FESTO

Expert knowledge and solutions

Food and packaging industry

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9th edition (previously ‘Manual’)

Edition 2018/01

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01 Festo – Your automation partner

Quality pays for itself

We know that food safety and efficiency are among your key requirements. Our clever mix of solutions delivers the perfect ingredients for production facilities that produce the best quality food economically.

Content

At the heart of Europe

Our Scharnhausen Technology Plant in Germany

Our main goal is fast, flexible and reliable production through a smooth workflow. This is true for both highly automated volume production and for the manufacture of complex, customised products.

A central position in the Midwest

Mason, Ohio, USA

70% of our customers that are served by Mason are located within a radius of 1000 kilometres.

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. In addition to having 13 service centres around the world, we have also made our own production particularly future-proof to minimise the distance between you and us – in our plants in Scharnhausen, Germany, Mason, Ohio, USA and in Jinan, China.

Applying the same standards worldwide

All Festo plants continuously exchange information and learn from each other. This Festo Value Production concept, enhanced by the continuous further training and upskilling of our employees, ensures that the highest possible standards are applied globally. For your benefit as the customer.

Keeping Industry 4.0 constantly in focus

The comprehensive approach that Festo takes to Industry 4.0 and the Internet of Things (IoT) sets it apart.

In our opinion, customised products demand plants that are completely networked using intelligent automation components that enable intuitive interfaces between people and machines.

Ensuring that people have the right training and competencies in planning and production is also key to the success of Industry 4.0. Furthermore, engineering processes must be implemented faster and more intuitively in the future.

Anticipating and targeting future trends

An ability to adapt, maximum added value, the best possible quality, speed, delivery reliability and short routes to the customer are the key requirements that the food and packaging industry must meet. This is the only way in which it can compete in the long term and at a global level.

Responding flexibly to customer needs

Without making production more flexible, many future challenges such as changing orders, fluctuating batch sizes, increasingly large numbers of product variants, or the smooth integration of new products, will be nearly impossible to overcome. With Festo, you will be more than well-equipped for this megatrend. By realising highly profitable and extremely process-reliable concepts as part of a continuous production system, bottlenecks in the value stream can be avoided. 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.

★ Marked with a star!

More than 2,200 products from our core product range are generally ready for dispatch from the Festo factory within 24 hours, even in large quantities. They span the entire electrical and pneumatic control sequence, from drives to accessories, for factory automation as well as for process automation. This means that we cover up to 80% of all automation tasks – at attractive prices and in the familiar Festo quality.

Available from 13 service centres around the world!

→ www.festo.com/stars

2018/01 – Subject to change

Overview of the key topics

Using compressed air reliably and efficiently

Decide what kind of compressed air quality you need for your application. Our preconfigured service units are designed to meet your requirements and can be ordered with just a single part number.

Automatically shutting off the compressed air in stand-by mode allows targeted energy savings. The energy efficiency module E2M monitors and regulates the compressed air supply fully automatically.

For maximum performance

Our decentralised valve terminal concepts increase the productivity of your systems – quickly, easily and energy-efficiently.
No need for a control cabinet, especially with the Clean Design valve terminal MPA-C with degree of protection IP69K! Or you can use valve terminal VTUG in the control cabinet, with multi-pin plug and all common fieldbuses or IO-Link®.

Food-grade approved

Dispensing food cleanly and safely with the pneumatic pinch valve VZQA. Its silicone diaphragm comes in an N/O variant and with a declaration of conformity in accordance with Regulation (EC) No. 1935/2004. Our pinch valve variant has thus been approved for direct contact with food products.

Operational reliability writ large

High system availability requires reliable components, such as the stainless-steel cylinder CRDSNU from our Clean Design drive portfolio. Its dry-running seal makes it particularly durable and thanks to its self-adjusting end position cushioning system PPS, it is always correctly set – and has no adjusting screw where dirt can accumulate.

Gain more production time

With the automation platform CPX, you can integrate pneumatic and electrical control chains easily, quickly, flexibly and seamlessly into all automation concepts and company-specific standards. Thanks to OPC UA and CODESYS control V3 your active diagnostics management is optimally suited for Industry 4.0 solutions.

The world's first digitised pneumatics

The Festo Motion Terminal VTEM is moving pneumatics into the age of Industry 4.0! It is the first pneumatic automation platform worldwide that is controlled by apps. Thanks to the digitalisation of pneumatics, the functions of a valve can be changed without having to change the hardware.

Flexibility at the push of a button

Highly flexible and easy to integrate, the Multi-Carrier-System opens up entirely new dimensions for your product transport. The innovative system solution provides your system with flexibility precisely where it is needed: acceleration, speed, grouping and synchronous motion can all be freely defined. The carriers can be transferred inward and outward without the need for a transfer station, allowing fast changeover of the machine to different formats.

Tailor-made services and support

From conceptualisation to commissioning and system operation, our Handling Guide Online reduces your engineering time and effort to a minimum and guides you to the right handling system in record time.

In addition, our Energy Saving Services support you with the energy-efficient and environmentally-conscious use of your systems.

02 Food safety made easy

Everything in place for hygienic automation technology

Festo helps you to optimally realise food safety – with automation components and materials that are food-grade. Suitable design comes as standard.

Content

Protecting the consumer and the manufacturer's brand are the focus of the hygienic and efficient automation technology used in food production. As all manufacturers are liable for their products, faultless production, especially from a microbiological standpoint, must be guaranteed. It is therefore extremely important that components and systems have a hygienic and easy-to-clean design. This is the only way in which the consequences of all hazards can be taken into consideration and measures can be taken to exclude them or reduce their impact.

The basics – standards, directives and organisations

Standards and directives enable people to enjoy food without risk. When implemented in production, they reduce the risks for the manufacturer and the consumer.

Significant hazards can arise in the food zone due to the following:

Significant hazards in the food sector are caused by:

- Biological factors
  e. g. Decay caused by microorganisms and their toxins
- Chemical influences
  e. g. Cleaning agents, disinfectants and unsuitable lubricants
- Foreign particles
  e. g. Contaminants, frequently caused by corrosion and abrasion of machines, or from other sources

Care in selecting materials

In order to protect consumers, the machine components must not deposit any substances during the production process that are harmful to health or that impair the taste or aroma, through either direct or indirect contact with the food.

Hygienic design of components

Resistant surfaces, high surface quality as well as large internal radii and a high IP protection class enable quick and efficient cleaning of the components and machine.

Legislation is not the same as a standard

Legislation differs not only with regard to the subject matter, but also in terms of the importance attributed to its content. Legislation sets out legal provisions that must be complied with, while standards propose regulations, guidelines or characteristics, the application of which is voluntary. Legislation such as the Machinery Directive 2006/42/EC stipulates a general requirements and safety level, the potential technical implementation of which is described in standards.

The Machinery Directive 2006/42/EC lays down health and safety requirements that enable the free movement of machinery within the EU. It ensures that only safe machinery is operated in the EU, while the harmonised standards provide detailed information on hygienic machine design and on the safety of food production systems.

Moreover, the EU directives are binding for all member countries and must be transposed into national law.

Machinery Directive 2006/42/EC Cleaning requirement

The focus of the directive is the health and safety requirements that are intended to protect operating personnel, the machine and, insofar as possible, the products manufactured and the environment.

Objective: To eliminate possible risks in advance. Special hygiene requirements therefore apply to machinery intended for the preparation and handling of food.

This EU law forms the basis for the EC conformity mark. It stipulates that machinery must be designed and constructed in such a way as to avoid any risk of infection, sickness or contagion.

ISO 14159

Hygiene requirements for the design of machinery

Background: Machines can present hygiene risks that, if passed to food products, could endanger the end consumer.

All machine manufacturers must therefore adhere to risk prevention requirements and provide food producers with operating instructions for their machines and systems.

EN 1672-1

Food processing machinery – Basic concepts, Part 1

Content: Comprehensive presentation of the risks, safety requirements and potential protective measures as a basis for the design of food manufacturing machines.

EN 1672-2

Food processing machinery – Basic concepts, Part 2

Content: Guidelines for the hygienic design of food processing machinery as well as general information on the special requirements for construction materials.

EHEDG, Doc 8

Design criteria for hygienic machinery, equipment and components

Content: Criteria for the hygienic design of equipment intended for the processing of foods.

The document was published for the first time in 1993 with the intention of describing the requirements of the Machinery Directive (currently 2006/42/EC) in more detail. Subsequently, sections of this guideline were adopted into the standards EN 1672-2 and ISO 14159. In the interim, the guideline has been adapted to take account of the latest developments in science and the law.

ISO 13849

Safety of machinery – Safety-related parts of control systems
The two parts of this standard describe the design, integration, verification and validation of safety circuits and safety components, irrespective of the technology used (electrical, electronic, hydraulic, pneumatic and mechanical).

This describes the required risk reduction when designing, setting up and integrating safety-related parts of control and protection systems, whether electric, electronic, hydraulic, pneumatic or mechanical.
Example: MS6-SV for the safe exhausting of pneumatic systems and system parts.

Directive on food hygiene 852/2004, 853/2004, 854/2004

Any business producing, processing or selling food products is obliged to determine the stages in the process sequence that are critical for food safety, to monitor and document them consistently and to stipulate appropriate safety measures.

Objective: To have a comprehensive, integrated policy for all foodstuffs, from primary production in agricultural production to the sale to the end consumer. In addition, food hygiene is to be guaranteed at all stages of production.

Food companies apply the principles of the HACCP system. This is an instrument that aims to bring about a higher standard in food safety; however, it is not a form of self-regulation and does not replace official monitoring.

The EU regulations from the EU hygiene package:

- Regulation (EC) No. 852/2004 – Food hygiene
- Regulation (EC) No. 853/2004 – Specific hygiene rules for food of animal origin
- Regulation (EC) No. 854/2004 – Specific rules for the organisation of official controls on products of animal origin intended for human consumption

HACCP Hazard Analysis Critical Control Points

In the production, handling and processing, transport, storage and sale of food products, any influences that are likely to cause illnesses in people after they have consumed the food product must be eliminated. To protect against such health risks, food companies have introduced their own control systems based on the HACCP concept.

Its international version is contained in the regulations FAO/WHO Codex Alimentarius. On the basis of this analytical procedure, chemical, physical and microbiological health risks are to be identified, the probability and significance of their occurrence evaluated and the measures required to avoid them stipulated.

Such a system can be used particularly in businesses with fixed, constantly repeated work processes and helps to avoid risks as early as the manufacture of the food products, to exclude them or at least to reduce them to an acceptable level. The HACCP concept can therefore be integrated in a quality management system in accordance with the ISO 9000 series.

DIN 10516 Food hygiene – Cleaning and disinfection

This standard applies in conjunction with Regulation (EC) No 852/2004.

Background: Support in selecting and implementing suitable cleaning and disinfection measures for systems and equipment in the food industry.

Regulation (EC) No. 1935/2004 on materials and articles intended to come into contact with food

During its production, processing, storage, preparation and serving, food comes into contact with many materials and articles, e. g. production systems, transport containers, packaging materials and kitchen utensils. Under EU law, these food contact materials should not adversely affect consumer health nor the quality of the food.

The regulation also stipulates individual measures for approved substances and/or materials and articles.

Regulation (EU) No. 10/2011

Individual measure implementing the conditions for plastic materials within the meaning of Framework Regulation (EC) No. 1935/2004. It applies to all plastic materials and articles intended to come into contact with food.

ISO 21469

International standard that specifies hygiene requirements for the formulation, manufacture and use of H1 lubricants. For the safety of people and machinery, these must be harmless and controllable should they inadvertently come into contact with food products.

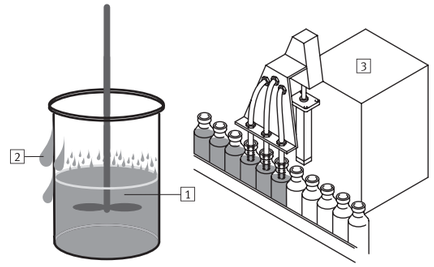
EN 1672-2

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.

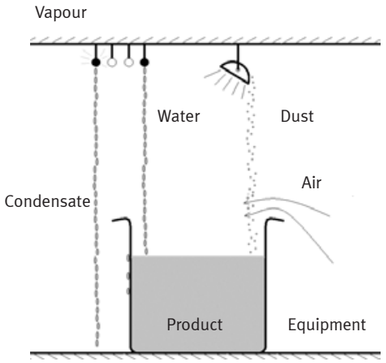


EHEDG and ISO 14159

The EHEDG (doc. 8) and ISO 14159 differ only on "food-contact surfaces" and "non-food-contact surfaces". For food-contact surfaces, the same requirements apply as per EN 1672-2 – Food zone.

Food-contact surfaces:
This includes all surfaces that are intended or not intended (e. g. by splashing) to come into contact with products or from which product or condensate can run, drip or otherwise enter into the main product or a product container. This includes all cases, e. g.non-sterile packaging, which can indirectly cross-contaminate food-contact surfaces or containers. A risk analysis can be helpful in the definition and delimitation of surfaces.

Non-food-contact surfaces:
All other exposed surfaces.



Note:

The EHEDG also considers the possibility of contamination through e. g. dust, condensate etc. and then defines these as food-contact surfaces.

Standards-compliant elements

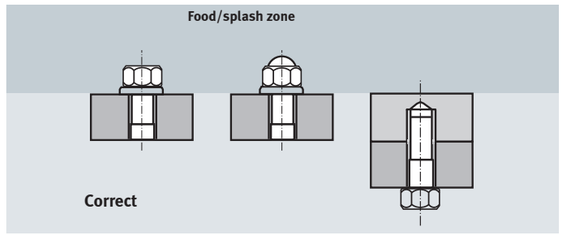
The key to hygienic machine and component design is the practical application of the theoretical content of EN 1672-2, ISO 14159 and EHEDG Doc. 8. These standards take into consideration all fundamental design elements used in the construction of systems.

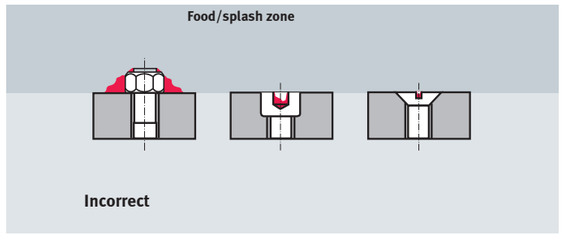
Surface

A high-quality surface finish is essential on components that come into contact with the product in order to reduce microbial contamination. A mean peak-to-valley height of Ra ≤ 0.8 µm in the food zone, in accordance with ISO 468, guarantees that microorganisms and spores measuring between 1 µm and 10 µm are removed from the surface at a flow velocity of the cleaning agent of 2 m / s. Components with a Ra value of ≤ 3.2 µm are also often used in the splash zone. Their smooth surfaces, created e. g. by grinding, blasting or electropolishing, are also particularly corrosion-resistant.

Connecting components and threads

Connecting components such as screws, bolts, rivets etc. may cause hygiene problems. If they are unavoidable for technical reasons, it must be possible to clean and disinfect them. Open threads are very difficult to clean and these very small spaces between metal and metal provide the perfect breeding ground for bacteria. Any threads that cannot be avoided should therefore be closed off with suitable covers and seals.





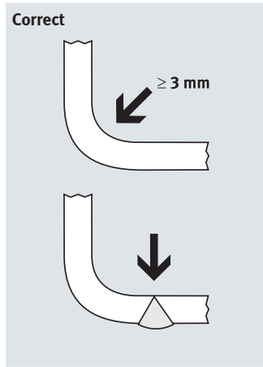
Draining of liquids

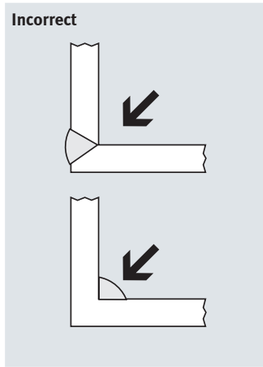
Ensure that the machine is self-draining (preferable) or that the liquid from product containers, production areas or product piping can be removed by other measures.

Product piping must be installed with an incline of at least 3° relative to a drainage point to avoid sagging, dead ends and puddles.
If any of these requirements cannot be fulfilled, the system should be designed so it can be easily dismantled.

