5 bar, 87->72.5 psi)	850 ... 2500 l/min	550 ... 7500 l/min
Standard nominal flow rate, pressurisation 0.6->0.5 MPa (6->5 bar, 87->72.5 psi)	350 ... 960 l/min	300 ... 4560 l/min
Operating pressure	0.2 ... 10 bar	0.2 ... 10 bar
Cleanroom class	Class 4 to ISO 14644-1	
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	•Minimal height •High flow rate •Reduced noise emission •Optionally with silencer •Available with ducted or unducted exhaust air •For faster cycle times	•Valve function: quick exhaust •Shut-off valve, piloted •Screw-in •With or without silencer
online: →	→ vbqf	→ se

Pneumatic shut-off valves

Shut-off valves and ball valves

	 Shut-off valves VBOC	 Hand slide valves VBOH	 Ball valves QH-QS, QHS-QS	 Ball valves QH
Valve function	2/2-way, single solenoid, closed	3/2-way, double solenoid	2/2-way, double solenoid	2/2-way, double solenoid
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8	G1/2, G1/4, G1/8, G3/4, G3/8, M5	QS-4, QS-6, R1/8	G1, G1 1/2, G1/2, G1/4, G3/4, G3/8
Standard nominal flow rate		236 ... 7691 l/min	148 ... 560 l/min	3400 ... 84000 l/min
Operating pressure [MPa]	0.05 ... 1 MPa	-0.095 ... 1.2 MPa	-0.1 ... 1 MPa	
Operating pressure	0.5 ... 10 bar	-0.95 ... 12 bar	-1 ... 10 bar	
Description	• 2/2-way valve for direct mounting on the cylinder with switching position monitoring • Suitable for safety functions in accordance with DIN 13849 • Extremely sturdy in the event of pressure surges from the cylinder • Optional: fully integrated additional functions • Pneumatically actuated	• Used as a shut-off function for pressurising and exhausting compressed air systems, e.g. upstream of service unit combinations, for air guns and also for exhausting pneumatic cylinders • Non-overlapping, so no pressure losses when switching • Minimal installation effort	• Shut-off valve, manually operated • In-line installation, can be screwed in, bulkhead fitting • Variants: thread at both ends, push-in connector at both ends, thread/push-in connector	• Shut-off valve, manually operated • Inline installation • Female thread at both ends • With hand lever • Pipe thread to ISO 2281
online: →	→ vboc	→ vboh	→ qh	→ qh

Logic valves

	 AND gates ZK
Valve function	AND function
Pneumatic connection 1	G1/8, PK-3
Standard nominal flow rate	100 ... 550 l/min
Operating pressure	1 ... 10 bar
Description	• AND valve • Connects two input signals in the AND function • Mounting via through-holes
online: →	→ zk

Pressure regulators

	 Pressure regulator VRPA
Pressure regulation range	1 ... 8 bar
Standard nominal flow rate	80 ... 130 l/min
Pneumatic connection 1	M5, QS-4, QS-6, QS-8, R1/4, R1/8
Pneumatic connection 2	QS-4, QS-6, QS-8
Ambient temperature	0 ... 60°C
Cleanroom class	Class 4 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B2-L
Description	• Regulates operating pressure independently of fluctuating input pressure • With secondary exhaust and with return flow function • Piston regulator with through pressure supply • Increased energy efficiency thanks to motion-specific pressure adjustment • Directly actuated • Optionally with pressure gauge • Connections: push-in connector at both ends, thread/push-in connector • Sustainable operation thanks to reduced pressure level
online: →	→ vrpa

Flow control valves
One-way check valves

						
	One-way flow control valves VFOE-L	One-way flow control valves GRLA, GRLZ, GRLSA, CRGRLA	One-way flow control valves VFOH	One-way flow control valves VFOF	One-way flow control valves GR, GRA	Precision one-way flow control valves GRP
Valve function	Exhaust air one-way flow control function, supply air one-way flow control function	Exhaust air one-way flow control function, one-way flow control function, supply air one-way flow control function	Exhaust air one-way flow control function	Exhaust air one-way flow control function	One-way flow control function	One-way flow control function
Pneumatic connection 1	QS-10, QS-4, QS-6, QS-8	Female thread G1/4, for barbed connector I.D. 4 with union nut, 6 with union nut, G1/2, G1/4, G1/8, G3/4, G3/8, M3, M5, PK-3, PK-3 with union nut, PK-4, PK-4 with union nut, PK-6 with union nut, QS-10, QS-12, QS-3, QS-4, QS-6, QS-8	QS-10, QS-4, QS-6, QS-8	QS-4, QS-6, QS-8	Female thread G1/2, G1/4, G3/8, G1/4, G1/8, G3/4, M3, M5, QS-3, QS-4, QS-6, QS-8	G1/8, PK-3, PK-4
Standard nominal flow rate in flow control direction	85 ... 750 l/min	0 ... 4320 l/min	180 ... 530 l/min	120 ... 590 l/min	29.5 ... 3300 l/min	3.8 ... 75.8 l/min
Adjusting element	Rotary knob with latch	Internal hex, knurled screw, slotted head screw	External hex	Internal hex	Knurled screw	Rotary knob with scale
Description	• Low-cost solution for standard applications • Simple and reliable adjustment of the speed of a pneumatic cylinder • Extremely easy assembly • Quick to commission • Compact dimensions	• Functional combination of one-way flow control valve and piloted check valve • Flow control valve, flow control at one end • Polymer, metal or stainless steel design • Standard, mini, in-line variants with different flow rates • Connections: thread at both ends, push-in connector at both ends, thread/push-in connector	• Easy-to-clean design • Increased corrosion protection • Can be rotated horizontally through 360° when mounted	• Functional combination of one-way flow control valve and piloted check valve • High flow rate • Can be rotated horizontally through 360° when mounted • Compact and can be operated from the side	• Non-return and flow control valve • Inline installation	• Non-return and flow control valve • Mounting on sub-base or for front panel mounting
online: →	→ vfoe	→ grla	→ vfoh	→ vfof	→ gra	→ grp

Flow control valves
Throttle valves

	 Flow control/silencers VFFK	 Precision flow control valves GRPO	 Exhaust air flow control valves, flow control/ silencer GRE, GRU
Valve function	Sound pressure control function	Flow control function	Sound pressure control function
Pneumatic connection 1	M5, M7, R1/4, R1/8	G1/8, PK-3, PK-4	G1/2, G1/4, G1/8, G3/4, G3/8
Standard flow rate in flow control direction 0.6->0 MPa (6->0 bar, 87->0 psi)		5.2 ... 129 l/min	
Standard nominal flow rate in flow control direction		3.8 ... 75.8 l/min	520 ... 3600 l/min
Standard flow rate 0.6->0 MPa (6->0 bar, 87->0 psi)	0 ... 420 l/min		0 ... 8000 l/min
Adjusting element	Knurled screw	Rotary knob with scale	Slotted head screw
Description	•With polymer silencer	•Connections: threaded connection at both ends, push-in connector at both ends •Metal version	•Exhaust air flow control valve GRE: sintered metal •Flow control/silencer GRU: polymer
online: →	→ vffk	→ grpo	→ gre

Proportional valves
Flow control valves

	 Proportional directional control valves VPWI	 Proportional directional control valves MPYE	 Proportional directional control valves VPWP	 Proportional flow control valves VPCF	 Proportional flow control valves VEMD	 Mass flow controller VEFC
Valve function	3-way proportional directional control valve	5/3-way, closed	5/3 proportional directional control valve, closed	3-way proportional flow control valve	2-way proportional flow control valve	2-way proportional flow control valve
Pneumatic connection 1	G1/8	G1/4, G1/8, G3/8, M5	G1/4, G1/8, G3/8	G3/8	Female thread G1/4, M5	G1/4, R1/4
Flow rate control range				20 ... 1500 l/min	0 ... 200 l/min	10 ... 200 l/min
Operating pressure [MPa]	0 ... 1.3 MPa	0 ... 1 MPa	0 ... 1 MPa	0.1 ... 1 MPa	0 ... 0.6 MPa	0.6 MPa
Operating pressure	0 ... 13 bar	0 ... 10 bar	0 ... 10 bar	1 ... 10 bar	0 ... 6 bar	6 bar
Standard nominal flow rate	490 l/min	100 ... 2000 l/min	350 ... 2000 l/min		100 ... 200 l/min	
Description	•Dynamic range up to a maximum of 180 Hz •Full graphic display •Stroke limitation •Adjustable incline •Actual value in pressure or stroke •Food-safe grease NSFH1	•Controlled piston spool valve •Analogue actuation •Setpoint input as analogue voltage signal (0 ... 10 V) •Suitable for servo-pneumatic applications with end-position controller SPC11	•Controlled piston spool valve •Digitally actuated •Integrated pressure sensors for monitoring function and force control •With auto identification •Diagnostic function •Integrated digital output, e.g. for a clamping/brake unit •Suitable for servo-pneumatic applications with axis controller CPX-CMAX and end-position controller CPX-CMPX	•Linear characteristic curve for extremely easy programming •To EU Explosion Protection Directive (ATEX) •Extremely dynamic •Piston spool with integrated sensor •Electrical connection via M12x1 plug, 8-pin	•Mass flow controller (MFC) with thermal flow sensor and integrated control electronics •Dynamic regulation with short response time •Operating medium: air, oxygen, nitrogen, argon, CO2 •The current flow rate value is available via the interface •Ideal for many applications where inert gases or oxygen need to be controlled •Sustainable operation thanks to efficient control	•Very compact: only 24 mm wide •Directly controlled, dynamic piezo valve •Very flexible thanks to customisable control parameters •Excellent price/performance ratio
online: →	→ vpwi	→ mpye	→ vpwp	→ vpcf	→ vemd	→ vefc

Proportional valves
Pressure regulators

	 Proportional pressure regulators MPPES	 Proportional pressure regulators VPPE	 Proportional pressure regulators VPPM	 Proportional-pressure regulators, NPT VPPM	 Proportional pressure regulators VPPX	 Proportional pressure regulators VPPL	 Proportional pressure regulators VEAB	 Proportional pressure regulators VEAA	 Proportional pressure regulators VPPI	 Valve terminals VTEP
Valve function	3-way proportional-pressure regulator, closed	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed	3-way proportional pressure regulator	3-way proportional pressure regulator	3-way proportional pressure regulator	3-way proportional-pressure regulator, closed	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed	3-way proportional pressure regulator	3-way proportional pressure regulator	3-way proportional-pressure regulator, closed
Pneumatic connection 1	G1/2, G1/4, G1/8	G1/8	Sub-base, G1/2, G1/4, G1/8	1/8 NPT, 1/4 NPT, 1/2 NPT	Sub-base, G1/2, G1/4, G1/8	Flange, G1/4	Flange, QS-4	Flange, QS-4	G1/8	for tubing O.D. 8
Pressure regulation range [MPa]	0 ... 1 MPa	0.002 ... 1 MPa	0.002 ... 1 MPa	0.006 ... 1 MPa		0.02 ... 4 MPa			-0.1 ... 1.2 MPa	-0.1 ... 0.6 MPa
Pressure regulation range	0 ... 10 bar	0.02 ... 10 bar	0.02 ... 10 bar	0.02 ... 10 bar	0.1 ... 10 bar	-0.8 ... 60 bar			-1 ... 16 bar	-1 ... 6 bar
Operating pressure [MPa]	≤1.2 MPa	0.8 MPa				≤5 MPa				0.2 ... 0.7 MPa
Operating pressure	≤12 bar	8 bar				≤50 bar			0 ... 13 bar	2 ... 7 bar
Standard nominal flow rate		310 ... 1250 l/min	380 ... 7000 l/min	380 ... 7000 l/min	1400 ... 7000 l/min	245 l/min	≥4.5 l/min	≥7 l/min	150 ... 1630 l/min	
Description	• Directly actuated (G1/8), pilot actuated (G1/4, G1/2) • Setpoint value input as analogue voltage or current signal • Choice of pressure regulation ranges • Optionally with setpoint module • Electrical connection via plug, round design to DIN 45326, M16 x 0.75, 8-pin • With proportional solenoid	• 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 • Variants recommended for production systems for manufacturing Li-ion batteries	• Piloted pressure regulator • Multi-sensor control (cascade control) • Three default presets for fast commissioning • Integration in valve terminal MPA • User interface with LED displays, LCD display, adjustment/selection buttons • Integrated pressure sensor • Electrical connection via plug, round design, 8-pin, M12 or terminal linking	• Piloted pressure regulator • Multi-sensor control (cascade control) • Three default presets for fast commissioning • Integration in valve terminal MPA • User interface with LED displays, LCD display, adjustment/selection buttons • Integrated pressure sensor • Electrical connection via plug, round design, 8-pin, M12 or terminal linking	• 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	• For high-pressure applications • Directly actuated piston regulator • Available in three variants: flanged valve, flanged valve with external pilot air supply, in-line valve	• Control vacuum and/or overpressure with a single valve • Highly dynamic pressure control for low flow rates • Top performance and optionally available with IO-Link interface • Available as a pipe socket or sub-base valve • Additional IO-Link features: customisable control parameters, diagnostics, 2-point calibration, etc. • Silent operation and low heat generation • Very short switching times • Sustainable operation with reduced pressure level and efficient control	• High-precision up to 10 bar • Very compact size • Highly dynamic pressure control for the lowest flow rates • Available as a pipe socket or sub-base valve • Silent operation and low heat generation • Very short switching times • Sustainable operation with reduced pressure level and efficient control	• 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 the 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	• Proportional valve terminal with piezo technology • Very compact: 10 channels on an overall width of less than 120 mm • Extremely dynamic and precise control of pressure and vacuum • Very flexible thanks to customisable control parameters • Digital communication interface EtherCAT • Very low energy consumption • No wear and tear, no particle abrasion • Silent operation • Sustainable operation thanks to efficient control
online: →	→ mppes	→ vppe	→ vppm	→ vppm	→ vppx	→ vppl	→ veab	→ veaa	→ vppi	→ vtep

Process valves
Ball valves

	 Ball valves VZBD	 Ball valves VZBE	 Ball valves VZBF	 Ball valves VAPB	 Ball valves VZBA	 Ball valves VZBC
Design	2-way ball valve	2-way ball valve, 2-way ball valve with hand lever, 3-way ball valve, L-bore, T-bore	2-way ball valve	2-way ball valve	2-way ball valve, 3-way ball valve, L-bore, T-bore	2-way ball valve
Actuation type	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Nominal width DN	15, 20, 25, 32, 40, 50, 65, 80, 100	8, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100	15, 20, 25, 32, 40, 50, 65, 80, 100, 150, 200	8, 10, 15, 20, 25, 32, 40, 50, 65	8, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100	15, 20, 25, 32, 40, 50, 65, 80, 100
Process valve connection	Clamp to ASME-BPE, clamp to DIN 32676 series B, weld-on end to ASME-BPE, weld-on end to ISO 1127	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, 2 NPT, 2 1/2 NPT, 3 NPT, 4 NPT, welded end as per ASME B16.11	Flange to ANSI B16.5 class 150	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3/4, Rp3/8	Weld-on ends/weld-on ends, Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3, Rp3/4, Rp3/8, Rp4	Ring housing with threaded flange
Flow rate Kv	13 ... 1641 m3/h	5.1 ... 1637 m3/h	32 ... 7816 m3/h	5.9 ... 535 m3/h	7 ... 1414 m3/h	19.4 ... 1414 m3/h
Temperature of medium	-20 ... 200 °C	-20 ... 200 °C	-20 ... 200 °C	-20 ... 150 °C	-10 ... 200 °C	-10 ... 200 °C
Nominal pressure of process valve PN	16	63	20	25, 40	63	16, 40
Description	• Electro-polished surfaces SFV4 • PTFE seal with minimal dead space • The powerful ball valve for the pharma-ceutical and cosmetic industries • FDA-compliant seal to FDA 21 CFR 177.1550	• 2-way manual, with lockable hand lever • 2-way and 3-way with ISO 5211 top flange, optionally with lockable hand lever • Stainless steel design • Pipe thread to ASME B1.20.1 or welded end to ASME B16.11 • Optionally with pre-assembled hand lever	• Flange connections to ANSI B 16.5. class 150 • Static discharge assured • API 607 Fire Safe approval • Stainless steel design • Easy to service • Optionally with pre-assembled hand lever	• Automatable 2-way ball valve • Brass design • Blow-out proof shaft • Manual operation possible using hand lever • Connecting thread to EN 10226-1 • Mounting flange to ISO 5211	• Automatable 2-way or 3-way ball valve • Stainless steel design • Blow-out proof shaft • Manual operation possible using hand lever • Connecting thread to EN 10226-1 • Mounting flange to ISO 5211 • Use in zone 1, 21, 2, 22	• Automatable 2-way compact flanged ball valve • Stainless steel design • Short installed length • Blow-out proof shaft • Manual operation possible using hand lever • Flange to DIN 1092-1 • Mounting flange to ISO 5211 • Use in zone 1, 21, 2, 22
online: →	→ vzbd	→ vzbe	→ vzbf	→ vapb	→ vzba	→ vzbc

Process valves
Angle seat valves

	 Angle seat valves VZXA	 Angle seat valves VZXF	 Pinch valves VZQH	 Pinch valves VZQA
Design	Poppet valve with piston actuator, poppet valve with diaphragm actuator	Poppet valve with piston drive	Pinch valve	Pinch valve, pneumatically actuated
Actuator size	46 mm, 75 mm, 90 mm		Manual	Pneumatic
Valve function	2/2	2/2-way, single solenoid, closed	2/2-way, single solenoid, closed	2/2-way monostable, closed, 2/2-way monostable, open
Control function	Closed by reduced spring force, NC, double-acting, opened by spring force, NO, closed by spring force, NC		6	6, 15, 25, 50
Actuation type	Pneumatic	Pneumatic	Clamp as per ASME-BPE type A, clamp as per DIN 32676 series A, 1/4 NPT, G1/4	Clamp in accordance with ASME-BPE type A, clamp in accordance with ASME-BPE type B, clamp in accordance with DIN 32676 series A, 1/4 NPT, 1/2 NPT, 1 NPT, 2 NPT, G1, G1/2, G1/4, G2
Nominal width DN			0.7 m3/h	0.7 ... 72 m3/h
Flow rate Kv	4.6 ... 77.9 m3/h	3.3 ... 43 m3/h	0 ... 0.6 MPa	0 ... 0.6 MPa
Medium pressure [MPa]	0 ... 3 MPa	-0.09 ... 4 MPa	0 ... 6 bar	0 ... 6 bar
Pressure of medium	0 ... 30 bar	-0.9 ... 40 bar	0 ... 87 psi	0 ... 87 psi
Temperature of medium	-30 ... 230 °C	-40 ... 200 °C	-5 ... 100 °C	-5 ... 150 °C
Nominal pressure of process valve PN		16, 40	10	10
Description	•Highly flexible, extremely high flow rates •Long service life •Stainless steel or Ecobrass process valves with stainless steel or polymer actuators •Modular design •Hygienic design, insensitive to dirt •Quick and easy maintenance •Simple and sturdy: an ideal choice for virtually all media with a viscosity of up to 600 mm2/s •High chemical and thermal resistance •Sustainable due to product lifecycle extended by ease of repair •Sustainable in production thanks to the use of alternative materials	•Sturdy design •Stainless steel and gunmetal (red brass) process valves with stainless steel, brass or aluminium actuators •Different actuator sizes and housing materials •Selection of different seat and shaft seals •For liquids, gases and other easily contaminated media •Easy-to-clean design		•Modular design •Quick and easy replacement of the diaphragm •Sustainable due to product lifecycle extended by ease of repair •For critical, abrasive and viscous media •Easy-to-clean design •Flow direction is freely selectable •Versions with end-position sensing
online: →	→ vzxa	→ vzxf	→ vzqh	→ vzqa

Process valves

Solenoid actuated media valves

	 Solenoid valves VZWD	 Solenoid valves VZWD	 Solenoid valves VZWF	 Solenoid valves VZWM	 Solenoid valves VZWP	 Media separated solenoid valves VYKA	 Media-separated solenoid valves VYKC
Design	Directly actuated poppet valve	Directly actuated poppet valve	Diaphragm valve, force pilot operated	Diaphragm valve, servo-controlled	Pilot-actuated piston poppet valve	Rocker valve with diaphragm seal	Electrical connection at side, rocker valve with diaphragm seal
Actuation type	Electrical	Electrical	Electrical	Electrical	Electrical	Electrical	Electrical
Nominal width	1 ... 6.4 mm	1 ... 6 mm	13.5 ... 50 mm	13 ... 50 mm	13 ... 25 mm	1.2 mm	1.6 ... 2 mm
Process valve connection	1/8 NPT, 1/4 NPT, G1/4, G1/8	1/8 NPT, 1/4 NPT, G1/4, G1/8	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, 2 NPT, G1, G1 1/2, G1 1/4, G1/2, G1/4, G2, G3/4, G3/8	G1, G1 1/2, G1 1/4, G1/2, G1/4, G2, G3/4, G3/8	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, 1 NPT, G1, G1/2, G1/4, G3/4, G3/8		
Flow rate Kv	0.04 ... 0.64 m3/h	0.06 ... 0.4 m3/h	1.8 ... 28 m3/h	1.6 ... 39 m3/h	1.5 ... 11.5 m3/h	0.013 ... 0.021 m3/h	0.026 ... 0.048 m3/h
Medium pressure [MPa]	0 ... 10 MPa	0 ... 9 MPa	0 ... 1 MPa		0.05 ... 4 MPa	-0.05 ... 0.2 MPa	-0.075 ... 0.3 MPa
Pressure of medium	0 ... 100 bar	0 ... 90 bar	0 ... 10 bar		0.5 ... 40 bar	-0.5 ... 2 bar	-0.75 ... 3 bar
Medium pressure [psi]	0 ... 1450 psi	0 ... 1305 psi	0 ... 145 psi		7.25 ... 580 psi	-7.25 ... 29 psi	-10,875 ... 43.5 psi
Temperature of medium	-10 ... 140 °C	-10 ... 80 °C	-10 ... 80 °C	-10 ... 60 °C	-10 ... 80 °C		0 ... 50 °C
Description		• Large pressure range • Directly actuated poppet valve • No pressure difference required • Can also be used in vacuum technology	• High flow rates • Large nominal widths with relatively small solenoids • No pressure difference required • Can also be used in vacuum technology	• Brass or stainless steel casting design • Electrical connection via solenoid armature tube • Wide range of coils • Coil can be ordered separately	• For all applications with a differential pressure of min. 0.5 bar • For high pressures and high flow rates with relatively small solenoids • For controlling gaseous and liquid media in open circuits	• Maximum power density and precision in a very small space (1.2 mm nominal width with a width of only 7 mm) • High repeat accuracy and precision in dispensing processes, including the lowest volumes • Very good flushability and minimised media consumption with optimised fluid chamber and small internal volume • FDA-listed materials (PEEK, EPDM, FKM, FFKM) also suitable for aggressive media • Also ideal for gas applications due to minimal leakage values • Developed according to ISO 13485 • Sustainable operation thanks to efficient control and active air shut-off	• Flexible nominal widths (1.2 mm/1.6 mm/2.0 mm) with the same size (16 mm) • High-quality materials, therefore also suitable for aggressive media • Minimised heating effect thanks to intelligent holding current reduction • FDA-listed materials • Visual feedback by two LEDs simplifies use • Optionally with holding current reduction • Low energy consumption with efficient control
online: →	→ vzwd	→ vzwd	→ vzwf	→ vzwm	→ vzwp	→ vyka	→ vykc

Pneumatically actuated media valves

	 Pneumatic valves VLX
Design	Diaphragm valve
Valve function	2/2-way, single solenoid, closed
Actuation type	Pneumatic
Nominal width	13 ... 25 mm
Process valve connection	G1, G1/2, G1/4, G3/4, G3/8
Standard nominal flow rate	2400 ... 14000 l/min
Temperature of medium	-10 ... 80 °C
Pressure of medium	1 ... 10 bar
Description	• Poppet valve • Indirectly actuated • Brass design • In-line mounting
online: →	→ vlx

Process valve units

Ball valve actuator units

	 Ball valve units VAPB	 Ball valve units VZBE	 Ball valve actuator units VZBC	 Ball valve actuator units VZBA	 Ball valve actuator units VZPR
Design	2-way ball valve, quarter turn actuator	2-way ball valve, quarter turn actuator	2-way ball valve, quarter turn actuator	2-way ball valve, 3-way ball valve, L-bore, quarter turn actuator, T-bore	2-way ball valve, quarter turn actuator
Actuation type	Pneumatic	Pneumatic	Pneumatic	Pneumatic	Electric, pneumatic
Nominal width DN	15, 20, 25, 32, 40, 50, 63	8, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100	15, 20, 25, 32, 40, 50, 65, 80, 100	8, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100	15, 20, 25, 32, 40, 50, 63
Process valve connection	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3/4, Rp3/8	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, 2 NPT, 2 1/2 NPT, 3 NPT, 4 NPT	Ring housing with threaded flange	Weld-on ends/weld-on ends, Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3, Rp3/4, Rp3/8, Rp4	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3/4, Rp3/8
Flow rate Kv	5.9 ... 535 m3/h	19 ... 1637 m3/h	19.4 ... 1414 m3/h	7 ... 1414 m3/h	
Temperature of medium	-10 ... 200 °C	-10 ... 200 °C	-10 ... 200 °C	-10 ... 200 °C	-20 ... 150 °C
Nominal pressure of process valve PN	25, 40	63	16, 40	63	25, 40
Description	• Ball valve actuator unit with double-acting quarter turn actuator DFPD • Brass ball valve • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions	• Ball valve actuator unit with double-acting quarter turn actuator DFPD • Stainless steel ball valve • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions	• Ball valve actuator unit with double-acting or single-acting quarter turn actuator DAPS • Stainless steel ball valve in compact design • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions • Use in zones 1, 21, 2, 22	• Ball valve actuator unit with double-acting or single-acting quarter turn actuator DAPS • Stainless steel ball valve • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions • Use in zone 1, 21, 2, 22	• Ball valve actuator unit with double-acting quarter turn actuator DAPS • Brass ball valve • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions
online: →	→ vapb	→ vzbe	→ vzbc	→ vzba	→ vzpr

Process valve units

Ball valve units



Ball valve units
KVZB

Description	• Manually actuated with hand lever • Automatically actuated with semi-rotary drive • Controlled operation with quarter turn actuator and valve positioner • Variants to EU Explosion Protection Directive (ATEX)
online: →	→ kvzb

Butterfly valve units



Butterfly valve units
KVZA

Description	• For versatile use in a wide range of industry segments • Manually actuated with hand lever • Automatically actuated with semi-rotary drive • Controlled operation with quarter turn actuator and valve positioner • Butterfly valve type: wafer or lug • Nominal width DN25 ... DN200 • Connection standard DIN EN 1092-1 or ANSI CLASS 150
online: →	→ kvza

Proportioning and pipetting devices

Dispense heads



	Dispense heads VTOI
Valve function	2/2-way, single solenoid, closed
Operating pressure	-0.2 bar, 0 bar, 0.65 bar, 1 bar
Internal volume	10 µl fluid chamber valve, 178 µl distributor block with valve, needle and fittings
Fluid connection	Female thread 1/4-28 UNF-2B
Medium	Liquid media, gaseous media
Materials in contact with the media	ETFE, FPM, PEI, PPS, high-alloy stainless steel
Nominal width of dosing needle	0.3 mm
Ambient temperature	5 ... 40 °C
Description	•One valve controller for distributing to 8 dispensing channels •9 mm grid dimension – ideal for microwell plates •Simple design with side-by-side mounting for increased throughput •Complete system using just a few components •Suitable for aggressive liquids
online: →	→ vtoi

Accessories 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. no. of outputs	8
Inrush current, per output	20 ... 1000 mA
Holding current, per output	20 ... 400 mA
Inrush 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	•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 to set the calibration factor between the individual channels (opening times per valve)
online: →	→ vaem

Accessories for dispense heads



	Disposable tips DHAP
Ambient temperature	5 ... 40 °C
Description	•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
online: →	→ dhap

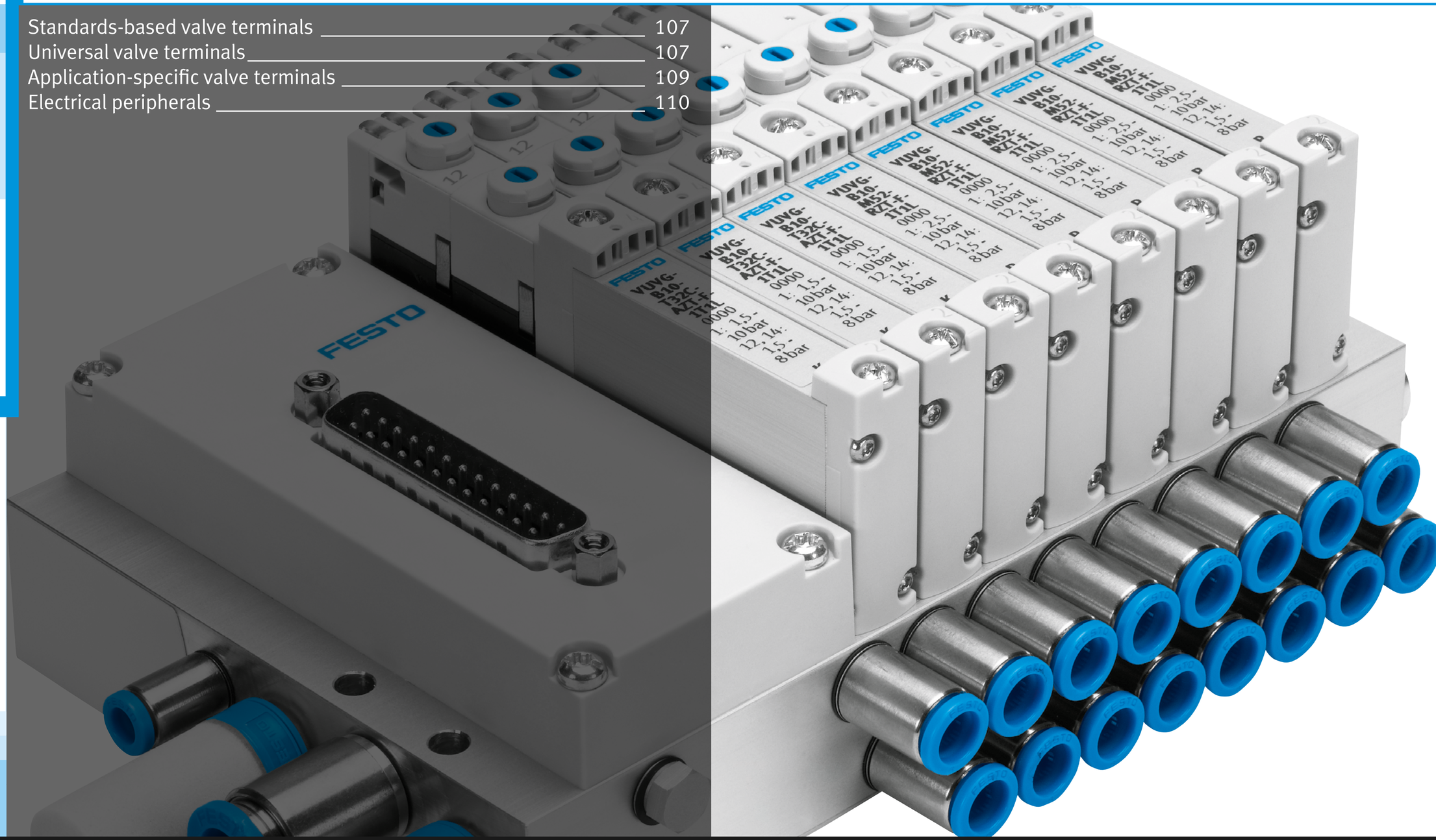
Piezo valves

	 Piezo valves VEVP	 Proportional flow control valves VEMD	 Proportional pressure regulators VEAA	 Proportional pressure regulators VEAB	 Valves VEVM
Valve function	3-way proportional-pressure regulator, closed	2-way proportional flow control valve	3-way proportional pressure regulator	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed	To be assigned via Motion App
Standard nominal flow rate		100 ... 200 l/min	≥7 l/min	≥4.5 l/min	
Operating pressure [MPa]	0.2 ... 0.7 MPa	0 ... 0.6 MPa			0.3 ... 0.8 MPa
Operating pressure	2 ... 7 bar	0 ... 6 bar			3 ... 8 bar
Pneumatic connection 1	Flange	Female thread G1/4, M5	Flange, QS-4	Flange, QS-4	G3/8
Nominal width	4 mm	1.4 ... 6 mm			4.2 mm
Nominal operating voltage DC	24 V	12 ... 24 V	24 V	24 V	24 V
Control range		0 ... 200 l/min	0.001 ... 1 MPa	-0.1 ... 0.6 MPa	
Cleanroom class	Class 3 to ISO 14644-1				
Description	•Developed for valve terminal VTEP •High precision with very low power consumption •Valve status display via LED •4 piezo valves in one bridge circuit for precise control •Available in two versions: standard and low pressure •Easy to replace with screw fastening on the connecting plate	•Mass flow controller (MFC) with thermal flow sensor and integrated control electronics •Dynamic regulation with short response time •Operating medium: air, oxygen, nitrogen, argon, CO_2 •The current flow rate value is available via the interface •Ideal for many applications where inert gases or oxygen need to be controlled •Sustainable operation thanks to efficient control	•High-precision up to 10 bar •Very compact size •Highly dynamic pressure control for the lowest flow rates •Available as a pipe socket or sub-base valve •Silent operation and low heat generation •Very short switching times •Sustainable operation with reduced pressure level and efficient control	•Control vacuum and/or overpressure with a single valve •Highly dynamic pressure control for low flow rates •Top performance and optionally available with IO-Link interface •Available as a pipe socket or sub-base valve •Additional IO-Link features: customisable control parameters, diagnostics, 2-point calibration, etc. •Silent operation and low heat generation •Very short switching times •Sustainable operation with reduced pressure level and efficient control	•Functionality can be assigned using Motion Apps •For Motion Terminal VTEM •Consisting of 4 wired piezo pilot-controlled piston seat valves •Extremely long service life •Very low energy consumption •Low leakage with the function of a proportional-pressure regulator
online: →	→ vevp	→ vemd	→ veaa	→ veab	→ vevm