Inner angles, corners and radii

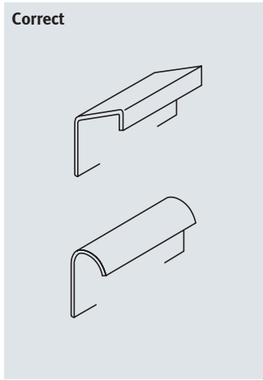
Very small radii and corners substantially reduce the flow velocities of cleaning agents and disinfectants. As the required cleaning effect can therefore not be achieved, they represent a significant hygiene risk. The prescribed minimum radius is thus 3 mm.

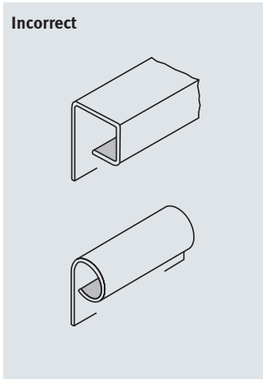




Dead spaces and blind areas

Machines and critical system parts must be designed so that they basically have no dead spaces, whether they are completely open or completely closed. Otherwise product residue cannot be removed and will thus cause contamination.





Bearings and shaft openings

All bearings should be installed outside of the food zone. If this is not possible due to technical reasons, they must be lubricated with food-grade lubricants.

No other country has more stringent statutory provisions governing the use of lubricants and auxiliary materials in the food industry than the USA. There, lubricating greases and oils must comply with the FDA regulations (particularly section 21 CFR 178.3570). These determine which substances are permitted in oils and lubricating greases that come into contact with food products or their ingredients, whether this is for lubricating purposes (e. g. as an anti-rust protective coating), as a releasing agent for seals and sealing rings on container closures or as a lubricant for machine parts and equipment. The approvals granted by the American National Sanitation Foundation (NSF) thus serve as globally recognised standards for the composition of raw materials and additives in lubricating greases (ISO 21469).

NSF-H1

Contact between food and lubricants may be unavoidable within the production process. Only lubricants that have been granted NSF-H1 approval may be used in such cases.

Examples:
The following Festo products are already lubricated with NSF-H1 approved grease:

- Standards-based cylinders CRDSNU, CRDNG
- Guided drive DGRF
- Standards-based cylinder DSBF
- Compact cylinder CDC
- Round cylinders CRHD, CRDSNU
- Push-in fitting NPQH
- One-way flow control valve GRLA-F
- Valve terminal MPA-C
- Service units – MS series

Can be selected as an option for:
- Electric cylinder ESBF
- Toothed belt and spindle axis ELGA

NSF-H2

NSF-H2 lubricants are suitable for general use in the food industry, but contact with food must be ruled out.

In practice, the introduction of HACCP systems has resulted in a greater focus on all lubrication points within the production process in order to avoid the potential risk of food contamination.

Tip:

To avoid any mix-up, only use NSF-H1

Corrosion-resistance as a quality factor

In an industry where intensive cleaning is required, such as the food and beverage industry, corrosion resistance plays a major role. This is no coincidence; after all, service life and the ease with which components can be cleaned are cost factors that cannot be underestimated.

Importance of corrosion resistance classes (CRC)

CRC are corrosion resistance classes defined by Festo in the internal standard FN 940070, for which a product must undergo different tests:

- Condensation water test atmospheres, DIN 50017-KFW, AHT per ISO 6270-2
- Sulphur dioxide testing (SO2), DIN EN ISO 6988, KFW 0.2 S (previously DIN 50018)
- Fog test with sodium chloride solution, DIN 50021-SS, NSS per ISO 9227

The CRC classes range from 0 to a maximum level 4. To achieve these levels, a specific number of cycles must be passed in each test (one cycle = 24-hour test). Depending on the results, the product can be categorised in a CRC matrix and the CRC class can be defined.

Corrosion resistance class (CRC)	Comment	Sample product
CRC 0 Very low or no protection	Components subject to **no** corrosion stress • For small, visually irrelevant standard parts, e. g. threaded pin	**CPX** 
CRC 1 Low protection	Components subject to **low** corrosion stress • Transport and storage protection • Parts that do not have primarily decorative surface requirements, e. g. in internal areas that are not visible or behind covers.	
CRC 2 Moderate protection	Components subject to **moderate** corrosion stress • Externally visible parts with primarily decorative surface requirements • Direct contact with a normal industrial environment or media such as coolants or lubricating agents.	**DSBC** 
CRC 3 High protection	Components subject to **high** corrosion stress • External, visible parts in direct contact with a normal industrial environment or media such as solvents and cleaning agents • Primarily functional surface requirements	**DSBF** 
CRC 4 Very high protection	Components subject to **particularly high** corrosion stress • Parts exposed to aggressive media, e. g. in the food or chemical industry • Outdoor exposure under extreme corrosive conditions These applications may need to be safeguarded by special tests using the media.	**CRDSNU** 

03 The challenge of cleaning

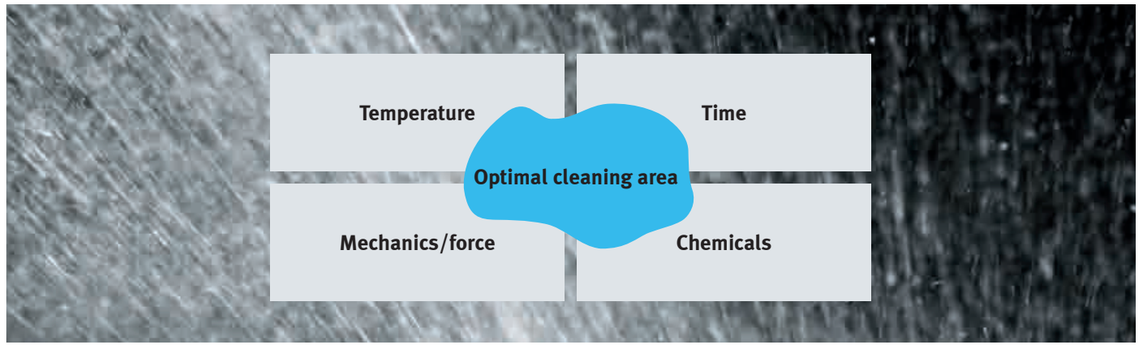
An effortless chore

Cleaning is absolutely essential 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.

Content

Every manufacturer is liable for its products. In the context of consumer protection, flawless product safety – especially from a microbiological standpoint – must be guaranteed. Preventing the spread of germs and eliminating foreign particles is therefore top priority.

Suitable cleaning methods are determined by the operational structures but also by special applications, products and processes.
The effect of these methods is in turn influenced by such primary factors 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 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 washed out machine components still function reliably.

Cleaning agents and disinfectants
Basic characteristics of cleaning agents (e.g. DIN 10516)

The cleaning agents suitable for the various food zones often differ greatly 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
- Equally good wettability of all surface materials to be cleaned
- 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.

There are various test methods and standards to assess housings and enclosures that aim to protect people from electrical 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

1 1st digit: Protection against the ingress of solid foreign matter
2 2nd digit: Protection against the ingress of water

Note:

The 1st digit encompasses the relevant subordinate digits.
For the 2nd digit this applies accordingly, but only to number 6.

NEMA degrees of protection

The evaluation of electrical components according to the American NEMA (National Electrical Manufacturers Association) system is performed in accordance with NEMA Standards Publications 250:2014-00 “Enclosures for Electrical Equipment (1000 Volts Maximum)”. With NEMA 250, enclosures for electrical components with a rated voltage not exceeding 1000 volts are classified 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 3
For external use; protection against wind-borne dust, rain, sleet and external ice formation.

Type 4
For internal and external use; protection against wind-borne dust, rain, wind-borne splash water and water jets.

Type 4X
For internal and external use; protection against corrosion, wind-borne dust, rain, wind-borne splash water and water jets.

Type 6
For internal and external use; protection against the ingress of water during occasional or temporary submersion at a limited depth.

Type 6P
For internal and external use; protection against the ingress of water during prolonged submersion at a limited depth.

Type 12
For internal use; protection against dust, falling dirt and dropping non-corrosive liquids.

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

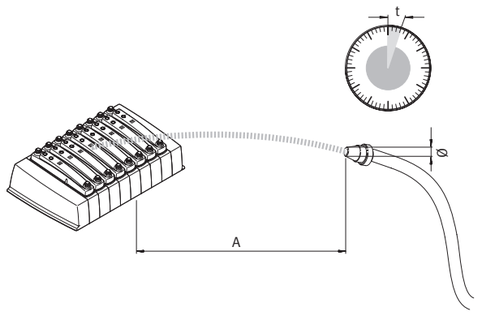
Normally components with NEMA degree of protection 4, 4x, 6 and 6P are used directly without further protection.

Note:

The NEMA standards publication specifies tests for environmental conditions such as corrosion, rust, ice, oil and coolants. In contrast, DIN EN 60529 does not set out these environmental conditions; neither does it specify the degree of protection against mechanical equipment damage.
For this reason and also because the tests and evaluations differ in relation to other characteristic data, 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

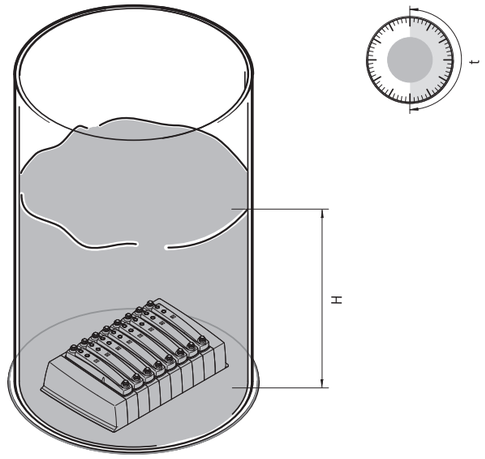


IP65:
A = 2500 ... 3000 mm
Ø = 6.3 mm
t = 3 min
p = 0.3 bar
Q = 12.5 l/min

IP66:
A = 2500 ... 3000 mm
Ø = 12.5 mm
t = 3 min
p = 1 bar
Q = 100 l/min

NEMA Hose down (4, 4X, 6, 6P):
A = 3000 ... 3500 mm
Q = 240 l/min
t = 5 min

IP67, IP68
NEMA Submersion



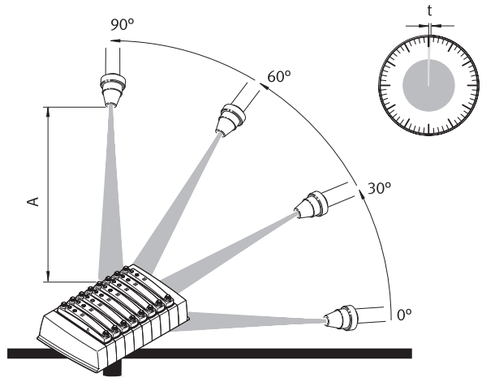
IP67:
H = 150 ... 1000 mm
t = 30 min.

IP68:

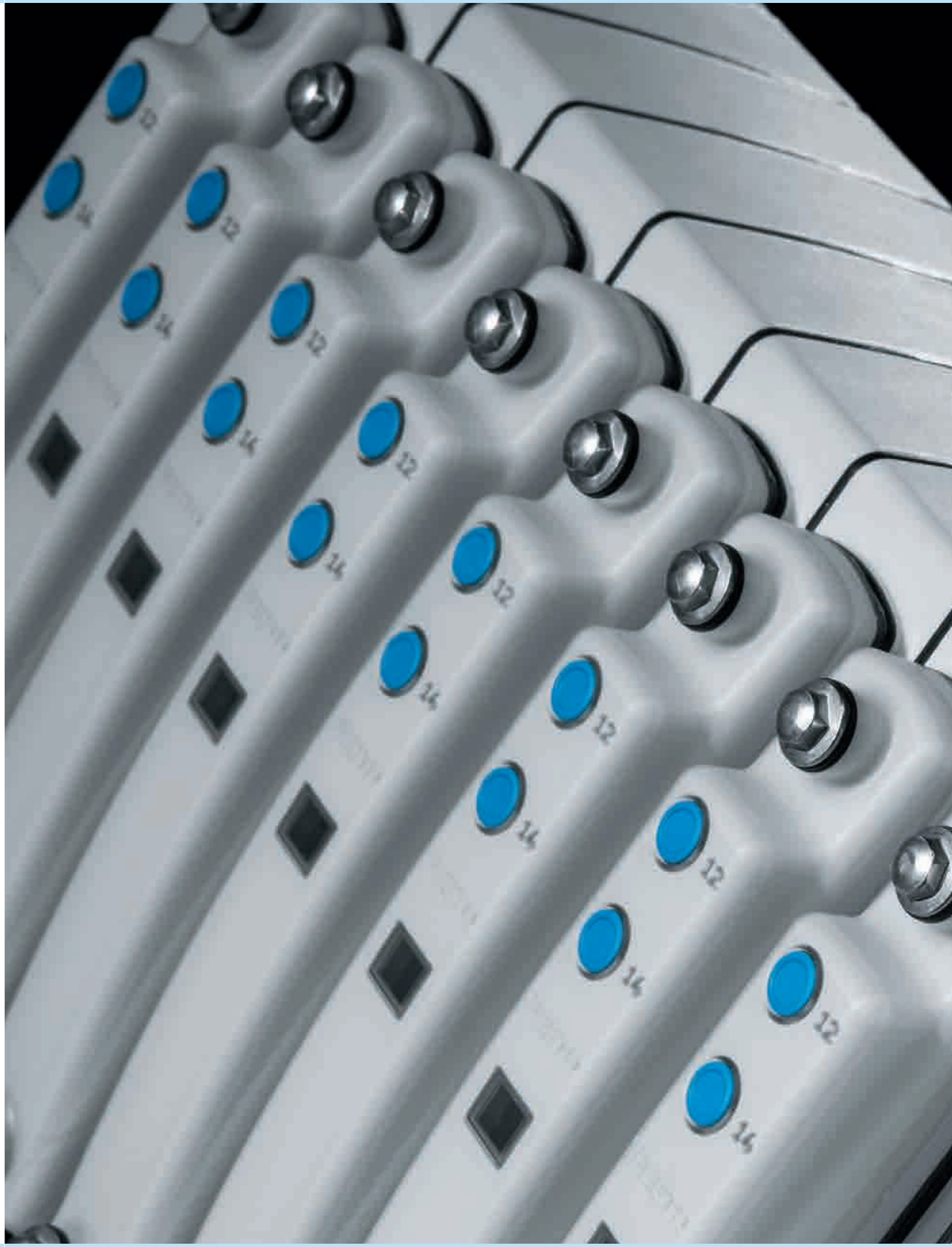
The test conditions must be agreed upon by the manufacturer and the user, but must be higher than IP67.

NEMA Submersion (6, 6P):
H = 1800 mm
t = 30 min

IP69K



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



Cleaning agents and disinfectants (according to typical ingredients, by way of example)

Cleaning agents and disinfectants (according to typical ingredients, by way of example)

Product	Cleaning agent type	Tubing						Cylinder			Seal				Valve	Fitting [1]			
								Corrosion protection											
								Standard	Increased	High									
ECOLAB®		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
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: conditionally resistant; –: not resistant

1) Resistance incl. inside seal. Higher resistance with purely external contact.

Cleaning agents and disinfectants (according to typical ingredients, by way of example)

Product	Cleaning agent type	Tubing						Cylinder			Seal				Valve	Fitting [1]			
								Corrosion protection											
								Standard	Increased	High									
Diversey for a cleaner, healthier future		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	+	+	+
Acigel VG07	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 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: conditionally resistant; –: not resistant

1) Resistance incl. inside seal. Higher resistance with purely external contact.

04 Compressed air quality

Perfect compressed 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.
And thus compressed air preparation designed for the application provides the best possible safety for food, consumers and food producers.

Content

Extremely strict demands are made of the compressed air quality in the food and beverage industry. 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.

International standards are helpful in this respect. 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, vapour	Liquid	Total oil content (liquid, aerosol and vapour)
	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

Compressed air preparation designed for the application

Success factors for correct compressed air preparation

Different compressed air qualities are required at different points within the production system.
This necessitates 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.

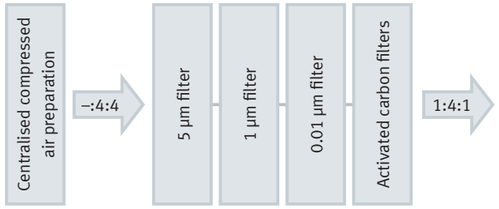
➔ **Compressed air as process air**
Significantly higher levels of purity are required when compressed air is used as process air, e. g. for blowing out moulds or when it comes directly into contact with food. In this case, which is usually limited to specific locations, decentralised compressed air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

Filter cascades for typical applications

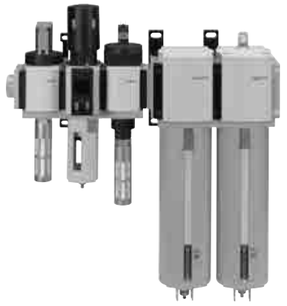
The sole purpose of ISO 8573-1:2010 is to define quality classes. It makes no recommendations about the degree of compressed air purity that should be specified in the food industry. Guidelines and recommendations, for example issued by the VDMA and the BCAS offer advice on suitable filter cascades.