Pneumatic control systems

	 Control blocks for two-hand start ZSB
Actuation type	Pneumatic
Pneumatic connection 2	G1/8
Type of mounting	Optional:, with through-hole, with female thread
Operating pressure	4 ... 8 bar
Performance level (PL)	Two-hand control/category 1, Performance Level c
Description	•Used wherever manual actuation poses a risk of accident to operating personnel •With safety functions
online: →	→ zsb

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Standards-based valve terminals

	 Valve terminals VTSA
Valve size	18 mm, 26 mm, 42 mm, 52 mm, 65 mm
Pneumatic working port	1/8 NPT, 1/4 NPT, 3/8 NPT, 1/2 NPT, G1, G1/2, G1/4, G1/8, G3/8, QS-1/2, QS-10, QS-12, QS-14, QS-16, QS-3/8, QS-5/16, QS-6, QS-8
Valve function	2x2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, double solenoid, dominant signal, 5/2-way, single solenoid, 5/2-way, single solenoid, safety function, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed, 5/3-way, port 2 pressurised, port 4 exhausted, 5/3-way, port 4 pressurised, port 2 exhausted
Max. standard nominal flow rate	550 l/min at 18 mm, 700 l/min at 18 mm, 1100 l/min at 26 mm, 1300 l/min at 42 mm, 1350 l/min at 26 mm, 1860 l/min at 42 mm, 2900 l/min at 52 mm, 4000 l/min at 65 mm
Max. no. of valve positions	32
Max. no. of pressure zones	32
Electrical control	AP interface, Ethernet, fieldbus, integrated controller
Valve terminal design	Modular, valve sizes can be mixed
Description	•Conforms to ISO 15407-2/ ISO 5599-2 •Multi-pin plug connection or fieldbus connection via the CPX system •Five valve sizes can be combined on one valve terminal •Integratable safety functions
online: →	→ vtsa

Universal valve terminals

	 Valve terminals VTUX-A-P	 Valve manifold assemblies VTUG-S	 Valve terminals with multi-pin plug/ fieldbus connection VTUG	 Valve terminal with multi-pin, fieldbus interface VTUG-EX	 Valve terminal with multi-pin, fieldbus interface VTUG-F1A
Valve size	10 mm	10 mm, 14 mm, 18 mm	10 mm, 14 mm, 18 mm	10 mm, 14 mm, 18 mm	10 mm, 14 mm
Valve function	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, closed, 5/4-way, closed, 2 or 4 exhausted	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed
Max. standard nominal flow rate		380 l/min at 10 mm, 780 l/min at 14 mm, 1380 l/min at 18 mm	330 l/min at 10 mm, 630 l/min at 14 mm, 1200 l/min at 18 mm	330 l/min at 10 mm, 630 l/min at 14 mm, 1200 l/min at 18 mm	330 l/min at 10 mm, 630 l/min at 14 mm
Max. no. of valve positions	32, 64	16	24	24	24
Max. no. of pressure zones	16	9	13	13	13
Electrical actuation		Individual connection	AP interface, individual connection, fieldbus, I-Port, IO-Link®, multi-pin plug	Fieldbus, I-Port, IO-Link®, multi-pin plug	AP interface, I-Port, IO-Link®, multi-pin plug
Valve terminal design	Modular and expandable	Fixed grid	Fixed grid	Fixed grid	Fixed grid
Description	•Flexible for centralised and decentralised installation •Compact, lightweight yet robust •Modular and cost-effective •High flow rates •Versatile options for creating pressure zones	•Compact thanks to small VUVG valves •Connection technology easy to change via the E-box •Wide range of valve functions •Also with semi in-line valves	•Low-cost fixed grid •Extremely easy assembly •Exchangeable electrical actuation •IO-Link® capable •Valves VUVG with individual electrical connection can be integrated •Also available with pneumatic multi-pin plug •Part of the VG series •Energy-efficient thanks to reverse operation and targeted pressure reduction •Optimised and space-saving variant available for installation in control cabinets •Variants with hot-swap connections: valves can be replaced during operation •Variants recommended for production systems for manufacturing Li-ion batteries	•To EU Explosion Protection Directive (ATEX) •Stainless-steel-coated terminal strips for extreme corrosion resistance, suitable for control cabinets and environments up to IP69k	•Recommended for production systems for manufacturing lithium-ion batteries •Low-cost fixed grid •Extremely easy assembly •Exchangeable electrical actuation •IO-Link® capable •Part of the VG series •Energy-efficient thanks to reverse operation and targeted pressure reduction
online: →	→ vtux	→ vtug	→ vtug	→ vtug	→ vtug-f1a

Universal valve terminals

	 Valve manifolds VTUS	 Valve terminals MPA-L	 Valve terminals MPA-S	 Valve terminals VTSA-F	 Valve terminals VTSA-F-NPT	 Valve terminals, Compact Performance CPV10, CPV14, CPV18
Valve size	21 mm, 26.5 mm, 31 mm	10 mm, 14 mm, 20 mm	10 mm, 14 mm, 20 mm	18 mm, 26 mm, 42 mm, 52 mm, 65 mm	18 mm, 26 mm, 42 mm, 52 mm, 65 mm	10 mm, 14 mm, 18 mm
Valve function	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3-way proportional pressure regulator, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, double solenoid, dominant signal, 5/2-way, single solenoid, 5/2-way, single solenoid, safety function, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed, 5/3-way, port 2 pressurised, 4 exhausted	2x2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, double solenoid, dominant signal, 5/2-way, single solenoid, 5/2-way, single solenoid, safety function, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed, 5/3-way, port 2 pressurised, 4 exhausted	2x2/2-way, single solenoid, closed, 2x2/2-way, single solenoid, open/closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 5/2-way, double solenoid, 5/2-way, single solenoid, vacuum generator, vacuum generator + 2/2-way, single solenoid, closed
Max. standard nominal flow rate		360 l/min at 10 mm, 670 l/min at 14 mm, 870 l/min at 20 mm	360 l/min at 10 mm, 550 l/min at 14 mm, 700 l/min at 20 mm	700 l/min at 18 mm, 1350 l/min at 26 mm, 1860 l/min at 42 mm, 2900 l/min at 52 mm, 4000 l/min at 65 mm	700 l/min at 18 mm, 1350 l/min at 26 mm, 1860 l/min at 42 mm, 2900 l/min at 52 mm, 4000 l/min at 65 mm	400 l/min at 10 mm, 800 l/min at 14 mm, 1600 l/min at 18 mm
Max. no. of valve positions	16	32	24, 64, 8	32	32	8
Max. no. of pressure zones	9	20	3, 7, 17	16	16	2
Electrical actuation	Single connection	Fieldbus, I-Port, IO-Link®, multi-pin plug	AS-Interface, fieldbus, multi-pin plug	AP interface, fieldbus, IO-Link, multi-pin	Ethernet, fieldbus, integrated controller	AS-Interface®, CPI installation system, individual connection, fieldbus, multi-pin plug
Valve terminal design	Fixed grid	Valve sizes can be mixed	Modular, valve sizes can be mixed	Modular, valve sizes can be mixed	Modular, valve sizes can be mixed	Fixed grid
Description	• Sturdy valves with long service life VUVS • Individual electrical connection • Pilot air supply in the manifold rail • Comprehensive accessories	• Maximum modularity • System can be extended as required with individual sub-bases and modular tie rods • Polymer sub-base • 3 valve sizes • Tamper-proof fixed flow restrictor • Fieldbus interface via CPX • IO-Link® capable	• Valve terminals for universal applications • High-performance valves in a sturdy metal housing • Metal links • Two valve sizes can be combined • Excellent communication thanks to serial links • Fieldbus interface via CPX • Max. 128 valves	• Flow rate-optimised VTSA valve terminal • Links with increased flow rates • Functions like standard valve terminals VTSA	• Flow rate-optimised valve terminal VTSA • Links with increased flow rates • Functions like standard valve terminals VTSA	• Maximum performance in the smallest of spaces • Three sizes • Wide range of connection and mounting options • Multi-pin or fieldbus actuation • IO-Link® capable
online: →	→ vtus	→ mpa-l	→ mpa-s	→ vtsa	→ vtsa	→ cpv

Application-specific valve terminals



	Valve terminals MPA-C
Valve size	14 mm
Pitch	26.8 mm
Valve function	2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed
Nominal width DN	
Max. standard nominal flow rate	780 l/min at 14 mm
Operating pressure [MPa]	-0.09 ... 0.8 MPa
Operating pressure	-0.9 ... 8 bar
Operating pressure [psi]	-13.05 ... 116 psi
Electrical control	I-Port, IO-Link®, multi-pin
Nominal operating voltage DC	24 V
Max. no. of valve positions	32
Valve terminal design	Modular and expandable
LABS (PWIS) conformity	VDMA24364-B2-L
Description	•Valve terminals in Clean Design •Easy-to-clean design •High corrosion resistance •IP69K degree of protection •FDA-compliant materials •Redundant sealing system
online: →	→ mpa-c



	Dispense heads VTOI
Pitch	9 mm
Valve function	2/2-way, single solenoid, closed
Nominal width	0.8 mm
Nominal width of dosing needle	0.3 mm
Length of dosing needle	30 mm
Operating pressure [MPa]	-0.02 ... 0.1 MPa
Operating pressure	-0.2 ... 1 bar
Operating pressure [psi]	-2.9 ... 14.5 psi
Electrical connection	2-core, 2x single core, open end
Nominal operating voltage DC	24 V
Description	•One valve controller for distributing to 8 dispensing channels •9 mm grid dimension – ideal for microwell plates •Simple design with side-by-side mounting for increased throughput •Complete system using just a few components •Suitable for aggressive liquids
online: →	→ vtoi





	Valve terminals VTEP	Valve terminals VTOP
Size		100 mm
Pitch	16 mm	
Versions		Connection block for safety functions, HFT0 prepared for exhaust, VDI/VDE 3845, connection block for safety functions, HFT0 prepared for exhaust, VDI/VDE 3847, connection block for safety functions, HFT1 prepared for exhaust, VDI/VDE 3847, end plate, double-acting, switchable direction of action, filter regulator, pressure range 0.5 ... 12 bar, grade of filtration 40 µm, filter regulator, pressure range 0.5 ... 12 bar, grade of filtration 5 µm, module for reaching a specific end position in case of a pressure failure, volume booster, double-acting, volume booster, single-acting
Operating pressure [MPa]	0.2 MPa, 0.7 MPa	0 MPa, 0.9 MPa
Operating pressure	2 bar, 7 bar	0 bar, 9 bar
Operating pressure [psi]	29 psi, 101.5 psi	0 psi, 130.5 psi
Pneumatic connection		Sub-base design, airing
Suitable for the production of Li-ion batteries	Metals with more than 5% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	
Description	•Proportional valve terminal with piezo technology •Very compact: 10 channels on an overall width of less than 120 mm •Extremely dynamic and precise control of pressure and vacuum •Very flexible thanks to customisable control parameters •Digital communication interface EtherCAT •Very low energy consumption •No wear and tear, no particle abrasion •Silent operation •Sustainable operation thanks to efficient control	•Innovative, modular, compact complete solution for control applications •Modules such as fail-safe, volume booster and filter regulator can be combined with one another as required, are easy to install, and can be extended and retrofitted without any problems •Patented integrated air duct to supply all modules as well as actuator and positioner, without leak-prone, external piping •Standardised mounting interface for direct attachment of a positioner according to VDI/VDE 3847-2 •Optimised for positioner CMSH for controlling single- and double-acting quarter turn and linear actuators •Suitable for quarter turn actuators DFPD-C with mechanical interface to VDI/VDE 3847-2 and for linear actuators DFPI-NB3 based on ISO 15552 •Sustainable operation thanks to leakage reduction at sealing points
online: →	→ vtep	→ vtop

Electrical peripherals

	 Terminal CPX	 Remote I/O systems CPX-AP-A	 Remote I/O systems CPX-AP-I	 For remote I/O systems CPX-AP-I	 Automation systems CPX-E	 Fieldbus modules CTEU
Protocol		AP		IO-Link®		AS-Interface, CANopen, CC-Link, DeviceNet, EtherCAT, EtherNet/IP, PROFINET, Modbus® TCP, PROFIBUS DP
Electrical control	Fieldbus, integrated controller	AP interface, Ethernet			Fieldbus, integrated controller	
Max. address capacity, inputs	64 bytes	1024 ... 4096 bytes		244 ... 2048 bytes	64 bytes	2 ... 64 bytes
Max. address capacity, outputs	64 bytes	1024 ... 4096 bytes		244 ... 2048 bytes	64 bytes	2 ... 64 bytes
Parameterisation	Diagnostic behaviour, failsafe response, forcing of channels, signal setup					Activate diagnostics, diagnostic behaviour, failsafe and idle response, failsafe response, IO-Link mode, watchdog disable, watchdog enable
Degree of protection	IP65, IP67	IP65, IP67		IP65, IP67	IP20	IP65, IP67
Nominal operating voltage DC	24 V					24 ... 30 V
Operational voltage range DC	18 ... 30 V					18 ... 31.6 V
Description	• Automation platform • Open to all common fieldbus protocols and Ethernet • Integrated diagnostic and maintenance functions • Applicable as stand-alone remote I/O or with valve terminals MPA-S, MPA-L, VTSA/VTSA-F • Choice of polymer or metal interlinking block with individual links • Analogue inputs and outputs, 2-way/4-way, optionally with HART protocol	• Modular and lightweight IO system with IP65/IP67 protection • Highly flexible remote IO system with maximum performance • Can be expanded and easily combined with CPX-AP-A and CPX-AP-I to form an integrated system • Seamless connectivity along with advanced diagnostics option increase machine availability and productivity • Easy to integrate into the controller of your choice: PROFINET, PROFIBUS, EtherCAT, EtherNet/IP, ModbusTCP • Module for IO-Link available • Powerful remote I/O system that flexibly links 80 modules at a data rate of 200 Mbaud in real time • Sustainable operation thanks to energy shut-off	• Powerful remote I/O system that flexibly links 80 modules at a data rate of 200 Mbaud in real time • Seamless connectivity along with advanced diagnostics option increase machine availability and productivity • Easy to integrate into the controller of your choice: PROFINET, EtherCAT, EtherNet/IP, ModbusTCP • Real-time capability and deterministic system behaviour enable cycle times of up to 250 µs • Cable lengths of up to 50 m between every module enable vast system dimensions • The IO-Link master and parameterisation software enable simple integration of any IO-Link devices • Ethernet performance up to the valve terminal and digital as well as analogue input/output modules • Sustainable operation thanks to energy shut-off	• Decentralised and lightweight I/O system in IP65/IP67 • Highly flexible remote IO system with maximum performance • Can be expanded and easily combined with CPX-AP-I and CPX-AP-A to form an integrated system • Seamless connectivity along with advanced diagnostics option increase machine availability and productivity • Easy to integrate into the controller of your choice: PROFINET, EtherCAT, EtherNet/IP, ModbusTCP • Module for IO-Link available • Powerful remote I/O system that flexibly links 80 modules at a data rate of 200 Mbaud in real time • Cable lengths of up to 50 m between every module enable vast system dimensions	• Modern control system with high performance • Fieldbus master interfaces, EtherCAT® master, fieldbus slave interfaces, PROFINET, EtherNet/IP, PROFIBUS, EtherCAT® digital input modules (16DI), digital output modules (8DO/0.5A) • Analogue input modules (current, voltage), analogue output modules (current, voltage) • Modern programming with CODESYS V3 to IEC 61131-3 • Integration of SoftMotion functions (SoftMotion) • High I/O component density • Easy mounting of the control system	• For valve terminals VTUG, MPA-L, VTOC • Can be expanded into the installation system CTEL • Fieldbus-typical LEDs, interfaces and switching elements • Isolated power supply for electronics and valves
online: →	→ cpx	→ cpx-apa	→ cpx-api	→ cpx-api	→ cpx-e	→ cteu

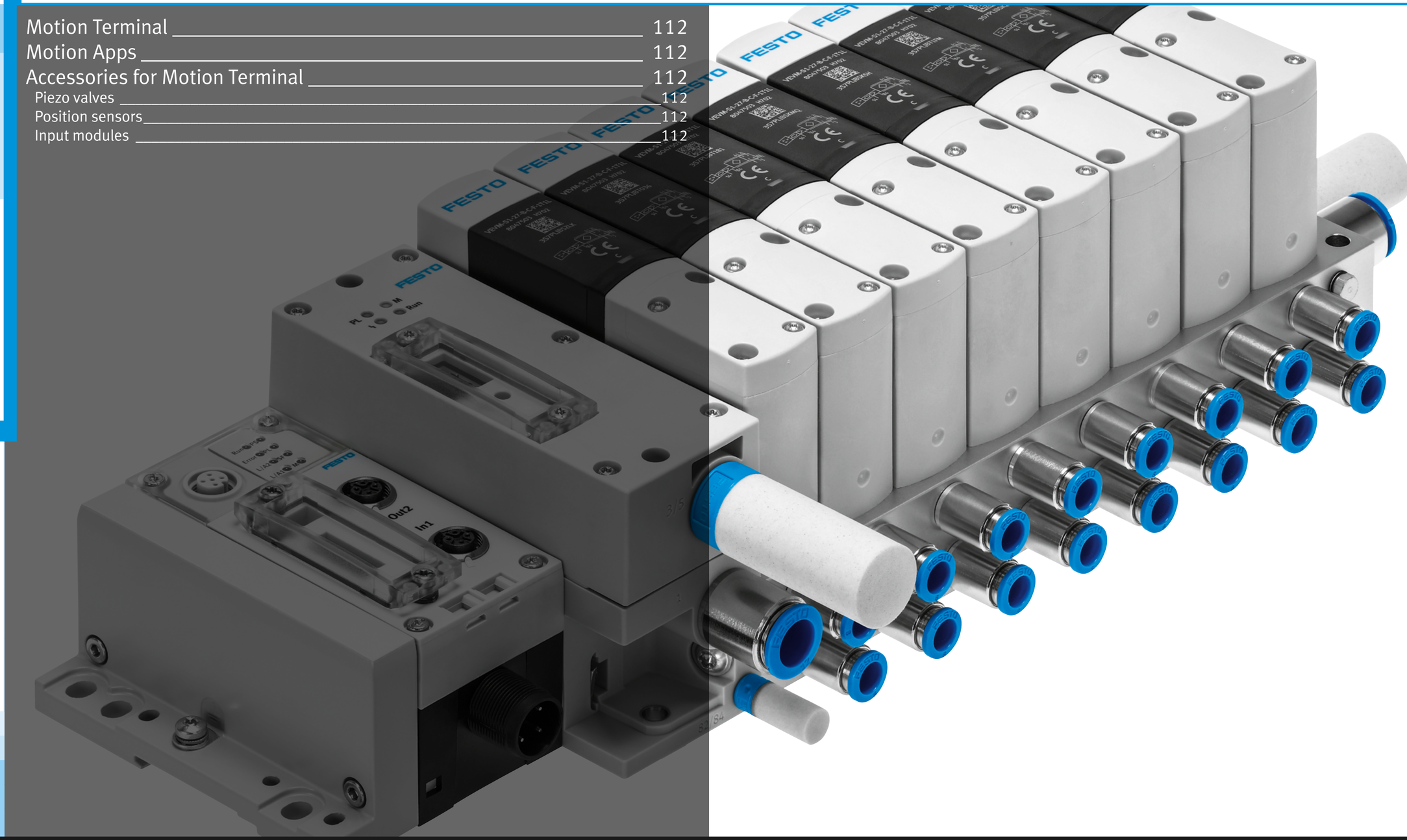
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Motion Terminal



	Motion Terminal VTEM
Valve terminal design	Fixed grid
Grid dimension	28 mm
Max. number of valve positions	8
Valve function	To be assigned via Motion App
Standard nominal flow rate, exhaust 0.6->0.5 MPa (6->5 bar, 87->72.5 psi)	480 l/min
Pneumatic connection 1	G3/8
Operating pressure [MPa]	0.3 ... 0.8 MPa
Operating pressure	3 ... 8 bar
Operating pressure [psi]	43.5 ... 116 psi
Note on operating pressure	0 - 8 bar with external pilot air, vacuum operation only at port 3
Pilot pressure [MPa]	0.3 ... 0.8 MPa
Pilot pressure	3 ... 8 bar
Pilot pressure [psi]	43.5 ... 116 psi
Motion Apps	Leakage diagnostics, Flow control, ECO drive, Positioning, Proportional pressure regulation, Proportional directional control valve, Soft stop, Presetting of travel time, Directional control valve functions, Supply and exhaust air flow control, Model-based proportional pressure regulation, Selectable pressure level
Actuation type	Electrical
Nominal operating voltage DC	24 V
Temperature of medium	5 ... 50°C
LABS (PWIS) conformity	VDMA24364 zone III
Description	•Many functions for movement, pressure and flow in one component – thanks to apps •Maximum repeat accuracy through digital parameter sets •Simple traceability – ideal for Industry 4.0 •Simple duplicability of the parameters •Increased energy efficiency •Reduced complexity and time to market •Greater profitability and knowledge protection •Predictive maintenance •Minimal installation effort
online: →	→ vtem

Motion Apps



	Motion Apps GAMM
Description	•Control programs for VEVM valves •A new dimension in flexibility thanks to Motion Apps – one valve, numerous functions •Accelerated engineering processes •Short response times without adjusting the hardware •Reduced system complexity •Shorter market launch times for your application
online: →	→ gamm

Accessories for Motion Terminal

Piezo valves



	Valves VEVM
Valve function	To be assigned via Motion App
Standard flow rate 0.8->0 MPa (8->0 bar, 116->0 psi)	1000
Operating pressure [MPa]	0.3 ... 0.8 MPa
Operating pressure	3 ... 8 bar
Pneumatic connection 1	G3/8
Nominal width	4.2 mm
Nominal operating voltage DC	24 V
Description	•Functionality can be assigned using Motion Apps •For Motion Terminal VTEM •Consisting of 4 wired piezo pilot-controlled piston seat valves •Extremely long service life •Very low energy consumption •Low leakage with the function of a proportional-pressure regulator
online: →	→ vevm

Position sensors



	Position transmitter SDAP-MHS
Design	For T-slot
Sensing range	0 ... 160000 µm
Analogue output	4 - 20 mA
Electrical connection, connection type	Cable with plug
Electrical connection, connection technology	M8x1, A-coded to EN 61076-2-104
Electrical connection, occupied pins/wires	4
Description	•Only for use with Festo Motion Terminal VTEM •Analogue sensor for VTEM input module CTMM •Measuring principle: magnetic Hall •Inserted in the slot from above, secured with screw •LED status indicators •Cable length 0.3 m •Suitable for T-slot
online: →	→ sdap

Input modules



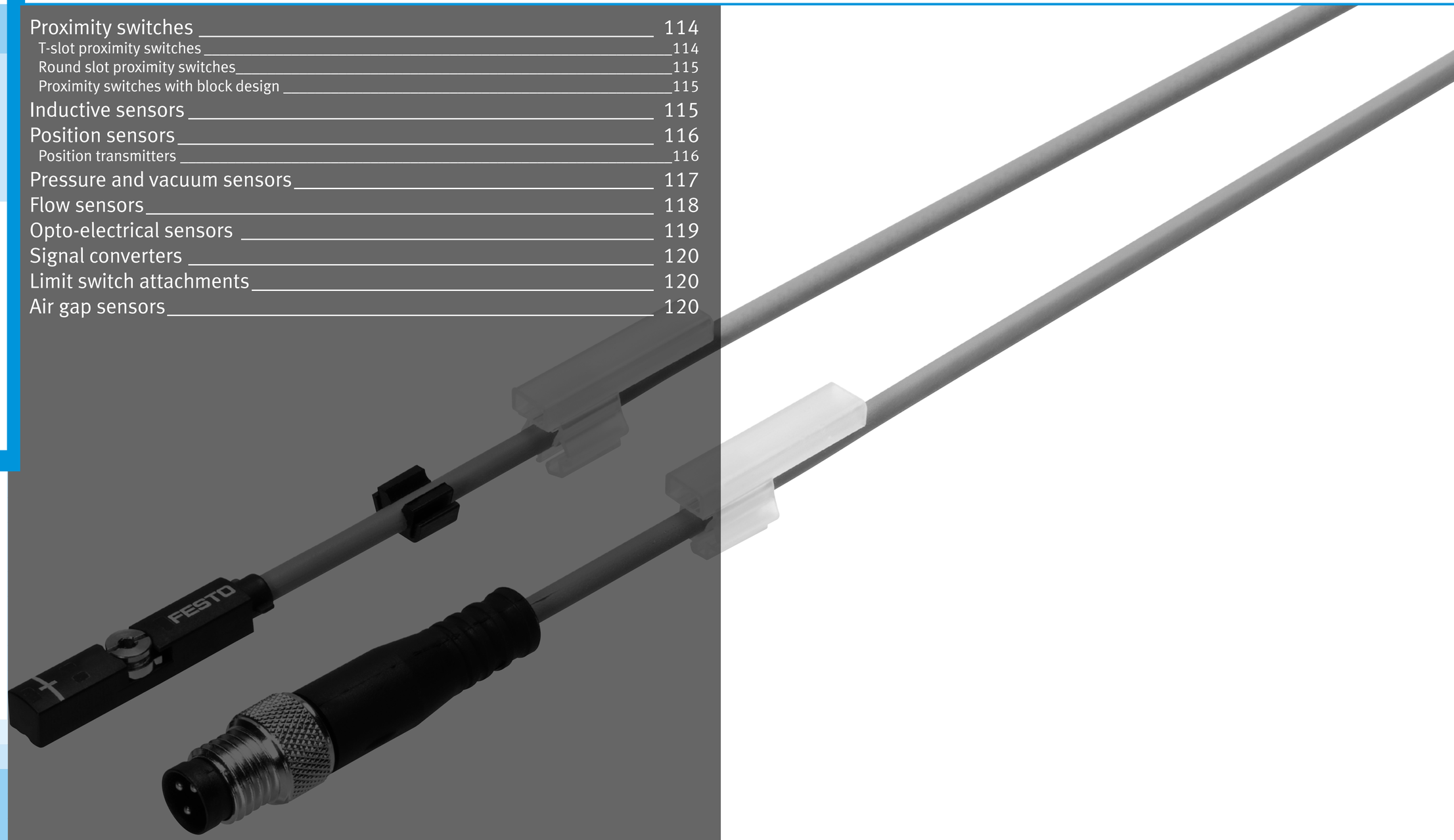
	Input modules CTMM
Electrical connection, input, function	Analog input, digital input
Electrical connection, input, connection type	8x socket
Electrical connection, input, connection technology	M8x1, A-coded to EN 61076-2-104
Electrical connection, input, number of pins/cores	3, 4
Number of inputs	8
Nominal operating voltage DC	24 V
Signal range	4 - 20 mA
Diagnostics via LED	Errors per module, status per channel
Degree of protection	IP65, IP67
Description	•For connecting analogue and digital sensors to the Motion Terminal •Digital module with PNP logic or analogue module for 4 ... 20 mA •Input signals can be transmitted to a higher-level controller by the Motion apps
online: →	→ ctmm

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Cylinder sensors
T-slot proximity switches

	 Proximity switch SMT-8M-A	 Proximity switch SDBT-MSX	 Proximity switch SDBT-BSW	 Proximity switch SDBT-MS-EX6	 Proximity switch SMT-8-SL	 Proximity switch SMT-8G	 Proximity switch CRSMT-8M
Electrical connection, connection type	Cable, cable with plug	Cable, cable with plug	Cable, cable with plug	Cable	Plug	Cable, cable with plug	Cable, cable with plug
Electrical connection, connection technology	M12x1 A-coded to EN 61076-2-101, M8x1 A-coded to EN 61076-2-104, open end	M12x1 A-coded to EN 61076-2-101, M8x1 A-coded to EN 61076-2-104, open end	M12x1 A-coded to EN 61076-2-101, open end	Open end	M8x1, A-coded to EN 61076-2-104	M8x1 A-coded to EN 61076-2-104, open end	M12x1 A-coded to EN 61076-2-101, M8x1 A-coded to EN 61076-2-104, open end
Operational voltage range DC	5 ... 30 V	10 ... 30 V	10 ... 30 V	7.5 ... 18 V	10 ... 30 V	10 ... 30 V	5 ... 30 V
Switching element function	N/C, N/O	NC or NO, switchable	N/O	NAMUR	N/O	N/O	N/O contact
Switching output	NPN, PNP, contactless, 2-wire	PNP, NPN switchable	NPN, PNP, contactless, 2-wire	NAMUR	PNP	NPN, PNP	PNP
Description	•Measuring principle: magneto-resistive •Can be used universally •Individually configurable or pre-assembled •Inserted in the slot from above, flush with the cylinder profile •LED switching status indication •LED operating reserve indication •Cable length 0.1 ... 30 m	•Measuring principle: magnetic Hall •Auto teach-in: automatic teach-in of the switching point at system start-up •Programmable: PNP/NPN, NO/NC and switching window range between 2 ... 15 mm •Inserted in the slot from above, secured with screw •LED status indicators •Cable length 0.3 ... 5 m	•Measuring principle: magneto-resistive •Welding-field-resistant •Resistant to welding spatter •For contactless piston rod position sensing on Festo pneumatic cylinders, especially the hinge cylinders DW/DWA/DWB/DWC for the automotive and tier 1 supplier industry •Inserted in the slot from above, secured with screw •LED switching status indication •Cable length 0.3 ... 5 m	•Measuring principle: magneto-resistive •To EU Explosion Protection Directive (ATEX) •Inserted in the slot from above, secured with screw •LED switching status indication •Cable length 2.5 ... 20 m	•Measuring principle: magneto-resistive •SMT-8-SL: sturdy thanks to long guides and plug directly on the sensor •Can be inserted in the slot lengthwise •LED switching status indication •Cable length 0.3, 2.5, 5 m	•Measuring principle: magneto-resistive •SMT-8G: design ideal for gripper sensing •Can be inserted in the slot lengthwise •LED switching status indication •Cable length 0.3, 2.5, 5 m	•Measuring principle: magneto-resistive •Corrosion-resistant design •Food-safe (see www.festo.com/certificates/CRSMT_8M), resistant to acids and cooling lubricants •Inserted in the slot from above, flush with the cylinder profile •LED switching status indication •Cable length 0.3 m, 5 m, 10 m
online: →	→ smt-8m	→ sdbt	→ sdbt	→ sdbt	→ smt-8	→ smt-8G	→ crsmt-8m

Cylinder sensors

Round slot proximity switch

	 Proximity sensor SMT-10M	 Proximity sensor SMT-10G
Electrical connection, connection type	Cable, cable with plug	Cable, cable with plug
Electrical connection, connection technology	M12x1 A-coded to EN 61076-2-101, M8x1 A-coded to EN 61076-2-104, open end	M8x1 A-coded to EN 61076-2-104, open end
Electrical connection, number of pins/cores	2, 3	3
Operational voltage range DC	5 ... 30 V	10 ... 30 V
Switching element function	N/O contact	N/O contact
Switching output	NPN, PNP, contactless, 2-wire	NPN, PNP
Description	•Measuring principle: magneto-resistive •Can be used universally •Individually configurable or pre-assembled •Inserted in the slot from above, flush with the cylinder profile •LED switching status indication •Cable length 0.3, 2.5 m	•Measuring principle: magneto-resistive •SMT-10G: design ideal for gripper sensing •Can be inserted in the slot lengthwise •LED switching status indication •Cable length 0.3, 2.5 m
online: →	→ smt-10M	→ smt-10

Proximity switches with block design

	 Proximity switch SMT-C1
Electrical connection, connection type	Cable, cable with plug
Electrical connection, connection technology	M12x1 A-coded to EN 61076-2-101, M8x1 A-coded to EN 61076-2-104, open end
Electrical connection, number of pins/cores	3
Operational voltage range DC	10 ... 30 V
Switching element function	N/O contact
Switching output	PNP
Description	•Measuring principle: magneto-inductive •Easy-to-clean design •Food grade see www.festo.com/certificates/SMT_C1 •For Clean Design standards-based cylinder DSBF with mounting rail for sensors •LED switching status indication
online: →	→ smt-c1

Inductive sensors

	 Proximity switch SIEN	 Proximity switch SIEH	 Proximity switch SIES-Q	 Proximity switch SIES-8M	 Distance sensor SOIA
Size	4 mm, 6.5 mm, M12, M12x1, M18, M18x1, M30, M30x1.5, M5x0.5, M8x1	3 mm, M12, M18	8x8x59 mm, 15x20x30 mm, 40x40x120 mm, 5x5x25 mm, 8x8x40 mm	Slot 8	Q40, M12, M18, M30, M8
Switching output	NPN, PNP	NPN, PNP	NPN, PNP	NPN, PNP	PNP/NPN switchable, push-pull
Switching element function	N/C, N/O	N/C, N/O	Antivalent, N/C contact, N/O contact	N/C, N/O	Switchable
Electrical connection	3-wire, cable		Screw terminal		
Operational voltage range DC	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V	10 ... 30 V
Description	•With standards-based switching distance •For DC voltage •Round design •Metric thread •Flush or non-flush mounting •LED switching status indication •Design with metal or polyamide housing	•With increased switching distance •Flush mounting •Metric thread •LED switching status indication •Design with stainless steel housing	•Block design •Flush mounting •LED switching status indication	•Suitable for position sensing for electric axes and grippers with T-slot •Flush mounting •Switching status indication with 2 LEDs for better visibility regardless of the direction from which it is approached •Only inductive sensor for 8 slot with patented LED status indicator	•Inductive distance, speed and acceleration sensor •Sensor for monitoring pneumatic, hydraulic and elastic cushioning •IO-Link 1.1 Smart Sensor Profile •Sizes: M8, M12, M18, M30, Q40 •Enables predictive maintenance and prevents expensive production downtime
online: →	→ sien	→ sieh	→ sies	→ sies	→ soia

Position sensors

Position transmitter

	 Position transmitter SDAC-MHS	 Position transmitter SDAT-MHS	 Position transmitter SDAS-MHS	 Position transmitter SMAT-8M	 Position transmitter SDAP-MHS
Design	For C-slot	For T-slot	For T-slot	For T-slot	For T-slot
Sensing range	25000 ... 35000 µm	0 ... 160000 µm	≤52000 µm	≤52000 µm	0 ... 160000 µm
Analogue output	0 - 10 V	0 - 10 V, 4 - 20 mA		0 - 10 V	4 - 20 mA
Electrical connection, connection type	Cable, cable with plug	Cable with plug	Cable, cable with plug	Cable, cable with plug	Cable with plug
Electrical connection, connection technology	M8x1 A-coded to EN 61076-2-104, open end	M8x1, A-coded to EN 61076-2-104	M8x1 A-coded to EN 61076-2-104, open end	M8x1 A-coded to EN 61076-2-104, open end	M8x1, A-coded to EN 61076-2-104
Electrical connection, occupied pins/wires	3, 4	4	4	3, 4	4
Description	•Measuring principle: magnetic Hall •Sensing range up to 35 mm •IO-Link, 2 programmable switching outputs •Analogue output 0 ... 10 V •Very compact design makes the unit especially well suited to work with pneumatic grippers, compact air cylinders and any application that needs to be performed in a tight space •LED status indicators •Cable length 0.3, 2.5 m •Suitable for round slot	•Measuring principle: magnetic Hall •Analogue output 0 ... 10 V or 4 ... 20 mA •Programmable IO-Link®/switching output •Inserted in the slot from above, secured with screw •LED status indicators •Cable length 0.3 m •Suitable for T-slot	•Measuring principle: magnetic Hall •IO-Link, 2 programmable switching outputs •Inserted in the slot from above •Very compact design makes the unit especially well suited to work with pneumatic grippers, compact air cylinders and any application that needs to be performed in a tight space •LED status indicators •Cable length 0.3, 2.5 m •Suitable for T-slot	•Measuring principle: magnetic Hall •Analogue output 0 ... 10 V •Very compact design makes the unit especially well suited to work with pneumatic grippers, compact air cylinders and any application that needs to be performed in a tight space •Inserted in the slot from above, secured with screw •LED status indicators •Cable length 0.3 m •Suitable for T-slot	•Only for use with Festo Motion Terminal VTEM •Analogue sensor for VTEM input module CTMM •Measuring principle: magnetic Hall •Inserted in the slot from above, secured with screw •LED status indicators •Cable length 0.3 m •Suitable for T-slot
online: →	→ sdac	→ sdat	→ sdas	→ smat-8m	→ sdap

Pressure and vacuum sensors

	 Pressure sensors SDE5	 Pressure sensors SPAN, SPAN-B	 Pressure sensors SPAE	 Pressure sensors SPAU	 Pressure sensors SPAW	 Pressure sensors SDE3	 Pressure transmitter SPTE	 Pressure transmitter SPTW	 PE converter PEN, PE, VPE
Pressure measuring range [MPa]		-0.1 ... 1.6 MPa	-0.1 ... 1 MPa	-0.1 ... 1.6 MPa	-0.1 ... 10 MPa	-0.1 ... 1 MPa	-0.1 ... 1 MPa	-0.1 ... 10 MPa	
Pressure measuring range	-1 ... 10 bar	-1 ... 16 bar	-1 ... 10 bar	-1 ... 16 bar	-1 ... 100 bar	-1 ... 10 bar	-1 ... 10 bar	-1 ... 100 bar	
Pressure measuring range [psi]		–14.5 ... 232 psi	–14.5 ... 145 psi	–14.5 ... 232 psi	–14.5 ... 1450 psi	–14.5 ... 145 psi	–14.5 ... 145 psi	–14.5 ... 1450 psi	
Switching element function	N/C, N/O, switchable	NC or NO, switchable	N/C, N/O, switchable	NC or NO, switchable	Switchable	Switchable			N/O
Switching output	NPN, PNP	2 x PNP or 2 x NPN switchable, PNP/NPN switchable	PNP, NPN switchable	2 x PNP or 2 x NPN switchable, 2xPNP	2x NPN, 2x PNP	2x NPN, 2x PNP			PNP
Pneumatic connection	QS-1/4, QS-4, QS-5/32, QS-6	Male thread 1/8 NPT, male thread G1/8, R1/8, female thread G1/8, M5, for tubing O.D. 4	Flange, cartridge 10, push-in sleeve QS-4, QS-6, QS-3, QS-4	Flange, 1/8 NPT, G1/8, M5, M7, QS-4, QS-5/32, QS-6, R1/4, R1/8	Male thread G1/2, female thread G1/4	QS-4, QS-5/32	Flange, cartridge 10, push-in sleeve QS-4, QS-6, QS-3, QS-4	G1/4	M5
Electrical connection	3-wire, 3-pin, cable, plug, as per EN 60947-5-2, round design, M8x1		3-core, cable, open end				3-core, cable, open end		3-core, cable, open end
Electrical connection 1, connection type		Plug		Plug	Plug	Cable, cable with plug, plug		Plug	
Display type		Illuminated LCD	LED display, 2-digit	Illuminated LCD, LED	4-character alphanumeric, LED indicator	Illuminated LCD			
Description	•Programmable and configurable pressure switch for simple pressure sensing tasks •Threshold/window comparator •Switching point adjustment via teach-in function •Integrated microprocessor •Switching status indication by an LED visible from all sides •Certification: c UL us Listed (OL), C-Tick	•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	•Electronic pressure sensor with piezoresistive pressure measuring cell, integrated signal processing, numeric pressure indicator in percent, operating key and a switching output, PNP/NPN switchable •Display of minimum and maximum measured value •All parameters entered can be transferred to other SPAEs (replicator function) •Communication interface IO-Link®	•For monitoring compressed air and non-corrosive gases •With or without display •Transfer of the pressure value as switching signal, analogue signal or via IO-Link® to the connected control system •Maximum flexibility thanks to a wide range of pneumatic adaptations and switchable electrical outputs	•Highly robust •For liquid and gaseous media •Quick and easy setting of the switching outputs using three pushbuttons •Optimum legibility: display housing rotatable 320°, display at an angle of 45°	•5 pressure measuring ranges •Measurement of relative or differential pressure or two independent pressure inputs •Switching output 2x PNP or 2x NPN •Numerical and graphical pressure indication •Mounting: with DIN rail, with wall/surface mount, front panel mounting, with through-hole •Certification: C-Tick, ATEX, c UL us Listed (OL)	•Piezoresistive pressure sensor •Measured variable: relative pressure •Cable length 2.5 m •Compact: 8-bracket wall mount for manifold assembly	•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	•Pneumatic/electrical differential pressure switch •Pneumatic/electric pressure transducer •Designed for vacuum •Mounting via through-hole, on mounting frame 1n, on mounting frame 2n •Splash-proof design •Certification: CCC, RCM
online: →	→ sde5	→ span	→ spae	→ spau	→ spaw	→ sde3	→ spte	→ sptw	→ pen

Flow sensors

	 Flow transmitter SFTE	 Flow sensors SFAH	 Flow sensors SFAW	 Flow sensors SFAB	 Flow sensors SFAM
Flow measuring range	0 ... 10 l/min	0.002 ... 200 l/min	1.8 ... 100 l/min	0.1 ... 1000 l/min	10 ... 15000 l/min
Operating medium	Nitrogen, compressed air to ISO 8573-1:2010 [6:4:4]	Argon, nitrogen, compressed air to ISO 8573-1:2010 [6:4:4]	Liquid media, water, neutral liquids	Argon, carbon dioxide, nitrogen, compressed air ISO 8573-1:2010 [7:4:4], ISO 8573-1:2010 [6:4:4]	Argon, carbon dioxide, nitrogen, compressed air ISO 8573-1:2010 [7:4:4]
Operating pressure	-0.9 ... 10 bar	-0.9 ... 10 bar	0 ... 12 bar	0 ... 10 bar	16 bar
Pneumatic connection	Female thread M5, for push-in connector O.D. 3, 4	Female thread G1/4, G1/8, for tubing O.D. 4, 6, 8		for tubing O.D. 1/4, 10, 12, 3/8, 5/16, 6, 8	Battery module, 1/2 NPT, 1 NPT, 1 1/2 NPT, G1, G1 1/2, G1/2
Switching output		2 x PNP or 2 x NPN switchable	2 x PNP or 2 x NPN switchable	2 x PNP or 2 x NPN switchable	2 x PNP or 2 x NPN switchable
Electrical connection, connection type	Cable, cable with plug	Plug	Plug	Plug	Plug
Electrical connection, connection technology	M8x1 A-coded to EN 61076-2-104, open end	Plug pattern L1J, M8x1 A-coded to EN 61076-2-104	M12x1, A-coded, to EN 61076-2-101	M12x1, A-coded, to EN 61076-2-101	M12x1, A-coded, to EN 61076-2-101
Description	• Compact design • Universal flow detection • Easy installation • Reliable pick & place application for extremely small workpieces	• Process air, compressed air, forming gas and pneumatic object monitoring, handling 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	• Cooling circuit monitoring, leakage or line break monitoring, process water monitoring, fill level monitoring • Input connection: clamped terminal connection DN15, DN20, barbed hose fitting 13 mm, female thread G1/2, G3/4, G1, user-specific connection • With optional integrated temperature sensor • Connection to higher-level systems is provided by two switching outputs, an analogue output and/or an IO-Link® interface • Certification: RCM, c UL us Listed (OL) • Rotatable display, 90° anticlockwise and 180° clockwise	• Flow sensor with integrated digital display • With unidirectional flow input • Mounting: H-rail, wall or surface mounting • Certification: C-Tick • Sustainable operation with system consumption monitoring	• IO-Link® communication with efficient remote parameterisation and replication function • All-in-one solution with integrated pressure and temperature measurement • As a stand-alone device or as a space-saving version in the service unit components of the MS series • Supplies absolute flow information and accumulated air consumption measurements • High accuracy, even at compressed air quality [7:4:4] as per ISO 8573 • Reliable measurement even of high flow rates • Sustainable operation with system consumption monitoring
online: →	→ sfte	→ sfah	→ sfaw	→ sfab	→ sfam

Opto-electrical sensors

	 Retro-reflective sensors, diffuse sensors, light barriers SOOD	 Retro-reflective sensors, diffuse sensors, distance sensor, light barriers SOOE	 Diffuse sensor, retro-reflective sensor SOEG-RT, SOEG-RS	 Through-beam sensors SOEG-E, SOEG-S	 Colour sensors SOEC	 Fibre-optic units SOE4	 Fork light barrier SOOF
Measurement method	Retro-reflective sensor, through-beam sensor, transmitter, receiver, diffuse sensor with background suppression	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	Retro-reflective sensor, diffuse sensor, diffuse sensor with background suppression	Through-beam sensor, receiver, transmitter	Colour sensor	Fibre-optic unit	Fork light barrier
Working range	0 ... 10000 mm	0 ... 20000 mm	10 ... 2000 mm	20000 mm	12 ... 32 mm		
Size			M12, M12x1, M18, M18x1	M18x1	50x50x17 mm		Fork 120x60 mm, 30x35 mm, 50x55 mm, 80x55 mm
Setting options		IO-Link®, potentiometer, teach-in	Potentiometer		Teach-in, teach-in via electrical connection	Teach-in, teach-in via electrical connection	IO-Link®, potentiometer, teach-in
Type of light	Laser, red, LED	Laser, red, LED	Red, polarised red	Red	White	Red	Red
Switching output	Push-pull	Push-pull	NPN, PNP	NPN, PNP	PNP	NPN, PNP	Push-pull, NPN, PNP
Description	•Easy to operate •Quick to commission •Reliable and stable sensing •Attractive price/performance ratio	•Easy to operate •Quick to commission •Reliable and stable sensing •Attractive price/performance ratio	•Round design •Electrical connection via open cable end or plug connector	•Round design •Electrical connection via open cable end or plug connector	•Diffuse sensor •Block design •Electrical connection via M12x1 plug, 8-pin •Display via 7 LEDs	•Use for precise and space-saving position sensing in the electronics and light assembly industry •Switching frequencies of up to 8000 Hz •Operational with fibre-optic cable SOOC as accessory •Variants: LED or LED display, timer function •Mounting: DIN rail mounting or with through-hole •With protection against mutual interference	•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 indicators
online: →	→ sood	→ sooe	→ soeg	→ soeg	→ soec	→ soe4	→ soof

Signal converter

	 Signal converter SCDN	 Signal converter SVE4
Signal range	0 - 10 V, 0 - 20 mA	Adapted for position sensors SMH-S1-HG
Switching output	2 x PNP or 2 x NPN switchable	2x NPN, 2x PNP
Switching function	Freely programmable	Freely programmable
Electrical connection, connection type	Plug	Socket
Electrical connection, connection technology	Plug pattern L1J	M8x1, A-coded to EN 61076-2-104
Electrical connection, number of pins/cores	4	4
Electrical connection 2, connection type	2 x socket	Plug
Electrical connection 2, connection technology	Connection pattern EC	M8x1, A-coded to EN 61076-2-104
Electrical connection 2, number of pins/cores	4	4
Description	•Converts analogue signals to IO-Link® signals •Switching function freely programmable with teach-in •Mounting: wall or surface mounting, front panel mounting, manifold mounting using mounting brackets •Large, illuminated LCD display	•Converts analogue signals into switching points •Switching function freely programmable with teach-in •Threshold value, hysteresis or window comparator •Mounting: DIN rail mounting or with adapter plate •LED switching status indication •Certification: c UL us Listed (OL), C-Tick
online: →	→ scdn	→ sve4

Limit switch attachments

	 Limit switch attachments SRBK	 Limit switch attachments SRBC	 Limit switch attachments SRBE	 Limit switch attachments SRAP
Information on housing materials	PA, PA66, electrically conductive	Die-cast aluminium	Painted die cast aluminium	Wrought aluminium alloy
Operating voltage range AC	0 ... 230 V	0 ... 230 V	0 ... 240 V	
Operational voltage range DC	0 ... 175 V	0 ... 175 V	0 ... 60 V	15 ... 30 V
Measuring principle	Inductive, magnetic reed, mechanical/electrical	Inductive, magnetic reed, mechanical/electrical	Inductive, magnetic reed, mechanical/electrical, for proximity sensor	Magnetic Hall
Switching element function	N/O contact, toggle switch, single-pole	N/C contact, N/O contact, toggle switch, single-pole	N/C contact, N/O contact, toggle switch, single-pole, toggle switch, double-pole	
Safety integrity level (SIL)	SIL 3	SIL 3	SIL 3	
Description	•Sturdy polymer housing with UV resistance •Different switch variants – mechanical, inductive and reed switches •Multifunctional mounting adapter for adaptations on the VDI/VDE 3845 interface •Variants with M12 plug connection for easy installation (plug&play)	•Pre-assembled mounting adapter for ease of installation •The trip cams can be easily set without additional tools •Sturdy, corrosion-resistant design, ideal for use in harsh ambient conditions •Clearly visible 3D position indicator enables the current position of the quarter turn actuator to be quickly detected •With safety functions •Variants to EU Explosion Protection Directive (ATEX)	•The trip cams can be easily set without additional tools •Sturdy, corrosion-resistant design, ideal for use in harsh ambient conditions •Clearly visible 3D position indicator enables the current position of the quarter turn actuator to be quickly detected •With safety functions •To EU Explosion Protection Directive (ATEX)	•Based on standard VDI/VDE 3845 (NAMUR) •Analogue •For monitoring the position of quarter turn actuators •Sensors based on 2D Hall technology •Variants to EU Explosion Protection Directive (ATEX)
online: →	→ srbk	→ srbc	→ srbe	→ srap

Air gap sensors

	 Air gap sensors SOPA
Sensing range	20 ... 200 µm
Operating pressure	4 ... 7 bar
Display type	Illuminated LCD, multi-colour
Operating medium	Compressed air to ISO 8573-1:2010 [7:4:4]
Description	•Convenient solution for high-precision contact and distance monitoring •Setting option: IO-Link®, teach-in or numerical setting using three buttons •Integrated blow-out function •Multi-coloured LCD display •Mounting: DIN rail mounting, wall mounting, through-hole •Certification: C-Tick
online: →	→ sopa

Compressed air service units 122
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Compressed air service units

Series MS-B



	Service units MS4-EM1FR, MS6-EM1FR
Size	4, 6
Pressure indicator	G1/8 prepared, with pressure gauge
Operating pressure [MPa]	0.1 ... 1 MPa
Operating pressure	1 ... 10 bar
Standard nominal flow rate	1500 ... 5300 l/min
Type of mounting	Optional:, cable installation, with mounting bracket, with accessories
LABS (PWIS) conformity	VDMA24364-B1/B2-L
Description	•Combination of on/off valve and filter regulator •With manual or fully automatic condensate drain •For filtered and unlubricated compressed air supply •Supply pressure can be switched on or off •Output pressure is infinitely adjustable within the pressure regulation range
online: →	→ ms4-em1fr

MS series





	Service units MSB4, MSB6, MSB9	Energy efficiency module MSE6
Pneumatic connection 1	1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, G1, G1 1/2, G1 1/4, G1/2, G1/4, G1/8, G3/4	G1/2, G3/4
Standard nominal flow rate	750 ... 18000 l/min	4500 ... 7000 l/min
Flow measuring range		50 ... 5000 l/min
Pressure regulation range	0.5 ... 16 bar	2.5 ... 10 bar
Operating pressure [MPa]	0 ... 2 MPa	0.35 ... 1.3 MPa
Operating pressure	0 ... 20 bar	3.5 ... 13 bar
Grade of filtration	0.01 ... 40 µm	
Fieldbus interface		2x socket, M12x1, 4-pin, D-coded, 2x socket RJ45 push-pull, AIDA, socket Sub-D, 9-pin
Description	•Combination of filter regulator, filter, lubricator, on/off valve, soft-start valve •Grid dimensions 40, 62, 90 mm (size 4, 6, 9)	•Intelligent service unit component for optimising the use of compressed air as an energy medium in industrial automation technology •Combination of flow sensor and shut-off valve with pressure sensor •Identification of production downtime and leakages •Equipped with measuring, control and diagnostic functions •Fieldbus connection (PROFIBUS DP, PROFINET IO, EtherNet/IP or EtherCAT) via integrated fieldbus nodes enables connection to a higher-level controller •Sustainable operation with active air shut-off and pressure reduction
online: →	→ msb4	→ mse6

Filter regulators/lubricators >

MS series



	Service units MSB4-FRC, MSB6-FRC
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8
Standard nominal flow rate	850 ... 4800 l/min
Pressure regulation range	0.3 ... 12 bar
Operating pressure	0.8 ... 20 bar
Grade of filtration	5 µm, 40 µm
Description	•Filter, regulator and lubricator functions in a single unit •High flow rate and extremely efficient in removing contaminants •Good regulation characteristics with minimal pressure hysteresis •Grid dimensions 40, 62 mm (size 4, 6)
online: →	→ msb4-frc

Filter regulator

Series MS-B

	 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 [MPa]	0.03 … 0.7 MPa
Pressure regulation range	0.3 … 7 bar
Grade of filtration	5 µm, 40 µm
Operating pressure [MPa]	0.1 … 1 MPa
Operating pressure	1 … 10 bar
Description	•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 perfect combination of low-cost basic functionality and high-end functional requirements •Stable control behaviour •With or without pressure gauge •Rotary knob with latch •With integrated secondary exhausting and primary exhausting with return flow function •MS2: directly actuated diaphragm regulator •MS4, MS6: directly actuated piston regulator •Grid dimensions 25, 40, 62 mm (sizes 2, 4, 6)
online: →	→ ms2-lfr

MS series

	 Filter regulators MS4-LFR, MS6-LFR, MS9-LFR, MS12-LFR
Pneumatic connection 1	internal, G1/2, G1/4, G1/8, G3/8
Standard nominal flow rate	850 … 24000 l/min
Pressure regulation range	0.3 … 16 bar
Operating pressure	0.8 … 20 bar
Grade of filtration	5 µm, 40 µm
Description	•MS4-LFR, MS6-LFR: directly actuated diaphragm regulator, MS9-LFR: piloted or directly actuated filter-diaphragm regulator, MS12-LFR: piloted diaphragm regulator without internal air consumption •Good regulation characteristics with minimal pressure hysteresis and primary pressure compensation •Good particle and condensate separation •With or without secondary exhausting •High flow rate •Lockable rotary knob •Return flow option for exhausting from output 2 to input 1 already integrated •Variants to EU Explosion Protection Directive (ATEX) •With or without pressure gauge •Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)
online: →	→ ms4-lfr

Individual devices

	 Filter regulators PCRI	 Filter regulators PCRP	 Filter regulators LFR-EX4
Pneumatic connection 1		1/4 NPT, 1/2 NPT, G1/2, G1/4, NPT1/2-14, NPT1/4-18	1/4 NPT, 1/2 NPT, G1/2, G1/4
Standard nominal flow rate	1400 l/min	1600 … 4115 l/min	1150 … 3400 l/min
Pressure regulation range	0.5 … 8 bar	0.5 … 12 bar	0.5 … 16 bar
Grade of filtration	5 µm, 40 µm	5 µm, 40 µm	5 µm, 40 µm
Operating pressure [MPa]	0.1 … 0.9 MPa	0.1 … 2 MPa	0.1 … 2 MPa
Operating pressure	1 … 9 bar	1 … 20 bar	1 … 20 bar
Description	•Pneumatic extension module for valve terminal VTOP •Smooths pressure fluctuations and regulates the compressed air to the set output pressure •Removes dirt particles from the compressed air that passes through it	•Sturdy housing for the specific requirements of process automation •Suitable for use outdoors and at temperatures down to –60 °C •Resistant to UV radiation and corrosive environments •Two pressure gauge connections for different installation options •With manual condensate drain, rotating •Size 44, 64 •Sustainable operation thanks to reduced pressure level	•Sturdy thanks to full metal design •High corrosion resistance (corrosion resistance class CRC 3 to Festo standard 940 070) and chemical resistance •Ambient temperature -40 … +80 °C •Resistant to UV radiation and corrosive environments •With or without pressure gauge •Reliable manual drain •Energy efficient: excellent leakage values •Attractively priced •To EU Explosion Protection Directive (ATEX) •Size: Midi
online: →	→ pcri	→ pcrp	→ lfr

Compressed air filter

Series MS-B

	 Filter MS2-LF-B
Pneumatic connection 1	M5, QS-6
Standard nominal flow rate	225 ... 250 l/min
Operating pressure	1 ... 10 bar
Grade of filtration	5 µm
Cleanroom class	Class 7 to ISO 14644-1
Suitable for the production of Li-ion batteries	Suitable for battery production in accordance with Festo internal definition in severity level F1A with restrictions regarding the use of Cu/Zn/Ni
Description	•Very compact and extremely lightweight series for use close to the process directly in the machine •Lightweight and sturdy thanks to modern polymer materials •Compatible with the MS series for the perfect combination of low-cost basic functionality and high-end functional requirements •With manual condensate drain, rotating •Variants recommended for production systems for manufacturing Li-ion batteries
online: →	→ ms2-lf-b

MS series

	Filter MS4-LF, MS6-LF, MS9-LF, MS12-LF	 Fine filters MS4-LFM-B, MS6-LFM-B, MS9-LFM-B, MS12-LFM-B	 Micro filter MS4-LFM-A, MS6-LFM-A, MS9-LFM-A, MS12-LFM-A	 Activated carbon filter MS4-LFX, MS6-LFX, MS9-LFX, MS12-LFX
Pneumatic connection 1	internal, G1/2, G1/4, G1/8, G3/8	Manifold module, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, G1, G1 1/2, G1 1/4, G1/2, G1/4, G1/8, G3/4, G3/8	Manifold module, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, G1, G1 1/2, G1 1/4, G1/2, G1/4, G1/8, G3/4, G3/8	Manifold module, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, G1, G1 1/2, G1 1/4, G1/2, G1/4, G1/8, G3/4, G3/8
Standard nominal flow rate	1000 ... 16000 l/min			4800 ... 6000 l/min
Operating pressure	0 ... 20 bar	0 ... 20 bar	0 ... 20 bar	0 ... 20 bar
Grade of filtration	5 µm, 40 µm	0.01 µm, 1 µm	0.01 µm, 1 µm	0.01 µm, 1 µm
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	•Good particle and condensate separation •High flow rate with minimal pressure drop •Available with manual, semi-automatic, fully automatic, or fully automatic, electrically actuated condensate drain •Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)	•High-efficiency filter for exceptionally clean compressed air •Removal of oil aerosols from compressed air •Available with differential pressure indicator for indicating filter contamination •Available with electronic filter pollution indicator •Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)	•High-efficiency filter for exceptionally clean compressed air •Removal of oil aerosols from compressed air •Available with differential pressure indicator for indicating filter contamination •Available with electronic filter pollution indicator •Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)	•Removal of gaseous oil particles from compressed air using activated carbon •Air quality class at the output [1.4.1] as per ISO 8573-1 •Eliminates odours and vapours •Residual oil content = 0.003 mg/m³ •Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)
online: →	→ ms4-lf	→ ms4-lfm-b	→ ms4-lfm-a	→ ms4-lfx

Individual devices

	 Micro filter PFML
Size	90, 186
Grade of filtration	0.01 µm
Operating pressure [MPa]	0 ... 5 MPa
Operating pressure	0 ... 50 bar
Operating pressure [psi]	0 ... 725 psi
Description	•For high-pressure applications •Food-safe see www.festo.com/certificates/PFML
online: →	→ pfml

Pressure regulator

Series MS-B

	 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 [MPa]	0.1 ... 1 MPa
Operating pressure	1 ... 10 bar
Description	•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 perfect combination of low-cost basic functionality and high-end functional requirements •Stable control behaviour •With or without pressure gauge •Rotary knob with latch •With integrated secondary exhausting and primary exhausting with return flow function •MS2: directly actuated diaphragm regulator •MS4, MS6: directly actuated piston regulator •Grid dimensions 25, 40, 62 mm (sizes 2, 4, 6) •Sustainable operation thanks to reduced pressure level
online: →	→ ms-lr-b

MS series

	 Pressure regulators MS4-LR, MS6-LR, MS9-LR	 Pressure regulators MS12-LR	 Pressure regulators MS4-LRB, MS6-LRB	 Precision pressure regulators MS6-LRP, MS6-LRPB
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8	Sub-base	G1/2, G1/4	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, G1/2, G1/4, G3/4, G3/8
Standard nominal flow rate	800 ... 30000 l/min	12000 ... 22000 l/min	300 ... 7300 l/min	800 ... 9000 l/min
Pressure regulation range	0.1 ... 16 bar	0.15 ... 16 bar	0.3 ... 16 bar	0.05 ... 12 bar
Operating pressure [MPa]	0.08 ... 1.4 MPa	0.08 ... 2.1 MPa		0.1 ... 1.4 MPa
Operating pressure	0.8 ... 20 bar	0.8 ... 21 bar	0.8 ... 20 bar	1 ... 14 bar
Description	•High flow rate with minimal pressure drop •Good control characteristics with minimal pressure hysteresis and primary pressure compensation •With or without secondary exhausting •Lockable rotary knob •Optional pressure sensor and rotary knob pressure gauge •Grid dimension 25, 40, 62, 90 mm (size 2, 4, 6, 9)	•High flow rate with minimal pressure drop •Good regulation characteristics with minimal pressure hysteresis and primary pressure compensation •With secondary exhaust •Lockable rotary knob •With or without pressure gauge •MS12-LR-...-PO: pneumatically actuated (pressure range determined by pilot regulator) •MS12-LR-...-PE6: electrically actuated (pilot control via proportional pressure regulator) •Grid dimensions 124 mm (size 12) •Sustainable operation thanks to reduced pressure level	•To build up a regulator manifold with through air supply for pressure ranges that can be adjusted independently of one another •Good control characteristics with minimal pressure hysteresis and primary pressure compensation •Lockable rotary knob •With or without secondary exhausting •Integrated return flow option for exhausting from output 2 to input 1 •Optional pressure sensor and rotary knob pressure gauge •Variants to EU Explosion Protection Directive (ATEX) •Grid dimensions 40, 62 mm (size 4, 6)	•As individual device and for manifold assembly •Manifold assembly with through air supply •Good control characteristics with minimal pressure hysteresis and primary pressure compensation •High secondary exhausting •Lockable rotary knob •Optional pressure sensor and rotary knob pressure gauge •Grid dimensions 62 mm (size 6)
online: →	→ ms4-lr	→ ms12-lr	→ ms4-lrb	→ ms6-lrp

Individual devices

	 Precision pressure regulators LRP, LRPS	 Electric pressure regulators PREL
Pneumatic connection 1	For sub-base Ø 7 mm, G1/4, G1/8	G1
Standard nominal flow rate	240 ... 2300 l/min	
Pressure regulation range	0.05 ... 10 bar	0.4 ... 40 bar
Operating pressure [MPa]	0.1 ... 1.2 MPa	0 ... 5 MPa
Operating pressure	1 ... 12 bar	0 ... 50 bar
Description	•Lockable design •Good regulation characteristics with minimal pressure hysteresis and primary pressure compensation •High secondary exhausting •Variants to EU Explosion Protection Directive (ATEX) •Variants recommended for production systems for manufacturing Li-ion batteries	•For high-pressure applications •Food grade see www.festo.com/certificates/PREL •Size 90 mm, 186 mm
online: →	→ lrp	→ prel

On/off and soft-start valves >

Series MS-B

	 On/off valves MS4-EE-B, MS6-EE-B	 Soft-start valves MS4-EDE-B, MS6-EDE-B
Design	Poppet valve, solenoid actuated	Poppet valve, solenoid actuated
Pneumatic connection 1	G1/2, G1/4	G1/2, G1/4
Operating pressure [MPa]	0.3 ... 0.7 MPa	0.3 ... 0.7 MPa
Operating pressure	3 ... 7 bar	3 ... 7 bar
Standard nominal flow rate	2000 ... 5000 l/min	2000 ... 5000 l/min
Exhaust air function	Cannot be throttled	Cannot be throttled
Electrical connection	Type C, to EN 175301-803	Type C, to EN 175301-803
Description	• Very compact and extremely lightweight series for use close to the process directly in the machine • Electrically operated 3/2-way valve for pressurising and exhausting pneumatic systems • Ducted exhaust air possible via threaded connection with silencer • Detenting and non-detenting manual override • Supply voltage 24 V DC • With solenoid coil, without plug socket • Variants recommended for production systems for manufacturing Li-ion batteries • Grid dimensions 40, 62 mm (size 4, 6)	• Very compact and extremely lightweight series for use close to the process directly in the machine • Electrically operated 3/2-way valve for slowly pressurising and exhausting pneumatic systems • The switching pressure can be precisely controlled with a solenoid valve • Adjustable switching time delay • Built-in connections into which the tubing can be directly inserted • Detenting and non-detenting manual override • Supply voltage 24 V DC • Variants recommended for production systems for manufacturing Li-ion batteries • Grid dimensions 40, 62 mm (size 4, 6)
online: →	→ ms-ee-b	→ ms-ede-b

MS series

	 Soft-start/quick exhaust valves MS6-SV-E, MS6-SV-D	 Soft-start/quick exhaust valves MS6-SV-C, MS9-SV-C	 On/off valves MS4-EM1, MS6-EM1, MS9-EM, MS12-EM	 On/off valves MS4-EE, MS6-EE, MS9-EE, MS12-EE	 Soft-start valves MS4-DL, MS6-DL, MS12-DL	 Soft-start valves MS4-DE, MS6-DE, MS12-DE
Pneumatic connection 1	G1/2	G1/2	Manifold module, G1/2, G1/4, G1/8, G3/8	Manifold module, G1/2, G1/4, G1/8, G3/8	Manifold module, G1/2, G1/4, G1/8, G3/8	Manifold module, G1/2, G1/4, G3/8
Standard nominal flow rate	4300 ... 16550 l/min	4300 ... 16550 l/min	1200 ... 32000 l/min	1000 ... 32000 l/min	1000 ... 42000 l/min	1000 ... 42000 l/min
Operating pressure	3 ... 16 bar	3 ... 16 bar	0 ... 20 bar	3 ... 18 bar	2 ... 20 bar	3 ... 18 bar
Actuation type	Electrical	Electrical	Manual	Electrical	Pneumatic	Electrical
Description	• With safety functions • For reducing pressure quickly and reliably and for building up pressure gradually • Adjustable pressure build-up time • Optionally with silencer • Supply voltage 24 V DC • Grid dimensions 62 mm (size 6)	• With safety functions • For reducing pressure quickly and reliably and for building up pressure gradually • Adjustable pressure build-up time • Adjustable switch-through pressure • Supply voltage 24 V DC • Grid dimensions 62, 90 mm (size 6, 9)	• Manual 3/2-way valve for pressurising and exhausting pneumatic systems • A silencer can be attached or the exhaust air can be ducted at port 3 • Switching position is immediately recognisable • Optionally with pressure gauge and pressure sensor • Variants to EU Explosion Protection Directive (ATEX) • Variants recommended for production systems for manufacturing Li-ion batteries • Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)	• Electric 3/2-way valve for pressurising and exhausting pneumatic systems • A silencer can be attached or the exhaust air can be ducted at port 3 • Supply voltage 24 V DC, 110, 230 V AC • Optionally with pressure gauge and pressure sensor • With solenoid coil, without plug socket • Variants to EU Explosion Protection Directive (ATEX) • Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)	• 2/2-way valve for slowly pressurising pneumatic systems (for use with on/off valves EM(1) and EE) • For building up pressure gradually • Adjustable pressure build-up time • Variants to EU Explosion Protection Directive (ATEX) • Grid dimension 40, 62, 124 mm (size 4, 6, 12)	• 2/2-way valve for slowly pressurising pneumatic systems with electrically switchable pressure switchover point • Supply voltage 24 V DC, 110, 230 V AC • Switchable pressure switching point • For advancing the actuators slowly and reliably into the initial position • For avoiding sudden and unexpected movements • Adjustable pressure build-up time • Variants to EU Explosion Protection Directive (ATEX) • Grid dimension 40, 62, 124 mm (size 4, 6, 12)
online: →	→ ms6-sv-e	→ ms6-sv-c	→ ms4-em1	→ ms4-ee	→ ms4-dl	→ ms4-de

Individual devices

	 On/off valves PVEL
Nominal width DN	54
Operating pressure [MPa]	0 ... 5 MPa
Operating pressure	0 ... 50 bar
Actuation type	Manual, pneumatic
Description	• Food grade see www.festo.com/certificates/PVEL • For high-pressure applications
online: →	→ pvel

Compressed air dryers

MS series

	Membrane air dryer MS4-LDM1, MS6-LDM1
Pneumatic connection 1	G1/2, G1/4
Standard nominal flow rate	50 ... 400 l/min
Operating pressure	3 ... 12.5 bar
Pressure dew point reduction	20 K
Description	•Final dryer with excellent operational reliability •Suitable for use as an individual device or for integration into existing service unit combinations •Flow rate-dependent dew point reduction •Wear-free function requiring no external energy •Grid dimensions 40, 62 mm (size 4, 6)
online: →	→ ms4-ldm1