➔ **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 compliance with Class 1:4:1



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

Filter cascade for compliance with Class 1:2:1

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

Important:

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

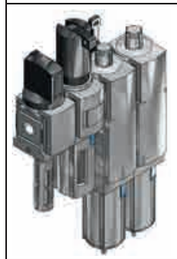
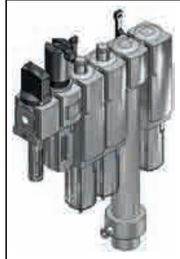
Tip:

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.

Compressed air preparation designed for the application

In the following overview, we have put together a number of service units that have proven their effectiveness in practice for typical 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 through 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	Flow rate	Connection size	Module	Part number
	3:4:2 according to ISO 8573-1:2010	360 l/min	1/4″	MSB4 3:4:2	8032468
		2500 l/min	1/2″	MSB6 3:4:2	8032469
		7800 l/min	1″	MSB9 3:4:2	8032467
	1:4:2 according to ISO 8573-1:2010	360 l/min	1/4″	MSB4 1:4:2	8031370
		2500 l/min	1/2″	MSB6 1:4:2	8031373
		7800 l/min	1″	MSB9 1:4:2	8031368
	1:4:1 according to ISO 8573-1:2010	360 l/min	1/4″	MSB4 1:4:1	8031372
		2500 l/min	1/2″	MSB6 1:4:1	8031371
		7800 l/min	1″	MSB9 1:4:1	8031374
	1:3:1 according to ISO 8573-1:2010	100 l/min	1/4″	MSB4 1:3:1	8031367
		400 l/min	1/2″	MSB6 1:3:1	8031369
	1:2:1 according to ISO 8573-1:2010	506 l/min	1/2″	MSB6 1:2:1	8031365
		994 l/min	1/2″	MSB6 1:2:1	8031366

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 restart with a padlock.

Tamper-proof

Lockable filter regulator MS-LFR
to protect against accidental readjustment

Simple

Pressure gauge with red/green scale
for monitoring operating pressure
Adjustable red/green range in bar (0 ... 12) and psi (0 ... 175)

Clear

Visual indicator for changing the filter cartridge
Fine and micro filters MS-LFM-A and MS-LFM-B with red/green differential pressure indicator

05 Overall Equipment Effectiveness – OEE

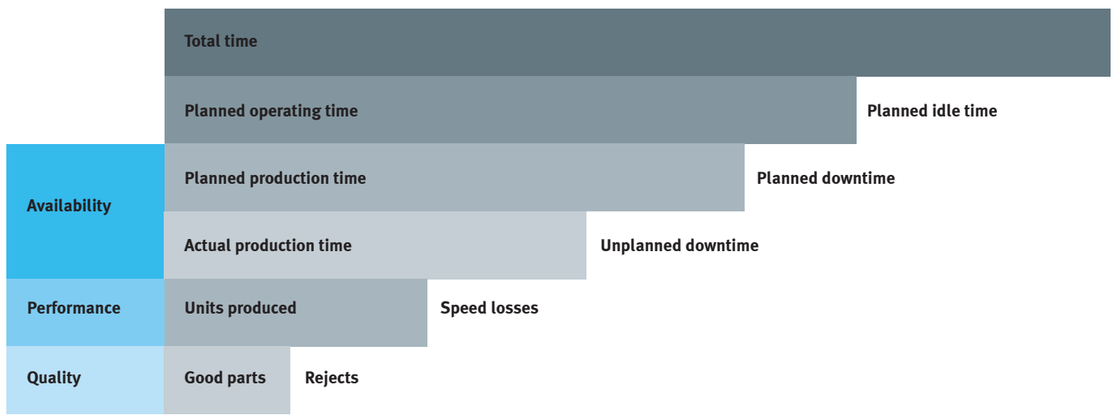
Content

Getting a head start with OEE

High system availability is not something that happens by chance, it is the result of forward-looking action. Taking overall equipment effectiveness into consideration provides clear guidance on how to maximise productivity, and thus design system operation to be more economical.

Getting a head start with OEE

Overall equipment effectiveness (OEE) is the measure of a system's value creation.
This is determined by three factors: Availability – Performance – Quality.



Rising competitive pressure and increasing customisation are best dealt with using OEE. Whether you want to produce large quantities continuously or to adjust formats relatively frequently because your customers are demanding different forms or packaging units, OEE is the method of choice to draft a plan for the maximum productivity and quality of your systems. The results are minimised downtimes and longer, more accurately predictable maintenance intervals. Products and services from Festo as well as the following practical tips will support you in implementing this.

Availability

Reducing the duration of planned downtimes and avoiding unplanned downtimes

Planned downtimes are necessary for:
- Format adjustments and changeovers
- Cleaning the system
- Scheduled maintenance

These tasks take up valuable time. Just analysing the procedures is often enough to reduce the downtimes associated with these tasks.

Important: preventive maintenance averts many failures but not all. If they do occur, the cause must be quickly identified and the problem eliminated as rapidly and simply as possible.
We have solutions that will enable you to achieve both objectives!

Clean Design valve terminal MPA-C
Extremely sturdy in IP69k for time-efficient cleaning

Pressure gauge MA-RG
For simple monitoring of the actual value via the adjustable red/green range

Automation platform CPX
Active diagnostics management for fast error detection

Performance

Fast machine cycles, optimal speed

How do you achieve maximum productivity? By finding the optimum cycle, which does not overload the system or the machine.

For this you need:
- Excellent processes
- Efficient system management
- Suitable machine components

Decentralised installation concepts
Close to the consuming device: short lines for fewer performance losses

Integrated drive EMCA
For flexible motion profiles in dynamic applications

Self-adjusting end-position cushioning system PPS
Pneumatic drives automatically adjusted for optimum operation

Quality

Consistently high quality is the top priority

Avoid:
- Rejects that cannot be used further
- Expensive rework, requiring the production process to be repeated
- The complete loss of the product

Service unit MS series
Always the right compressed air – up to class 1:2:1 (ISO 8573-1:2010)

Vision sensor SBSx
Reliable quality inspection with intuitive vision systems

Fast-switching valve MH2/3/4
Short switching times and maximum repetition accuracy ensure consistent quality

06 Energy efficiency@Festo

Energy efficiency in focus

Rely on our technical experts and efficient technologies so that your machines and systems consume fewer resources and less energy. Our expertise will reduce not only your CO_2 emissions, but your operating costs as well. And many other things will increase too, such as the sustainability of your production processes and your company's productivity.

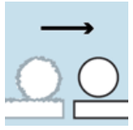
Content

12 ways to save energy

12 different measures: that's 12 different ways to save energy successfully. In the opinion of our experts, these measures promote quick and simple implementation of suitable optimisation, 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 you can save with the help of each measure.

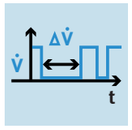
Our tip: Ask for advice from the experts at Festo who are extremely knowledgeable about energy efficiency and have mastered the implementation of this integrated approach.

-15%



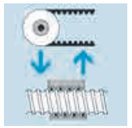
Reduce friction
- Use low-friction components
  → Mini slides DGSL

-60%



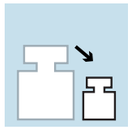
Use air-saving circuits
- Vacuum handling with monitored switch-off
  → Use OVEM

-14%



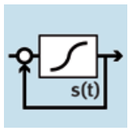
Choose the right components
- Motor with holding brake for long standstills
  → Servo motor EMMS-AS

-18%



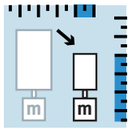
Reduce weight
- Optimal technology mix
- Electric handling unit with pneumatic Z-axis
  → Handling Guide Online

-10%



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

-35%



Size correctly
- Optimum size
- Opt for one size smaller for pneumatic drives
  → Festo Engineering Tools

-22%

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

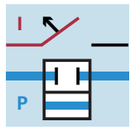
-20%

Reduce leaks
- Regular leakage detection, condition monitoring
  → Energy Saving Services

-10%

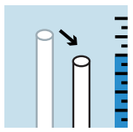
Recover energy
- Save braking energy in the coupled intermediate circuits
  → Controller CMMP

-10%



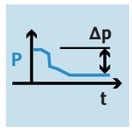
Switch off power
- Leakage reduced by up to 10%
- In this case for the entire compressed air system
  → Energy efficiency module E2M

-25%



Shorten tube lengths
- Decentralised valve terminal
- Optimal tubing layout
  → Pipe and tubing cutter ZRS
  → Festo engineering tools
  → Clean Design valve terminal MPA-C

-6%



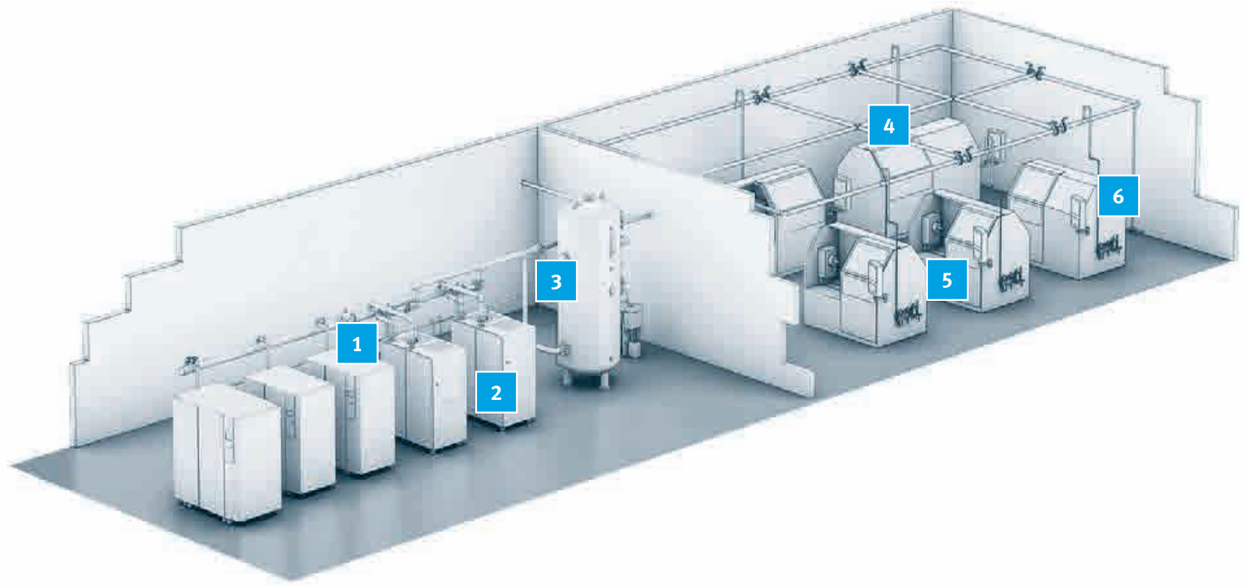
Reduce pressure losses
- Ideal tubing diameters, less resistance
- Reduced network pressure 8 → 7 bar
  → MS series

Services that pay for themselves

1. Energy analysis of compressed air generation

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

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 requirement, including fluctuations in consumption at different operating times, from the base to the peak load. The savings potentials are set out in the following report.



2. Compressed air quality analysis

The benefits to you
- Assurance of optimum compressed air quality
- Increased service life of pneumatic components
- Minimisation of unexpected production downtimes
- Targeted adaptation of compressed air preparation to requirements

Oil, water or particles in compressed air have a negative effect on the service life of pneumatic components. Energy and operating costs rise, and in worst-case scenarios, they can lead to unexpected production downtime. Centralised and decentralised measurement of the compressed air quality includes inspecting the service units, measuring the water and oil content, air temperature and pressure as well as determining the pressure dew point.

3. Pressure drop measurement

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

The pressure drop in the system can be recorded via multiple pressure sensors with data loggers that are installed at various places in the compressed air system. If the pressure can be reduced, up to 8% of the energy for generated compressed air can be saved.

4. Compressed air consumption analysis

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

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

5. Leakage detection and elimination

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

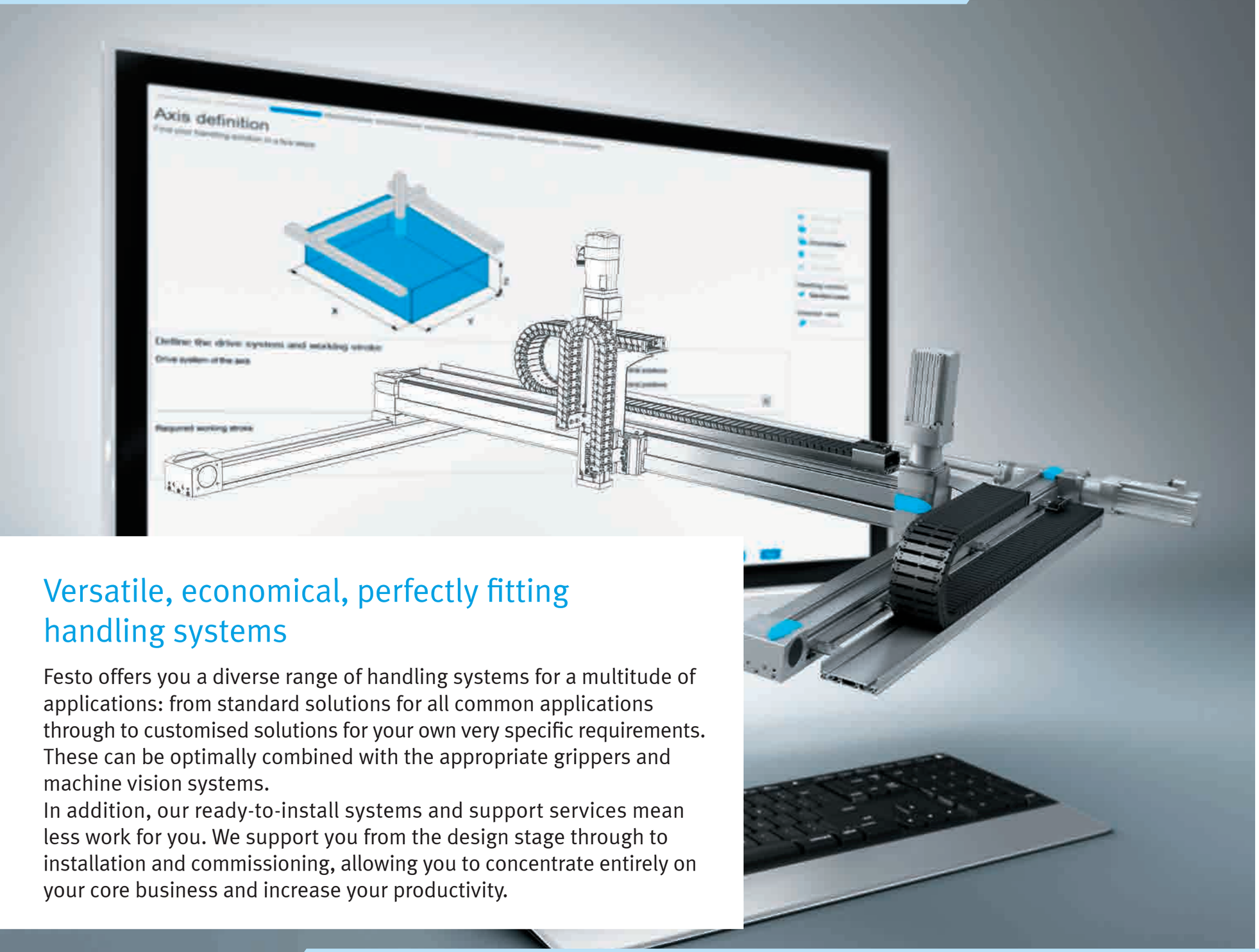
Systematically identifying leaks in compressed air systems and professionally eliminating them considerably reduces compressed air costs – because leaking compressed air components waste a lot of energy and money. Our specialists check the entire compressed air system, from compressor through to pneumatic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

6. Machine analysis for energy efficiency

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 analysed compressed air applications
- On request: installation and commissioning of the developed solutions

Stabilise 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 realise potential energy optimisations in compressed air applications. Including an estimation of the costs and savings plus the predicted amortisation time.

07 Handling systems



Versatile, economical, perfectly fitting handling systems

Festo offers you a diverse range of handling systems for a multitude of applications: from standard solutions for all common applications through to customised solutions for your own very specific requirements. These can be optimally combined with the appropriate grippers and machine vision systems.
In addition, our ready-to-install systems and support services mean less work for you. We support you from the design stage through to installation and commissioning, allowing you to concentrate entirely on your core business and increase your productivity.

Content

An overview of our handling systems

You can pick and choose from our large selection of handling systems for a multitude of applications, from single-axis systems to 2D and 3D gantries and the extremely dynamic parallel kinematic system.

Our variety

Your tailor-made solution

Standard

Single-axis system YXCS

2D: Linear gantry YXCL

2D: Planar surface gantry YXCF

3D: Three-dimensional gantry YXCR

3D: Cantilever

Compact

2D: Planar surface gantry EXCM

High dynamic response

2D: Linear gantry EXCT

2D: Planar surface gantry EXCH

3D: Parallel kinematic system EXPT

Application-specific

For projecting loads

With frame solution

For heavy loads

The fast route to your handling system

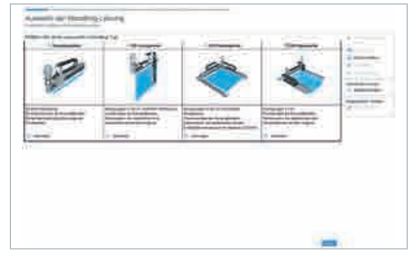
Handling Guide Online

The Handling Guide Online is a configuration and ordering platform in one and is integrated in our online product catalogue. This unique online engineering tool supports you in configuring and ordering your standard handling system. It reduces your engineering time and effort to a minimum and guides you to the right handling system in record time.

Three steps to your handling system
www.festo.com/handling-guide

1st step:

Choose the type of handling system and enter your application data into the Handling Guide Online. The tool calculates appropriate handling systems, including price.



2nd step:

Select the most suitable handling system from the list of suggestions. A correctly configured CAD model and a data sheet with all the relevant figures are immediately available for download.

3rd step:

You can use additional options to configure your selected system in accordance with your requirements. Then add the preferred handling system to your shopping basket and confirm your order. Festo will deliver a ready-to-install system, including all user documentation in accordance with the EC Machinery Directive, as quickly as possible.

Do you have other technical requirements? If so, you can simply send your application data to our experts with the click of a mouse and you will receive a customised offer.

The benefits to you:

+ Intuitive: The Handling Guide Online is very easy to use and features structured data prompts.
+ Ideal for planning: Immediate display of net prices allows you to calculate your costs with certainty.
+ Fast: The right standard handling system in just 20 minutes, including CAD model.
+ Efficient: The Handling Guide Online cuts your engineering time and effort to a minimum, and you don't need any detailed product knowledge.

A variety of gripper functions, designs and performance




Standard

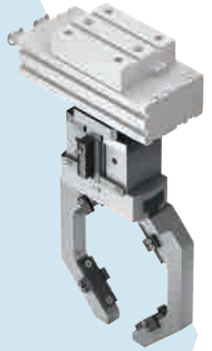
Precise

Bellows

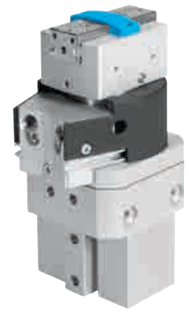

Vacuum


Electrical

Adaptive



Function combination gripper fingers



Function combination


Sealed

Long stroke

Vacuum


Sturdy

Micro

2018/01 – Subject to change

You too can benefit from maximum process reliability as well as top quality and productivity at the highest level. Machine vision systems from Festo make a decisive contribution to ensuring that the input and output are right. They monitor and stabilise processes, whether they're reading codes or detecting positions for handling tasks. In some cases they even control the process itself. And they inspect quality from when the goods come in to when they are finished.

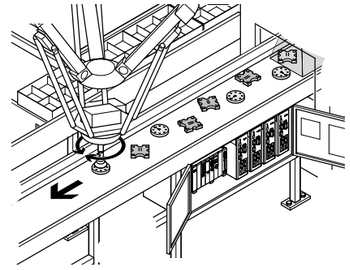
That makes your work easier. It makes your machines and systems more productive and flexible. And it further optimises your use of materials.

Machine vision systems for maximum productivity

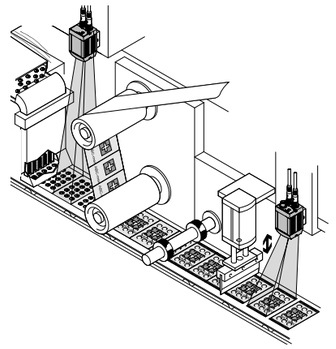
Quality inspection and position sensing

With vision systems from Festo a huge array of inspection procedures can be carried out, whether it's for position sensing to ensure an unobstructed production process or for quality criteria such as complete packaging or correct fill levels.

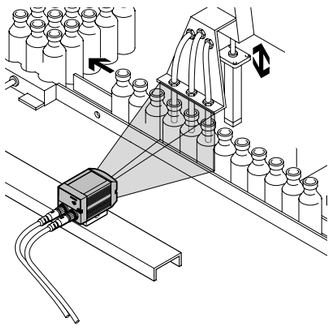
Position and rotary orientation detection
The SBO...-Q determines the position and the rotary orientation of any part so that it can be processed flexibly and smoothly by handling systems. After calibration, position values can also be output in millimetres. In the packaging industry, for example, different parts are detected and the data is transmitted to the robot controller. If a part is in the wrong position, the robot will correct it.



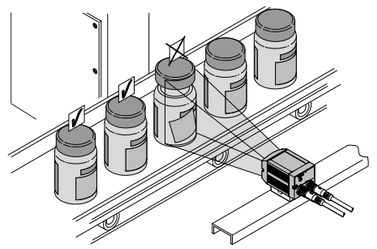
Checking for presence and completeness
The camera checks whether or not all of the parts have been installed, assembled or printed.
This type of application can be found in many industry sectors. In the pharmaceutical industry, for instance, blister packs are inspected in just a fraction of a second to ensure that each blister contains a tablet and is printed. If an error is detected the blister pack is ejected. Otherwise, the blister packs are transported to the packaging station, where, if required, the outer package can be inspected too.



Fill-level monitoring
The vision sensor SBSI-Q determines whether or not the fill-level of each and every bottle is within its permissible tolerances, even at high cycle rates. If necessary, the vision sensor can check simultaneously that the cap is correctly positioned and sealed. If either of these two criteria is not fulfilled, the bottle is ejected.



Printing and labelling inspection
The vision sensor analyses whether or not the label and the printing are present and correctly positioned. If required, the lid can be inspected at the same time. The vision sensor checks these criteria very quickly. If any of them has not been fulfilled, the container is ejected.

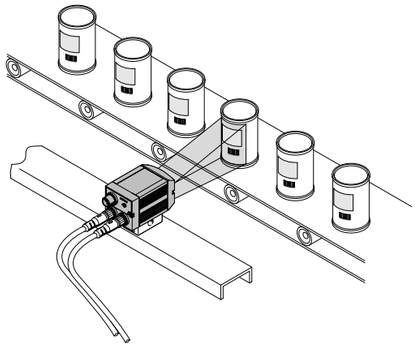


Handling systems
07

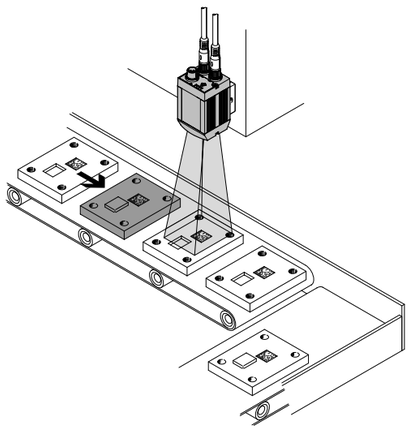
Identification

Topics such as serialisation and traceability of products are becoming more and more important in order to safeguard the manufacturer – and at the same time to protect consumers. Because if you can identify parts in automated production and logistics you will have a handle on one of the most frequent error sources, e. g. for just-in-time delivery to the production line.

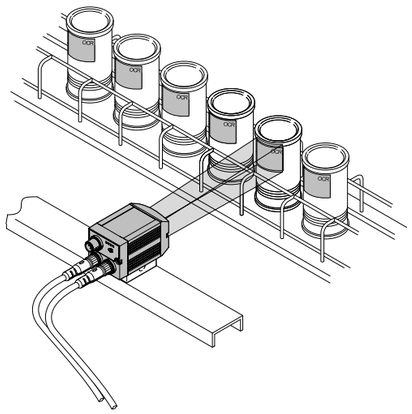
Reading 1D codes
The code reader scans the barcode and can also check its quality in accordance with ISO 15416. If there is an incorrect product on the conveyor or if the quality of its code is not up to par, it is immediately ejected. And thus only the right parts are packaged or assembled.

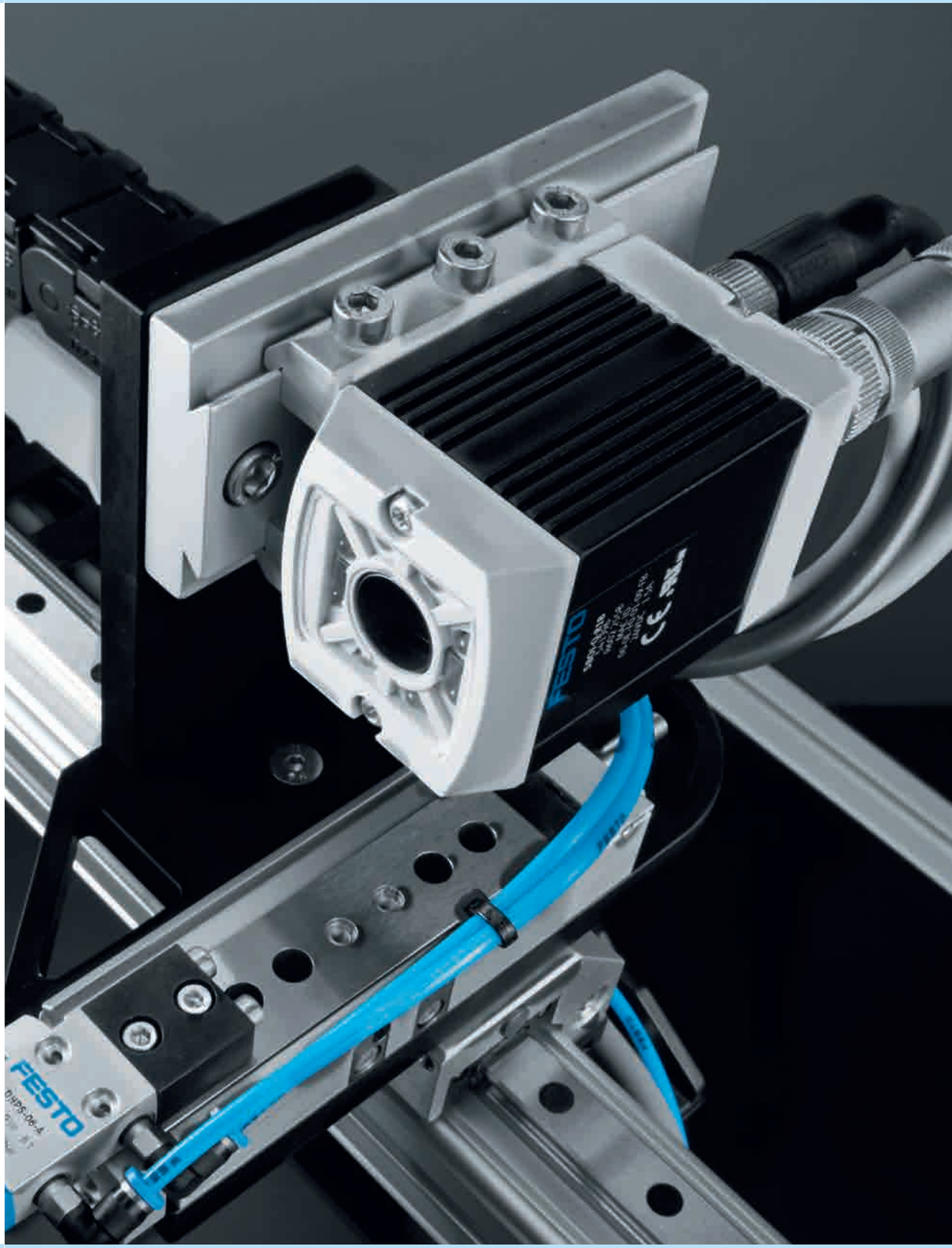


Reading 2D codes
In this case too, inspection determines whether or not the 2D code is present, e. g. as a data matrix code, and if the right part is on the conveyor. If necessary, the quality of the code can also be checked in accordance with various standards such as ISO 15415 or AIM DPM 2006. The code reader transmits the data to the controller or the central data server. While incorrect products are sorted out, the right parts are transported for further processing.



Text recognition (OCR)
The SBO...-Q reads all types of texts including expiry dates, serial numbers and type codes. Illegible and incorrect texts are detected and the respective parts are ejected. All good parts continue on their way through the production process.





08 Into the future with smart manufacturing

Aspiration meets reality

Traceability in production processes right down to individual batches, and maximum flexibility for different shapes, sizes and formats are features that have already become indispensable.

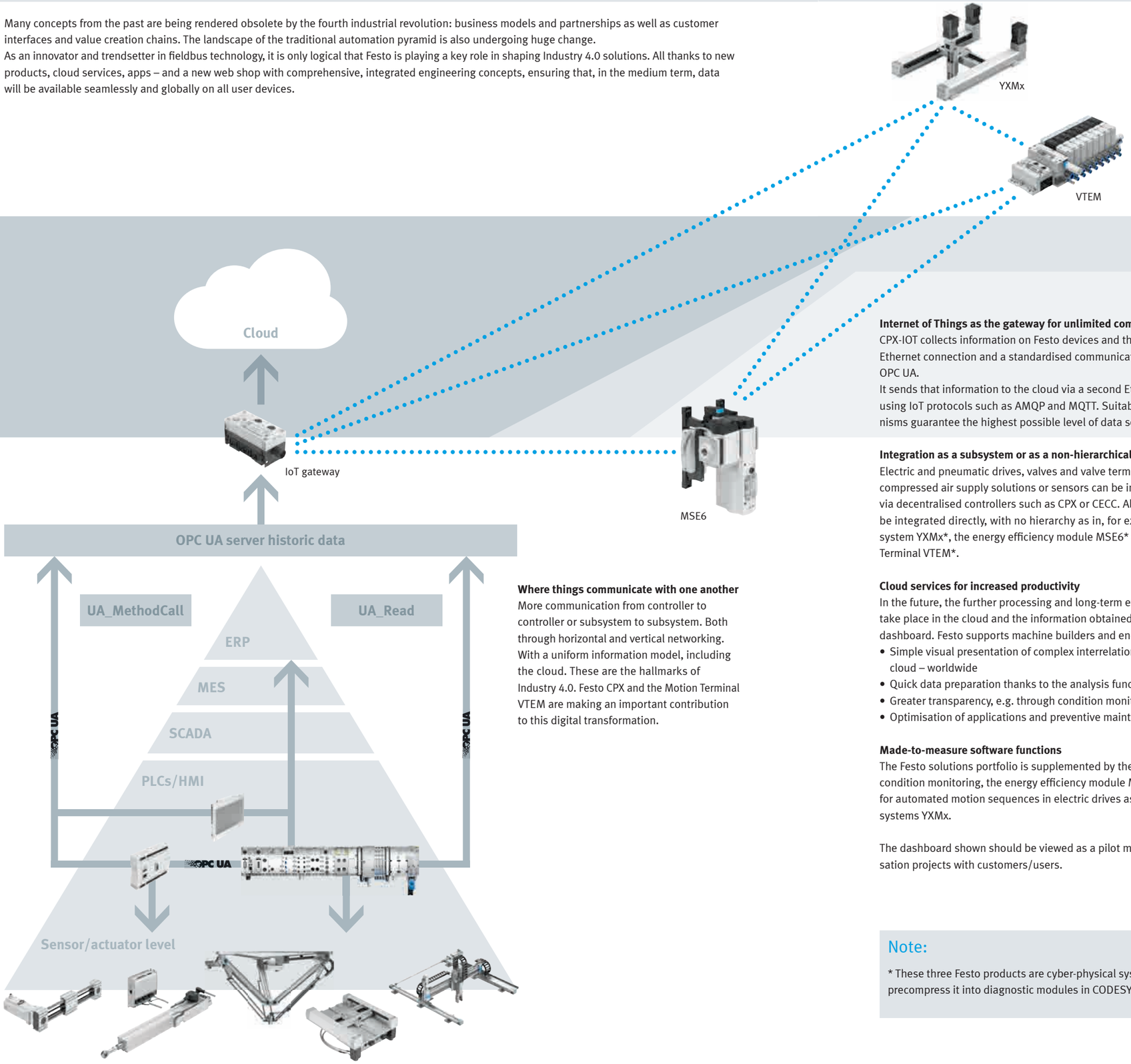
The answer is Industry 4.0. With our intelligent automation solutions, your production processes will be much more flexible and reliable, enabling you to future-proof your business.