Individual devices

	 Adsorption dryer PDAD
Pneumatic connection 1	G1/2, G3/8
Input pressure 1	4 ... 16 bar
Pressure dew point	-40 °C
Description	•Ideal for decentralised compressed air drying •Integrated filtering of oil and particulates •Defined pressure dew point •Low purge air consumption
online: →	→ pdad

Compressed air distributor

MS series

	 Branching modules MS4-FRM, MS6-FRM, MS9-FRM, MS12-FRM	 Distributor blocks MS4-FRM-FRZ, MS6-FRM-FRZ
Pneumatic connection 1	G1/4, G1/2, G1, G2, manifold module, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, G1, G1 1/2, G1 1/4, G1/2, G1/4, G1/8, G3/4, G3/8	G1/4, G1/2
Standard nominal flow rate in main flow direction 1->2	1200 ... 50000 l/min	4050 ... 14600 l/min
Operating pressure	0 ... 20 bar	0 ... 20 bar
Description	•Optionally with integrated non-return function and pressure sensor •Outlet at the top and underneath •Can be used as an intermediate distributor for varying air qualities •Optionally with pressure sensor •Variants recommended for production systems for manufacturing Li-ion batteries •Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)	•Slim pneumatic distributor •Outlet at the top and underneath •Can be used as an intermediate distributor for varying air qualities •Can be used as an adapter between two pressure regulators with large rotary knob with pressure gauge of size 4 •Grid dimensions 40, 62 mm (size 4, 6)
online: →	→ ms*-frm	→ ms*-frm-frz

Individual devices

	 Branching modules PMBL
Pneumatic connection 3	G1
Pneumatic port 4	G1
Operating pressure [MPa]	0 ... 5 MPa
Operating pressure	0 ... 50 bar
Description	•For high-pressure applications •Food grade see www.festo.com/certificates/PMBL •Size 90 mm, 186 mm
online: →	→ pmbl

Compressed air lubricators
MS series



	Lubricators MS4-LOE, MS6-LOE, MS9-LOE, MS12-LOE
Pneumatic connection 1	internal, G1/2, G1/4, G1/8, G3/8
Standard nominal flow rate	1100 ... 27000 l/min
Operating pressure	1 ... 16 bar
Minimum flow rate for lubricator function	40 ... 400 l/min
Description	• Proportional lubricator with precision oil dosing • Quick and easy top-up even under pressure • Oil capacity 30 ... 1500 cm^3 • Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12)
online: →	→ ms4-loe

Condensate drain
MS series



	Water separator MS6-LWS, MS9-LWS, MS12-LWS
Pneumatic connection 1	G1/2, G1/4, G3/8
Operating pressure	0.8 ... 16 bar
LABS (PWIS) conformity	VDMA24364-B1/B2-L
Description	• Replacement of filter cartridges not required • Constantly high condensate separation (99%) up to the maximum flow rate • Available with fully automatic or fully automatic, electrically actuated condensate drain • Grid dimension 62, 90, 124 mm (size 6, 9, 12)
online: →	→ ms6-lws

Air boosters



	Pressure booster DPA
Pneumatic connection 1	G1/2, G1/4, G3/8, QS-10, QS-12, QS-16
output pressure 2	4 ... 16 bar
Input pressure 1	2 ... 10 bar
Description	• Pneumatic pressure increase up to the double input pressure • Available as pressure booster/air pressure reservoir combinations • Any mounting position possible • Short filling times • Long service life • Compact design • Available with sensing option
online: →	→ dpa

Pressure gauge

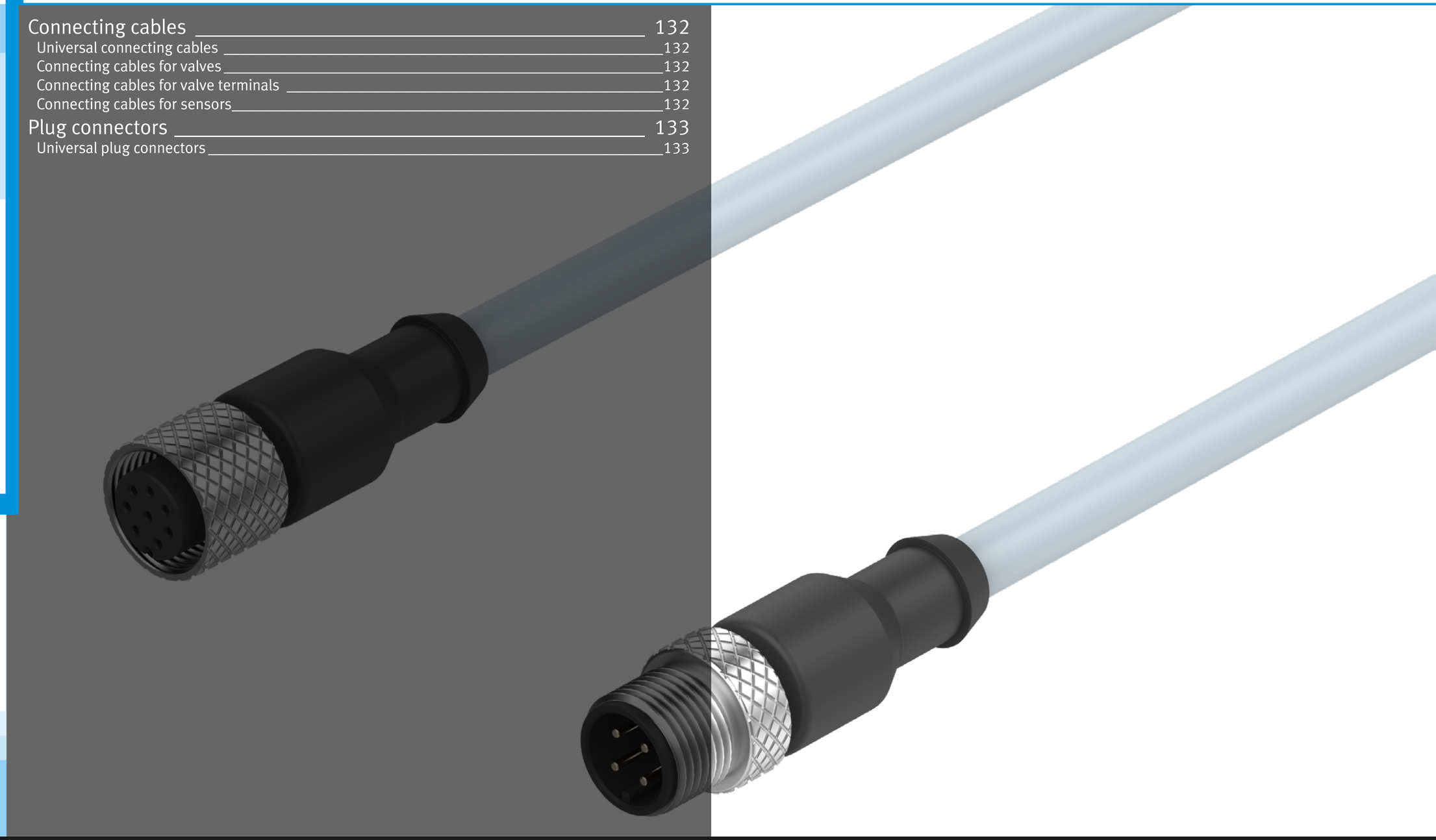
	 Pressure gauge PAGN	 Pressure gauge MA	 Flanged pressure gauge FMA	 Pressure gauge kits DPA	 Vacuum gauge VAM, FVAM	 Pressure gauge PAGL
Type of mounting	Front panel mounting, inline installation	Inline installation	Front panel mounting	With male thread	Front panel mounting, screw-in	Inline installation
Indicating range [MPa]	0 ... 1.6 MPa	0 ... 1.6 MPa				0 ... 6 MPa
Display range	0 ... 16 bar	0 ... 25 bar	0 ... 16 bar		-1 ... 9 bar	0 ... 60 bar
Display range [psi]	0 ... 232 psi	0 ... 362.5 psi	0 ... 232 psi		0 ... 130 psi	0 ... 870 psi
Pneumatic connection	G1/8 with sealing ring, cartridge 10, G1/4, R1/8	G1/4, G1/8, M5, QS-4, QS-6, QS-8, R1/4, R1/8	G1/4	G1/4, G1/8, R1/8	G1/4, G1/8, R1/4, R1/8	G1/4
Operating pressure [MPa]	0 ... 1.6 MPa	0 ... 2.5 MPa	0 ... 1.6 MPa			0 ... 6 MPa
Operating pressure	0 ... 16 bar	0 ... 25 bar	0 ... 16 bar	10 ... 16 bar	-1 ... 9 bar	0 ... 60 bar
Operating pressure [psi]	0 ... 232 psi	0 ... 362.5 psi	0 ... 232 psi			0 ... 870 psi
Measurement accuracy class	1, 1.6, 2.5, 4, 5	1.6, 2.5, 4, 5	1.6, 2.5	2.5, 4	2.5	1.6
Description	• Designs based on EN 837-1 • Display units bar, psi, MPa	• Designs based on DIN EN 837-1, optionally with red-green range • Pneumatic connection via R, G or metric thread, push-in connector • Display units bar, psi, MPa	• Designs based on EN 837-1 • Pneumatic connection via G thread • Display units bar, psi	• For pressure booster DPA • For monitoring the input and output pressure • Pneumatic connection via R or G thread	• Designs based on DIN EN 837-1, optionally with red-green range • Pneumatic connection via R or G thread • Double or single scale • Display units bar, inHg, psi	• For high-pressure applications • Display units bar, psi, MPa
online: →	→ pagn	→ ma	→ fma	→ dpa	→ vam	→ pagl

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Connecting cables

Universal connecting cables

	 Power supply sockets NEBU	 Plug sockets with cables M12x1 A-coded, 8-pin NEBU-M12W8-K, SIM-M12	 Connecting cables M12x1 A-coded, 1 mm² NEBU-M12G5-E
Electrical connection, connection type	Socket, cable	Socket, cable	Socket, cable, plug
Electrical connection, cable outlet	Angled	Angled	Straight
Electrical connection, design	Round	Round	Round
Electrical connection, connection technology	G7/8 coded in accordance with NFPA/T3.5.29 R1-2007, open end	M12x1 A-coded to EN 61076-2-101, open end	M12x1 A-coded to EN 61076-2-101, open end
Electrical connection, number of pins/cores	5	8	5
Cable length	2 m	2 ... 15 m	5 ... 10 m
Description	•Connecting cables with 5-pin plug/socket M12x1 A-coded as per EN 61076-2-101 and nominal conductor cross-section 1 mm² (NEBU-M12G5-E-...-Q8N-...) •Shielded connecting cables with 8-pin angled socket M12x1 A-coded as per EN 61076-2-101 (NEBU-M12W8-K-...) •Connecting cable with power supply socket G7/8 coded as per NFPA/T3.5.29 R1-2007 (NEBU-G78W5-...)	•Screened connecting cables with 8-pin sockets M12x1 A-coded as per EN 61076-2-101 •Cable length 2 ... 25 m	•Connecting cables with 5-pin plug/socket M12x1 A-coded as per EN 61076-2-101 •Nominal conductor cross-section 1mm² •Cable length 5 ... 10 m
online: →	→ nebu	→ m12_m8	→ m12_1

Connecting cables for valves

	 Connecting cables MHJ9-KMH
Electrical connection	2-pin / 2-pin / 4-core, straight socket / straight socket / cable
Operational voltage range DC	12 ... 53 V
Trigger signal range DC	3 ... 30 V
Additional functions	Spark quenching; holding current reduction with energy recovery; protective shutdown
Cable length	0.5 ... 2.5 m
Description	•With control electronics for solenoid valves MHJ9 •With plug sockets KMH •With PVC cable •Ambient temperature -5 ... +50 °C
online: →	→ mhj9-kmh

Connecting cables

Connecting cables for valve terminals

	 Connecting cables VMPA-KMS1, VMPA-KMS2, VMPAL-KM, VMPAL-KMSK	 Power supply sockets NEBU
Electrical connection	Cable with plug	
Electrical connection, connection type	Socket, cable	Socket, cable
Electrical connection, cable outlet	Angled	Angled
Electrical connection, design	Rectangular	Round
Electrical connection, connection technology	Open end, Sub-D	G7/8 coded in accordance with NFPA/T3.5.29 R1-2007, open end
Electrical connection, number of pins/cores	10, 25	5
Cable length	2.5 ... 10 m	2 m
Description	•For multi-pin plug connection Sub-D •Connecting cable between valve terminal MPA and controller •Variants suitable for energy chains •Pre-assembled at one end •With PVC or PUR cable •Ambient temperature -40 ... +80 °C	•Connecting cables with 5-pin plug/ socket M12x1 A-coded as per EN 61076-2-101 and nominal conductor cross-section 1 mm² (NEBU-M12G5-E-...-Q8N-...) •Shielded connecting cables with 8-pin angled socket M12x1 A-coded as per EN 61076-2-101 (NEBU-M12W8-K-...) •Connecting cable with power supply socket G7/8 coded as per NFPA/ T3.5.29 R1-2007 (NEBU-G78W5-...)
online: →	→ vmpa-kms	→ nebu

Connecting cables for sensors

	 Power supply sockets NEBU
Electrical connection, connection type	Socket, cable
Electrical connection, cable outlet	Angled
Electrical connection, design	Round
Electrical connection, connection technology	G7/8 coded in accordance with NFPA/T3.5.29 R1-2007, open end
Electrical connection, number of pins/cores	5
Cable length	2 m
Description	•Connecting cables with 5-pin plug/ socket M12x1 A-coded as per EN 61076-2-101 and nominal conductor cross-section 1 mm² (NEBU-M12G5-E-...-Q8N-...) •Shielded connecting cables with 8-pin angled socket M12x1 A-coded as per EN 61076-2-101 (NEBU-M12W8-K-...) •Connecting cable with power supply socket G7/8 coded as per NFPA/ T3.5.29 R1-2007 (NEBU-G78W5-...)
online: →	→ nebu

Plug connector

Universal plug connectors

	 Push-in T-connector NEDU	 Multi-pin plug distributor NEDU
Electrical connection	Straight socket, M12, 5-pin, A-coded, straight socket, M12x1, 5-pin, A-coded, straight plug, M12x1, 2-pin, A-coded, 4-pin / 4-pin / 4-pin, A-coded / A-coded / A-coded, socket / socket / plug, M12x1 / M12x1 / M12x1	Straight socket, M8, 3-pin, straight plug, M12x1, 8-pin
Operational voltage range DC	0 V ... 30 V	10 V ... 30 V
Current rating at 40° C	4 A	3 A
Degree of protection	IP65, IP67	IP68
Description	•For fieldbus connection •Branch line for connecting and disconnecting fieldbus components	•Particularly compact •LED switching status indication
online: →	→ nedu	→ nedu

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- → About Festo

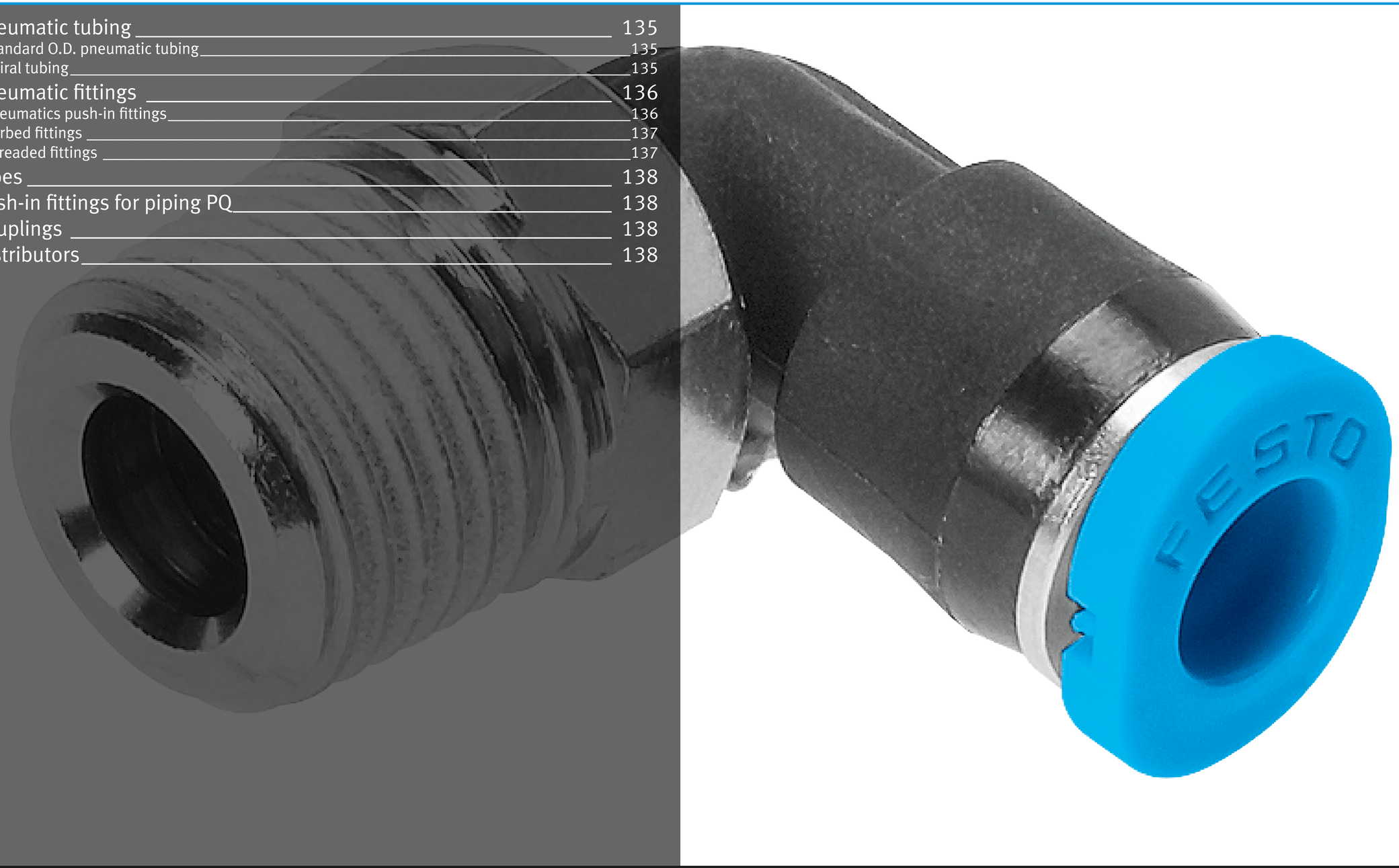
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Pneumatic tubing

Standard O.D. pneumatic tubing

	 Plastic tubing PUN-H, PUN-H-DUO	 Plastic tubing PUN-H-SF	 Plastic tubing PUN-H-F	 Plastic tubing PTFEN	 Plastic tubing PEN	 Plastic tubing PAN	 Heavy-duty tubing PAN-R	 Customer-specific tubing PAN, PEN, PLN, PUN	 Plastic tubing PLN	 Plastic tubing PFAN
Outside diameter	2 ... 16 mm	4 ... 25 mm	4 ... 16 mm	4 ... 16 mm	4 ... 16 mm	4 ... 16 mm	4 ... 28 mm	3 ... 16 mm	4 ... 16 mm	3 ... 12 mm
Inside diameter	1.2 ... 11 mm	2.3 ... 15.3 mm	2.6 ... 11 mm	2.9 ... 11 mm	2.7 ... 10.8 mm	2.9 ... 12 mm	2.5 ... 23 mm	2 ... 12 mm	2.9 ... 12 mm	2.3 ... 8.4 mm
Temperature-dependent operating pressure [MPa]	-0.095 ... 1 MPa	-0.095 ... 1.3 MPa	-0.095 ... 1 MPa	-0.095 ... 1.5 MPa	-0.095 ... 1 MPa	-0.095 ... 1.9 MPa	-0.095 ... 3.5 MPa		-0.095 ... 1.4 MPa	-0.095 ... 1.6 MPa
Temperature-dependent operating pressure	-0.95 ... 10 bar	-0.95 ... 13 bar	-0.95 ... 10 bar	-0.95 ... 15 bar	-0.95 ... 10 bar	-0.95 ... 19 bar	-0.95 ... 35 bar	-0.95 ... 35 bar	-0.95 ... 14 bar	-0.95 ... 16 bar
Temperature-dependent operating pressure [psi]	-13,775 ... 145 psi	-13,775 ... 188.5 psi	-13,775 ... 145 psi	-13,775 ... 217.5 psi	-13,775 ... 145 psi	-13,775 ... 275.5 psi	-13,775 ... 507.5 psi		-13,775 ... 203 psi	-13,775 ... 232 psi
Ambient temperature	-35 ... 60 °C	-35 ... 80 °C	-35 ... 60 °C	-20 ... 150 °C	-30 ... 60 °C	-30 ... 80 °C	-30 ... 80 °C	-60 ... 100 °C	-30 ... 80 °C	-20 ... 150 °C
Description	• Polyurethane • High resistance to microbes and hydrolysis • Suitable for energy chains • Cleanroom-compatible combination with fitting NPKA • Also available as DUO tubing • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PUN_H	• Polyurethane • Very resistant to kinking and extremely sturdy thanks to increased wall thickness • Maximum flexibility despite increased wall thickness • High resistance to microbes and hydrolysis • Suitable for energy chains • Operating medium: compressed air, vacuum, water	• Polyurethane • High resistance to microbes and hydrolysis • For food safety certificates, see www.festo.com/certificates/PUN_H_F • Operating medium: compressed air, vacuum, water	• Polytetrafluoroethylene • For food-safe grade, see www.festo.com/certificates/PTFEN • Highly resistant to chemicals • High temperature resistance • Operating medium: compressed air, vacuum	• Polyethylene • High resistance to chemicals and very high resistance to hydrolysis • Resistant to most cleaning agents and lubricants • Suitable for energy chains • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PEN_S	• Polyamide • High thermal and mechanical load capacities • Highly resistant to microbes • Operating medium: compressed air, vacuum	• Polyamide • For applications with a high pressure range • Highly resistant to microbes • Operating medium: compressed air, vacuum	• Individual lengths: delivered in units of 25, 50, 100, 200 ... 500 m • Minimum order quantity: from 1500 m/3000 m (or less depending on type) depending on diameter • Customised design: specific printing possible • Easy to recognise and use: individual colour selection • Choose from 9 basic colours; further colours available on request • Select, size and order quickly, easily and reliably with the configurator	• Polyethylene • High resistance to chemicals, microbes and hydrolysis • Food-safe see www.festo.com/certificates/PLN • Resistant to most cleaning agents and lubricants • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PLN	• Perfluoroalkoxy alkane • Pneumatic tubing with resistance to high temperatures and chemicals • For food-safe grade, see www.festo.com/certificates/PFAN • High resistance to chemicals, microbes, UV radiation, hydrolysis and stress cracks • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PFAN
online: →	→ pun-h	→ pun-h-sf	→ pun-h-f	→ ptfen	→ pen	→ pan	→ pan-r	→ pan	→ pln	→ pfan

Spiral tubing

	 Spiral plastic tubing PPS
Outside diameter	6.3 ... 7.8 mm
Inside diameter	4.7 ... 6.2 mm
Working length	7.5 ... 15 m
Temperature-dependent operating pressure	-0.95 ... 21.2 bar
Ambient temperature	-30 ... 80 °C
Description	• Polyamide, brass, galvanised steel • Pre-assembled with 2 rotatable connectors and captive sealing rings OL • Highly resistant to microbes • Operating medium: compressed air, vacuum
online: →	→ pps

Pneumatic fittings
Pneumatics push-in fittings

	 Push-in fittings/connectors, mini series QSM	 Push-in fittings/connectors, standard series QS	 Push-in fittings/connectors NPQH	 Push-in fitting NPQO	 Push-in fittings/connectors NPQR
Pneumatic connection 1	Male thread M8x1.25, push-in sleeve Ø 2 mm, Ø 3 mm, Ø 4 mm, Ø 6 mm, male thread G1/8, M3, M5, M6, M6x0.75, M7, M8x0.75, R1/8, female thread M3, M5, for hose O.D. 2 mm, 3 mm, 4 mm, 6 mm	Push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, Ø 16 mm, 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, for hose O.D. 10 mm, 12 mm, 16 mm, 4 mm, 6 mm, 8 mm	Push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, Ø 14 mm, male thread G1/2, G1/4, G1/8, G3/8, M5, M7, female thread G1/4, G1/8, for tubing O.D. 10 mm, 12 mm, 14 mm, 4 mm, 6 mm, 8 mm	Male thread G1/4, G1/8, G3/8, M5, for tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	Male thread G1/2, G1/4, G1/8, G3/8, M5, M7, for tubing O.D. Ø 10 mm, 12 mm, 14 mm, 16 mm, 4 mm, 6 mm, 8 mm
Pneumatic connection 2	For tubing O.D. 2 mm, 3 mm, 4 mm, 6 mm	Female thread 1/8 NPT, push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, Ø 16 mm, female thread G1/2, G1/4, G1/8, G3/8, for hose outer Ø 10 mm, 12 mm, 16 mm, 22 mm, 4 mm, 6 mm, 8 mm	Push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, Ø 14 mm, for tubing O.D. 10 mm, 12 mm, 14 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. 10 mm, 12 mm, 14 mm, 16 mm, 4 mm, 6 mm, 8 mm
Design	Blanking plug, L-shape, L-shape, long, L-shape, additional push-in connection lengthwise, bulkhead, T-shape, X-shape, Y-shape, straight shape, straight shape, round releasing ring	45° angle, 45° angle, long, blanking plug, L-shape, L-shape, 2-way, parallel, L-shape, long, L-shape, additional connection female thread lengthwise, L-shape, additional push-in connector lengthwise, bulkhead, T-shape, X-shape, Y-shape, straight shape	Blanking plug, L-shape, L-shape, long, bulkhead, T-shape, screw plug, Y-shape, straight shape	L-shape, T-shape, straight design	L-shape, bulkhead, T-shape, screw plug, Y-shape, straight shape
Temperature-dependent operating pressure	-0.95 ... 14 bar	-0.95 ... 14 bar		-0.9 ... 16 bar	
Operating pressure for full temperature range	-0.95 ... 6 bar	-0.95 ... 14 bar	-0.95 ... 20 bar	-0.9 ... 20 bar	-0.95 ... 16 bar
Ambient temperature	-10 ... 80 °C	-20 ... 80 °C	0 ... 150 °C	0 ... 120 °C	-20 ... 150 °C
Description	• Mini series • Compact for maximum component density in confined installation spaces • PBT and nickel-plated brass • Operating medium: compressed air, vacuum • Straight shape, L-shape, T-shape, X-shape, Y-shape, push-in bulkhead connector	• 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. Water according to manufacturer's declaration see www.festo.com/certificates/QS • Straight shape, L-shape, T-shape, at 45° angle, X-shape, Y-shape, push-in bulkhead connector	• Solid-metal brass, chemically nickel-plated • High corrosion and chemical resistance • Highly resistant to temperatures and pressure • Food-safe see www.festo.com/certificates/NPQH • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/NPQH • Straight design, L-shape, T-shape, Y-shape, push-in bulkhead connector	• Oxygen compatibility (in accordance with ISO 15001 and ASTM G93) • Biocompatibility (in accordance with ISO 18562) • FDA-listed materials • Can be used with a range of gases (O2, CO2, N2O, NO, He, N2, Xe, Ar) • Wide range from 4 mm to 12 mm in size • Push-in fittings and connections (straight, L-shape, T-shape)	• Very easy to clean thanks to chamfered O-ring and reduced number of 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) • Straight design, L-shape, T-shape, Y-shape, push-in bulkhead connector
online: →	→ qsm	→ qs	→ npqh	→ npqo	→ npqr

Pneumatic fittings

Pneumatics push-in fittings

	 Push-in fittings/connectors, media resistant NPQP	 Push-in fittings, self-sealing/connectors QSK	 Push-in fittings, rotatable QSR
Pneumatic connection 1	Push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, male thread R1/2, R1/4, R1/8, R3/8, for hose O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	Male thread G1/2, G1/4, G1/8, G3/8, M5, R1/2, R1/4, R1/8, R3/8, for tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	Male thread G1/2, G1/4, G1/8, G3/8, M5, R1/2, R1/4, R1/8, R3/8
Pneumatic connection 2	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm
Design	Blanking plug, L-shape, L-shape, additional push-in connector lengthwise, bulkhead, T-shape, Y-shape, straight shape	L-shape, partition, straight design	L-shape, straight design
Temperature-dependent operating pressure	-0.95 ... 10 bar	-0.95 ... 14 bar	-0.95 ... 14 bar
Operating pressure for full temperature range		-0.95 ... 6 bar	-0.95 ... 6 bar
Ambient temperature	-20 ... 60 °C	-10 ... 80 °C	0 ... 60 °C
Description	• Polypropylene • Low-cost alternative to stainless steel: resistant to most cleaning agents in combination with tubing PLN • For use with extreme media influences • For suitability for use in the food industry see www.festo.com/certificates/NPQP • Operating medium: compressed air, vacuum • Straight design, L-shape, T-shape, Y-shape, push-in bulkhead connector	• Standard series • Self-sealing push-in fitting blocks the air flow after the tubing is disconnected • PBT and nickel-plated brass • Operating medium: compressed air, vacuum • Straight shape, L-shape, push-in bulkhead connector	• Rotatable push-in fitting with swivel connection: rotatable by 360° with max. 500 rpm • Compact installation space • Straight shape, L-shape
online: →	→ npqp	→ qsk	→ qsr

Barbed fittings

	 Fittings NPCK
Nominal width	2 ... 6.2 mm
Pneumatic connection 1	Male thread G1/4, G1/8, G3/8, M5
Pneumatic connection 2	For tubing O.D. 10 mm, 4 mm, 6 mm, 8 mm
Design	Straight design
Operating pressure for full temperature range	-0.95 ... 12 bar
Ambient temperature	-20 ... 120 °C
Description	• Stainless steel design • Food grade see www.festo.com/certificates/NPCK • Fulfils all clean design requirements • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/NPCK • Straight shape
online: →	→ npck

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	• Nickel-plated brass • Sleeve • Extension • Double nipple • Reducing nipple • Operating medium: compressed air, vacuum • Straight shape, L-shape, T-shape, X-shape, Y-shape
online: →	→ npfc

Pipes

	 Plastic pipes PQ-PA	 Pipes PQ-AL
Outside diameter	12 ... 28 mm	12 ... 28 mm
Information on tubing materials	PA	Wrought aluminium alloy
Temperature-dependent operating pressure	-0.95 ... 15 bar	-0.95 ... 15 bar
Ambient temperature	-25 ... 75 °C	-30 ... 75 °C
Description	• Rigid pipe made from high-quality polyamide • Smooth inside wall ensures optimum flow conditions • Operating media compressed air, vacuum, liquid media	• Rigid aluminium pipe • Smooth inside wall ensures optimum flow conditions • Operating media compressed air, vacuum, liquid media
online: →	→ pq-pa	→ pq-al

Push-in fittings for piping PQ

	 Push-in fittings CQ, CQC, CQH, CQL, CQT
Pneumatic connection 1	Male thread G1, G1/2, G3/4, G3/8, push-in sleeve CQ-12, CQ-15, CQ-18, CQ-22, CQ-28, for pipe/tubing O.D. 12 mm, 15 mm, 18 mm, 22 mm, 28 mm
Pneumatic connection 2	Push-in sleeve CQ-12, CQ-15, CQ-18, CQ-22, CQ-28, QS-12, QS-16, for pipe/tubing O.D. 12 mm, 15 mm, 18 mm, 22 mm, 28 mm
Nominal width	8 ... 24.9 mm
Temperature-dependent operating pressure	-0.95 ... 15 bar
Ambient temperature	-25 ... 70 °C
Description	• For pipes PQ-PA, PQ-AL and tubing PAN and PUN • Operating media compressed air, vacuum, liquid media • POM • Straight design, L-shape, T-shape
online: →	→ cq

Couplings

	 Quick coupling sockets, quick coupling plugs KD1, KD2, KD3, KD4, KS1, KS2, KS3, KS4
Pneumatic connection 1	Barbed hose fitting 2 mm, barbed hose fitting 6 mm, barbed hose fitting 9 mm, male thread G1/2, G1/4, G1/8, G3/8, M5, female thread G1/2, G1/4, G1/8, G3/8, M5, for tubing O.D. 4, 6, 8, for barbed connector I.D. 3 with union nut, 4 with union nut, 6 with union nut, 9 with union nut
Standard nominal flow rate	44 ... 1350 l/min
Operating pressure	-0.95 ... 12 bar
Ambient temperature	-10 ... 60 °C
Description	• Quick connection coupling for standard applications without safety function • Shut off at one or both ends • With male or female thread or with barbed connector or quick connector • Nickel-plated brass, PP • Operating medium: compressed air, vacuum
online: →	→ kd1

Distributor

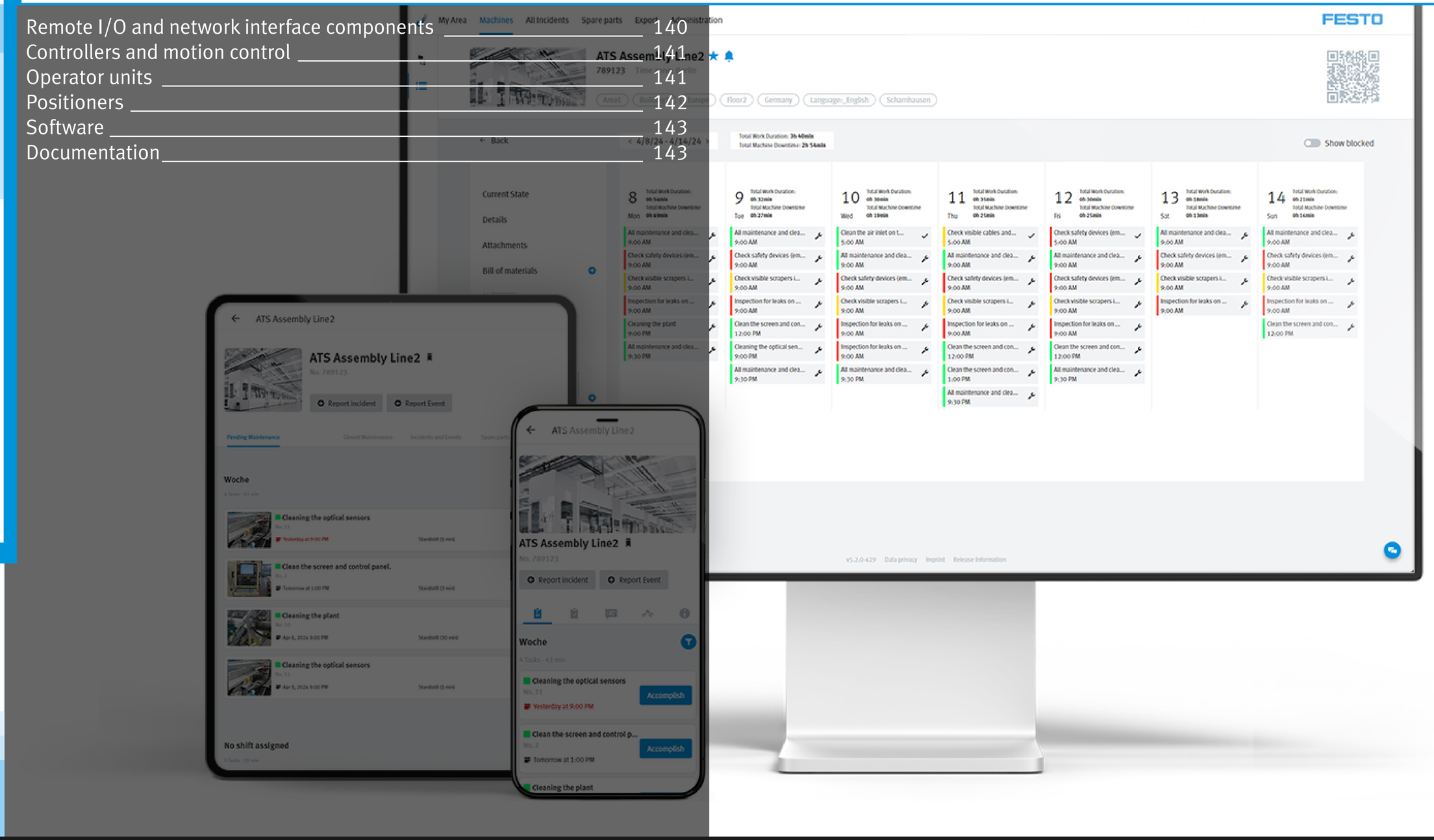
	 Multiple distributor QSYTF	 Rotary distributor GF
Pneumatic connection 1	Male thread G1/2, G1/4, G1/8, G3/8, R1/2, R1/4, R1/8, R3/8	Male thread G1/4, G3/8, G1/2, G1/4, G1/8
Pneumatic connection 2	Female thread G1/2, G1/4, G1/8, G3/8, for tubing O.D. 10 mm, 12 mm, 6 mm, 8 mm	Female thread G1/4, G3/8, G1/2, G1/4, G1/8, M5
No. of supply lines	1	
Number of outlets	3	
Max. speed		300 ... 3000 rpm
Description	• PBT and nickel-plated brass • Rotatable 360° • Operating medium: compressed air, vacuum, (water) • Y-shape	• 2 or 4 axial and radial outlets • Single or multiple rotary distributor • Operating medium: compressed air, vacuum • Brass, high-alloy steel
online: →	→ qsytf	→ gf

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Remote I/O and network interface components

	 For remote I/O systems CPX-AP-I	 Remote I/O systems CPX-AP-A	 Remote I/O systems CPX-AP-I	 Automation systems CPX-E	 Input modules CTSL	 Fieldbus modules CTEU	 Terminal CPX	 Measuring modules CPX-CMIX
Address capacity, inputs	244 ... 2048 bytes	1024 ... 4096 bytes		64 bytes		2 ... 64 bytes	64 bytes	
Max. no. of inputs					16			
Address capacity, outputs	244 ... 2048 bytes	1024 ... 4096 bytes		64 bytes		2 ... 64 bytes	64 bytes	
Electrical control		AP interface, Ethernet		Fieldbus, integrated controller			Fieldbus, integrated controller	
Protocol	IO-Link®	AP			I-Port, IO-Link	AS-Interface, CANopen, CC-Link, DeviceNet, EtherCAT, EtherNet/IP, PROFINET, Modbus® TCP, PROFIBUS DP		
Description	• Decentralised and lightweight I/O system in IP65/IP67 • Highly flexible remote IO system with maximum performance • Can be expanded and easily combined with CPX-AP-I and CPX-AP-A to form an integrated system • Seamless connectivity along with advanced diagnostics option increase machine availability and productivity • Easy to integrate into the controller of your choice: PROFINET, EtherCAT, EtherNet/IP, ModbusTCP • Module for IO-Link available • Powerful remote I/O system that flexibly links 80 modules at a data rate of 200 Mbaud in real time • Cable lengths of up to 50 m between every module enable vast system dimensions	• Modular and lightweight IO system with IP65/IP67 protection • Highly flexible remote IO system with maximum performance • Can be expanded and easily combined with CPX-AP-A and CPX-AP-I to form an integrated system • Seamless connectivity along with advanced diagnostics option increase machine availability and productivity • Easy to integrate into the controller of your choice: PROFINET, PROFIBUS, EtherCAT, EtherNet/IP, ModbusTCP • Module for IO-Link available • Powerful remote I/O system that flexibly links 80 modules at a data rate of 200 Mbaud in real time • Sustainable operation thanks to energy shut-off	• Powerful remote I/O system that flexibly links 80 modules at a data rate of 200 Mbaud in real time • Seamless connectivity along with advanced diagnostics option increase machine availability and productivity • Easy to integrate into the controller of your choice: PROFINET, EtherCAT, EtherNet/IP, ModbusTCP • Real-time capability and deterministic system behaviour enable cycle times of up to 250 µs • Cable lengths of up to 50 m between every module enable vast system dimensions • The IO-Link master and parameterisation software enable simple integration of any IO-Link devices • Ethernet performance up to the valve terminal and digital as well as analogue input/output modules • Sustainable operation thanks to energy shut-off	• Modern control system with high performance • Fieldbus master interfaces, EtherCAT® master, fieldbus slave interfaces, PROFINET, EtherNet/IP, PROFIBUS, EtherCAT® digital input modules (16DI), digital output modules (8DO/0.5A) • Analogue input modules (current, voltage), analogue output modules (current, voltage) • Modern programming with CODESYS V3 to IEC 61131-3 • Integration of SoftMotion functions (SoftMotion) • High I/O component density • Easy mounting of the control system	• For installation system CTEL • For recording sensor input signals • Indication of the input statuses for each input signal via an assigned LED • Diagnostic LED for short circuit/overload in sensor supply	• For valve terminals VTUG, MPA-L, VTOC • Can be expanded into the installation system CTEL • Fieldbus-typical LEDs, interfaces and switching elements • Isolated power supply for electronics and valves	• Automation platform • Open to all common fieldbus protocols and Ethernet • Integrated diagnostic and maintenance functions • Applicable as stand-alone remote I/O or with valve terminals MPA-S, MPA-L, VTSA/VTSA-F • Choice of polymer or metal interlinking block with individual links • Analogue inputs and outputs, 2-way/4-way, optionally with HART protocol	• Pneumatics and electrics – movement and measurement on one platform • Innovative measurement technology for piston rod drives, rodless drives, rotary drives • Actuation via fieldbus • Remote maintenance, remote diagnostics, web server, SMS and e-mail alerts are all possible via TCP/IP • Modules can be quickly exchanged and expanded without altering the wiring
online: →	→ cpx-api	→ cpx-apa	→ cpx-api	→ cpx-e	→ ctsl	→ cteu	→ cpx	→ cpx-cmix

Controllers and motion control

	 Control blocks CPX-CEC-M1
CPU data	Processor 800 MHz, 256 MB RAM, 32 MB Flash
Processing time	Approx. 200 µs/1 k instruction
Degree of protection	IP65, IP67
Configuration support	CODESYS V3
Fieldbus interface, type	CAN bus
Fieldbus interface, connection technology	Plug, Sub-D, 9-pin
Additional functions	Diagnostic functions, soft-motion functions for electric actuators
Description	•Easy actuation of valve terminal configurations •Programming with CODESYS to IEC 61131-3 •Connection to all fieldbuses as a remote controller and for pre-processing •Actuation of electric drives via CANopen •SoftMotion functions for coordinated multi-axis movements
online: →	→ cpx-cec-m1

Operator units

	 Operator units CDSA	 IO-Link® master USB CDSU-1	 Operator units CDSB	 Operator units CDPX
Conforms to standard		EN 61131-9		
Electrical connection for IO-Link®, connection type		Socket		
Electrical connection for IO-Link®, connection technology		M12x1, A-coded to EN 61076-2-101		
Electrical connection for IO-Link®, number of pins/cores		5		
Protocol		IO-Link®		
Display	LCD display, with background illumination		TFT colour	With backlighting
Display size	7 in		1.77“	5“, 10.1“, 15.6“, 21.5“, 7 in, 4.3 in
Display resolution	WSVGA, 600x1024 pixels		128x160 pixels	1024x600 pixels, 1025x600 pixels, 1280x800 pixels, 1366x768 pixels, 1920x1080 pixels, 800x480 pixels, 480x272 pixels
Description	•For mobile commissioning and optimisation •Integrated reporting system and user administration in combination with the robotics library from Festo •Interface unit for installation in a control cabinet and various cable lengths available •EtherNet/USB interface •With colour touchscreen	•Allows Festo IO-Link® products to be commissioned quickly and intuitively •Compact, cost-effective, powerful •Universal connections •Galvanic isolation •Connecting cables for almost all IO-Link® devices from Festo •For IO-Link devices with protocol version 1.1 and 1.0 •Supports data storage	•Plug-in display and control unit for the servo drive CMMT and automation system CPX-E •Colour touchscreen •Diagnostic function •Very compact size •Mini USB interface •Update function for basic unit	•Cost-optimised for simple visualisation tasks, e.g. of process data •Powerful processors combined with wide-screen technology •Ideally matched to CODESYS controls from Festo or ModbusTCP networks •Integrated EtherNet interfaces •With touchscreen •Variants according to EU explosion protection directive (ATEX) and in IP67 suitable for the requirements in process automation
online: →	→ cdsa	→ cdsu	→ cdsb	→ cdpx

Positioner

	 Positioner CMSH	 Positioner CMSX
Mode of operation	Double-acting, single-acting	Double-acting, single-acting
Standard nominal flow rate		50 ... 130 l/min
Ambient temperature	-40 ... 80 °C	-5 ... 60 °C
Operational voltage range DC		21.6 ... 26.4 V
Operating pressure [MPa]	0.14 ... 0.8 MPa	0.3 ... 0.8 MPa
Operating pressure	1.4 ... 8 bar	3 ... 8 bar
Operating pressure [psi]	20.3 ... 116 psi	43.5 ... 116 psi
Design features	Safety position – pneumatic outputs closed, safety position – pneumatic output 2 exhausted, safety position – pneumatic output 4 pressurised	Safety position – pneumatic output 4 exhausted, safety position – pneumatic output 2 pressurised, safety position – pneumatic outputs closed
Degree of protection	IP66, IP67	IP65
Type of mounting	Via accessories, to VDI/VDE 3845, to VDI/VDE 3847-2	With accessories
Information on materials: Housing	Aluminium, powder-coated	Reinforced PC
Description	• Intelligent, digital electropneumatic positioner with HART communication • Fast and precise position control of single-acting and double-acting pneumatic rotary and linear drives • With integrated or external path/angular detection • Commissioning, operation, maintenance and diagnostics on the local display via the user-friendly software menu or via remote access with EDD-based (Electronic Device Description) or FDT-based (Field Device Tool) transmission • 2-conductor technology • Perfect teamwork with the pneumatic extension modules VTOP • Variants with safety functions • Sustainable operation thanks to efficient control	• Digital, electropneumatic positioner • Simple and efficient position control of single-acting and double-acting pneumatic rotary and linear drives • Sustainable due to product lifecycle extended by ease of repair • With integrated or external path/angular detection • Simple commissioning through automatic initialisation function • Intuitive menu navigation • 3-conductor technology • Variants with safety functions
online: →	→ cmsh	→ cmsx

Software

	Festo AX Data Access GASA-DA	Festo AX Motion Insights Pneumatic GASA-MIP	Motion Apps GAMM	Software (FluidDraw® P6/365) GSWF	Eplan projects (Schematic Solution) GDDE	Smartenance GASM
Description	• Access to Festo components (brownfield or greenfield) • IoT gateway with protocol translator from OT to IT (MQTT) • Reduces IT administration with plug and play solution • Simplifies asset management, creates transparency • Monitors existing and new processes (process data) • Enables data-driven solutions (e.g. status and diagnostic messages) • Can save hundreds of hours of work for many components	• Continuous monitoring of the pneumatic drive chain • Detects wear and anomalies, enables planned maintenance • Connectivity using PLC, data science expertise not required • Simple visualisation and access via browser • One standard app that works with drives from all manufacturers • Reduces unplanned downtime, increases productivity (OEE) • Fixed price per cylinder helps to plan the investment	• Control programs for VEVM valves • A new dimension in flexibility thanks to Motion Apps – one valve, numerous functions • Accelerated engineering processes • Short response times without adjusting the hardware • Reduced system complexity • Shorter market launch times for your application	• Generate pneumatic and electrical circuit diagrams quickly and easily • Documentation of complete systems • Extensive standard symbol library • Insert products directly via the integrated Festo product catalogue • Automatically generated evaluations of item data and circuit information • Automatic equipment labelling with customisation options • Create your own symbols, libraries, product databases or drawing frames	• Get complete EPLAN projects of complex products in minutes • Simple integration into existing EPLAN projects • Significant time saving • Greater certainty with completeness	• Combines maintenance and servicing software (CMMS) with a machine logbook in a single solution • Web application for maintenance or production managers and mobile app for maintenance technicians and machine operators • Seamless integration with SAP maintenance management (S4/HANA) • Optimises processes and reduces unplanned downtime • Integration of AI software enables predictive maintenance (condition-based maintenance) • Creation of an internal knowledge database for rapid problem solving
online: →	→ gasa	→ gasa	→ gamm	→ gswf	→ gdde	→ gasm

Documentation

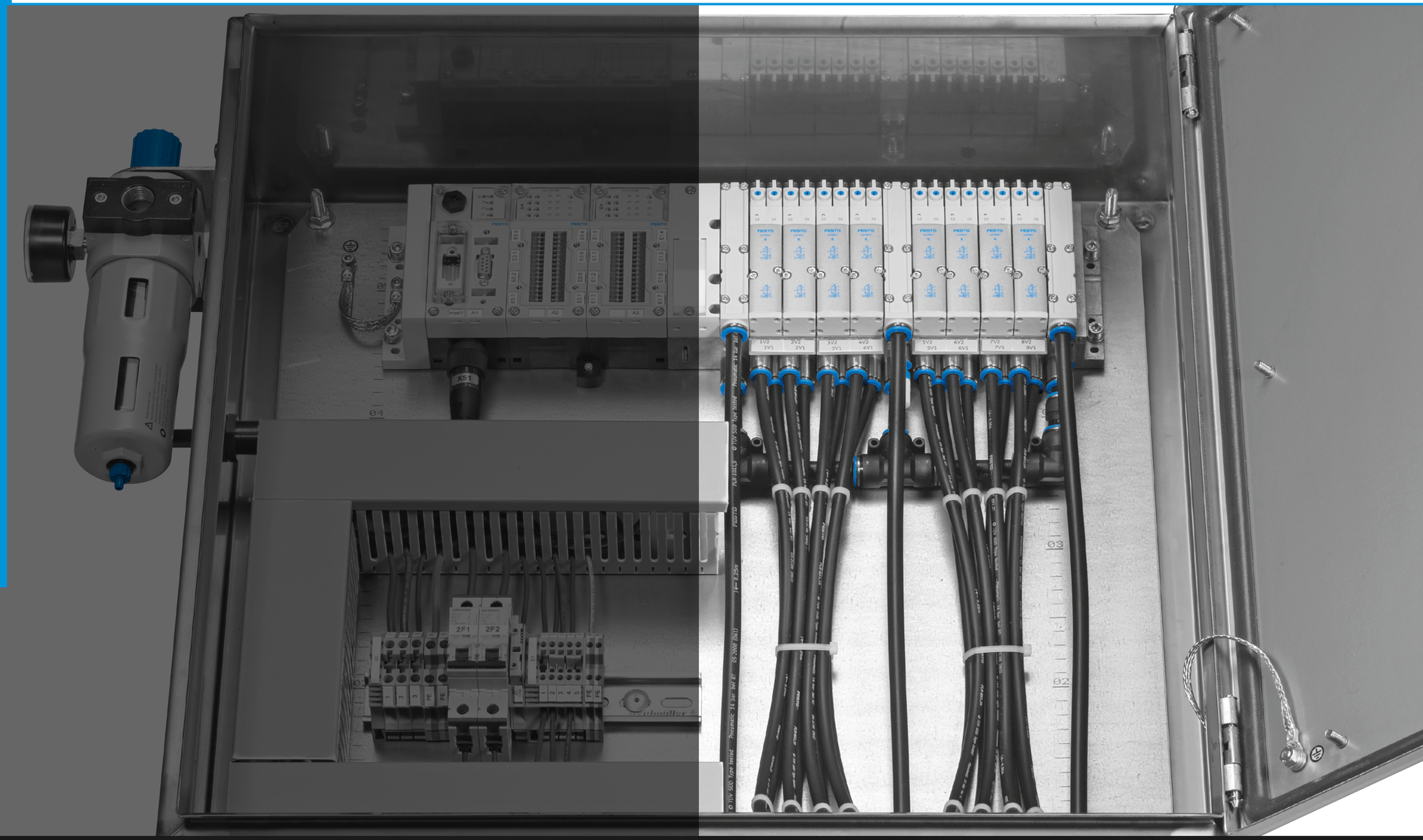
	Descriptions
Description	• Manuals, operating instructions
online: →	→ p.be

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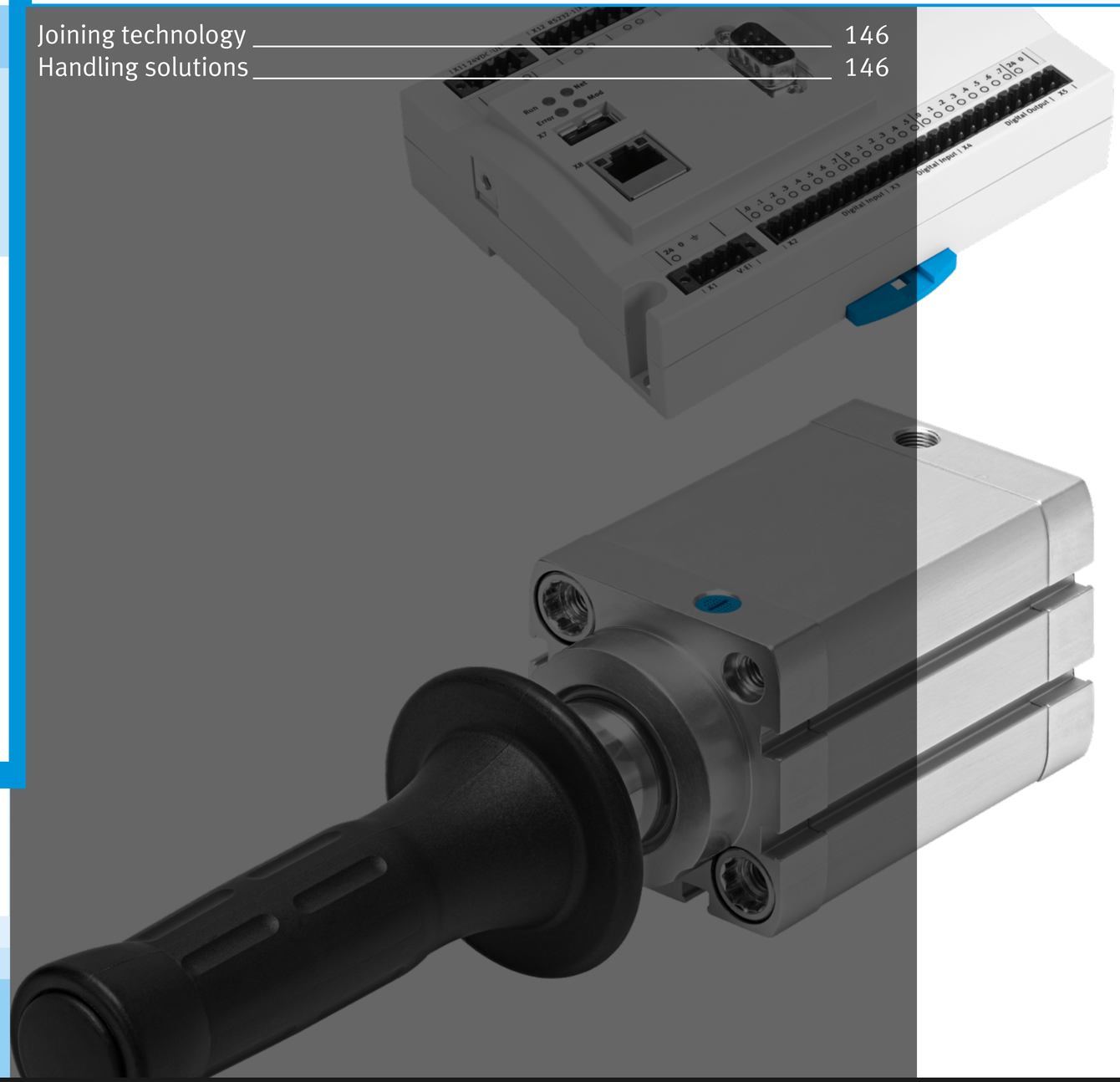
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Pneumatic drives with accessories

	 Linear drive with accessories KDFP-DFPI	 Compact cylinder, double-acting, with accessories KDPC-ADN-S	 Compact cylinder, single-acting, with accessories KDPC-AEN-S
Description	•Pneumatic module consisting of linear drive DFPI with matching accessories •Simple, quick and reliable configuration using the Festo 3D Design tool •Accessories can be selected directly at the CAD model •All components for the configured module can be ordered efficiently using one single part number •Supplied as individual components in one package or pre-assembled	•Pneumatic module consisting of double-acting compact cylinder ADN-S with matching accessories •Simple, quick and reliable configuration using the Festo 3D Design tool •Accessories can be selected directly at the CAD model •All components for the configured module can be ordered efficiently using one single part number •Supplied as individual components in one package or pre-assembled	•Pneumatic module consisting of single-acting compact cylinder AEN-S with matching accessories •Simple, quick and reliable configuration using the Festo 3D Design tool •Accessories can be selected directly at the CAD model •All components for the configured module can be ordered efficiently using one single part number •Supplied as individual components in one package or pre-assembled
online: →	→ kdfp-dfpi	→ kdpc	→ kdpc

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Joining technology

	 Servo press kits YJKP	 Commissioning service GFCA-Y2
Working stroke	100 ... 400 mm	
Pressing force	0 ... 17 kN	
Feed speed	0 ... 250 mm/s	
Accuracy in ± % FS	0.25 %FS	
Protocol	EtherNet/IP, OPC-UA, PROFINET IO, TCP/IP, Modbus® TCP	
Description	• Optimised and qualified interaction: electric cylinder, motor, servo drive, force sensor, controller and application software including the necessary accessories. • Save time with fast commissioning via the web interface • Simple configuration of even the most complex process sequences • Options for the precise analysis of the force-displacement curve to ensure the high quality of your workpiece • Easily integrated with function blocks for your system controllers	• Commissioning services for the servo press kit YJKP • Available remotely or on site • Support with commissioning • Support with the electrical installation • Checking the electrical connections and the travel path • Configuration and parameterisation • Testing the system, data backup and documentation • Introduction to WebVisu software
online: →	→ yjkp	→ gfca

Handling solutions

	 Balancer kits YHBP	 Control systems CMCB
Stroke range	100 ... 1990 mm	
Cylinder diameter	50 ... 200 mm	
Max. travel speed	1 m/s	
Load	25 ... 999 kg	
Operating pressure [MPa]	0.4 ... 0.8 MPa	
Operating pressure	4 ... 8 bar	
Nominal operating voltage DC	24 V	24 V
Design		Mounting plate, control cabinet, integrated safety relay unit
Electrical connection		Spring-loaded terminal, push-in
Nominal operating voltage AC		230 V
Max. current consumption		1100 mA
Performance level (PL)		Category B, Performance Level b, Category 3, Performance Level d
Description	• Very low operating forces of just 10 N • For applications involving the movement of heavy loads in defined, repetitive sequences • Very fast, automatic weight detection for production processes with large numbers of variants • With safety functions • The individual components are delivered mounted in the control cabinet, on a mounting plate or unassembled	• Ready-to-install control system • Available on a mounting plate with or without control cabinet housing • Variants with safety functions • Adapted for balancer kit YHBP • With connecting cables for balancer kit YHBP connected
online: →	→ yhbp	→ cmcb

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Compressed air guns 149



Pneumatic silencers

	 Silencer AMTE	 Silencer U	 Silencer UC	 Silencer UO	 Silencer UOS-1, UOS-1-LF	 Silencer UOM, UOMS
Information on silencer insert materials	Bronze	PE, bronze	PE	PE	PE	Polyurethane foam
Pneumatic connection	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	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	G1/4, G1/8, M5, M7	G1	G1/4, G3/8
Noise level	55 ... 95 dB(A)	70 ... 90 dB(A)	58 ... 68 dB(A)		75 dB(A)	
Description	•Long or short design •Metal design •Operating medium: compressed air •High temperature resistance up to 80 °C •Slim width •Many different variants •Universal applications	•Compact design, polymer or die-cast •Barbed fitting or threaded connection •Operating medium: compressed air	•To reduce noise and prevent contamination at the 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	•Special open minimal resistance silencer •For vacuum generators •Facilitates trouble-free operation of the vacuum generator •Operating medium: compressed air	•Silencer for MS6-SV, MS series •Operating medium: compressed air	•Special open minimal resistance silencer •For vacuum generators •Facilitates trouble-free operation of the vacuum generator •Silencer extension for extending the silencer for further noise reduction •Operating medium: compressed air
online: →	→ amte	→ u	→ uc	→ uo	→ uos	→ uom

Air reservoir

	 Air reservoir VZS	 Air reservoir CRVZS
Volume	20 l	0.1 l, 0.4 l, 0.75 l, 10 l, 2 l, 20 l, 5 l
Information on air reservoir materials	Powder-coated steel	High-alloy stainless steel
Conforms to standard	EN 286-1	AD 2000
Condensate drain connection	G3/8	G3/8
Description	• Compensation of pressure fluctuations and as accumulators in the event of sudden air consumption • Providing large volumes of compressed air for supplying fast pulsing drives • With connection for condensate drain • Conforms to the requirements of Directive 2014/29/EC and EN 286-1 • Operating medium: compressed air, vacuum	• Corrosion-resistant • Compensation of pressure fluctuations and as accumulators in the event of sudden air consumption • Providing large volumes of compressed air for supplying fast pulsing drives • With connection for condensate drain in some cases • Suitable for use in the food industry, see www.festo.com/catalogue/crvzs > Support / Downloads > Certificates tabs • Operating medium: compressed air, vacuum
online: →	→ vzs	→ crvzs

Compressed air guns

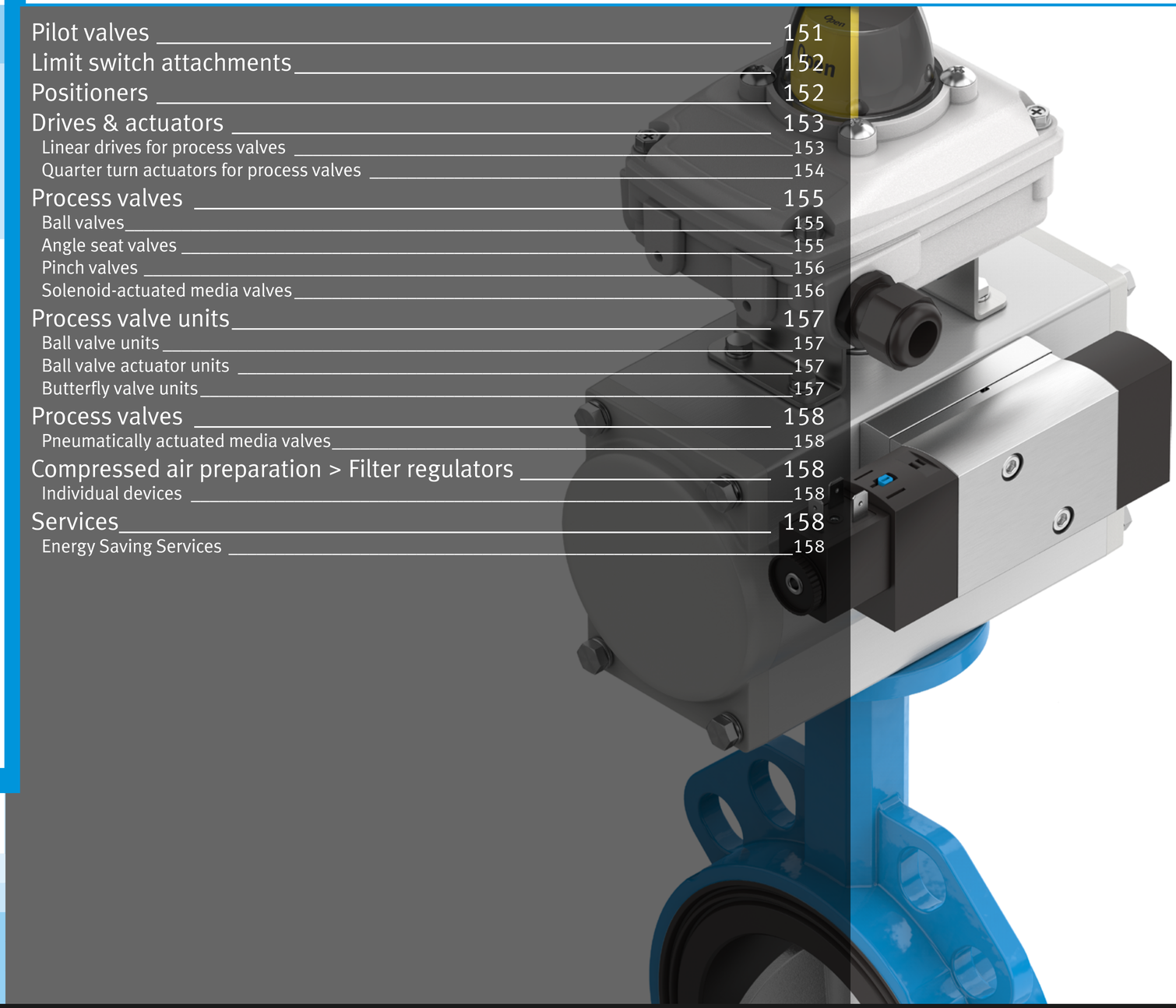
	 Air guns LSP
Exhaust air function	Metered blowing
Pneumatic connection	Female thread G1/4
Information on housing materials	Wrought aluminium alloy, reinforced PA6
Description	• Precise, infinitely variable, lever-operated flow metering • Interchangeable nozzles • Operating medium: compressed air
online: →	→ lsp

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Pilot valves

	 Solenoid valves VSNC	 Solenoid valves VSNC-G1/8	 Solenoid valves VOFC	 Solenoid valves VOFD
Valve function	5/2-way double solenoid, 5/2- or 3/2-way convertible, 5/3-way pressurised, 5/3-way exhausted, 5/3-way closed	3/2-way single solenoid, 5/2-way single solenoid, connections swapped	3/2-way, single solenoid, closed, 5/2-way, double solenoid, 5/2-way, single solenoid	3/2-way, closed, single solenoid, semi-automatic, 3/2-way, closed, single solenoid
Operating pressure [MPa]	0.15 ... 1 MPa	0.25 ... 0.8 MPa	0 ... 1 MPa	0 ... 1.2 MPa
Operating pressure	1.5 ... 10 bar	2.5 ... 8 bar	0 ... 10 bar	0 ... 12 bar
Ambient temperature	-20 ... 60 °C	-20 ... 50 °C	-25 ... 60 °C	-50 ... 60°C
Pneumatic connection 1	1/4 NPT, G1/4, QS-1/4, QS-10, QS-3/8, QS-5/16, QS-6, QS-8	G1/8	1/4 NPT, 1/2 NPT, NAMUR connection pattern, G1/2, G1/4, M5	1/4 NPT, NAMUR connection pattern, G1/4, M5
Standard nominal flow rate	800 ... 1350 l/min	400 l/min	595 ... 2794 l/min	52 ... 1900 l/min
Explosion protection	Class I, Div. 1 (US), Class I, Div. 2 (US), Class II, Div. 1 (US), Class II, Div. 2 (US), Class III, Div. 1 (US), Class III, Div. 2 (US), Zone 0 (IEC-EX), Zone 0 (KR), Zone 1 (ATEX), Zone 1 (IEC-EX), Zone 1 (KR), Zone 2 (ATEX), Zone 2 (KR), Zone 20 (IEC-EX), Zone 21 (ATEX), Zone 21 (IEC-EX), Zone 21 (KR), Zone 22 (ATEX), Zone 22 (KR)		Zone 1 (ATEX), Zone 1 (IEC-EX), Zone 1 (KR), Zone 2 (ATEX), Zone 21 (ATEX), Zone 21 (IEC-EX), Zone 21 (KR), Zone 22 (ATEX)	Zone 1 (ATEX), Zone 2 (ATEX), Zone 21 (ATEX), Zone 22 (ATEX)
Safety integrity level (SIL)			Up to SIL 3 High Demand mode, up to SIL 3 Low Demand mode	Up to SIL 3 High Demand mode, up to SIL 3 Low Demand mode
Description	•NAMUR connection pattern to VDI/VDE 3845 •Rotatable seal for 3/2-way or 5/2-way valve •Wide choice of EX solenoid systems •Sturdy and powerful •Extended temperature range •Excellent price/performance ratio •All solenoid coils can be used on an armature tube •The variant VSNC-...FN achieves increased energy efficiency thanks to reduced power consumption	•NAMUR connection pattern according to VDI/VDE 3845 •Compact, cost-effective, powerful •Particularly suitable for quarter turn actuators DAPS and DFPD with connection pattern to VDI/VDE 3845 •Extended temperature range •Electrical connection with plug pattern type C, to EN 175301-803 •24 V solenoid coil integrated •Excellent price/performance ratio	•Suitable for process automation in the chemical and petro-chemical industries •Suitable for outdoor use under harsh, dusty ambient conditions •Especially suitable for quarter turn actuators thanks to NAMUR flange pattern •Valve can switch between internal and external pilot air •Variants with safety functions •Variants to EU Explosion Protection Directive (ATEX)	•Suitable for process automation in the chemical and petro-chemical industries •Suitable for outdoor use under harsh, dusty ambient conditions •Especially suitable for quarter turn actuators thanks to NAMUR flange pattern •Variants with safety functions •Variants to EU Explosion Protection Directive (ATEX)
online: →	→ vsnc	→ vsnc	→ vofc	→ vofd