With our training and consulting services, you can make sure that both you and your employees are equipped with the right expertise. We will be happy to work with you directly on site, in your company.

Content

Welcome to the age of Industry 4.0

Many concepts from the past are being rendered obsolete by the fourth industrial revolution: business models and partnerships as well as customer interfaces and value creation chains. The landscape of the traditional automation pyramid is also undergoing huge change.
As an innovator and trendsetter in fieldbus technology, it is only logical that Festo is playing a key role in shaping Industry 4.0 solutions. All thanks to new products, cloud services, apps – and a new web shop with comprehensive, integrated engineering concepts, ensuring that, in the medium term, data will be available seamlessly and globally on all user devices.



Where things communicate with one another
More communication from controller to controller or subsystem to subsystem. Both through horizontal and vertical networking. With a uniform information model, including the cloud. These are the hallmarks of Industry 4.0. Festo CPX and the Motion Terminal VTEM are making an important contribution to this digital transformation.

Internet of Things as the gateway for unlimited communication
CPX-IOT collects information on Festo devices and their statuses via an Ethernet connection and a standardised communication protocol, such as OPC UA.
It sends that information to the cloud via a second Ethernet connection using IoT protocols such as AMQP and MQTT. Suitable IT security mechanisms guarantee the highest possible level of data security.

Integration as a subsystem or as a non-hierarchical system
Electric and pneumatic drives, valves and valve terminals, I/O terminals, compressed air supply solutions or sensors can be integrated hierarchically via decentralised controllers such as CPX or CECC. Alternatively they can be integrated directly, with no hierarchy as in, for example, the handling system YXMx*, the energy efficiency module MSE6* and the Festo Motion Terminal VTEM*.

Cloud services for increased productivity
In the future, the further processing and long-term evaluation of data will take place in the cloud and the information obtained will be displayed on a dashboard. Festo supports machine builders and end users through:
- Simple visual presentation of complex interrelationships in the Festo cloud – worldwide
- Quick data preparation thanks to the analysis function
- Greater transparency, e.g. through condition monitoring online
- Optimisation of applications and preventive maintenance

Made-to-measure software functions
The Festo solutions portfolio is supplemented by the Festo CM-Lib for condition monitoring, the energy efficiency module MSE6, Motion Apps for automated motion sequences in electric drives as well as handling systems YXMx.

The dashboard shown should be viewed as a pilot model for joint customisation projects with customers/users.

Realising functions digitally
Apps make configuring and using products and services so much easier. In the future, Festo will offer apps for numerous technical applications, target systems and working environments, such as:
- Cloud-based apps
- Desktop-based apps
- Apps for mobile end devices
- Product and hardware-related apps

Product-specific apps
- Motion Apps for the Festo Motion Terminal VTEM for the easy programming of automated motion
- Motion Apps for the handling systems YXMx with electric drives

Software and service apps
- Fluid Draw App: CAD functions for electrical and pneumatic circuit diagrams
- Festo Design Tool 3D: a 3D product configurator for generating Festo-specific CAD product combinations with all accessories
- EPLAN schematic services: macro libraries created by Festo for E-CAD software EPLAN Electric P8, version 2.1

Our website ➔ **www.festo.com/iot** takes you to the latest comprehensive tools, products and services.

Note:

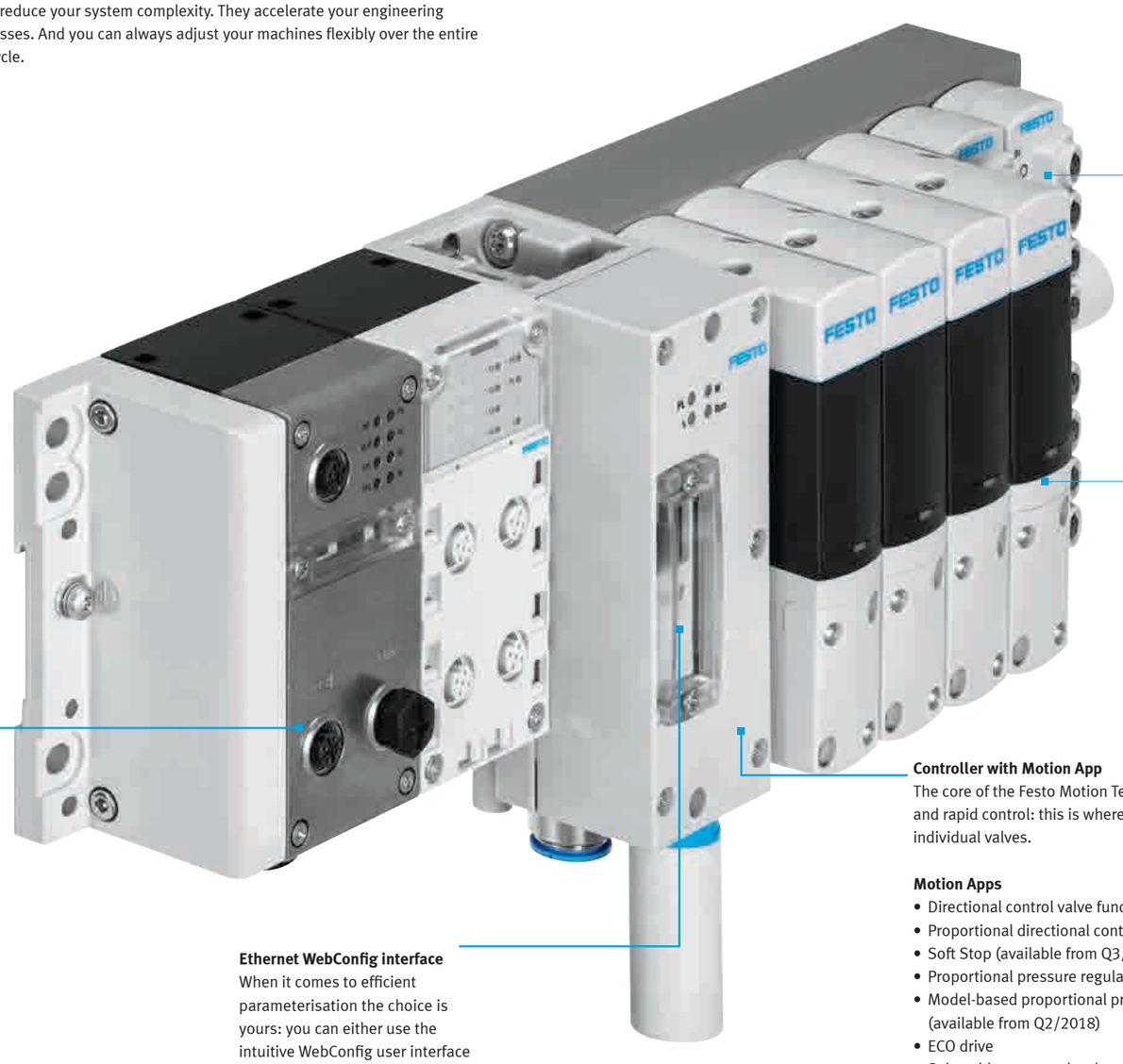
* These three Festo products are cyber-physical systems in line with Industry 4.0. They take in data from the application and the device itself, precompress it into diagnostic modules in CODESYS V3 in accordance with VDMA 24582, and then forward that information to the cloud.

Rediscover flexibility with just one piece of hardware for all functions!

Identical hardware for a host of combinable functions – made possible for the first time by the VTEM. No changes, no integration of additional parts, no time-consuming installation: none of that is necessary any more. Whether it's a simple change to the directional control valve functions, soft movement into the end position, energy-efficient movements or proportional behaviour with motion profiles. With the corresponding Motion App, you can change the function at the push of a button.
The Festo Motion Terminal thus combines the advantages of electric and pneumatic automation.

Numerous products, functions and complete solution packages are integrated in the Festo Motion Terminal. A single valve technology, a high-performance controller and smart apps: this combination is leading the way to a new era of flexibility.

Apps as the key to virtually limitless function integration with valve terminals
Apps reduce your system complexity. They accelerate your engineering processes. And you can always adjust your machines flexibly over the entire life cycle.



Input module
Up to 16 analogue or digital inputs for direct control applications, such as Soft Stop. Direct sensor technology on the actuator records and transmits the required data.

Valve
The app-controlled valve comprises four 2/2-way diaphragm poppet valves, which are controlled by four piezo pilot valves. The integrated stroke and pressure sensors provide optimal control and transparent condition monitoring.

CPX module
CPX gives you the option of using many different control systems and end user specifications, as well as all the usual digital and analogue I/O modules. With integrated CODESYS controller and OPC UA for Industry 4.0 on request.

CPX-CTEL
The installation system allows you to integrate up to four standard valve terminals cost-effectively, as no other fieldbus nodes are required. This makes it really easy to use a mix of technologies.

Ethernet WebConfig interface
When it comes to efficient parameterisation the choice is yours: you can either use the intuitive WebConfig user interface via the PC's web browser or easily access the PLC machine control system as usual – without the need for additional configuration software.

Controller with Motion App
The core of the Festo Motion Terminal is about decentralised intelligence and rapid control: this is where the Motion Apps are assigned to the individual valves.

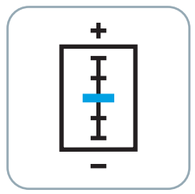
Motion Apps
- Directional control valve functions
- Proportional directional control valve
- Soft Stop (available from Q3/2018)
- Proportional pressure regulation
- Model-based proportional pressure regulation (available from Q2/2018)
- ECO drive
- Selectable pressure level
- Leakage diagnostics
- Supply and exhaust air flow control
- Presetting of travel time

Important: The Festo Motion Terminal will be introduced worldwide in Q3/2018, and was introduced in 2017 in selected countries. Please check availability at: **www.festo.com/motionterminal**

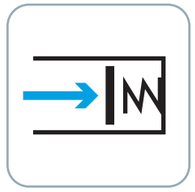
Flexibility and standardisation go hand in hand with our Motion Apps

The Festo Motion Terminal offers benefits along the entire value chain, from the conceptualisation to the modernisation of your machine. The Motion Apps, which control a single piece of hardware, are an integral part. They allow you to standardise your applications while offering unparalleled levels of flexibility. The result is significant savings and increased productivity. More apps are already being planned.

Directional control valve functions
This provides maximum flexibility for special-purpose machines as well as for handling systems in series production. You can modify standard directional control valve functions such as 4/2-way, 4/3-way and 3/2-way, etc.at any time and as often as necessary, even during operation.
It also enables you to respond to a large number of requirements at the touch of a button.



Proportional directional control valve
For the first time at Festo, two proportional flow control functions have been integrated in one valve and on one platform, resulting in an economical and compact solution.



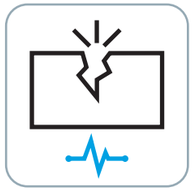
Soft Stop (available Q3/2018)
Shorten your cycle times by up to 70%! With Soft Stop, you can implement highly dynamic yet gentle positioning motion without wear-pronse shock absorbers. This reduces maintenance times, increases the service life of your system and thus enhances your productivity.
(Required accessory: position sensor SDAP)

Proportional pressure regulation
Save space and hardware costs by combining the functions of two individual and independent proportional pressure regulators in just one valve, including with vacuum!

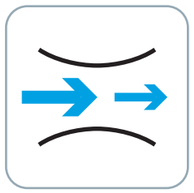
Model-based proportional pressure regulation (available Q2/2018)
With model-based control, there is no need for external sensors.
By storing fewer boundary parameters for the system, such as tube length, tube diameter and cylinder size, the anticipatory control system ensures maximum accuracy, as the app can compensate for a drop in pressure and volume using the control technology.

ECO drive
Reduce costs by operating your actuator with the minimum pressure necessary for the load. This eliminates the rise in pressure in the drive chamber at the end of the movement, allowing energy savings of up to 70%. With a single DSBC32-100 and a 2 kg load, this is a saving of approx. € 100 a year.
(Required accessory: cylinder limit switch)

Selectable pressure level
Save energy by setting several pressure levels. Simply set the pressure for the selected movements to a reduced level. Additionally, you can control the speed by adjusting the flow control valve setting.



Leakage diagnostics
Fewer system downtimes due to preventive maintenance and faster fault detection. Separate diagnostic cycles and defined threshold values enable you to detect and localise individual leaks in the application operated by the Festo Motion Terminal.



Supply and exhaust air flow control
Do away with separate flow control valves on the actuator and set tamper-proof travel speeds quickly and conveniently at the touch of a button. There is also an option to implement new motion sequences such as dynamic flow control setting.

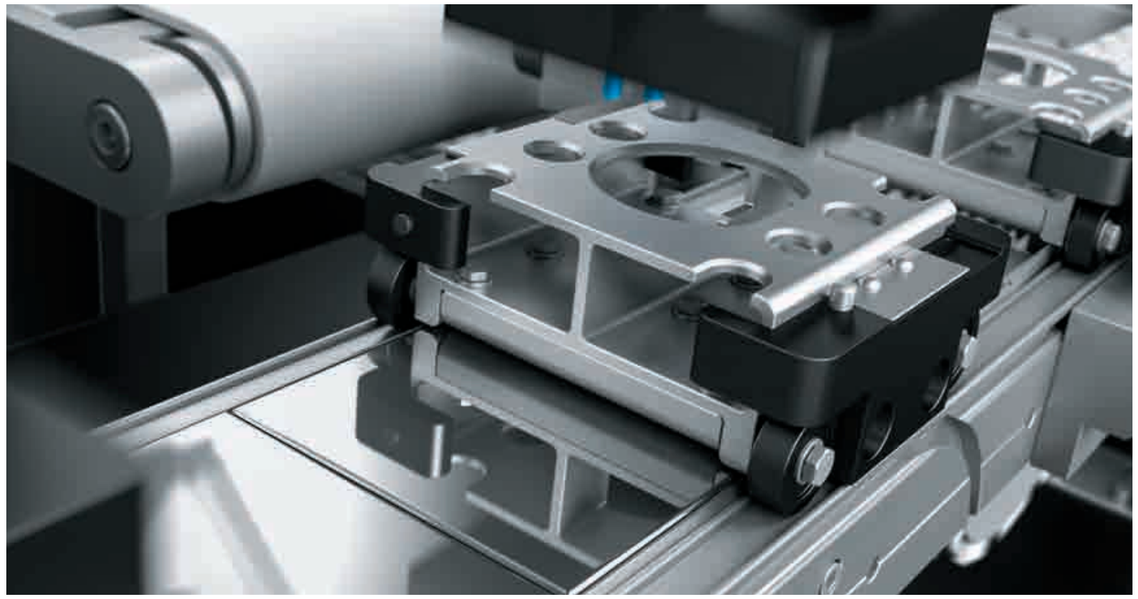
Presetting of travel time
For quick and easy commissioning and stable operation, all you have to do is enter the travel time for the advancing and retracting motions. The exhaust air flow control function adapts itself to the travel time and then maintains it. The system automatically adjusts the values in the case of influences such as increased friction due to wear.
(Required accessory: cylinder limit switch)

Maximum flexibility in the machine

How do you keep pace with markets that are developing at an ever faster pace? How do you meet increasingly individual customer needs? And how do you adapt to product lifecycles that are becoming ever shorter? To master these challenges, you need solutions that provide maximum flexibility and efficiency in the production processes.

With the innovative Multi-Carrier-System MCS, a joint development by Festo and Siemens, you are on the right track. The modular transport system can be integrated as appropriate into existing intralogistics and thus complement and in some cases partially replace classic transport solutions. The carriers can be freely transferred inwards and outwards. They offer smooth acceleration and extremely precise positioning. The high dynamic response minimises changeover times during the process, while virtually seamless format changeovers and shorter retooling times significantly increase productivity and therefore market success. The powerful motion control systems from Siemens integrate controller and motion control tasks for the entire system.