Limit switch attachments

	 Limit switch attachments SRBK	 Limit switch attachments SRBC	 Limit switch attachments SRBE	 Limit switch attachments SRAP
Information on housing materials	PA, PA66, electrically conductive	Die-cast aluminium	Painted die cast aluminium	Wrought aluminium alloy
Operating voltage range AC	0 ... 230 V	0 ... 230 V	0 ... 240 V	
Operational voltage range DC	0 ... 175 V	0 ... 175 V	0 ... 60 V	15 ... 30 V
Measuring principle	Inductive, magnetic reed, mechanical/electrical	Inductive, magnetic reed, mechanical/electrical	Inductive, magnetic reed, mechanical/electrical, for proximity sensor	Magnetic Hall
Switching element function	N/O contact, toggle switch, single-pole	N/C contact, N/O contact, toggle switch, single-pole	N/C contact, N/O contact, toggle switch, single-pole, toggle switch, double-pole	
Safety integrity level (SIL)	SIL 3	SIL 3	SIL 3	
Description	•Sturdy polymer housing with UV resistance •Different switch variants – mechanical, inductive and reed switches •Multifunctional mounting adapter for adaptations on the VDI/VDE 3845 interface •Variants with M12 plug connection for easy installation (plug&play)	•Pre-assembled mounting adapter for ease of installation •The trip cams can be easily set without additional tools •Sturdy, corrosion-resistant design, ideal for use in harsh ambient conditions •Clearly visible 3D position indicator enables the current position of the quarter turn actuator to be quickly detected •With safety functions •Variants to EU Explosion Protection Directive (ATEX)	•The trip cams can be easily set without additional tools •Sturdy, corrosion-resistant design, ideal for use in harsh ambient conditions •Clearly visible 3D position indicator enables the current position of the quarter turn actuator to be quickly detected •With safety functions •To EU Explosion Protection Directive (ATEX)	•Based on standard VDI/VDE 3845 (NAMUR) •Analogue •For monitoring the position of quarter turn actuators •Sensors based on 2D Hall technology •Variants to EU Explosion Protection Directive (ATEX)
online: →	→ srbk	→ srbc	→ srbe	→ srap

Positioner

	 Positioner CMSH	 Positioner CMSX
Mode of operation	Double-acting, single-acting	Double-acting, single-acting
Standard nominal flow rate		50 ... 130 l/min
Ambient temperature	-40 ... 80 °C	-5 ... 60 °C
Operational voltage range DC		21.6 ... 26.4 V
Operating pressure [MPa]	0.14 ... 0.8 MPa	0.3 ... 0.8 MPa
Operating pressure	1.4 ... 8 bar	3 ... 8 bar
Operating pressure [psi]	20.3 ... 116 psi	43.5 ... 116 psi
Design features	Safety position – pneumatic outputs closed, safety position – pneumatic output 2 exhausted, safety position – pneumatic output 4 pressurised	Safety position – pneumatic output 4 exhausted, safety position – pneumatic output 2 pressurised, safety position – pneumatic outputs closed
Degree of protection	IP66, IP67	IP65
Type of mounting	Via accessories, to VDI/VDE 3845, to VDI/VDE 3847-2	With accessories
Information on materials: Housing	Aluminium, powder-coated	Reinforced PC
Description	•Intelligent, digital electropneumatic positioner with HART communication •Fast and precise position control of single-acting and double-acting pneumatic rotary and linear drives •With integrated or external path/angular detection •Commissioning, operation, maintenance and diagnostics on the local display via the user-friendly software menu or via remote access with EDD-based (Electronic Device Description) or FDT-based (Field Device Tool) transmission •2-conductor technology •Perfect teamwork with the pneumatic extension modules VTOP •Variants with safety functions •Sustainable operation thanks to efficient control	•Digital, electropneumatic positioner •Simple and efficient position control of single-acting and double-acting pneumatic rotary and linear drives •Sustainable due to product life-cycle extended by ease of repair •With integrated or external path/angular detection •Simple commissioning through automatic initialisation function •Intuitive menu navigation •3-conductor technology •Variants with safety functions
online: →	→ cmsh	→ cmsx

Drives & actuators

Linear drives for process valves

	 Linear drives DFPC	 Piston drives DFPK	 Linear drives with displacement encoder DFPI
Design	Piston, piston rod, tie rod, cylinder barrel		Piston, piston rod, tie rod, cylinder barrel
Operating mode	Double-acting		Double-acting
Size of valve actuator	80, 100, 125, 160, 200, 250, 320	46, 75	100, 125, 160, 200, 250, 320
Stroke	10 ... 1600 mm	17 ... 20 mm	40 ... 990 mm
Operating pressure [MPa]	0.2 ... 0.8 MPa	0.5 ... 1 MPa	0.3 ... 0.8 MPa
Operating pressure	2 ... 8 bar	5 ... 10 bar	3 ... 8 bar
Operating pressure [psi]	29 ... 116 psi	72.5 ... 145 psi	43.5 ... 116 psi
Ambient temperature	-20 ... 80 °C	0 ... 60 °C	-20 ... 80 °C
Description	•Robust and corrosion-resistant tie-rod design •Ideal for use in harsh ambient conditions •Numerous configuration options •Variants with mounting interface to ISO 5210 or ISO 15552 with extended tie rods	•Stainless steel design •Available as a valve actuator with angle seat valve VZXA and as a valve block solution •Linear actuating motion •High actuating forces •To EU Explosion Protection Directive (ATEX)	•Mounting interfaces to ISO 15552 on bearing and end caps •Sturdy tie rod design •Integrated air duct •Optionally with integrated displacement encoder or fully integrated positioner •IP65, IP67, IP69K, NEMA4 •To EU Explosion Protection Directive (ATEX)
online: →	→ dfpc	→ dfpk	→ dfpi

Drives & actuators

Quarter turn actuators for process valves

	 Quarter turn actuator units KDFP-DFPD	 Quarter turn actuator DFPD	 Quarter turn actuator DFPD-C	 Semi-rotary drives with heavy-duty guide DFPD-HD	 Quarter turn actuator DAPS
Design	Gear rack/pinion	Gear rack/pinion	Gear rack/pinion	Scotch yoke system	Scotch yoke system
Operating mode	Double-acting, single-acting	Double-acting, single-acting	Single-acting	Double-acting, single-acting	Double-acting, single-acting
Size of valve actuator	10, 20, 40, 80, 120, 160, 240, 300, 480, 700, 900, 1200, 2300	10, 20, 40, 60, 80, 120, 160, 240, 300, 480, 700, 900, 1200, 2300	20, 40, 80, 120, 160, 240, 300, 480, 700, 900, 1200, 2300	9000, 18000, 32000	0008, 0015, 0030, 0053, 0060, 0090, 0106, 0120, 0180, 0240, 0360, 0480, 0720, 0960, 1440, 1920, 2880, 3840, 4000, 5760, 8000
Flange hole pattern	F03, F04, F05, F07, F10, F12, F14, F16	F03, F04, F05, F07, F10, F12, F14, F16, F0507, F0710, F1012, F1216	F05, F07, F10, F12, F14, F16	F25, F30, F35	F03, F04, F05, F07, F10, F12, F14, F16, F25
Swivel angle	90 deg	90 deg, 120 deg, 135 deg, 180 deg	90 deg	90 deg	90 deg, 92 deg
Operating pressure [MPa]	0.2 ... 0.8 MPa	0.2 ... 0.8 MPa	0.2 ... 0.8 MPa	0.1 ... 0.85 MPa	0.1 ... 0.84 MPa
Operating pressure	2 ... 8 bar	2 ... 8 bar	2 ... 8 bar	1 ... 8.5 bar	1 ... 8.4 bar
Operating pressure [psi]	29 ... 116 psi	29 ... 116 psi	29 ... 116 psi	14.5 ... 123.25 psi	
Ambient temperature	-50 ... 150 °C	-50 ... 150 °C	-20 ... 80 °C	-20 ... 80 °C	-50 ... 150 °C
Safety function		The safety function consists of the actuator switching to the specified safety switching position. This switching movement is achieved by pressurising the corresponding pressure chamber with compressed air. The value of the torque generated depends on the pressure difference between the two pressure chambers separated by the piston. The safety function consists of the actuator switching to the defined safety switching position when the compressed air is shut off and the spring chamber is exhausted. This switching movement is achieved through the spring force of the spring assembly.	The safety function consists of the actuator switching to the specified safety switching position when the compressed air is switched off and the spring chamber is exhausted. This switching movement is achieved through the spring force of the spring assembly.		
Safety integrity level (SIL)		Up to SIL 2 Low Demand mode, up to SIL 3 in a redundant architecture, up to SIL 1 High Demand mode	Up to SIL 2 Low Demand mode, up to SIL 3 in a redundant architecture, up to SIL 1 High Demand mode		Up to SIL 2 High Demand mode, up to SIL 2 Low Demand mode
Description	• Quarter turn actuator unit comprising quarter turn actuator DFPD and accessories • Select, size and order quickly, easily and reliably with the configurator • Optionally with pilot valve • Optionally with positioner • Optional with position indicator • Optionally with end position feedback • Optionally with the necessary mounting adapters or reducing sleeves for mounting on the process valve	• Constant torque across the entire rotation angle range of 90° with the double-acting version • Process valve connection to ISO 5211 • Mounting hole pattern to VDI/VDE 3845 • Sturdy, non-slip and easy-to-clean aluminium housing • Long service life, low wear • Version with swivel angle 120°, 135°, 180° for the sizes 40, 120, 240, 480, double-acting • Variants with safety functions • To EU Explosion Protection Directive (ATEX)	• Suitable for process automation in the chemical and petrochemical industries • Extended NAMUR interface to VDI/VDE 3847 • Anti-blow-out screws for end-position adjustment • Hard anodised cover to prevent surface damage • Metal-free, non-ferrous spring cartridges • Version with compressed air ducts in the housing for direct attachment of positioner and pilot valve on the actuator, without extra barbed tubing connectors	• Ideal for applications with high torques up to max. 32,000 Nm • Extremely modular for a variety of uses: configurable spring forces, a choice between right or left direction of rotation and mechanical or hydraulic manual override • With safety functions • NAMUR connection pattern according to VDI/VDE 3845 • Variants to EU Explosion Protection Directive (ATEX)	• High breakaway torques • Sustainable due to product lifecycle extended by ease of repair • Flange hole pattern to ISO 5211 • Mounting hole pattern to VDI/VDE 3845 • Available with handwheel as a manual emergency override • Corrosion-resistant version made from stainless steel • To EU Explosion Protection Directive (ATEX) • With safety functions
online: →	→ kdfp	→ dfpd	→ dfpd	→ dfpd	→ daps

Process valves

Ball valves

	 Ball valves VZBD	 Ball valves VZBE	 Ball valves VZBF	 Ball valves VAPB	 Ball valves VZBC	 Ball valves VZBA
Design	2-way ball valve	2-way ball valve, 2-way ball valve with hand lever, 3-way ball valve, L-bore, T-bore	2-way ball valve	2-way ball valve	2-way ball valve	2-way ball valve, 3-way ball valve, L-bore, T-bore
Actuation type	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Nominal width DN	15, 20, 25, 32, 40, 50, 65, 80, 100	8, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100	15, 20, 25, 32, 40, 50, 65, 80, 100, 150, 200	8, 10, 15, 20, 25, 32, 40, 50, 65	15, 20, 25, 32, 40, 50, 65, 80, 100	8, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100
Process valve connection	Clamp to ASME-BPE, clamp to DIN 32676 series B, weld-on end to ASME-BPE, weld-on end to ISO 1127	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, 2 NPT, 2 1/2 NPT, 3 NPT, 4 NPT, welded end as per ASME B16.11	Flange to ANSI B16.5 class 150	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3/4, Rp3/8	Ring housing with threaded flange	Weld-on ends/weld-on ends, Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3, Rp3/4, Rp3/8, Rp4
Flow rate Kv	13 ... 1641 m3/h	5.1 ... 1637 m3/h	32 ... 7816 m3/h	5.9 ... 535 m3/h	19.4 ... 1414 m3/h	7 ... 1414 m3/h
Temperature of medium	-20 ... 200 °C	-20 ... 200 °C	-20 ... 200 °C	-20 ... 150 °C	-10 ... 200 °C	-10 ... 200 °C
Nominal pressure of process valve PN	16	63	20	25, 40	16, 40	63
Description	• Electro-polished surfaces SFV4 • PTFE seal with minimal dead space • The powerful ball valve for the pharmaceutical and cosmetic industries • FDA-compliant seal to FDA 21 CFR 177.1550	• 2-way manual, with lockable hand lever • 2-way and 3-way with ISO 5211 top flange, optionally with lockable hand lever • Stainless steel design • Pipe thread to ASME B1.20.1 or welded end to ASME B16.11 • Optionally with pre-assembled hand lever	• Flange connections to ANSI B 16.5. class 150 • Static discharge assured • API 607 Fire Safe approval • Stainless steel design • Easy to service • Optionally with pre-assembled hand lever	• Automatable 2-way ball valve • Brass design • Blow-out proof shaft • Manual operation possible using hand lever • Connecting thread to EN 10226-1 • Mounting flange to ISO 5211	• Automatable 2-way compact flanged ball valve • Stainless steel design • Short installed length • Blow-out proof shaft • Manual operation possible using hand lever • Flange to DIN 1092-1 • Mounting flange to ISO 5211 • Use in zones 1, 21, 2, 22	• Automatable 2-way or 3-way ball valve • Stainless steel design • Blow-out proof shaft • Manual operation possible using hand lever • Connecting thread to EN 10226-1 • Mounting flange to ISO 5211 • Use in zone 1, 21, 2, 22
online: →	→ vzbd	→ vzbe	→ vzbf	→ vapb	→ vzbc	→ vzba

Angle seat valves

	 Angle seat valves VZXF	 Angle seat valves VZXA
Design	Poppet valve with piston actuator	Poppet valve with piston actuator, poppet valve with diaphragm actuator
Actuator size		46 mm, 75 mm, 90 mm
Valve function	2/2-way, single solenoid, closed	2/2
Control function		Closed by reduced spring force, NC, double-acting, opened by spring force, NO, closed by spring force, NC
Actuation type	Pneumatic	Pneumatic
Nominal width DN		
Flow rate Kv	3.3 ... 43 m3/h	4.6 ... 77.9 m3/h
Medium pressure [MPa]	-0.09 ... 4 MPa	0 ... 3 MPa
Pressure of medium	-0.9 ... 40 bar	0 ... 30 bar
Temperature of medium	-40 ... 200 °C	-30 ... 230 °C
Nominal pressure of process valve PN	16, 40	
Description	• Sturdy design • Stainless steel and gunmetal (red brass) process valves with stainless steel, brass or aluminium actuators • Different actuator sizes and housing materials • Selection of different seat and shaft seals • For liquids, gases and other easily contaminated media • Easy-to-clean design	• Highly flexible, extremely high flow rates • Long service life • Stainless steel or Ecobrass process valves with stainless steel or polymer actuators • Modular design • Hygienic design, insensitive to dirt • Quick and easy maintenance • Simple and sturdy: an ideal choice for virtually all media with a viscosity of up to 600 mm2/s • High chemical and thermal resistance • Sustainable due to product lifecycle extended by ease of repair • Sustainable in production thanks to the use of alternative materials
online: →	→ vzxf	→ vzxa

Process valves

Pinch valves

	 Pinch valves VZQA
Design	Pinch valve, pneumatically actuated
Actuation type	Pneumatic
Valve function	2/2-way, monostable, closed, 2/2-way, monostable, open
Nominal width DN	6, 15, 25, 50
Process valve connection	Clamp in accordance with ASME-BPE type A, clamp in accordance with ASME-BPE type B, clamp in accordance with DIN 32676 series A, 1/4 NPT, 1/2 NPT, 1 NPT, 2 NPT, G1, G1/2, G1/4, G2
Flow rate Kv	0.7 ... 72 m3/h
Medium pressure [MPa]	0 ... 0.6 MPa
Pressure of medium	0 ... 6 bar
Medium pressure [psi]	0 ... 87 psi
Temperature of medium	-5 ... 150 °C
Nominal pressure of process valve PN	10
Description	•Modular design •Quick and easy replacement of the diaphragm •Sustainable due to product lifecycle extended by ease of repair •For critical, abrasive and viscous media •Easy-to-clean design •Flow direction is freely selectable •Versions with end-position sensing
online: →	→ vzqa

Solenoid-actuated media valves

	 Solenoid valves VZWD	 Solenoid valves VZWD	 Solenoid valves VZWF	 Solenoid valves VZWM	 Solenoid valves VZWP	 Media separated solenoid valves VYKA
Design	Directly actuated poppet valve	Directly actuated poppet valve	Diaphragm valve, force pilot operated	Diaphragm valve, servo-controlled	Pilot-actuated piston poppet valve	Rocker valve with diaphragm seal
Actuation type	Electrical	Electrical	Electrical	Electrical	Electrical	Electrical
Nominal width	1 ... 6.4 mm	1 ... 6 mm	13.5 ... 50 mm	13 ... 50 mm	13 ... 25 mm	1.2 mm
Process valve connection	1/8 NPT, 1/4 NPT, G1/4, G1/8	1/8 NPT, 1/4 NPT, G1/4, G1/8	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, 1 NPT, 1 1/4 NPT, 1 1/2 NPT, 2 NPT, G1, G1 1/2, G1 1/4, G1/2, G1/4, G2, G3/4, G3/8	G1, G1 1/2, G1 1/4, G1/2, G1/4, G2, G3/4, G3/8	1/4 NPT, 3/8 NPT, 1/2 NPT, 3/4 NPT, 1 NPT, G1, G1/2, G1/4, G3/4, G3/8	
Flow rate Kv	0.04 ... 0.64 m3/h	0.06 ... 0.4 m3/h	1.8 ... 28 m3/h	1.6 ... 39 m3/h	1.5 ... 11.5 m3/h	0.013 ... 0.021 m3/h
Medium pressure [MPa]	0 ... 10 MPa	0 ... 9 MPa	0 ... 1 MPa		0.05 ... 4 MPa	-0.05 ... 0.2 MPa
Pressure of medium	0 ... 100 bar	0 ... 90 bar	0 ... 10 bar		0.5 ... 40 bar	-0.5 ... 2 bar
Medium pressure [psi]	0 ... 1450 psi	0 ... 1305 psi	0 ... 145 psi		7.25 ... 580 psi	-7.25 ... 29 psi
Temperature of medium	-10 ... 140 °C	-10 ... 80 °C	-10 ... 80 °C	-10 ... 60 °C	-10 ... 80 °C	
Description		•Large pressure range •Directly actuated poppet valve •No pressure difference required •Can also be used in vacuum technology	•High flow rates •Large nominal widths with relatively small solenoids •No pressure difference required •Can also be used in vacuum technology	•Brass or stainless steel casting design •Electrical connection via solenoid armature tube •Wide range of coils •Coil can be ordered separately	•For all applications with a differential pressure of min. 0.5 bar •For high pressures and high flow rates with relatively small solenoids •For controlling gaseous and liquid media in open circuits	•Maximum power density and precision in a very small space (1.2 mm nominal width with a width of only 7 mm) •High repeat accuracy and precision in dispensing processes, including the lowest volumes •Very good flushability and minimised media consumption with optimised fluid chamber and small internal volume •FDA-listed materials (PEEK, EPDM, FKM, FFKM) also suitable for aggressive media •Also ideal for gas applications due to minimal leakage values •Optionally with slide-on E-box VAVE-K1 with holding current reduction as accessory to minimise the heat input •Developed according to ISO 13485 •Sustainable operation thanks to efficient control and active air shut-off
online: →	→ vzwd	→ vzwd	→ vzwf	→ vzwm	→ vzwp	→ vyka

Process valve units

Ball valve units

	 Ball valve units KVZB
Description	• Manually actuated with hand lever • Automatically actuated with semi-rotary drive • Controlled operation with quarter turn actuator and valve positioner • Variants to EU Explosion Protection Directive (ATEX)
online: →	→ kvzb

Ball valve actuator units

	 Ball valve actuator units VZBC	 Ball valve actuator units VZBA	 Ball valve actuator units VZPR
Design	2-way ball valve, quarter turn actuator	2-way ball valve, 3-way ball valve, L-bore, quarter turn actuator, T-bore	2-way ball valve, quarter turn actuator
Actuation type	Pneumatic	Pneumatic	Electric, pneumatic
Nominal width DN	15, 20, 25, 32, 40, 50, 65, 80, 100	8, 10, 15, 20, 25, 32, 40, 50, 65, 80, 100	15, 20, 25, 32, 40, 50, 63
Process valve connection	Ring housing with threaded flange	Weld-on ends/weld-on ends, Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3, Rp3/4, Rp3/8, Rp4	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3/4, Rp3/8
Flow rate Kv	19.4 ... 1414 m3/h	7 ... 1414 m3/h	
Temperature of medium	-10 ... 200 °C	-10 ... 200 °C	-20 ... 150 °C
Nominal pressure of process valve PN	16, 40	63	25, 40
Description	• Ball valve actuator unit with double-acting or single-acting quarter turn actuator DAPS • Stainless steel ball valve in compact design • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions • Use in zones 1, 21, 2, 22	• Ball valve actuator unit with double-acting or single-acting quarter turn actuator DAPS • Stainless steel ball valve • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions • Use in zone 1, 21, 2, 22	• Ball valve actuator unit with double-acting quarter turn actuator DAPS • Brass ball valve • NAMUR port pattern for solenoid valves/limit switch attachments in accordance with VDI/VDE 3845 • Flow is fully opened or closed in both directions
online: →	→ vzbc	→ vzba	→ vzpr

Butterfly valve units

	 Butterfly valve units KVZA
Description	• For versatile use in a wide range of industry segments • Manually actuated with hand lever • Automatically actuated with semi-rotary drive • Controlled operation with quarter turn actuator and valve positioner • Butterfly valve type: wafer or lug • Nominal width DN25 ... DN200 • Connection standard DIN EN 1092-1 or ANSI CLASS 150
online: →	→ kvza

Process valves
Pneumatically actuated media valves



	Pneumatic valves VLX
Design	Diaphragm valve
Valve function	2/2-way, single solenoid, closed
Actuation type	Pneumatic
Nominal width	13 ... 25 mm
Process valve connection	G1, G1/2, G1/4, G3/4, G3/8
Standard nominal flow rate	2400 ... 14000 l/min
Temperature of medium	-10 ... 80 °C
Pressure of medium	1 ... 10 bar
Operating pressure	
Description	•Poppet valve •Indirectly actuated •Brass design •In-line mounting
online: →	→ vlx

Compressed air preparation > Filter regulators
Individual devices



	Filter regulators PCRP
Pneumatic connection 1	1/4 NPT, 1/2 NPT, G1/2, G1/4, NPT1/2-14, NPT1/4-18
Standard nominal flow rate	1600 ... 4115 l/min
Pressure regulation range	0.5 ... 12 bar
Grade of filtration	5 µm, 40 µm
Operating pressure [MPa]	0.1 ... 2 MPa
Operating pressure	1 ... 20 bar
Description	•Sturdy housing for the specific requirements of process automation •Suitable for use outdoors and at temperatures down to –60 °C •Resistant to UV radiation and corrosive environments •Two pressure gauge connections for different installation options •With manual condensate drain, rotating •Size 44, 64 •Sustainable operation thanks to reduced pressure level
online: →	→ pcrp

Services
Energy Saving Services



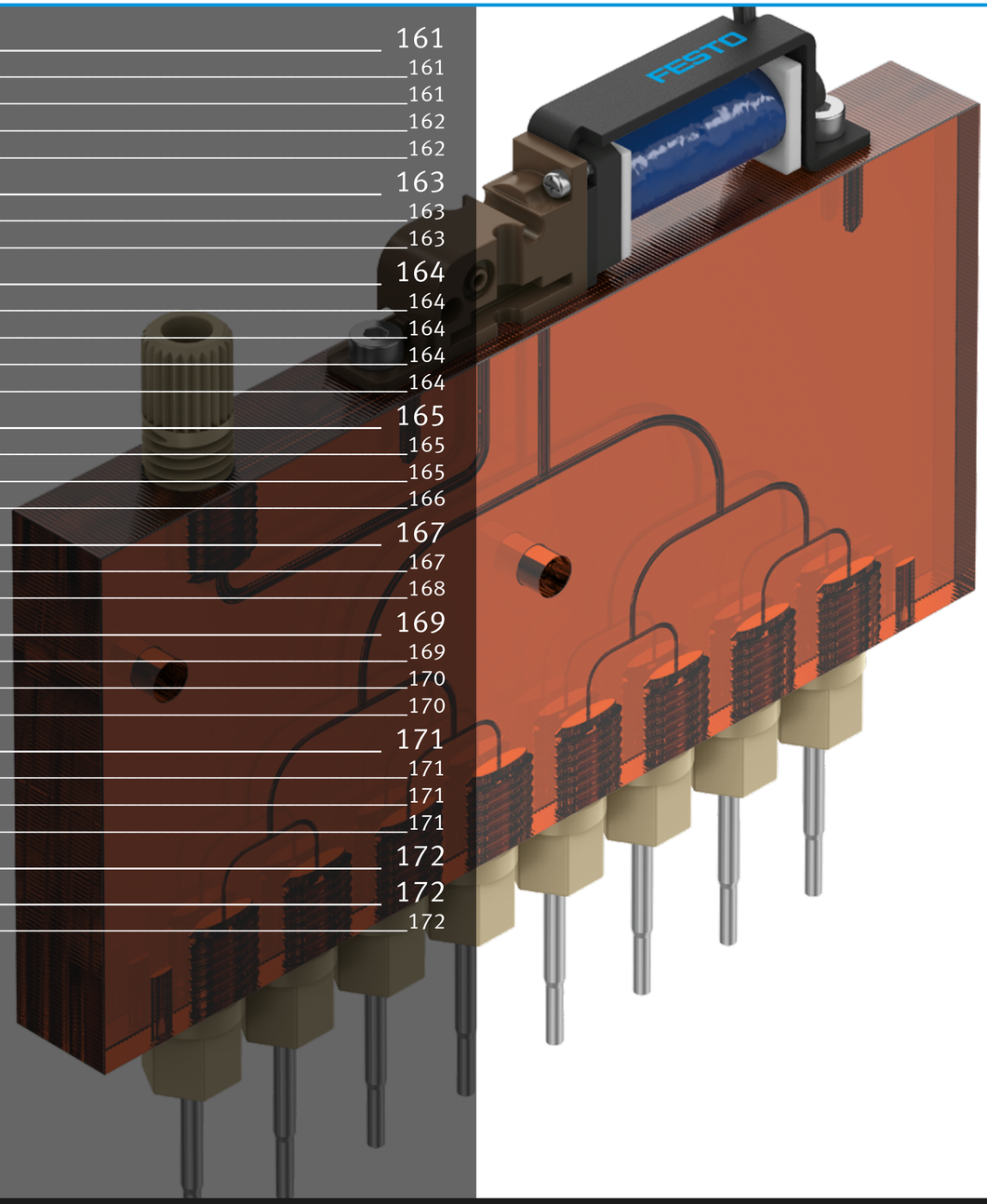
	Compressed air energy efficiency audit GFAA
Scope of services	Analysis of compressed air generation on 4 to 6 compressors: energy consumption/delivery capacity/pressure/utilisation, analysis of compressed air generation on up to 3 compressors: energy consumption/delivery capacity/pressure/utilisation, analysis of compressed air generation on more than 6 compressors: energy consumption/delivery capacity/pressure/utilisation, analysis of compressed air distribution: pressure measurement at a minimum of two consumer points and calculation of the pressure drop, analysis of pneumatic applications: visual inspection of the production system with leakage location and detailed energy efficiency analysis of pneumatic applications on at least two selected machine cells (depending on complexity), detailed analysis of energy saving potential and recommendation of measures to increase energy efficiency, documentation of results in accordance with DIN EN ISO 11011, concept for a compressed air monitoring system, measurement and analysis of compressed air treatment at the point of production: dimensioning/drying capacity/measurement of compressed air quality (water and residual oil content)
Description	•TÜV-certified energy efficiency analysis of the entire compressed air system clamp in accordance with DIN EN ISO 11011 •Available in three packages, depending on the number of existing compressors •Analysis of the current situation with weighted recommendations for improving energy efficiency •Documentation of CO2 values, costs and savings potentials •Savings of up to 60% of the compressed air costs of pneumatic systems •Improved productivity and Overall Equipment Effectiveness (OEE) •Sustainable operation by checking the energy efficiency of the compressed air system
online: →	→ gfaa

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- Pneumatic or Electric?