The system is quick and easy to configure. Adaptations can be made flexibly in the digital model, while reconfigurations and format changeovers are carried out at the push of a button.

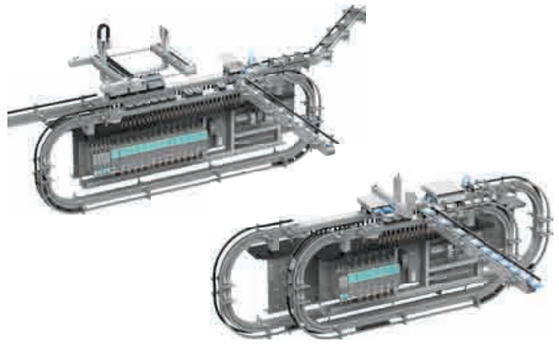


Continuous processing of different packaging quantities

The application
Individual packaged products are put into secondary packaging in different quantities and different box sizes, for example 4, 6 or 8 units in one box. When changing the quantity, the box feeder has to be adapted to the new box size.

The challenge
Significantly reducing laborious changeovers on a production line.

The solution
The different box sizes and the corresponding product quantities and combinations are placed directly on the system using the freely positionable carriers. Since each box is secured by two carriers, the different sizes can be safely and reliably transported. The products to be packaged are also flexibly transported to the top loader or side loader via the Multi-Carrier-System and grouped into the appropriate quantity immediately before being packaged on the MCS.

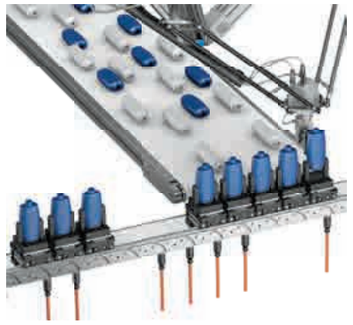


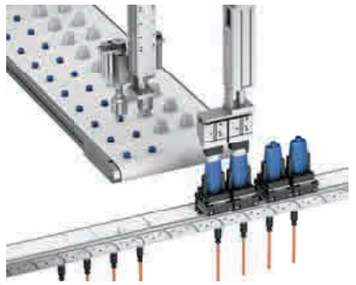
Continuous operation and cyclic operation

The application
Bottles are loaded on the MCS® while the carriers are continuously moving and then flexibly grouped for the subsequent filling process. Capping takes place later in cyclic operating mode, since the bottles are stationary during this process step.

The challenge
The combination of continuous and cyclic operation in one system without separating the sections into different zones and without additional queuing sections and transfer functions.

The solution
The Multi-Carrier-System combines cyclic operation and continuous movement on one line. The movement and grouping of the carriers on the section are freely configurable, as appropriate to the station. This optimises the system design and process sequence.



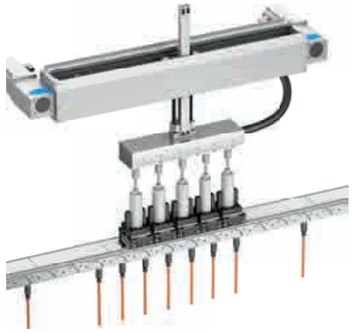


Synchronous movement of the carriers with the process

The application
During the filling process, the carriers holding the bottles move continuously and synchronously with the filling bridge. The bottles are filled with a specific amount in a continuous and time-optimised movement.

The challenge
Adapting the transport system's movement to the different filling quantities and therefore changing the transport speeds.
For example, the filling process takes longer for a seasonal product with 25% more content and therefore the movement of the bottles is slower.

The solution
The MCS enables completely free and variable adaptation of the travel speed in line with the product requirement and filling quantity. This has no effect on upstream and downstream processes, since the time differences by speeding up and slowing down are balanced out between the carriers. The combined control of the transport system and the individual modules in the overall filling system ensures that the carrier runs completely synchronised.



The benefit to you:

+ Transport and handling of different packaging sizes on one line
+ Formats and batch sizes greater than 1 can be changed over at the push of a button
+ Minimal downtimes, maximum productivity and optimal machine utilisation increase productivity and thus your market success.

09 Products, solutions and services

Content

Standards-based cylinders

	 **Compact cylinders ADN** ★	 **Compact cylinders AEN**	 **Compact cylinders ADN-EL**
Mode of operation	Double-acting	Single-acting, pushing, pulling	Double-acting
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	20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm
Theoretical force at 6 bar, advancing	51 ... 7363 N	54 ... 4416 N	188 ... 4712 N
Stroke	1 ... 500 mm	1 ... 25 mm	10 ... 500 mm
Cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends
Description	• ISO 21287 • Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 • Piston rod with female or male thread • Wide range of variants for customised applications • For position sensing	• ISO 21287 • Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 • Piston rod with female or male thread • Wide range of variants for customised applications • For position sensing	• Mounting hole pattern to ISO 21287 • With end-position locking at both ends, front or rear • Piston rod with female or male thread • For position sensing
online: ➔	**adn**	**aen**	**adn-el**

Standards-based cylinders

	 **Compact cylinders, Clean Design CDC**	 **Standards-based cylinders DSBC** ★	 **Standards-based cylinders DSBG**
Mode of operation	Double-acting	Double-acting	Double-acting
Piston diameter	20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 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
Theoretical force at 6 bar, advancing	141 ... 3016 N	415 ... 7363 N	415 ... 7363 N
Stroke	1 ... 500 mm	1 ... 2800 mm	1 ... 2800 mm
Cushioning	Elastic cushioning rings/plates 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
Description	• 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	• ISO 15552 (ISO 6431, VDMA 24562) • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • 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	• ISO 15552 (ISO 6431, VDMA 24562) • Sturdy tie rod design • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • Comprehensive range of mounting accessories for just about every type of installation • For position sensing
online: ➔	**cdc**	**dsbc**	**dsbg**

Standards-based cylinders

	 **Standards-based cylinders, Clean Design DSBF**	 **Round cylinders DSNU** ★	 **Round cylinders ESNU**
Mode of operation	Double-acting	Double-acting	Single-acting, pushing
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	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm
Theoretical force at 6 bar, advancing	415 ... 7363 N	23 ... 295 N	19 ... 271 N
Stroke	1 ... 2800 mm	1 ... 500 mm	1 ... 50 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
Description	• ISO 15552 • Increased corrosion protection • Easy-to-clean design • FDA-approved lubrication and sealing on the basic version • Long service life thanks to optional dry-running seal • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • For position sensing	• ISO 6432 • Wide range of variants for customised applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • Piston rod with female or male thread • 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
online: ➔	**dsbf**	**dsnu**	**esnu**

Standards-based cylinders

	 **Round cylinders CRDSNU, CRDSNU-B**
Mode of operation	Double-acting
Piston diameter	12 mm, 16 mm, 20 mm, 25 mm
Theoretical force at 6 bar, advancing	68 ... 295 N
Stroke	1 ... 500 mm
Cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, 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 dry-running seal • Wide range of variants for customised applications • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • For position sensing
online: ➔	**crdnsu**

Round cylinders

	 **Round cylinders DSNU** ★	 **Round cylinders DSNU**	 **Round cylinders ESNU**	 **Round cylinders ESNU**
Mode of operation	Double-acting	Double-acting	Single-acting, pushing	Single-acting, pushing
Piston diameter	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm
Theoretical force at 6 bar, advancing	23 ... 295 N	482.5 ... 1870.3 N	19 ... 271 N	406 ... 1765 N
Stroke	1 ... 500 mm	1 ... 500 mm	1 ... 50 mm	1 ... 50 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	Elastic cushioning rings/ plates 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 which adapts optimally to changes in load and speed • Piston rod with female or male thread • For position sensing	• Wide range of variants for customised applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • Piston rod with female or male thread • 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
online: ➔	**dsnu**	**dsnu**	**esnu**	**esnu**

Stainless-steel cylinders

	 **Round cylinders CRDSNU, CRDSNU-B**	 **Round cylinders CRDSNU, CRDSNU-B**	 **Standards-based cylinders CRDNG, CRDNGS**	 **Round cylinders 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	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 6 bar, advancing	68 ... 295 N	483 ... 1870 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 dry-running seal • Wide range of variants for customised applications • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • For position sensing	• Corrosion resistant against aggressive ambient conditions • Easy-to-clean design • Long service life thanks to optional dry-running seal • Wide range of variants for customised applications • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed • 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 very exacting demands • Flexible design thanks to different end caps • Male piston rod thread • For position sensing
online: ➔	**crdnsu**	**crdsnu**	**crdng**	**crhd**

Compact, short-stroke and flat cylinders

	 **Compact cylinders ADN** ★	 **Compact cylinders AEN**	 **Compact cylinders ADNGF**	 **Compact cylinders, Clean Design CDC**
Mode of operation	Double-acting	Single-acting, pushing, pulling	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, 125 mm	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, guide rod with yoke	20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm
Theoretical force at 6 bar, advancing	51 ... 7363 N	54 ... 4416 N	68 ... 4712 N	141 ... 3016 N
Stroke	1 ... 500 mm	1 ... 25 mm	1 ... 400 mm	1 ... 500 mm
Cushioning	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends
Description	• ISO 21287 • Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 • Piston rod with female or male thread • Wide range of variants for customised applications • For position sensing	• ISO 21287 • Up to 50% less installation space than comparable standards-based cylinders to ISO 15552 • Piston rod with female or male thread • Wide range of variants for customised applications • For position sensing	• Mounting hole pattern to 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	• 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
online: →	**adn**	**aen**	**adngf**	**cdc**

Compact, short-stroke and flat cylinders

	 **Short-stroke cylinders ADVC, AEVC** ★	 **Flat cylinders DZF**	 **Flat cylinders DZH**
Mode of operation	Double-acting, single-acting, pushing	Double-acting	Double-acting
Piston diameter	4 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	12 mm, 18 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, oval piston, equivalent diameter	16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, oval piston, equivalent diameter
Theoretical force at 6 bar, advancing	4.9 ... 4712 N	51 ... 1870 N	104 ... 1870 N
Stroke	2.5 ... 25 mm	1 ... 320 mm	1 ... 1000 mm
Cushioning	Elastic cushioning rings/plates at both ends	Elastic cushioning rings/plates at both ends	Pneumatic cushioning, adjustable at both ends
Description	• Very short overall length • High forces in a compact size • Piston rod with female or male thread • Optimised fitting space and height • Mounting hole pattern to VDMA 24562 as of Ø 32 mm • For position sensing with proximity sensor for T-slot and for C-slot	• Extremely flat design • Protected against rotation thanks to special piston shape • Ideal for manifold assembly • Wide variety 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 variety of mounting and attachment options • Piston rod with male thread • For position sensing
online: →	**advc**	**dzf**	**dzh**

Cartridge cylinders and multimount cylinders

	 **Multimount cylinders DMM, EMM**
Mode of operation	Double-acting, single-acting, pushing, pulling
Piston diameter	10 mm, 16 mm, 20 mm, 25 mm, 32 mm
Theoretical force at 6 bar, advancing	30 ... 483 N
Stroke	1 ... 50 mm
Cushioning	Elastic cushioning rings/plates at both ends
Description	• Wide variety of mounting and attachment options • Wide selection of piston rod variants • Piston rod with male thread • For position sensing
online: →	**dmm**

Cylinders with clamping unit

	 **Standards-based cylinders with clamping cartridge DSBC-C**	 **Compact cylinders with clamping cartridge ADN-KP**	 **Round cylinders with clamping cartridge DSNU-KP**
Mode of operation	Double-acting	Double-acting	Double-acting
Piston diameter	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 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
Theoretical force at 6 bar, advancing	415 ... 7363 N	188 ... 4712 N	23 ... 295 N
Stroke	1 ... 2800 mm	10 ... 500 mm	1 ... 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	Elastic cushioning rings/plates at both ends, self-adjusting pneumatic end-position cushioning, pneumatic cushioning, adjustable at both ends
Description	• The piston rod can be held in any position • The 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	• The piston rod can be held in any position • The piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure or loss of pressure • Mounting hole pattern to ISO 21287 • Piston rod with female or male thread • For position sensing	• The piston rod can be held in any position • The piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure or loss of pressure • Mounting hole pattern to ISO 6432 • For position sensing
online: →	**dsbc-c**	**adn-kp**	**dsnu-kp**

Cylinders with clamping unit

	 **Round cylinders with clamping cartridge DSNU-KP**	 **Cylinders with clamping unit DNCKE, DNCKE-S**
Mode of operation	Double-acting	Double-acting
Piston diameter	32 mm, 40 mm, 50 mm, 63 mm	40 mm, 63 mm, 100 mm
Theoretical force at 6 bar, advancing	483 ... 1870 N	754 ... 4712 N
Stroke	1 ... 500 mm	10 ... 2000 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
Description	• Piston rod can be clamped in any position • The piston rod can be held in position for long periods even with alternating loads, fluctuating operating pressure or loss of pressure • For position sensing	• Piston rod can be held and braked in any position • Variant DNCKE-...-S approved for use in safety-oriented parts of control systems • Mounting hole pattern to ISO 15552 • Piston rod with male thread • Static holding force of up to 8000 N • For position sensing
online: →	**dsnu-kp**	**dncke**

Rodless cylinders

	 **Linear drives DGC-K**	 **Linear drives DGC-G, DGC-GF, DGC-KF**	 **Linear drives with heavy-duty guide DGC-HD**
Piston diameter	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
Theoretical force at 6 bar, advancing	153 ... 3016 N	30 ... 1870 N	153 ... 754 N
Stroke	1 ... 8500 mm	1 ... 8500 mm	1 ... 5000 mm
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
Position sensing	Via proximity sensor	Via proximity sensor	Via proximity sensor
Description	• Compact design: 30% smaller than the basic design DGC-G • Basic drive without guide, for simple drive functions • Low moving dead weight • Symmetrical design	• Basic design, plain or recirculating ball bearing guides • All settings accessible from one side • Optionally with variable end stops and intermediate position module • Software tool available for bearing calculation • Optional: NSF-H1 lubricant for the food zone (see www.festo.com/sp/dgc -> "Certificates" tab) • Optional: clamping unit for holding loads	• For maximum loads and torques thanks to duo rail guide • Very good operating performance under torque load • Long service life • Ideal as a basic axis for linear gantries and cantilever axes • Wide range of adaptation options on the drive units
online: →	**dgc-k**	**dgc**	**dgc-hd**

Rodless cylinders

	 **Linear drives SLG**	 **Linear drives DGO**	 **Linear drive units SLM**
Piston diameter	8 mm, 12 mm, 18 mm	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 6 bar, advancing	30 ... 153 N	68 ... 754 N	68 ... 754 N
Stroke	100 ... 900 mm	10 ... 4000 mm	10 ... 1500 mm
Cushioning	Elastic cushioning rings/plates at both ends, shock absorber, hard characteristic curve	Elastic cushioning rings/plates at both ends, pneumatic cushioning, adjustable at both ends	Elastic cushioning rings/plates at both ends, shock absorber, hard characteristic curve
Position sensing	Via proximity sensor	Via proximity sensor	Via proximity sensor, via inductive sensors
Description	• 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	• Magnetic power transmission • Pressure-tight and zero leakage • Dirt-proof and dust-proof	• Magnetic power transmission • Recirculating ball bearing guide: combination of slide unit and rodless linear drive • Individual choice of end-position cushioning and sensing
online: →	**slg**	**dgo**	**slm**

Quarter turn actuators

	 NEW ★ **Quarter turn actuators DRVS**	 **Quarter turn actuators DSM**	 **Quarter turn actuators 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 6 bar	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 sensor	Without, via proximity sensor	Via proximity sensor
Swivel angle	0 ... 270°	0 ... 240°	0 ... 270°
New	• New for 4/2017: Additional accessories, push-on flange and flange mounting		
Description	• Double-acting semi-rotary drive with rotary vane • Lighter than other semi-rotary drives • Fixed swivel angle, adjustable swivel angle possible with the help of accessories • Housing protected against splash water and dust	• Double-acting semi-rotary drive with rotary vane or with tandem rotary vanes • Fixed swivel angle or infinitely adjustable swivel angle • With spigot or hollow flanged 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**

Quarter turn actuators

	 NEW ★ **Quarter turn actuators DRRD**	 **Swivel/linear units DSL-B**
Size	8, 10, 12, 16, 20, 25, 32, 35, 40, 50, 63	16, 20, 25, 32, 40
Theoretical torque at 6 bar	0.2 ... 112 Nm	1.25 ... 20 Nm
Permissible mass moment of inertia	15 ... 420000 kgcm²	0.35 ... 40 kgcm²
Position sensing	Via proximity sensor	Via proximity sensor
Swivel angle	180°	0 ... 272°
New	• New for 4/2017: Additional accessories, drive shaft	
Description	• Twin-piston rotary drive, power transmission via rack and pinion principle • Very high accuracy in the end positions • Very high load capacity of the bearing • Very good axial run-out at the flanged shaft • Greater stability even with smaller sizes	• Rotary and linear motion can be controlled individually or simultaneously • High repetition accuracy • With plain or recirculating ball bearing guide • Through piston rod
online: ➔	**drrd**	**dsl**

Tandem and high-force cylinders

	 **High-force cylinders ADNH**	 **Tandem cylinders DNCT**
Piston diameter	25 mm, 40 mm, 63 mm, 100 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm
Theoretical force at 6 bar, advancing	1036 ... 18281 N	898 ... 14244 N
Stroke	1 ... 150 mm	2 ... 500 mm
Description	• Max. 4 cylinders can be combined • Thrust increase • 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
Theoretical force at 6 bar, 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**

Drives with slides

	 **Mini slides DGSL** ★	 **Mini slides DGSC**	 **Mini slides SLF**	 **Mini slides SLS**
Piston diameter	6 mm, 8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm	6 mm	6 mm, 10 mm, 16 mm	6 mm, 10 mm, 16 mm
Theoretical force at 6 bar, advancing	17 ... 483 N	17 N	17 ... 121 N	17 ... 121 N
Stroke	10 ... 200 mm	10 mm	10 ... 80 mm	5 ... 30 mm
Cushioning	Short elastic cushioning rings/plates at both ends; no cushioning; elastic cushioning rings/plates at both ends; elastic cushioning rings/ plates at both ends with fixed stop; shock absorber, progressive, at both ends; shock absorber, self-adjusting, progressive, at both ends, with reducing sleeve	Elastic cushioning rings/ plates at both ends	Elastic cushioning rings/ plates at both ends	Elastic cushioning rings/ plates at both ends
Position sensing	Via proximity sensor	None	Via proximity sensor	Via proximity sensor
Description	• High load capacity and positioning accuracy • Maximum movement precision thanks to ground-in ball bearing cage guide • Maximum flexibility thanks to 8 sizes • Reliable in the event of pressure drop thanks to clamping cartridge or end-position locking • Wide variety of mounting and attachment options • Compact design	• Smallest guided slide unit on the market • Precision ball bearing cage guide for a reliable and high-quality process • Long service life thanks to housing made from high-alloy steel • Low break-away pressure and uniform movement thanks to minimal friction of guide and seal	• Flat design • Ball bearing cage guide • Versatile mounting options • Easy adjustment of end positions	• Flat design • Ball bearing cage guide • Versatile mounting options
online: ➔	**dgsl**	**dgsc**	**slf**	**sls**

Drives with guide rods

	 **Guided drives DFM, DFM-B** ★	 **Guided drives DGRF**	 **Compact cylinders ADNGF**
Piston diameter	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
Theoretical force at 6 bar, advancing	68 ... 4712 N	189 ... 1870 N	68 ... 4712 N
Stroke	10 ... 400 mm	10 ... 400 mm	1 ... 400 mm
Cushioning	Elastic cushioning rings/plates 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/plates at both ends; self-adjusting pneumatic end-position cushioning
Position sensing	Via proximity sensor	Via proximity sensor	Via proximity sensor
Description	• Drive and guide unit in a single housing • High resistance to torques and lateral forces • Plain or recirculating ball bearing guides • Wide variety of mounting and attachment options • Wide range of variants for customised applications	• Easy-to-clean design • Increased corrosion protection • FDA-approved lubrication and sealing on the basic version • Hygienic mounting of the sensors possible • Compact design with high guidance accuracy and load capacity • Long service life thanks to optional dry-running seal • Self-adjusting pneumatic end-position cushioning which adapts optimally to changes in load and speed	• Mounting hole pattern to 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
online: ➔	**dfm**	**dgrf**	**adngf**

Stopper cylinders

	 **Stopper cylinders DFSP**	 **Stopper cylinders DFST**
Piston diameter	16 mm, 20 mm, 32 mm, 40 mm, 50 mm	50 mm, 63 mm, 80 mm
Impact force	710 ... 6280 N	3000 ... 6000 N
Stroke	5 ... 30 mm	30 ... 40 mm
Position sensing	Via proximity sensor	Via proximity sensor
Toggle lever position sensing		Via inductive sensors
Description	• Trunnion version with/without protection against rotation, with/without female thread • 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 • Lever locking mechanism • Toggle lever deactivator
online: ➔	**dfsp**	**dfst**

Clamping cylinders

	Clamping modules EV
Clamping area	Ø16 mm, Ø20 mm, Ø25 mm, Ø32 mm, Ø40 mm, Ø50 mm, Ø63 mm, Ø12 mm, 10x30 mm, 15x40 mm, 15x63 mm, 20x75 mm, 20x120 mm, 20x180 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 6 bar	51 ... 1682 N
Clamping stroke	10 ... 50 mm
Swivel angle	90° +/–2°, 90° +/–3°, 90° +/–4°
Description	• Swivelling and clamping in one step • Swivel direction adjustable • Available with clamping fingers as accessories • Available with dust and welding spatter protection • Double-acting • For position sensing
online: ➔	clr

Bellows actuators

	Bellows actuators 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 • Uniform movement: no stick-slip effect • Use in dusty environments or in water • Maintenance-free
online: ➔	eb

Shock absorbers

	Shock absorbers DYSR	**Shock absorbers YSR-C**	**Shock absorbers DYSC**	**Shock absorbers DYSW**
Stroke	8 ... 60 mm	4 ... 60 mm	4 ... 25 mm	6 ... 20 mm
Max. energy absorption per stroke	4 ... 384 J	0.6 ... 380 J	0.6 ... 100 J	0.8 ... 12 J
Cushioning	Adjustable	Self-adjusting	Self-adjusting	Self-adjusting, soft characteristic curve
Description	• 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
online: ➔	dysr	ysr-c	dysc	dysw

Accessories for pneumatic drives

	 **Guide units FEN, FENG**	 **Clamping units KPE, KEC, KEC-S**	 **Mounting components** ★	 **Piston-rod attachments** ★
Size	8/10, 12/16, 20, 25, 32, 40, 50, 63, 80, 100		M10x1, M18x1.5, M22x1.5, M30x1.5, M8, 6, 8, 8/10, 12, 12/16, 16, 18, 20, 20/25, 25, 30, 32, 40, 50, 63, 65, 80, 100, 125, 160, 200, 250, 320	M10, M10x1.25, M12, M12x1.25, M16, M16x1.5, M20x1.5, M27x2, M36x2, M4, M42x2, M48x2, M5, M6, M8, 6, 8, 8/12, 10, 12, 16, 18, 20, 20/25, 25, 25/32, 32, 32/40, 40, 50, 50/63, 63, 80, 10x30, 15x40, 15x63, 20x75, 20x120, 20x180
Stroke	1 ... 500 mm			
Round material to be clamped		4 ... 32 mm		
Static holding force		80 ... 8000 N		
Description	• For protecting standards-based cylinders against rotation at high torque loads • Plain or recirculating ball bearing guide • High guide precision for workpiece handling	• KPE: ready-to-install combination of clamping cartridge KP and housing • KEC: for use as a holding device (static application) • KEC-S: for safety-related applications	• Mounting kits DARQ • Direct mountings • Foot mountings • Flange mountings • Swivel mountings • Clevis feet LNG, trunnion supports LNZ • Slot nuts NST/NSTL • Centring pins/sleeves NSTH	• Rod clevises SG, CRSG • Rod eyes SGS • Coupling pieces KSG • Self-aligning rod couplers FK • Adapter AD
online: →	**fen**	**kpe**	**n_015001**	**n__03150**

Products, solutions and services
09

Parallel grippers

	 **Parallel grippers DHPS**	 **Parallel grippers HGPD**	 **Parallel grippers, electric HGPLE**
Total gripping force at 6 bar, closing	25 ... 910 N	94 ... 3716 N	See the product documentation on our website
Stroke per gripper jaw	2 ... 12.5 mm	3 ... 20 mm	30 ... 80 mm
Position sensing	Via Hall sensor, via proximity sensor	Via proximity sensor	Via integrated angular displacement encoder
Gripping force backup	During opening, during closing	During opening, during closing	
Description	• Heavy-duty, precision T-slot guide for gripper jaws • High gripping force with compact size • Max. repetition accuracy • Wide range of adaptation options on the drive units	• Ideal for very harsh environments • Precise gripping even at high torque load • Max. gripping force at optimum installation space/force ratio • 8 sizes with up to 40 mm total stroke • Repetition accuracy of 0 ... 0.05 mm	• Electrically actuated gripper with long stroke • Free, speed-controlled selection of gripping positions • Long stroke allows use with workpieces of different sizes • Adjustable gripping force for highly sensitive and large, heavy workpieces • Very high torque resistance, very high accuracy • Short opening and closing times • Minimal installation costs
online: →	**dhps**	**hgpd**	**hgple**

Parallel grippers

	 **Parallel grippers HGPT**	 **Parallel grippers HGPL-B**	 **Parallel grippers HGPP**
Total gripping force at 6 bar, closing	106 ... 6300 N	158 ... 2742 N	80 ... 830 N
Stroke per gripper jaw	1.5 ... 25 mm	20 ... 150 mm	2 ... 12.5 mm
Position sensing	Via proximity sensor	Via proximity sensor	Via Hall sensor, via inductive sensors
Gripping force backup	During opening, during closing		During opening, during closing
Description	• Sturdy and powerful • With T-slot guide • Suitable for external and internal gripping • Gripper jaw guide protected by sealing air against dust • High-force variant available	• Space-saving, high forces and torques • Controlled, precise and centred gripping • Long stroke: long guide length for the gripper jaws • Suitable for external and internal gripping • Opening stroke can be adjusted to optimise time	• High-precision gripper jaw guide • Suitable for external and internal gripping • Very flexible thanks to versatile attachment, mounting and application options
online: →	**hgpt**	**hgpl**	**hgpp**

Three-point grippers

	 **Three-point grippers DHDS**	 **Three-point grippers HGDD**	 **Three-point grippers HGDT**
Total gripping force at 6 bar, closing	87 ... 750 N	336 ... 2745 N	207 ... 2592 N
Stroke per gripper jaw	2.5 ... 6 mm	4 ... 12 mm	1.5 ... 10 mm
Position sensing	Via Hall sensor, via proximity sensor	Via proximity sensor	Via proximity sensor
Gripping force backup	During closing	During opening, during closing	During opening, during closing
Description	• Heavy-duty, precision T-slot guide for gripper jaws • High gripping force with compact size • Max. repetition accuracy • Wide range of adaptation options on the drive units	• Precise gripping with centric movements despite high torque loads • Ideal for very harsh environments • 5 sizes with up to 12 mm stroke/jaw • Repetition accuracy of 0 ... 0.05 mm	• Synchronous movement of the gripper jaws • With T-slot guide • Suitable for external and internal gripping • Gripper jaw guide protected by sealing air against dust • High-force variant available
online: →	**dhds**	**hgdd**	**hgdt**

Angle grippers

	 **Angle grippers DHWS**	 **Angle grippers HGWM**
Total gripping torque at 6 bar, closing	30 ... 1362 Ncm	22 ... 64 Ncm
Max. opening angle	40°	14 ... 18.5°
Position sensing	Via Hall sensor, via proximity sensor	None
Gripping force backup	During closing	
Description	• Improved gripper jaw guide • Link guided movement • Internal fixed flow control, does away with the need for external flow control in 90% of applications • Max. repetition accuracy • Wide range of adaptation options on the drive units	• Micro gripper: compact, handy design • Mounting options with clamping flange, with flange mounting, with Z-stroke compensation • Versatile thanks to externally adaptable gripper fingers
online: →	**dhws**	**hgwm**

Grippers

Radial grippers

	 **Radial grippers DHRS**	 **Radial grippers HGRT**
Total gripping torque at 6 bar, closing	15 ... 660 Ncm	158 ... 7754 Ncm
Max. opening angle	180°	180°
Position sensing	Via Hall sensor, via proximity sensor	Via proximity sensor, via inductive sensors
Description	• Lateral gripper jaw support for high torque loads • Self-centring • Gripper jaw centring options • Max. repetition accuracy	• Secure gripping thanks to precise, polished plain-bearing guides • Gripping force backup via compression spring holds the gripped workpiece securely in the event of pressure failure • Compression spring also boosts the gripping force for applications involving heavier loads • Optimum cycle times thanks to freely adjustable opening angle of up to max. 90° per gripper finger. This prevents possible collisions due to the gripper jaws opening too wide
online: ➔	**dhrs**	**hgrt**

Swivel/gripper units

	 **Swivel/gripper units HGDS**
Total gripping force at 6 bar, closing	74 ... 168 N
Stroke per gripper jaw	2.5 ... 7 mm
Swivel angle	210°
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 grippers

	 **Bellows grippers DHEB**
Bellows stroke	3.5 ... 25 mm
Min. diameter to be gripped	8 ... 66 mm
Max. diameter to be gripped	11 ... 85 mm
Max. operating frequency of gripper	≤4 Hz
Description	• 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: ➔	**dheb**

Accessories for grippers

	 **Adaptive gripper fingers DHAS**
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 • Sizes 60, 80, 120 • For workpiece diameters from 6 to 120 mm
online: ➔	**dhas**

Servo-pneumatic positioning systems

Linear drives with displacement encoder

	 **Linear drives with displacement encoder DDLI**	 **Standards-based cylinders with displacement encoder DDPC**	 **Standards-based cylinders with displacement encoder DNCI**	 **Linear drives with displacement encoder DGCI**
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
Theoretical force at 6 bar, advancing	295 ... 1870 N	3016 ... 4712 N	415 ... 1870 N	153 ... 1870 N
Max. load, horizontal	30 ... 180 kg	300 ... 450 kg	45 ... 180 kg	1 ... 180 kg
Max. load, vertical	10 ... 60 kg	100 ... 150 kg	15 ... 60 kg	1 ... 60 kg
Stroke	100 ... 2000 mm	10 ... 2000 mm	10 ... 2000 mm	100 ... 2000 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 • IP67 degree of protection • For attachment to customer's own guide • Supply ports on 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 • Optional, 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 • Optional, 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 • Choice of supply ports on end face or front
online: ➔	**ddli**	**ddpc**	**dnci**	**dgci**

Swivel modules with displacement encoder

	 **Semi-rotary drives with angular displacement encoder DSMI-B**
Piston diameter	25 mm, 40 mm, 63 mm
Theoretical torque at 6 bar	5 ... 40 Nm
Max. mass moment of inertia, horizontal	0.03 ... 0.6 kgm²
Max. mass moment of inertia, vertical	0.03 ... 0.6 kgm²
Swivel angle	0 ... 272°
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 controllers

	 **Axis controllers CPX-CMAX**	 **End-position controllers 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 fieldbuses/Ethernet and controllers CEC available on CPX • Easy commissioning thanks to auto identification function • Rapid commissioning and comprehensive diagnostics with the parameterisation software FCT (Festo Configuration Tool)	• Electronic end-position control for pneumatic drives • Soft Stop for smooth braking and quick acceleration • Use with all fieldbuses/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 VPWP**
Valve function	5/3-way proportional directional control valve, closed
Pneumatic connection 1	G1/4, G1/8, G3/8
Operating pressure for positioning/Soft Stop	4 ... 8 bar
Operating pressure	0 ... 10 bar
Standard nominal flow rate	350 ... 2000 l/min
Description	• Controlled piston spool valve • Digital control • 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 CPX-CMAX and CPX-CMPX
online: ➔	**vpwp**