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Individual valves

Media separated valves

	 Media separated solenoid valves VYKA	 Media separated solenoid valves VYKC
Size	7	16
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
Operational voltage range DC	12 ... 26 V	12 ... 24 V
Note on operating voltage range DC	With E-box VAVE-K1-...	Holding current reduction necessary
Coil characteristics	12 - 26 V DC: low-current phase 0.06 W, high-current phase 2.2 W	12 - 24 V DC: low-current phase 1.4 W, high-current phase 5.5 W
Fluid connection	Flange	Flange
Nominal width	1.2 mm	1.6 mm, 2 mm
Flow rate Kv	0.013 m³/h, 0.018 m³/h, 0.021 m³/h	0.026 m³/h, 0.046 m³/h, 0.048 m³/h
Medium	Liquid media, gaseous media	Liquid media, gaseous media
Medium pressure [MPa]	-0.05 MPa, 0 MPa, 0.2 MPa	-0.075 MPa, 0.2 MPa, 0.3 MPa
Materials in contact with the media	EPDM, FFPM, FPM, PEEK	PEEK, EPDM
Ambient temperature	0 ... 50 °C	0 ... 50 °C
Description	•Maximum power density and precision in a very small space (1.2 mm nominal width with a width of only 7 mm) •High repeat accuracy and precision in dispensing processes, including the lowest volumes •Very good flushability and minimised media consumption with optimised fluid chamber and small internal volume •FDA-listed materials (PEEK, EPDM, FKM, FFKM) also suitable for aggressive media •Also ideal for gas applications due to minimal leakage values •Optionally with slide-on E-box VAVE-K1 with holding current reduction as accessory to minimise the heat input •Developed according to ISO 13485 •Sustainable operation thanks to efficient control and active air shut-off	•Flexible nominal widths (1.2 mm/1.6 mm/2.0 mm) with the same size (16 mm) •High-quality materials, therefore also suitable for aggressive media •Minimised heating effect thanks to intelligent holding current reduction •FDA-listed materials •Visual feedback by two LEDs simplifies use •Optionally with holding current reduction •Low energy consumption with efficient control
online: →	→ vyka	→ vykc

Proportional valves, piezo valves

	 Proportional directional control valves VPWI
Design	Poppet valve with spring return
Valve function	3-way proportional directional control valve
Pneumatic connection 1	G1/8
Actuation type	Electrical
Operating pressure	0 bar, 2 bar, 6 bar, 8 bar, 12 bar, 13 bar
Standard nominal flow rate	490 l/min
Ambient temperature	0°C, 50°C
Description	•Dynamic range up to a maximum of 180 Hz •Full graphic display •Stroke limitation •Adjustable incline •Actual value in pressure or stroke •Food-safe grease NSFH1
online: →	→ vpwi

Individual valves

Switching valves

	 Solenoid valves MHA1, MHP1	 Solenoid valves MHE2, MHP2, MHA2, MHE3, MHP3, MHA3, MHE4, MHP4, MHA4	 Fast switching valves MHJ9, MHJ10
Design	Poppet valve with spring return	Pressure relief poppet valve	Poppet valve without spring return
Width	10 mm, 20 mm	10 mm, 14 mm, 18 mm	9 mm, 10 mm
Valve function	2/2-way, single-solenoid, closed, 2x2/2-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	2/2-way, single solenoid, closed
Actuation type	Electrical	Electrical	Electrical
Standard nominal flow rate	10 l/min, 14 l/min, 30 l/min	90 l/min, 100 l/min, 200 l/min, 400 l/min	50 l/min, 100 l/min, 160 l/min
Nominal width	0.65 mm, 0.7 mm, 0.9 mm, 1.5 mm	2 mm, 3 mm, 4 mm	
Operating pressure	-0.9 bar, 0 bar, 1.5 bar, 2 bar, 6 bar, 8 bar	-0.9 bar, 8 bar	0.5 bar, 4 bar, 6 bar, 8 bar
Operating pressure [MPa]	-0.09 MPa, 0 MPa, 0.15 MPa, 0.2 MPa, 0.6 MPa, 0.8 MPa	-0.09 MPa, 0.8 MPa	0.05 MPa, 0.4 MPa, 0.6 MPa, 0.8 MPa
Operating medium	Compressed air to ISO 8573-1:2010 [7:4:4]	Compressed air to ISO 8573-1:2010 [7:4:4]	Compressed air to ISO 8573-1:2010 [7:4:4]
Nominal operating voltage DC			
Ambient temperature	-5 °C, 40 °C, 50 °C	-5 °C, 40 °C, 60 °C	-5°C, 60°C
Description	•Directly actuated poppet valve •Miniature valve: grid dimension 10 mm •Switching times down to 4 ms •Sub-base valve •Manifold block for 2 ... 10 valves •Use as a pilot valve •UL certification; same connections and cables as for VUVG	•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	•Directly actuated poppet valve •Identical basic valves for direct or battery assembly •Individual valve with integrated plug connection •Switching frequencies up to 1000 Hz •Very good reproducibility •MHJ9: Valve manifold assembly with individual outputs or with air nozzle output •MHJ9: Electrical connection via connecting cable MHJ9-KMH with integrated control electronics •MHJ10: Valve manifold assembly with individual outputs •MHJ10: Electrical connection via moulded-in cable, control electronics included in the valve
online: →	→ mh1	→ mh2	→ mhj9

Accessories for individual valves

	 Silencer U
Information on silencer insert materials	PE, bronze
Pneumatic connection	3/4 NPT, G1, G1/2, G1/4, G1/8, G3/4, G3/8, PK-3, PK-4
Noise level	70 ... 90 dB(A)
Ambient temperature	-10 ... 70 °C
Description	•Compact design, polymer or die-cast •Barbed fitting or threaded connection •Operating medium: compressed air
online: →	→ u

Regulators

Flow control valves

	 Proportional flow control valves VEMD
Valve function	2-way proportional flow control valve
Operating pressure	0 bar, 1 bar, 2.5 bar, 6 bar
Flow rate control range	0 l/min, 2 l/min, 4 l/min, 20 l/min, 100 l/min, 200 l/min
Nominal width	1.4 mm, 6 mm
Nominal operating voltage DC	12 V, 24 V
Reference value	4 - 20 mA, 0.2 - 10 V, 1 - 5 V, Modbus, 0 - 10 V
Medium	Argon, compressed air as per ISO 8573-1:2010 [5:4:1], compressed air as per ISO 8573-1:2010 [6:4:4], carbon dioxide, oxygen, oxygen (oxygen applications as per IEC 60601-1 only on request), nitrogen
Ambient temperature	0 ... 50 °C
Description	•Mass flow controller (MFC) with thermal flow sensor and integrated control electronics •Dynamic regulation with short response time •Operating medium: air, oxygen, nitrogen, argon, CO2 •The current flow rate value is available via the interface •Ideal for many applications where inert gases or oxygen need to be controlled •Sustainable operation thanks to efficient control
online: →	→ vemd

Pressure regulators

	 Proportional pressure regulators VEAA	 Proportional pressure regulators VEAB	 Proportional pressure regulators VPPE	 Proportional pressure regulators VPPX	 Proportional pressure regulators VPPI
Valve function	3-way proportional pressure regulator	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed	3-way proportional pressure regulator	3-way proportional pressure regulator
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	1400 l/min, 1650 l/min, 2750 l/min, 7000 l/min	150 l/min, 375 l/min, 900 l/min, 1400 l/min, 1630 l/min
Operating pressure			8 bar		0 bar, 1 bar, 2 bar, 4 bar, 6 bar, 8 bar, 10 bar, 12 bar, 13 bar
Input pressure 1	0 bar, 11 bar	0 bar, 1 bar, 2 bar, 3 bar, 4 bar, 5.5 bar, 6.5 bar	3 bar, 4 bar, 6 bar, 8 bar, 11 bar	0 bar, 11 bar	0 bar, 6 bar, 13 bar, 16 bar
Pressure regulation range			0.02 bar, 0.06 bar, 0.1 bar, 0.15 bar, 2 bar, 6 bar, 10 bar	0.1 bar, 10 bar	-1 bar, 0 bar, 2 bar, 6 bar, 10 bar, 12 bar, 16 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]	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			24 V
Reference value	4 - 20 mA, 0 - 5 V, 0 - 10	4 - 20 mA, 0 - 5 V, 0 - 10			
Ambient temperature	0 ... 50 °C	0 ... 50 °C	0 ... 60 °C	0 ... 60 °C	0 ... 50 °C
Description	•High-precision up to 10 bar •Very compact size •Highly dynamic pressure control for the lowest flow rates •Available as a pipe socket or sub-base valve •Silent operation and low heat generation •Very short switching times •Sustainable operation with reduced pressure level and efficient control	•Control vacuum and/or overpressure with a single valve •Highly dynamic pressure control for low flow rates •Top performance and optionally available with IO-Link interface •Available as a pipe socket or sub-base valve •Additional IO-Link features: customisable control parameters, diagnostics, 2-point calibration, etc. •Silent operation and low heat generation •Very short switching times •Sustainable operation with reduced pressure level and efficient control	•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 •Variants recommended for production systems for manufacturing Li-ion batteries	•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	•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 the 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: →	→ veaa	→ veab	→ vppe	→ vppx	→ vppi

Air preparation

Filter regulators, series MS-B



	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	•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 perfect combination of low-cost basic functionality and high-end functional requirements •Stable control behaviour •With or without pressure gauge •Rotary knob with latch •With integrated secondary exhausting and primary exhausting with return flow function •MS2: directly actuated diaphragm regulator •MS4, MS6: directly actuated piston regulator •Grid dimensions 25, 40, 62 mm (sizes 2, 4, 6)
online: →	→ ms2-lfr

Pressure regulators, series MS-B



	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	•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 perfect combination of low-cost basic functionality and high-end functional requirements •Stable control behaviour •With or without pressure gauge •Rotary knob with latch •With integrated secondary exhausting and primary exhausting with return flow function •MS2: directly actuated diaphragm regulator •MS4, MS6: directly actuated piston regulator •Grid dimensions 25, 40, 62 mm (sizes 2, 4, 6) •Sustainable operation thanks to reduced pressure level
online: →	→ ms-lr-b

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	•Lockable design •Good regulation characteristics with minimal pressure hysteresis and primary pressure compensation •High secondary exhausting •Variants to EU Explosion Protection Directive (ATEX) •Variants recommended for production systems for manufacturing Li-ion batteries
online: →	→ lrp

On/off and soft-start valves, MS-B Basic series





	On/off valves MS4-EE-B, MS6-EE-B	Soft-start valves MS4-EDE-B, MS6-EDE-B
Pneumatic connection 1	G1/2, G1/4	G1/2, G1/4
Standard nominal flow rate	2000 … 5000 l/min	2000 … 5000 l/min
Operating pressure	3 … 7 bar	3 … 7 bar
Actuation type	Electrical	Electrical
Ambient temperature	-5 … 50 °C	-5 … 50 °C
Description	•Very compact and extremely lightweight series for use close to the process directly in the machine •Electrically operated 3/2-way valve for pressurising and exhausting pneumatic systems •Ducted exhaust air possible via threaded connection with silencer •Detenting and non-detenting manual override •Supply voltage 24 V DC •With solenoid coil, without plug socket •Variants recommended for production systems for manufacturing Li-ion batteries •Grid dimensions 40, 62 mm (size 4, 6)	•Very compact and extremely lightweight series for use close to the process directly in the machine •Electrically operated 3/2-way valve for slowly pressurising and exhausting pneumatic systems •The switching pressure can be precisely controlled with a solenoid valve •Adjustable switching time delay •Built-in connections into which the tubing can be directly inserted •Detenting and non-detenting manual override •Supply voltage 24 V DC •With solenoid coil, without plug socket •Variants recommended for production systems for manufacturing Li-ion batteries •Grid dimensions 40, 62 mm (size 4, 6)
online: →	→ ms-ee-b	→ ms-ede-b

Sensors

Pressure and vacuum sensors

	 Pressure transmitter SPTW	 Pressure transmitter SPTE	 Pressure sensors SPAN, SPAN-B
Pressure measuring range start value	-1 bar, 0 bar	-1 bar, 0 bar	-1 bar, 0 bar
Pressure measuring range start value [MPa]	-0.1 MPa, 0 MPa	-0.1 MPa, 0 MPa	-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
Pressure measuring range end value [MPa]	0.1 MPa, 0.2 MPa, 0.6 MPa, 1 MPa, 1.6 MPa, 2.5 MPa, 5 MPa, 10 MPa	-0.1 MPa, 0.1 MPa, 1 MPa	-0.1 MPa, 0.1 MPa, 1 MPa, 1.6 MPa
Switching element function			N/C or N/O, 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		3-core, cable, open end	
Display type			Illuminated LCD
Ambient temperature	0 ... 80 °C	0 ... 50 °C	0 ... 50 °C
Description	•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	•Piezoresistive pressure sensor •Measured variable: relative pressure •Cable length 2.5 m •Compact: 8-bracket wall mount for manifold assembly	•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

Flow sensors

	 Flow sensors SFAH	 Flow transmitter SFTE
Flow measuring range final 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	
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	•Process, compressed air, forming gas and pneumatic object monitoring, handling 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	•Compact design •Universal flow detection •Easy installation •Reliable pick & place application for extremely small workpieces
online: →	→ sfah	→ sfte

Sensors
Opto-electrical sensors

	 Colour sensors SOEC	 Retro-reflective sensors, diffuse sensors, distance sensor, light barriers SOOE	 Fork light barrier SOOF	 Retro-reflective sensors, diffuse sensors, light barriers SOOD	 Diffuse sensor, retro-reflective sensor SOEG-RT, SOEG-RS	 Through-beam sensors SOEG-E, SOEG-S	Fibre-optic units SOE4
Measurement method	Colour sensor	Distance sensor	Fork light barrier		Retro-reflective sensor, diffuse sensor, diffuse sensor with background suppression	Through-beam sensor, receiver, transmitter	Fibre-optic unit
Working range	12 ... 32 mm	0 ... 20000 mm		0 ... 10000 mm	10 ... 2000 mm	20000 mm	
Size	50x50x17		Clevis 120x60, 30x35, 50x55, 80x55		M12, M12x1, M18, M18x1	M18x1	
Setting options	Teach-in, teach-in via electrical connection	IO-Link®, potentiometer, teach-in	IO-Link®, potentiometer, teach-in		Potentiometer		Teach-in, teach-in via electrical connection
Type of light	White	Laser, red, LED	Red	Laser, red, LED	Red, polarised red	Red	Red
Switching output	PNP	Push-pull	Push-pull, NPN, PNP	Push-pull	NPN, PNP	NPN, PNP	NPN, PNP
Ambient temperature	-10 ... 55 °C	-40 ... 60 °C	-25 ... 60 °C	-25 ... 60 °C	-25 ... 55 °C	-25 ... 55 °C	-20 ... 60 °C
Description	• Diffuse sensor • Block design • Electrical connection via M12x1 plug, 8-pin • Display via 7 LEDs	• Easy to operate • Quick to commission • Reliable and stable sensing • Attractive price/performance ratio	• 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 indicators	• Easy to operate • Quick to commission • Reliable and stable sensing • Attractive price/performance ratio	• Round design • Electrical connection via open cable end or plug connector	• Round design • Electrical connection via open cable end or plug connector	• Use for precise and space-saving position sensing in the electronics and light assembly industry • Switching frequencies of up to 8000 Hz • Operational with fibre-optic cable SOOC as accessory • Variants: LED or LED display, timer function • Mounting: DIN rail mounting or with through-hole • With protection against mutual interference
online: →	→ soec	→ sooe	→ soof	→ sood	→ soeg	→ soeg	→ soe4

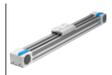
Connection technology
Standard O.D. pneumatic tubing

	 Plastic tubing PFAN	 Plastic tubing PTFEN	 Plastic tubing PLN	 Plastic tubing PUN-H, PUN-H-DUO	 Customer-specific tubing PAN, PEN, PLN, PUN
Outside diameter	3 ... 12 mm	4 ... 16 mm	4 ... 16 mm	2 ... 16 mm	3 ... 16 mm
Inside diameter	2.3 ... 8.4 mm	2.9 ... 11 mm	2.9 ... 12 mm	1.2 ... 11 mm	2 ... 12 mm
Temperature-dependent operating pressure	-0.95 ... 16 bar	-0.95 ... 15 bar	-0.95 ... 14 bar	-0.95 ... 10 bar	-0.95 ... 35 bar
Ambient temperature	-20 ... 150 °C	-20 ... 150 °C	-30 ... 80 °C	-35 ... 60 °C	-60 ... 100 °C
Description	• Perfluoroalkoxy alkane • Pneumatic tubing with resistance to high temperatures and chemicals • For food-safe grade, see www.festo.com/certificates/PFAN • High resistance to chemicals, microbes, UV radiation, hydrolysis and stress cracks • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PFAN	• Polytetrafluoroethylene • For food-safe grade, see www.festo.com/certificates/PTFEN • Highly resistant to chemicals • High temperature resistance • Operating medium: compressed air, vacuum	• Polyethylene • High resistance to chemicals, microbes and hydrolysis • Food-safe see www.festo.com/certificates/PLN • Resistant to most cleaning agents and lubricants • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PLN	• Polyurethane • High resistance to microbes and hydrolysis • Suitable for energy chains • Cleanroom-compatible combination with fitting NPKA • Also available as DUO tubing • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PUN_H	• Individual lengths: delivered in units of 25, 50, 100, 200 ... 500 m • Minimum order quantity: from 1500 m/3000 m (or less depending on type) depending on diameter • Customised design: specific printing possible • Easy to recognise and use: individual colour selection • Choose from 9 basic colours; further colours available on request • Select, size and order quickly, easily and reliably with the configurator
online: →	→ pfan	→ ptfen	→ pln	→ pun-h	→ pan

Connection technology
Pneumatic fittings

	 Push-in fittings/connectors, media resistant NPQP	 Push-in fittings/connectors, standard series QS	 Push-in fittings/connectors NPQR	 Threaded fittings NPFC
Design	Push-pull principle	Push-pull principle	Push-pull principle	
Design	Blanking plug, L-shape, L-shape, additional push-in connector lengthwise, bulkhead, T-shape, Y-shape, straight shape	45° angle, 45° angle, long, blanking plug, L-shape, L-shape, 2-way, parallel, L-shape, long, L-shape, additional connection female thread lengthwise, L-shape, additional push-in connector lengthwise, bulkhead, T-shape, X-shape, Y-shape, straight shape	L-shape, bulkhead, T-shape, screw plug, Y-shape, straight shape	
Pneumatic connection 1	Push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, male thread R1/2, R1/4, R1/8, R3/8, for hose O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	Push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, Ø 16 mm, 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, for hose 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. Ø 10 mm, 12 mm, 14 mm, 16 mm, 4 mm, 6 mm, 8 mm	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	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	Female thread 1/8 NPT, push-in sleeve Ø 4 mm, Ø 6 mm, Ø 8 mm, Ø 10 mm, Ø 12 mm, Ø 16 mm, female thread G1/2, G1/4, G1/8, G3/8, for hose outer Ø 10 mm, 12 mm, 16 mm, 22 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. 10 mm, 12 mm, 14 mm, 16 mm, 4 mm, 6 mm, 8 mm	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 for full temperature range		-0.95 bar, 6 bar, 14 bar	-0.95 bar, 12 bar, 16 bar	
Operating pressure				-0.95 bar, 10 bar, 50 bar
Operating pressure [MPa] for full temperature range		-0.095 MPa, 0.6 MPa, 1.4 MPa	-0.095 MPa, 1.2 MPa, 1.6 MPa	
Operating pressure [psi] for full temperature range		-13.775 psi, 87 psi, 203 psi	-13.775 psi, 174 psi, 232 psi	
Ambient temperature	-20 ... 60 °C	-20 ... 80 °C	-20 ... 150 °C	-20 ... 150 °C
Description	• Polypropylene • Low-cost alternative to stainless steel: resistant to most cleaning agents in combination with tubing PLN • For use with extreme media influences • For suitability for use in the food industry see www.festo.com/certificates/NPQP • Operating medium: compressed air, vacuum • Straight design, L-shape, T-shape, Y-shape, push-in bulkhead connector	• 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. Water according to manufacturer's declaration see www.festo.com/certificates/QS • Straight shape, L-shape, T-shape, at 45° angle, X-shape, Y-shape, push-in bulkhead connector	• Very easy to clean thanks to chamfered O-ring and reduced number of 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) • Straight design, L-shape, T-shape, Y-shape, push-in bulkhead connector	• Nickel-plated brass • Sleeve • Extension • Double nipple • Reducing nipple • Operating medium: compressed air, vacuum • Straight shape, L-shape, T-shape, X-shape, Y-shape
online: →	→ npqp	→ qs	→ npqr	→ npfc

Drives & actuators
Electric drives

	 Toothed belt axes EGC-TB-KF	 Ball screw axes EGC-BS-KF	 Toothed belt axes ELGC-TB-KF	 Ball screw axes ELGC-BS-KF	 Electric slide EGSK	 Mini slide EGSL-BS	 Mini slide EGSC-BS-KF
Design	Electromechanical linear axis, with toothed belt	Electromechanical linear axis, with recirculating ball spindle	Electromechanical linear axis, with toothed belt	Electromechanical linear axis, with recirculating ball spindle	Electromechanical linear axis, with ball screw	Electric mini slide, guide, with ball screw	Electric mini slide, with ball screw
Size	50, 70, 80, 120, 185	70, 80, 120, 185	45, 60, 80	32, 45, 60, 80	15, 20, 26, 33, 46	35, 45, 55, 75	25, 32, 45, 60
Working stroke	50 ... 8500 mm	50 ... 3000 mm	200 ... 2000 mm	100 ... 1000 mm	25 ... 840 mm	50 ... 300 mm	25 ... 200 mm
Max. acceleration	50 m/s²	15 m/s²	15 m/s²	15 m/s²	10 m/s², 20 m/s²	25 m/s²	5 m/s², 15 m/s²
Max. speed	3 ... 5 m/s	0.5 ... 2 m/s	1.2 ... 1.5 m/s	0.6 ... 1 m/s	0.16 ... 1.48 m/s	0.3 ... 1.3 m/s	0.133 ... 0.6 m/s
Max. feed force Fx	50 ... 2500 N	400 ... 3000 N	75 ... 250 N	40 ... 350 N	19 ... 392 N	75 ... 450 N	20 ... 250 N
Max. force Fy	50 ... 2500 N	400 ... 3000 N	75 ... 250 N	40 ... 350 N	19 ... 392 N	75 ... 450 N	20 ... 250 N
Max. force Fz	650 ... 15200 N	1850 ... 15200 N	880 ... 5543 N	356 ... 5543 N	764 ... 4919 N	291 ... 1539 N	669 ... 4937 N
Motor type	Stepper motor, servo motor	Stepper motor, servo motor	Stepper motor, servo motor	Stepper motor, servo motor		Stepper motor, servo motor	Stepper motor, servo motor
Ambient temperature	-10 ... 60 °C	-10 ... 60 °C	0 ... 50 °C	0 ... 50 °C	0 ... 40 °C	0 ... 60 °C	0 ... 50 °C
Description	• 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 • The motor can be flexibly mounted on 4 sides • 22 types in stock with short delivery times and modular products for custom variants • Long strokes of up to 8.5 m possible	• 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 • The motor can be flexibly mounted on 2 sides • 34 types in stock with short delivery times and modular products for custom variants • Strokes of up to 3 m possible	• Precision guide rail with high load capacity • Internal guide and toothed belt • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants recommended for production systems for manufacturing Li-ion batteries	• Internal guide and ball screw • Space-saving position sensing • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants recommended for production systems for manufacturing Li-ion batteries	• 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	• 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	• 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 recommended for production systems for manufacturing Li-ion batteries
online: →	→ egc	→ egc	→ elgc-tb	→ elgc-bs	→ egsk	→ egsl	→ egsc-bs

Drives & actuators

Handling systems



2D planar surface gantries
EXCM

Design	Planar surface gantry
Size	30, 40
Motor type	Stepper motor
Ambient temperature	10 ... 50 °C
Description	•Axis mechanism based on parallel kinematic functional principle •Excellent functionality in confined spaces •Low moving dead weight and flat system design •Ideal in combination with stepper motors •With recirculating ball bearing guide •Sustainable operation due to weight-optimised axes
online: →	→ excm

Motors and servo drives



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

Operating voltage	19.2 - 30 V DC, 20.4 - 30 V DC
CPU data	Dual core 500 MHz
Ambient temperature	0 ... 55 °C
Description	•Compact programmable logic controller •Programming with CODESYS to IEC 61131-3 •12 digital inputs, 8 digital outputs, additionally two high-speed counters up to 200 kHz •Ethernet 10/100 Mbit/s •USB interface for data transfer
online: →	→ cecc



Servo drive
CMMT-ST

Nominal current, load supply	8 A
Nominal voltage, load supply DC	24 V, 48 V
Fieldbus coupling	EtherCAT, EtherNet/IP, 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	•Space-optimised servo drive for operating stepper motors, brushless direct current motors (BLDC motors) and EC motors •Ideal for positioning tasks and point-to-point and interpolating motion solutions •The new multiprotocol variant (CMMT-...-MP) has all fieldbuses (PROFINET, EtherCAT®, EtherNet/IP, Modbus) integrated in one servo drive hardware •A servo drive for direct fieldbus integration for controllers from the major manufacturers with associated function blocks •Integrated safety functions STO (SafeTorqueOff) - Cat 3, Ple / SIL 3 / SILCL 3 ensure safe operation •For extremely economical applications with low power requirements of 150 W at 24 V DC, 300 W at 48 V DC and a peak power of 800 W •Energy recovery and energy management ensure sustainable operation and increased efficiency •Auto-tuning makes commissioning of rotary and linear motions easier •Very efficient for tasks with low power requirements •50% more compact than the smallest servo drive CMMT-AS •Ideal for use with stepper motors such as the EMMB-ST and EMMT-ST, BLDC motors and EC motors
online: →	→ cmmt-st

Gripper, rotary 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 Fz, static	200 ... 450 N
Gripper repetition accuracy	0.01 mm, 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	•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 ratchet switch or via IO-Link® interface •RA1 version with robot connection, enables fast integration in lightweight robot environments
online: →	→ ehps

Accessories for grippers



	Gripper jaws DHAS-GG
Size	16 mm
Type of mounting	Via female thread M3
Ambient temperature	-40 ... 180 °C
Description	•Reliable gripping of microwell plates in life sciences •Easy to mount
online: →	→ dhas

Electric semi-rotary drives



	rotary actuators ERMO
Size	12, 16, 25, 32
Max. driving torque	0.15 ... 5 Nm
Rotation angle	Infinite
Description	•Integrated motor with gear stage for a compact design •Motor control with encoder for reaching high angular accuracy •Sturdy output bearings for absorbing high forces and torques •Backlash-free pre-stressed rotating plate with very good axial eccentricity and concentricity properties •Quick and accurate installation
online: →	→ ermo

Electronic controllers



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

Operating voltage	19.2 - 30 V DC, 20.4 - 30 V DC
CPU data	Dual core 500 MHz
Ambient temperature	0 ... 55 °C
Description	•Compact programmable logic controller •Programming with CODESYS to IEC 61131-3 •12 digital inputs, 8 digital outputs, additionally two high-speed counters up to 200 kHz •Ethernet 10/100 Mbit/s •USB interface for data transfer
online: →	→ cecc

Services

Energy Saving Services



Compressed air energy efficiency audit
GFAA

Scope of services	Analysis of compressed air generation on 4 to 6 compressors: energy consumption/delivery capacity/pressure/utilisation, analysis of compressed air generation on up to 3 compressors: energy consumption/delivery capacity/pressure/utilisation, analysis of compressed air generation on more than 6 compressors: energy consumption/delivery capacity/pressure/utilisation, analysis of compressed air distribution: pressure measurement at a minimum of two consumer points and calculation of the pressure drop, analysis of pneumatic applications: visual inspection of the production system with leakage location and detailed energy efficiency analysis of pneumatic applications on at least two selected machine cells (depending on complexity), detailed analysis of energy saving potential and recommendation of measures to increase energy efficiency, documentation of results in accordance with DIN EN ISO 11011, concept for a compressed air monitoring system, measurement and analysis of compressed air treatment at the point of production: dimensioning/drying capacity/measurement of compressed air quality (water and residual oil content)
Description	•TÜV-certified energy efficiency analysis of the entire compressed air system clamp in accordance with DIN EN ISO 11011 •Available in three packages, depending on the number of existing compressors •Analysis of the current situation with weighted recommendations for improving energy efficiency •Documentation of CO_2 values, costs and savings potentials •Savings of up to 60% of the compressed air costs of pneumatic systems •Improved productivity and Overall Equipment Effectiveness (OEE) •Sustainable operation by checking the energy efficiency of the compressed air system
online: →	→ gfaa

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Discontinued products

On this and the following pages you will find a list of Festo products that have been discontinued or are no longer available.
Some products are only available on request (SOR products = Sales on Request) and are not recommended for new projects. To provide you with an alternative to these discontinued or SOR products, we will present suitable products of a newer generation that offer you technical and price advantages.

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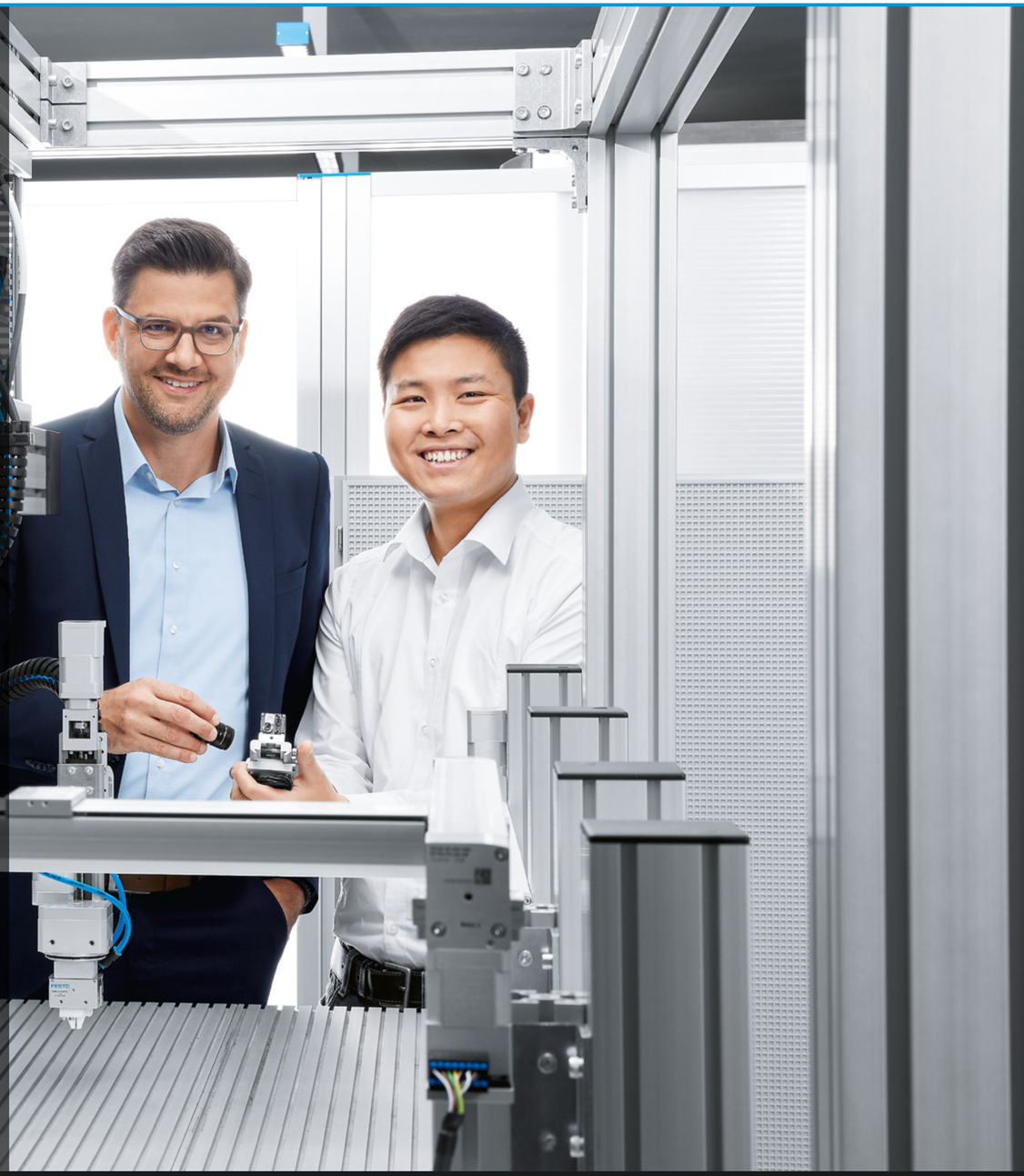
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*Austausch prüfen:
Unterschiedliche Befestigungslöcher und Gesamtabmessungen

Piston rod cylinders
Round cylinders

Discontinued product	 Standards-based cylinder DSN			 Standards-based cylinder DNC
No longer available	x			
Not for new projects				x
Only on request				x
Alternative product	 Standards-based cylinder DSNU	 Round cylinder DSNU	 Round cylinder DSNU-S	 Standards-based cylinder DSBC
Replacement	1:1	Check replacement*	Check replacement*	1:1
Operating mode	Double-acting	Double-acting	Double-acting	Double-acting
Piston diameter	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm	8 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	23 ... 295 N	482.5 ... 1870.3 N	30.2 ... 294.5 N	415 ... 7363 N
Stroke	1 ... 500 mm	1 ... 500 mm	1 ... 200 mm	1 ... 2800 mm
Cushioning	Elastic cushioning rings/bumpers at both ends, self-adjusting pneumatic end-position cushioning, adjustable pneumatic cushioning, at both ends	Elastic cushioning rings/bumpers at both ends, self-adjusting pneumatic end-position cushioning, adjustable pneumatic cushioning, at both ends	Elastic cushioning rings/bumpers at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/bumpers at both ends, self-adjusting pneumatic end-position cushioning, adjustable pneumatic cushioning, at both ends
Description	• ISO 6432 • Wide range of variants for customized applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with internal or external thread • For position sensing • Variants recommended for production facilities for the manufacture of lithium-ion batteries	• Wide range of variants for customized applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with internal or external thread • For position sensing • Variants recommended for production facilities for the manufacture of lithium-ion batteries	• Compact variant of standards-based cylinder DSNU • Quick and easy to install, even in tight spaces • Light weight • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with external thread • For position sensing • Variants recommended for production facilities for the manufacture of lithium-ion batteries • Sustainable in production thanks to reduced use of materials	• ISO 15552 (ISO 6431, VDMA 24562) • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Standard profile with two sensor slots • Wide range of variants for customized applications • Comprehensive range of mounting accessories for just about every type of installation • For position sensing • Variants recommended for production facilities for the manufacture of lithium-ion batteries
Online: →	→ dsnu	→ dsnu	→ dsnu-s	→ dsbc

*Austausch prüfen:
Unterschiedliche Befestigungslöcher und Gesamtabmessungen

Piston rod cylinders
Compact, short-stroke and flat cylinders

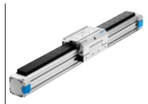
Discontinued product	 Compact cylinder, metric ADVU, AEVU			
No longer available				
Not for new projects	x			
Only on request	x			
Alternative product	 Compact cylinder ADN	 Compact cylinder AEN	 Compact cylinder ADN-S	 Compact cylinder AEN-S
Replacement	Check replacement*	Check replacement*	Check replacement*	Check replacement*
Operating mode	Double-acting	Single-acting, pushing, pulling	Double-acting	Pushing
Piston diameter	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	51 ... 7363 N	54 ... 4416 N	17 ... 1870 N	13 ... 1780 N
Stroke	1 ... 500 mm	1 ... 25 mm	5 ... 50 mm	5 ... 25 mm
Cushioning	Elastic cushioning rings/bumpers at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/bumpers at both ends	Elastic cushioning rings/bumpers at both ends, no cushioning	Elastic cushioning rings/bumpers at both ends, no cushioning
Description	• ISO 21287 • Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 • Piston rod with internal or external thread • Wide range of variants for customized applications • For position sensing • Variants recommended for production facilities for the manufacture of lithium-ion batteries	• ISO 21287 • Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 • Piston rod with internal or external thread • Wide range of variants for customized applications • For position sensing	• Minimal fitting space • Extra light • Ideal for small movements • Piston rod with internal or external thread • For position sensing • Variants recommended for production facilities for the manufacture of lithium-ion batteries • Sustainable in production thanks to reduced use of materials	• Minimal fitting space • Extra light • Ideal for small movements • High forces in a compact size • Piston rod with internal or external thread • For position sensing
Online: →	→ adn	→ aen	→ adn-s	→ aen-s

*Austausch prüfen:
Unterschiedliche Befestigungslöcher und Gesamtabmessungen

Piston rod cylinders
Cylinders with clamping unit

Discontinued product	 Cylinder with holding brake DNCKE
No longer available	x
Not for new projects	
Only on request	
Alternative product	 Cylinder with holding brake DFLC
Replacement	Check replacement*
Operating mode	Double-acting
Piston diameter	40 mm, 63 mm, 100 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	754 ... 4712 N
Stroke	10 ... 2000 mm
Cushioning	Pneumatic cushioning, adjustable at both ends
Position sensing	Stopping, holding, blocking a movement/Category 1, Performance Level c
Description	•Combination of holding brake and standards-based cylinder based on ISO 15552 •Holding function: the piston rod is retained by clamping with frictional locking •Emergency braking function: the movement of the piston rod is stopped by clamping with frictional locking •With safety functions •Variants as per the EU Explosion Protection Directive (ATEX) •Optional: high corrosion protection level •For position sensing
Online: →	→ dflc

Rodless cylinders
Mechanically coupled cylinders

Discontinued product	 Linear actuator, metric DGPL
No longer available	
Not for new projects	x
Only on request	x
Alternative product	 Linear actuator DGC-...-G, DGC-...-GF, DGC-...-KF
Replacement	Check replacement*
Operating mode	Double-acting
Piston diameter	8 mm, 12 mm, 18 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	30 ... 1870 N
Stroke	1 ... 8500 mm
Cushioning	Elastic cushioning rings/bumpers at both ends, adjustable pneumatic cushioning, at both ends, shock absorber, hard characteristic curve, shock absorber, soft characteristic curve
Position sensing	Via proximity switch
Description	•All settings accessible from one side •Optionally with variable end stops and intermediate position module •Optional: NSF-H1 lubricant for the food zone (see www.festo.com/certificates/DGC) •Optional: clamping unit for holding loads •Sustainable in operation due to leakage reduction at sealing points
Online: →	→ dgc

Guided actuator
Actuators with guide rods

Discontinued product	 Compact cylinders, multi-mount DMM
No longer available	x
Not for new projects	
Only on request	
Alternative product	 Compact cylinder DPDM
Replacement	Check replacement*
Operating mode	Double-acting, single-acting Pushing, pulling
Piston diameter	6 mm, 10 mm, 16 mm, 20 mm, 25 mm, 32 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	9 ... 483 N
Stroke	5 ... 50 mm
Cushioning	Elastic cushioning rings/bumpers at both ends
Position sensing	Via proximity switch
Description	•Mounting via through-hole and internal thread •Compact design •Piston rod variants •For position sensing •Sustainable in production thanks to reduced use of materials
Online: →	→ dpdm

*Austausch prüfen:
Unterschiedliche Befestigungslöcher und Gesamtabmessungen

Guide cylinders
Linear slides

Discontinued product	 Mini slide SLT
No longer available	x
Not for new projects	
Only on request	
Alternative product	 Mini slides DGST
Replacement	Check replacement*
Piston diameter	6 mm, 8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	34 ... 589 N
Stroke	10 ... 200 mm
Cushioning	Short elastic cushioning rings/bumpers on both sides, elastomer cushioning, on both sides, stroke not adjustable, elastic cushioning rings/bumpers on both sides, elastic cushioning rings/bumpers on both sides with fixed stop, external hydraulic cushioning
Position sensing	Via proximity switch
Description	•Powerful twin-piston actuator •Shortest mini slide on the market •Precise recirculating ball bearing guide •Versatile mounting options •Version with mirrored supply port configuration and sensor slots for compact assembly available to order using the configurator •Variants recommended for production facilities for the manufacture of lithium-ion batteries •Sustainable in production thanks to reduced use of materials
Online: →	→ dgst

Semi-rotary actuator
Vane actuators

Discontinued product	 Semi-rotary actuator DSR
No longer available	
Not for new projects	x
Only on request	x
Alternative product	 Semi-rotary actuator DRVS
Replacement	Check replacement*
Size	6, 8, 12, 16, 25, 32, 40
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	0.15 ... 20 Nm
Permissible mass moment of inertia	6.5 ... 350 kgcm²
Position sensing	Via proximity switch
Swivel angle	0 ... 270 deg
Description	•Double-acting semi-rotary actuator with rotary vane •Lighter than other semi-rotary actuators •Fixed swivel angle, swivel angle can be adjusted with the help of accessories •Housing protected against splash water and dust •Sustainable in production thanks to reduced use of materials
Online: →	→ drvs

Rack and pinion actuators

Discontinued product	 Semi-rotary actuator DRQD
No longer available	x
Not for new projects	
Only on request	
Alternative product	 Semi-rotary actuator DRRD
Replacement	Check replacement*
Size	8, 10, 12, 16, 20, 25, 32, 35, 40, 50, 63
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	0.2 ... 112 Nm
Permissible mass moment of inertia	15 ... 420000 kgcm²
Position sensing	Via proximity switch
Swivel angle	180 deg
Description	•Twin-piston rotary actuator, power transmission via rack and pinion principle •Very high accuracy in the end positions •Very high load-bearing capacity •Very good axial run-out at the flanged shaft •Greater stability even with smaller sizes •Sustainable in production thanks to reduced use of materials
Online: →	→ drrd

*Austausch prüfen:
Unterschiedliche Befestigungslöcher und Gesamtabmessungen

Vacuum
Vacuum generators

Discontinued product	 Vacuum generator VADMI	 Vacuum generator VAK, VAD
No longer available		
Not for new projects	x	x
Only on request	x	x
Alternative product	 Vacuum generator OVEM	 Vacuum generator VN
Replacement	Check replacement*	Check replacement*
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 muffler, vacuum switch	Pneumatic ejector pulse valve, pressure sensor, open silencer
Max. suction rate with respect to atmosphere	6 ... 348 l/min.	6.1 ... 339 l/min.
Description	•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 muffler •Integrated filter with inspection window •Optionally with air-saving function and LCD display •Short switching times thanks to integrated solenoid valves •Adjustable ejector pulse: precise and safe depositing of the workpiece •Sustainable in operation thanks to the use of an air-saving circuit	•Can be used directly in the work space •Available as a 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 muffler
Online: →	→ ovem	→ vn

Universal directional control valves
Solenoid valves

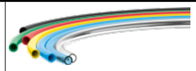
Discontinued product	 Solenoid valve CPE	 Solenoid valve Tiger 2000 MFH	 Solenoid valve MIDI, MEH, MEBH
No longer available			x
Not for new projects	x	x	
Only on request	x	x	
Alternative product	 Solenoid valve VUVS		
Replacement	Check replacement*		
Actuation type	Electrical		
Pneumatic connection 1	1/8 NPT, G1/4, G1/8, G3/8		
Pneumatic working port	1/8 NPT, 1/4 NPT, 3/8 NPT, G1/4, G1/8, G3/8, QS-1/2, QS-1/4, QS-10, QS-12, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8		
Operating pressure [MPa]	-0.09 ... 1 MPa		
Operating pressure	-0.9 ... 10 bar		
Standard nominal flow rate	500 ... 2400 l/min.		
Valve function	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurized, 5/3-way, exhausted, 5/3-way, closed		
Electrical connection	3-pin, socket, type B, type C, screw terminal, as per EN 175301-803, as per industry standard (11 mm)		
Description	•Universal valve, sturdy and durable •Low-cost with no performance limitations •Can be used as individual valves or manifold valves VTUS		
Online: →	→ vuvs		

*Austausch prüfen:
Unterschiedliche Befestigungslöcher und Gesamtabmessungen

Valve Manifolds
Universal valve manifolds

Discontinued product	 Valve manifold, Compact Performance CPV
No longer available	
Not for new projects	x
Only on request	x
Alternative product	 Valve manifold MPA-L
Configuration	Please check with Festo
Valve size	10 mm, 14 mm, 20 mm
Valve function	2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurized, 5/3-way, exhausted, 5/3-way, closed
Max. standard nominal flow rate	360 l/min at 10 mm, 670 l/min at 14 mm, 870 l/min at 20 mm
Max. no. of valve positions	32
Max. no. of pressure zones	20
Electrical actuation	Fieldbus, I-Port, IO-Link, multi-pin
Valve manifold design	Interchangeable valve sizes
Description	•Maximum modularity •System can be extended as required with individual sub-bases and modular tie rods •Polymer sub-bases •3 valve sizes •Tamper-proof fixed flow restrictor •Fieldbus interface via CPX •IO-Link capable
Online: →	→ mpa-l

Pneumatic tubing
Standard O.D. pneumatic tubing

Discontinued product	 Plastic tubing PU
No longer available	
Not for new projects	x
Only on request	x
Alternative product	 Plastic tubing PUN-H, PUN-H-DUO
Replacement	
Outer diameter	2 ... 16 mm
Inner diameter	1.2 ... 11 mm
Temperature-dependent operating pressure [MPa]	-0.095 ... 1 MPa
Temperature-dependent operating pressure	-0.95 ... 10 bar
Temperature-dependent operating pressure [psi]	-13.775 ... 145 psi
Ambient temperature	-35 ... 60 °C
Description	•Polyurethane •High resistance to microbes and hydrolysis •Suitable for energy chains •Cleanroom-compatible combination with fitting NPKA •Also available as DUO plastic tubing •Operating media: compressed air, vacuum, water. Water according to manufacturer's declaration: see www.festo.com/certificates/PUN_H
Online: →	→ pun-h

Sensors
Pressure sensors

Discontinued product	 Pressure sensor SDE1
No longer available	x
Not for new projects	
Only on request	
Alternative product	 Pressure sensor SPAU
Replacement	
Pressure measuring range	-1 ... 16 bar
Switching element function	N/C contact/N/O contact, switchable
Switching output	2 x PNP or 2 x NPN switchable, 2 x PNP
Pneumatic connection	Flange, 1/8 NPT, G1/8, M5, M7, QS-4, QS-5/32, QS-6, R1/4, R1/8
Electrical connection 1, connection type	Plug
Display type	Illuminated LCD, LED
Description	•For monitoring compressed air and non-corrosive gases •With or without display •Transfer of the pressure value as switching signal, analog signal or via IO-Link to the connected control system •Maximum flexibility thanks to versatile pneumatic adaptation and switchable electrical outputs
Online: →	→ spau

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Digital engineering tools

Software for the right design and optimal sizing of products

Are you wondering whether digitalisation offers opportunities for simplifying your design and sizing process?
Of course! With our online engineering tools, you can design your solution easily and reliably, select exactly the right components or run calculations, regardless of your level of expertise.
Take a look at our overview now and find the right tool to make your day-to-day work easier.

Simulation

System configurator
Design your machine concept with Festo products and solutions.

→ **www.festo.com/sc**

Pneumatic simulation
Helps with optimisation of the combination of pneumatic drive and accessories.

→ **www.festo.com/x/pneumatic-simulation**

Electric Motion Sizing
Simulate your electric drive system quickly and easily.

→ **www.festo.com/x/electric-motion-sizing**

Handling Guide Online
A customised handling system with just a few clicks.

→ **www.festo.com/x/handling-guide-online**

Sizing

Simplified Motion Series - Solution Finder
Pneumatic simplicity meets electrical automation.

→ **www.festo.com/x/simplified-motion-series**

CO_2 values und TCO Guide
Compare the CO_2, costs and performance for pneumatic and electric solutions.

→ **www.festo.com/x/co2-tco**

Vacuum sizing
Calculate customised vacuum solutions for your ideal vacuum system.

→ **www.festo.com/x/vacuum-sizing**

Shock absorber selection
Select the right shock absorber for your application.

→ **www.festo.com/x/shock-absorber**



Sizing

Gripper sizing
Get customised gripper solutions for precise and efficient handling.
→ www.festo.com/x/gripper-sizing

Pneumatic sizing
Calculate the optimum pneumatic control chain.
→ www.festo.com/x/pneumatic-sizing

Calculation

Flow rate
Start the flow rate calculation for your pneumatic system.
→ www.festo.com/x/flowrate-calculation

Media resistance
Evaluate the chemical resistance of materials and hoses.
→ www.festo.com/x/Media resistance

Mass moment of inertia
This tool calculates all mass moments of inertia for you quickly and easily.
→ www.festo.com/x/mass-moment-of-inertia

Cylinder air consumption
Calculate the air consumption of pneumatic cylinders for system optimisation.
→ www.festo.com/x/air-consumption

Rotary indexing tables
Select the right rotary indexing table for your application.
→ www.festo.com/x/rotary-indexing-table-selection

Service unit components
Find the right service unit component for your application.
→ www.festo.com/x/pneumatic-sizing

Feed separator
Decide on the ideal feed separator.
→ www.festo.com/x/pneumatic-sizing

Configuration

Quarter turn actuator units KDFP-DFPD
Use this configurator to select your specific quarter turn actuator units.
→ www.festo.com/catalogue/kdfp-dfpd

Butterfly valve units KVZA
Easily configure butterfly valve units in the wafer or lug variants.
→ www.festo.com/catalogue/kvza

Ball valve units KVZB
Configure ball valves with threaded, flanged or clamp connections.
→ www.festo.com/catalogue/kvzb

Design

FluidDraw
Your reliable solution for electrical and pneumatic circuit diagrams.
→ www.festo.com/fluiddraw

EPLAN Schematic Solution (GDDE)
With one click Schematic Solution documents your project in accordance with standards.
→ www.festo.com/eplan

Festo Design Tool 3D
Create CAD product combinations with accessory search for pneumatic cylinders.
→ www.festo.com/fdt-3d-online

Festo PARTdataManager
2D/3D CAD data for more than 33,000 products.
→ www.festo.com/partdatamanager

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Catalogue

Spare parts catalogue
Select suitable spare parts online and order them in the online shop.

→ www.festo.com/x/spare-parts-catalog

QuickSearchPlus
Get all product information in the Festo catalogue quickly and efficiently.

→ www.festo.com/quicksearch

Commissioning

Festo Automation Suite
Automate the entire drive package, from the mechanical system to the controller.

→ www.festo.com/fas

Festo Configuration Tool
Configuration and commissioning software for the motor controller CMMS-ST.

→ www.festo.com/configuration-tool

Festo Maintenance Tool
Tool for commissioning, configuring and diagnosing a CPX valve terminal.

→ www.festo.com/search/?q=fmt

Connectivity Finder
Find the optimum connection of a Festo solution to your PLC control system.

→ www.festo.com/x/connectivity-finder

PA Toolkit (GSPL)
Easy process programming and visualisation with the PA Toolkit for Codesys.

→ www.festo.com/pa-toolkit

Service

Festo Energy Saving Services portal
Take advantage of our Energy Saving Services Portal.

→ energysavingservices.festo.com

Further services
We're there when you need us – in person or with digital support.

→ www.festo.com/support

Training

Festo Learning Experience for industry
Benefit from our digital learning portal with over 700 courses, functions and the AI-supported authoring tool.

→ www.festo.com/lx

FluidSIM 365
Discover the leading simulation software for circuit diagrams in pneumatics, hydraulics and electrical engineering.

→ www.festo.com/fluidsim

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Services

...and support by Festo

You can rely on it in every single case:
We're there when you need us – in person or with digital support.
This applies to all phases of the value creation process, from engineering to operation and beyond.

And we listen to you. After all, it is your systems that are at stake.
We help you to keep your processes running smoothly and without downtimes.
When it matters most, we’re there right away to help.

Services and support at every stage



	Technical support	Commissioning services				
	 Technical support	 Installation service	 On-site commissioning service for axis systems	 Remote commissioning service for axis systems	 Commissioning service servo press kit GFCA-Y2-A5, GFCA-Y2-A5-R	 PLC integration service servo press kit GFCA-Y2-A2, GFCA-Y2-A2-R
Description	• Support with equipment down-time or malfunction • Identifying the cause of the fault • Derivation of technical solutions • Remedy • Remote support/on-site support	• Mechanical installation • Pneumatic installation • Electrical installation • Available for Festo products and system solutions	• Inspection of the cabling, electrical and pneumatic connections as well as travel distances and energy chains • Configuration and parameterisation, incl. optimisation of the controller parameters and homing • Activation of components in test mode • Data backup and documentation • Instruction manual for machine operators • Available for 1, 2 and 3-axis systems with and without safety module • Service available on site	• Checking electrical connections and travel paths • Configuration and parameterisation • System test • Data backup and documentation • Introduction to the Festo Automation Suite software • Available for 1, 2 and 3-axis systems with and without safety module • Service is provided via remote communication	• Support with commissioning • Support with the electrical installation • Checking the electrical connections and the travel path • Configuration and parameterisation • Testing the system, data backup and documentation • Introduction to WebVisu software • Remote service/on-site service	• On-site support for the integration of function blocks into the higher-level controller (based on an empty project) • Test communication between the servo press kit YJKP and the higher-order controller • Functional test for the relevant function blocks for controlling the YJKP servo press kit using an sample project • Introduction to the structure of the function blocks and their functionality • Remote service/on-site service
online: →	→ www.festo.com/support	→ www.festo.com/services	→ www.festo.com/catalogue/gfch	→ www.festo.com/catalogue/gfch	→ www.festo.com/catalogue/gfca	→ www.festo.com/catalogue/gfca

	Maintenance and repair services		Energy Saving Services		
	 Maintenance service	 Repair service	 Pre-audit energy efficiency compressed air system	 Compressed air energy efficiency audit	 Analysing compressed air generation
Description	• Checking for signs of damage and wear • Checking mechanical, pneumatic and electrical connections and connectors • Checking compressed air preparation • Carrying out component-specific inspections • Lubrication/relubrication of guides • Tightening of connectors • Replacement of air filters • Replacement of silencers • Carrying out component-specific preventive maintenance tasks • Troubleshooting • Solution finding/error elimination • Elimination of leakages • Replacement or repair of components	• Inhouse repair of Festo components • Analysis of economic efficiency • Inspection • Cleaning • Replacement of worn-out parts • Function test	• Inspection of the cabling, electrical and pneumatic connections as well as travel distances and energy chains • Configuration and parameterisation, incl. optimisation of the controller parameters and homing • Activation of components in test mode • Data backup and documentation • Instruction manual for machine operators • Available for 1, 2 and 3-axis systems with and without safety module • Service available on site	• TÜV-certified energy efficiency analysis of the entire compressed air system according to DIN EN ISO 11011 • Available in three packages, depending on the number of existing compressors • Analysis of the current situation with weighted recommendations for improving energy efficiency • Documentation of CO2 values, costs and savings potentials • Savings of up to 60% of the compressed air costs of pneumatic systems • Improved productivity and Overall Equipment Effectiveness (OEE) • Implementing and documenting the results in the "Festo Energy Saving Services Portal" according to DIN ISO 11011	• Measuring the installed compressors • Power consumption • Delivery quantity • Pressure band • Analysis of the compressor output • Analysis of the usage ratio (workload) • Calculation of the leakage • Calculation of the annual electrical and compressed air costs, as well as potential savings by eliminating leakage • Implementing and documenting the results in the "Festo Energy Saving Services Portal" according to DIN ISO 11011
online: →	→ www.festo.com/service	→ www.festo.com/services	→ www.festo.com/catalogue/energysaving	→ www.festo.com/catalogue/gfaa	→ www.festo.com/catalogue/energysaving

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Energy Saving Services

	 Air quality analysis	 Compressed air consumption analysis	 Leakage detection and documentation	 Leakage elimination	 Machine analysis for energy efficiency
Description	• Inspection of the decentralised air preparation • Measuring the residual oil content (up to ISO 8573-1:2010 class 2) • Measurement of the pressure dew point (up to ISO 8573-1:2010 class 2) • Analysis of the measurement results • Suggested improvements • Implementing and documenting the results in the "Festo Energy Saving Services Portal" according to DIN ISO 11011	• Installing and removing measuring devices with standard parts (fittings, tubing, etc.) • Measurement of the static compressed air consumption of machines at stand-still and in operation • Calculation of the losses due to leakages • Determining consumption per machine cycle • Determining the average consumption per minute • Determining max./min. pressure • Determining average pressure level • Determining max./min. air flow • Analysis of the measurement results • Implementing and documenting the results in the "Festo Energy Saving Services Portal" according to DIN ISO 11011	• Localisation of leakages with ultrasonic detectors in the entire compressed air system during operation • Classification of leakages according to size and cost • Compilation of relevant information for eliminating the leakage: photo documentation, recommended measures, required spare parts, estimated repair time, prioritising measures, assessing whether maintenance can be carried out during machine operation, indicating optimisation options • Results available online on the Festo Energy Saving Assessment Portal • Implementing and documenting the results in the "Festo Energy Saving Services Portal" according to DIN ISO 11011	• Comprehensive elimination of leakages • Repair or replacement of the affected components based on the report of the leakage detection • Final verification by leakage test • Implementing and documenting the results in the "Festo Energy Saving Services Portal" according to DIN ISO 11011	• Measurement of the compressed air consumption of machines/systems • Carrying out a leakage detection process • Identification of the energy saving potential by assessing the energy efficiency of the system design • Proposing solutions for improving energy consumption including calculation of potential annual savings • Calculation of the amortisation period • Implementing and documenting the results in the "Festo Energy Saving Services Portal" according to DIN ISO 11011
online: →	→ www.festo.com/service	→ www.festo.com/services	→ www.festo.com/catalogue/energysaving	→ www.festo.com/catalogue/energysaving	→ www.festo.com/catalogue/energysaving

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	System optimisation	Service contract	Training and courses
	 System optimisation	 Service contract	 Energy saving services workshop
Description	• Development of customer-specific solutions for the modernisation and optimisation of equipment and/or applications • Calculation, selection and sizing of products, including CAD drawings and circuit diagrams • Simulation and testing for optimising the existing system/application • Implementation of optimisation measures • Documentation	• Customer-specific service contract with a range of service options • Regular inspections as recommended by Festo • Regular preventive maintenance • Software updates • Replacement of worn or defective components • Guaranteed availability • Guaranteed response times for on-site support in the event of machine downtime or malfunctions	• Basic principles of “energy efficiency in pneumatic systems” • Leakage detection with ultrasonic detection equipment • Documentation of leakages • Theory and practical exercises
online: →	→ www.festo.com/service	→ www.festo.com/services	→ www.festo.com/services

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Festo Didactic

Your Partner for Technical Skills Development

Lifelong learning and skills development for employees and new recruits are absolutely critical to meeting industrial challenges. We are the perfect partner,
when it comes to training equipment, learning programs and courses. We offer you answers to technological and organizational questions, as well as courses and content on the topics
Factory and process automation, pneumatics and hydraulics, electrics and electrical engineering, as well as topics such as digitalization and industrial transformation.

You decide what is important to you and take advantage of our range of classroom-based training courses and digital learning solutions.

With experienced trainers and consultants and the right formats and methods, we make your employees and your company successful, with a lasting and verifiable effect.

Our principles:

+ We see companies as complete entities, improve the organization, empower people
+ We trust in the potential of all the company's employees and promote (learning) dialog at all levels
+ Depending on the situation, we contribute our skills as trainers, experts and process facilitators
+ As Festo Didactic, we combine learning and working, and thus ensure that the skills learned can be put into practice
+ We embody the values, experience and success that the Festo name stands for

→ **www.festo.com/didactic**



Festo Industrial Workforce Development | From industry, for industry



Innovation
Develop competencies for tomorrow: prepare for learning, leading, and future production in line with IoT/I4.0

Public, customized, and online courses
Skills development: practical and hands-on learning with state-of-the-art industrial components



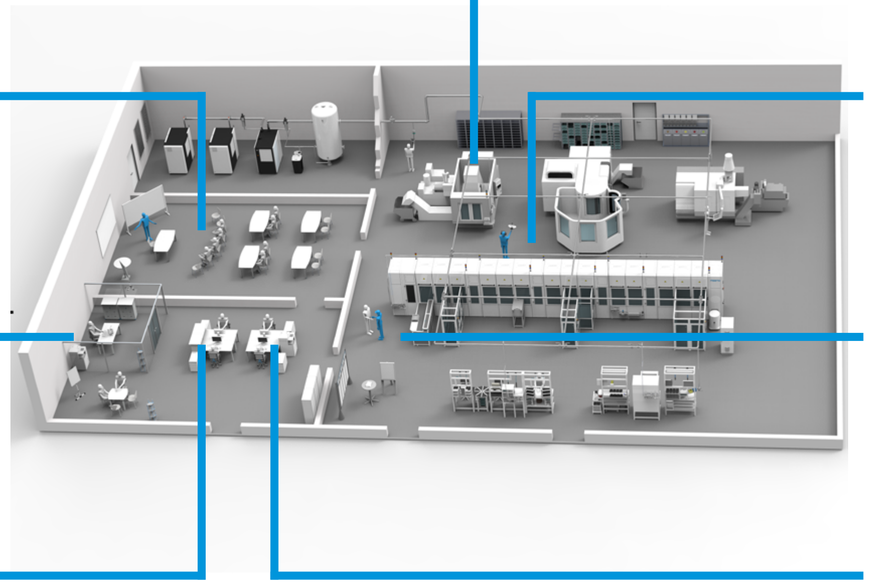
Training needs analysis
Define future roles and competencies, and design corporate learning targets and training requirements



Digital transformation
Added value: we initiate, design, and support change processes.



Competency programs
Knowledge and methods for individual job roles:
relevant theory combined with practical exercises



Technology
Technical skills:
Core technologies in factory and process automation



Organization
Continuous improvement:
Strategic planning and process optimization along the value chain



People
Behaviors and mindset:
Team work, communication, and leadership



Digital
Future of learning:
Digital learning with Festo LX

→ lx.festo.com



Festo Learning Journey

→ lx.festo.com

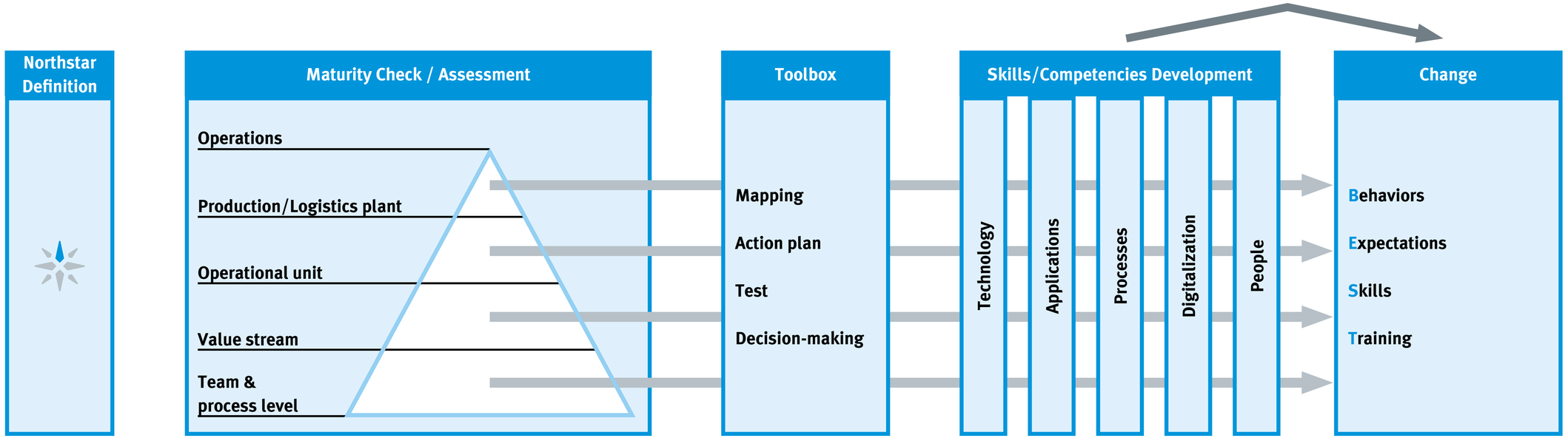


Learning Experience

For the company...

Less time away from the workplace for training and added value actions are the key. Knowledge leveling makes the competence development journey more effective and brings more results – operational excellence!

People are at the center of every Festo Learning Journey, which is, in fact, their journey, from where they are to where they need and/or should be.
We set the stage for their development, either for their own future, or by creating harmonized teams aligned with the company's present and future goals.



Festo Learning Journey

→ lx.festo.com



Learning Experience

For the learners...

It is all about flexibility and targeted steps to achieve their goals. Our integrated learning experience consists of various formats and methods, from digital to face-to-face training sessions, so that we can consider the learners' past knowledge and experiences in order to maximize their potential.

Festo Learning Experience bridges the gap between digital and face-to-face training

Target Group

Who needs to be trained?

Operator
Technician
Maintenance specialist
Design engineer

Profile Analysis & Design

What job profiles need to be fulfilled and where are the skill gaps?

Establish competency profiles

Training needs analysis | Interviews | Workshops | Value stream analysis

Learning Journey

Which formats will be best to meet the demand for training?

Self-study with Festo LX

Face-to-face training

Blended learning | Hybrid learning | Live online training for different levels

Learning Transfer

How can we transfer knowledge into practice?

Hardware
Software
Learning Factories

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→ www.festo.com/didactic

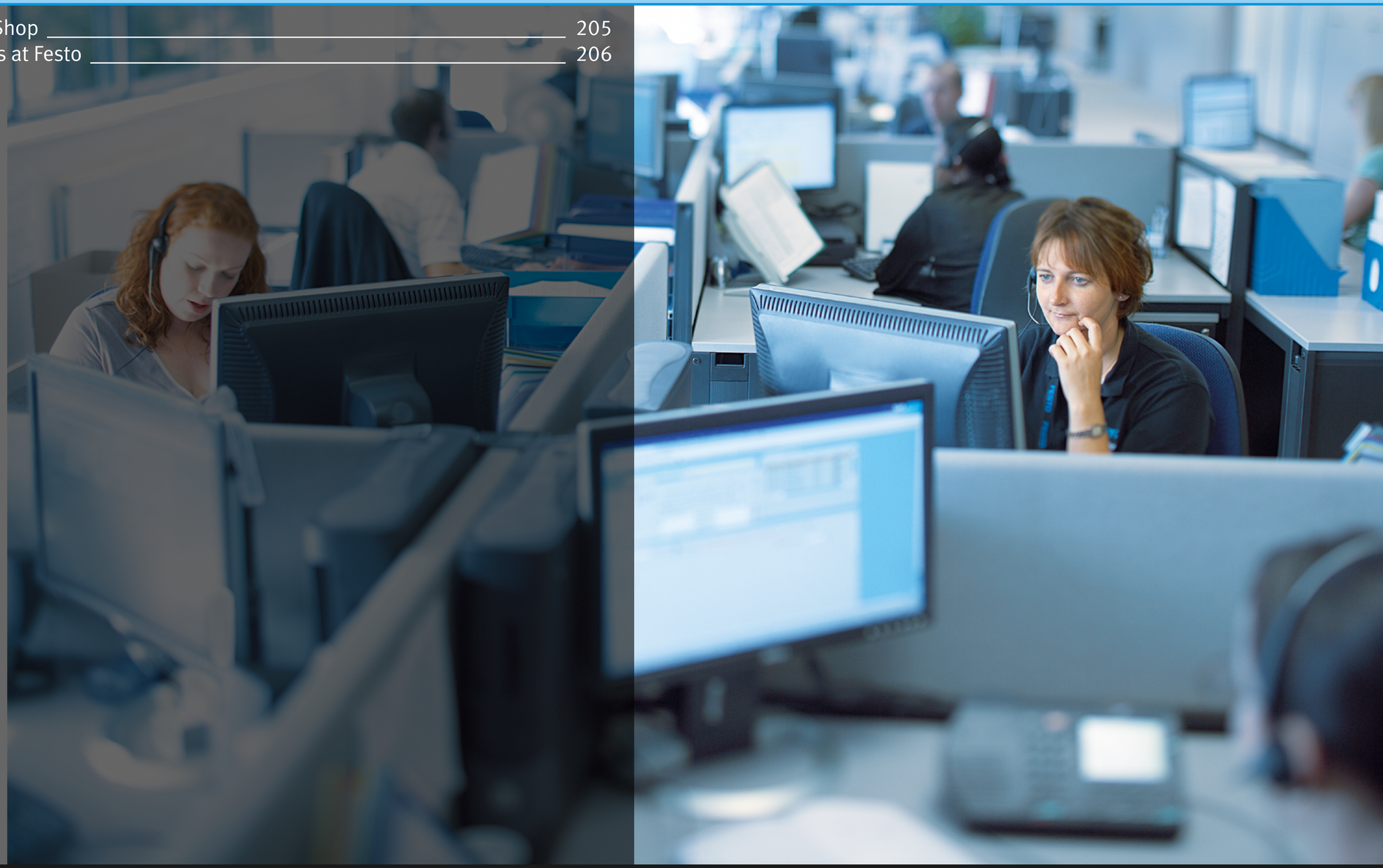
→ www.labvolt.com

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Online Shop

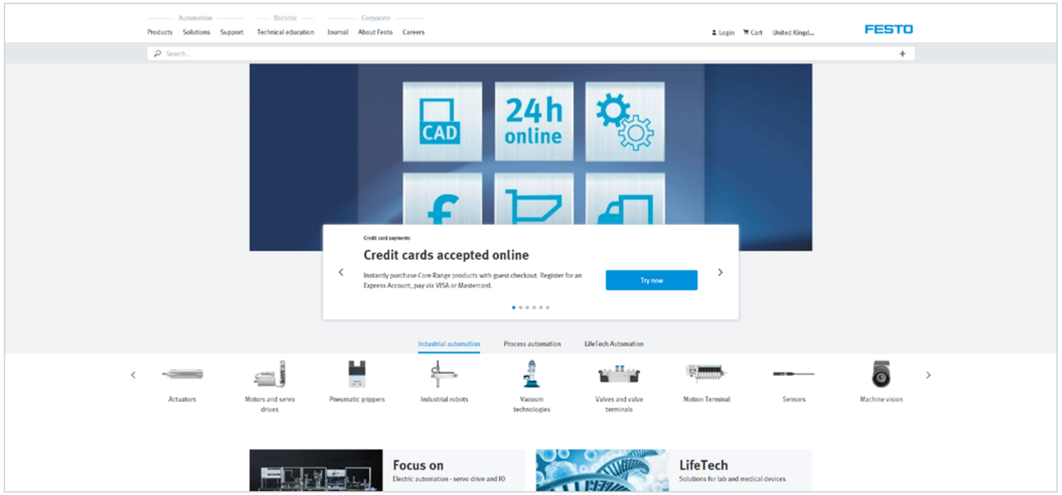
We want to make your work easier and keep your production running with the help of our new website and Online Shop.
On our new Festo website you can:

→ Find all the necessary information about our products
→ Easily access the configurators
→ Conveniently order products via our Online Shop

The Festo website includes:

→ Information on Festo worldwide
→ Quick links to over 25,000 CAD models and downloads
→ Technical product data
→ Manuals and descriptions
→ New product releases

Everybody has easy access to and can view the Festo online catalog. In addition, when you register and log in, you can also download CAD files for your specific design.
If you would like to view customer-specific pricing, product availability, purchase or track orders, please register for our Online Shop.



Registering for the Online Shop:

There are three different levels for accessing the Online Shop:
1. Individual account: Access to catalog/CAD file only
2. Corporate account: Planner, price & product availability
3. Purchasing account: Access to the ordering function

Choose your access level by clicking the button next to the level you require.
The registration process can take up to 24 hours if you don‘t have an existing account with Festo at the time of registration.
If you already have an account with Festo, your Online Shop account will be activated the same business day.

The benefits to you at a glance

General information	Product selection	Ordering	After-sales
Intuitive design and user guidance	All product information in a single place	Quick and easy check-out	Order history, order tracking improvements
Mobile friendly/ responsive design	**Intelligent search functions**	**Easy to convert a quote into an order**	**Free third-party shipping addresses**

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What should I bear in mind when using Festo products?

The limit values specified in the technical data and any specific safety instructions must be adhered to by the user in order to ensure correct functioning.

The pneumatic components must be supplied with properly prepared compressed air without aggressive media.
Take the ambient conditions at the place of use into consideration. Corrosive, abrasive and dusty environments (e.g., water, ozone, grinding dust) will reduce the service life of the product.
Check the resistance of the materials of Festo products to the media used or the environmental media.

When using Festo products in safety-related applications, all national and international laws and regulations, for example the EC Machinery Directive, must be observed and complied with together with the relevant references to standards, trade association rules and the applicable international regulations.

Unauthorized conversions or modifications to products and systems from Festo constitute a safety risk and are thus not permitted.
Festo cannot accept any liability for any resulting damage.

You should contact Festo if one of the following applies to your application:
The ambient conditions and conditions of use or the operating medium differ from the specified technical data.
The product is to perform a safety function.
A risk or safety analysis is required.
In case of uncertainty about the suitability of the product for the intended use.
In case of uncertainty about the suitability of the product for use in safety applications.

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