Linear drives, actuators and slides

	 **Electric cylinders EPCO**	 **Electric cylinders ESBF**	 **Spindle axes EGC-BS-KF**	 **Toothed belt axes EGC-TB-KF**
Size	16, 25, 40	32, 40, 50, 63, 80, 100	70, 80, 120, 185	50, 70, 80, 120, 185
Max. feed force Fx	50 … 650 N	1000 … 17000 N	300 … 3000 N	50 … 2500 N
Repetition accuracy	+/–0.02	+/–0.01, +/–0.015, +/–0.05	+/–0.02	+/–0.08, +/–0.1
Stroke	50 … 400 mm	30 … 1500 mm	50 … 3000 mm	50 … 8500 mm
Description	• Linear drive with permanently attached motor • With ball screw • Optional: encoder, holding brake and female thread on the piston rod • Two different spindle pitches for high force or high speed • Suitable for simple applications in factory automation that in the past were mostly carried out using pneumatic solutions • Cost-optimised: 28 types and modular products in stock for individual specifications • Optional: precise and backlash-free guide • Also available as an OMS (Optimised Motion Series) product	• Available with ball screw (size 32 … 100) or lead screw (size 32 … 50) • Optional: high corrosion protection, degree of protection IP65, food-safe (see www.festo.com/sp/esbf -› “Certificates” tab), piston rod extension • Ball screw: with three spindle pitches for selecting the optimal force-speed ratio • Axial or parallel motor mounting • 68 types in stock with short delivery times and modular products for individual specifications	• Recirculating ball bearing guide for high loads and torques • Optionally with clamping unit, at one or both ends • Profile with optimised rigidity • Various spindle pitches • The spindle support enables maximum travel speed • Axial or parallel motor mounting	• Recirculating ball bearing guide for high loads and torques • Optionally with clamping unit, at one or both ends • Profile with optimised rigidity • 22 types in stock with short delivery times and modular products for individual specifications
online: ➔	**epco**	**esbf**	**egc**	**egc**

Linear drives, actuators and slides

	 **Toothed belt axes ELGA-TB-KF**	 **Toothed belt axes ELGA-TB-RF**	 **Toothed belt axes ELGA-TB-G**	 **Spindle axes EGC-HD-BS**
Size	70, 80, 120, 150	70, 80, 120	70, 80, 120	125, 160, 220
Max. feed force Fx	260 … 2000 N	260 … 1000 N	350 … 1300 N	300 … 1300 N
Repetition accuracy	+/–0.08	+/–0.08	+/–0.08	+/–0.02
Stroke	50 … 8500 mm	50 … 7400 mm	50 … 8500 mm	50 … 2400 mm
Description	• Recirculating ball bearing guide for high loads and torques • High feed forces • Precise and resilient guide • Speeds up to 5 m/s with high acceleration up to 50 m/s² • Optional: Food-safe (for further information see www.festo.com/sp/elga-tb-kf › “Certificates” tab) • Flexible motor mounting • Guide and toothed belt protected by cover band • 22 types in stock with short delivery times and modular products for individual specifications	• 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 • As a driving component for external guides, especially for high speeds • Motor can be mounted on any one of 4 sides	• 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 can be mounted on any one of 4 sides	• With heavy-duty guide • With integrated ball screw • For maximum loads and torques • Precise and resilient DUO guide rail • For maximum lateral load up to 900 Nm • Ideal as a basic axis for linear gantries and cantilever axes • The spindle support enables maximum travel speed
online: ➔	**elga**	**elga**	**elga**	**egc**

Linear drives, actuators and slides

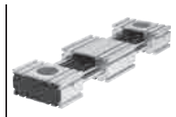
	 **Toothed belt axes EGC-HD-TB**	 NEW **Mini slides EGSC-BS**	 **Mini slides EGSL**
Size	125, 160, 220	25, 32, 45, 60	35, 45, 55, 75
Max. feed force Fx	450 … 1800 N	70 … 345 N	75 … 450 N
Repetition accuracy	+/–0.08 mm, +/–0.1 mm	+/–0.015	+/–0.015
Stroke	50 … 5000 mm	25 … 200 mm	50 … 300 mm
New		• New product for 11/2017	
Description	• With heavy-duty guide • For high loads and torques, high feed forces • Precise and resilient DUO guide rail • Motor can be mounted on any one of 4 sides • For maximum lateral load up to 900 Nm	• Precise 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	• Slides with very high load rating, 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: ➔	**egc**	**egsc-bs**	**egsl**

Electromechanical drives

Linear drives, actuators and slides

	 **Electric slides EGSK**	 NEW **Spindle axes ELGC-BS-KF**	 **Spindle axes ELGA-BS-KF**	 **Toothed belt axes ELGC-TB**
Size	15, 20, 26, 33, 46	32, 45, 60, 80	70, 80, 120, 150	45, 60, 80
Max. feed force Fx	19 ... 392 N	40 ... 350 N	300 ... 3000 N	75 ... 250 N
Repetition accuracy	+/–0.003 - +/–0.004, +/–0.003 - +/–0.01, +/–0.01	+/–0.01, +/–0.015	+/–0.02	+/–0.1
Stroke	25 ... 840 mm	100 ... 1000 mm	50 ... 3000 mm	200 ... 2000 mm
New		• New product for 11/2017		
Description	• 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 individual specifications	• 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	• Internal, precision recirculating ball bearing guide with high load capacity for high torque loads • Guide and ball screw protected by cover strip • For the highest requirements in terms of feed force and accuracy • 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	• Internal guide and toothed belt • Precise and resilient guide • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation
online: →	egsk	elgc-bs	elga	elgc-tb

Linear drives, actuators and slides

	 **Toothed belt axes ELGG**	 **Toothed belt axes ELGR**	 **Cantilever axes DGEA-ZR**
Size	35, 45, 55	35, 45, 55	18, 25, 40
Max. feed force Fx	50 ... 350 N	50 ... 350 N	230 ... 1000 N
Repetition accuracy	+/–0.1	+/–0.1	+/–0.05
Stroke	50 ... 1200 mm	50 ... 1500 mm	1 ... 1000 mm
Description	• 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 any one of 4 sides	• Optimum price/performance ratio • Ready-to-install unit for quick and easy design • With plain or recirculating ball bearing guide • Motor can be mounted on any one of 4 sides • Also available as an OMS (Optimised Motion Series) product	• Toothed belt drive with recirculating ball bearing guide • Dynamic cantilever operation • Stationary drive head
online: →	elgg	elgr	dgea

Quarter turn actuators

	 **Rotary drives 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	50 ... 100 rpm	900 ... 1350 rpm
Rotation angle	Infinite	Infinite
Description	• Electric rotary drive with stepper motor and integrated gear unit • ServoLite – closed-loop operation with encoder • Heavy-duty bearing for high forces and torques • Backlash-free pre-stressed rotating plate with very good axial eccentricity and concentricity properties • Quick and accurate installation • For simple rotary indexing table applications and as a rotary axis in multi-axis applications • Also available as an OMS product (Optimised Motion Series)	• 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

Linear guides

	 **Guide axes ELFC**	 **Guide axes ELFA**	 **Guide axes EGC-FA**
Size	32, 45, 60, 80	70, 80	70, 80, 120, 185
Stroke	100 ... 2000 mm	50 ... 7000 mm	50 ... 8500 mm
Guidance	Recirculating ball bearing guide	Roller bearing	Recirculating ball bearing guide
Description	• Driveless linear guide unit with guide and freely movable slide unit • Higher torsional resistance • Reduced vibrations with dynamic loads	• For spindle/toothed belt axes ELGA (drive axes) • For supporting forces and torques in multi-axis applications • Higher torsional resistance • Reduced vibrations with dynamic loads	• For spindle/toothed belt axes EGC (drive axes) • For supporting forces and torques in multi-axis applications • Higher torsional resistance
online: →	elfc	elfa	egc

Servo motors

	 **Servo motors EMME-AS**	 **Servo motors EMMS-AS**
Nominal torque	0.12 ... 6.4 Nm	0.14 ... 22.63 Nm
Nominal rotary speed	3000 ... 9000 rpm	2000 ... 10,300 rpm
Peak torque	0.7 ... 30 Nm	0.5 ... 120 Nm
Max. rotational speed	3910 ... 10,000 rpm	2210 ... 23,040 rpm
Description	• Brushless, permanently excited synchronous servo motor • Digital absolute displacement encoder, single-turn or multi-turn • Reliable, dynamic, precise • Optimised connection technology • Over 40 stock types • Optionally with holding brake • Optional: multi-turn encoder with SIL2	• Brushless, permanently excited synchronous servo motor • Digital absolute displacement encoder, single-turn or multi-turn • 66 types in stock • 490 built-to-order variants • Optionally with holding brake, IP65, resolver • Different winding variants
online: →	**emme**	**emms**

Stepper motors

	 **Stepper motors EMMS-ST**
Max. rotational speed	430 ... 6000 rpm
Motor holding torque	0.09 ... 9.3 Nm
Description	• Small increment and high driving torques thanks to 2-phase hybrid technology • Optimised connection technology • 28 stock types • With incremental encoder for closed-loop operation • Optionally with holding brake
online: →	**emms**

Motors with integrated controller

	 NEW **Integrated drives EMCA**
Nominal torque	0.37 ... 0.45 Nm
Nominal rotary speed	3100 ... 3150 rpm
Peak torque	0.85 ... 0.91 Nm
Max. rotational speed	3300 ... 3500 rpm
New	• New product for 4/2017
Description	• 64 freely programmable position sets • Convenient web diagnostics • Digital absolute displacement encoder, single-turn and multi-turn with buffering • Degree of protection IP54 as standard, optionally IP65 • Activation via CANopen, EtherNet/IP, I/O interface, PROFINET and EtherCAT
online: →	**emca**

Controllers for AC servo motors

	 **Motor controllers CMMP-AS-M0, CMMP-AS-M3**
Nominal current	2 ... 13 A
Nominal operating voltage AC	230 ... 400 V
Nominal operating voltage phases	1-phase, 3-phase
Rated output controller	500 ... 9000 VA
Fieldbus coupling	PROFIBUS DP, CANopen, DeviceNet, EtherCAT, EtherNet/IP, Modbus/TCP, PROFINET
Description	• Many interfaces and functions for decentralised motion functions (flying saw, flying measurement, modulo function, etc.) • Optional: integrated cam disk controllers and highly dynamic movements • Standardised interfaces allow seamless integration in mechatronic multi-axis modular systems • Reliable and easy commissioning and parameterisation with the Festo Configuration Tool (FCT) • Optionally with 3 slots, safety module or extension module • 255 position sets
online: →	**cmmp**

Controllers for stepper motors

	 **Motor controllers CMMO-ST**	 **Motor controllers CMMS-ST**
Nominal current load supply	6 A	8 A
Nominal voltage, load supply DC	24 V	48 V
Fieldbus coupling	Ethernet	PROFIBUS DP, CANopen
Description	• Motor controllers of the Optimised Motion Series (for electric cylinders EPCO, toothed belt axes ELGR, rotary drives ERMO) • With convenient FCT (Festo Configuration Tool) commissioning for stepper motors EMMS-ST • Simple and quick parameterisation via web browser and parameter cloud • Reliable and easy commissioning and parameterisation with the Festo Configuration Tool (FCT) • Simple actuation via digital I/Os, IO-Link®, I-Port, Modbus® TCP • Safety function Safe Torque Off (STO) PLe • Sinusoidal current injection for especially silent motor operation • Compact design	• For controlling stepper motors EMMS-ST and Optimised Motion Series (for electric cylinders EPCO, toothed belt axes ELGR, rotary drives ERMO) • Easy and convenient: commissioning and firmware updates via SD card slot • Reliable and easy commissioning and parameterisation with the Festo Configuration Tool (FCT) • Integrated process interface: digital I/O, CAN, RS485 • Safety function Safe Torque Off (STO) PLd • Optional: PROFIBUS and DeviceNet
online: →	**cmmo**	**cmms**

Multi-axis controllers

	 **Controllers** **CECX-X-C1, CECX-X-M1**
CPU data	64 MB DRAM, 400 MHz processor
Degree of protection	IP20
Description	• Modular master controller with CODESYS or motion controller with CODESYS and SoftMotion • Programming to standard IEC 61131-3 • Three plug-in slots for optional modules • Optional: communication module for PROFIBUS
online: →	**cecx-x**

Products, solutions and services
09

Handling systems

Handling modules

	 **Handling modules HSP**
Size	12, 16, 25
Theoretical force at 6 bar	40 ... 65 N
Min. cycle time	0.6 ... 1 s
Y-stroke	52 ... 170 mm
Z-stroke	20 ... 70 mm
Repetition accuracy	+/–0.01, +/–0.02
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 systems

	 **Single-axis systems YXCS**	 **2D linear gantries YXCL**	 **2D planar surface gantries YXCF**	 **3D gantries YXCR**
Description	• Ready-to-install single-axis solution including energy chain for cable and tubing routing as well as matching motor and motor controller package • For any single-axis movement • Ideal for long gantry strokes and heavy loads • High mechanical rigidity and sturdy design	• Ideal for long gantry strokes and heavy loads • High mechanical rigidity and sturdy design • Frequently used in feeding or loading applications • Use of tried and tested drives/axes from Festo	• Can be used universally for handling light to very heavy workpieces or high payloads • Especially suitable for very long strokes • High mechanical rigidity and sturdy design • Freely positionable; any intermediate positions	• Can be used universally for handling light to very heavy workpieces or high payloads • Especially suitable for very long strokes • High mechanical rigidity and sturdy design • Pneumatic or electric vertical axis on request • As an electrical solution – freely positionable/any intermediate positions
online: ➔	**yxcs**	**yxcl**	**yxcf**	**yxcr**

Cartesian systems

	 **Linear gantries EXCT**	 NEW **2D planar surface gantries EXCM**	 **2D planar surface gantries EXCH**
New		• New for 4/2017: size 40, extended Y stroke, protection against particles, 48 V controller	
Description	• Short cycle times thanks to high dynamic response • Perfectly matched drive and controller package for quick commissioning • Especially economical due to the low moving dead weight	• Excellent functionality in small installation spaces • Small moving mass • Actuation via two stepper motors with integrated optical encoder and two-axis controller • With recirculating ball bearing guide	• Optimal dynamic response when compared with other Cartesian gantry systems • Drive concept with low moving dead weight • Flat system design • High acceleration in both axial directions • Large working space
online: ➔	**exct**	**excm**	**exch**

Parallel kinematic systems

	 **Parallel kinematic systems, tripod EXPT**
Max. effective load	5 kg
Working space nominal diameter	450 ... 1200 mm
Working space nominal height	100 mm
Max. picking rate	150 picks/min in 12" cycle
Description	• Low moving mass – ideal for demanding requirements on dynamic response in three dimensions • Great path accuracy with a range of path profiles, even for very dynamic operation • Optional: rotary unit as 4th axis, on request with pneumatic rotary throughfeed for vacuum or gauge pressure
online: ➔	**expt**

Control systems

	 **Control systems CMCA**
Electrical connection	Spring-loaded terminal
Mains voltage AC	230/400 V
Nominal operating voltage phases	3-phase
Mains frequency	50 ... 60 Hz
Safety function	Safe Stop 1 (SS1)
Description	• Control system for handling systems from Festo • Available on a mounting plate with or without control cabinet housing • Includes the multi-axis controller CMXR and the motor controller CMMP required for actuation • The control solution CMCA is pre-programmed and already tested together with the relevant parallel kinematic system • The version with the control cabinet housing also features control elements and fans in the door • Also included: terminals for control cabinet lighting, plug socket for PC in the control cabinet, terminals for Festo camera, terminals for two proximity sensors per axis
online: ➔	**cmca**

Vacuum generators

	 Vacuum generators OVEL	 Vacuum generators OVEM	 Vacuum generators, pneumatic VN
Nominal width of Laval nozzle	0.45 ... 0.95 mm	0.45 ... 2 mm	0.45 ... 3 mm
Ejector characteristics	High suction rate, high vacuum, standard	High suction rate, high vacuum, standard	High suction rate, high vacuum, standard, in-line, high vacuum, high suction rate
Integrated function	Electric ejector pulse, flow control valve, pressure sensor, pressure transmitter, electric on-off valve, filter, open 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, open silencer, vacuum switch
Max. vacuum	89 ... 92%	93%	86 ... 93%
Max. suction rate with respect to atmosphere	4 ... 21 l/min	6 ... 86.5 l/min	6.1 ... 339 l/min
Description	• Low-cost, compact vacuum generator • Lightweight • Various performance levels and vacuum types • Short switching times thanks to integrated solenoid valves • Quick, precise and safe placement of the workpiece via the ejector pulse • Simple installation via H3 plugs and push-in fittings	• 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 • Adjustable ejector pulse	• Can be used directly in the work space • Available as straight type (inline: vacuum port in line with the supply port) or T-shape (standard: vacuum port at 90° to the supply port) • Compact and cost-effective • Maintenance-free operation and reduced noise level through an integrated, open silencer
online: ➔	ovel	ovem	vn

Vacuum generators

	 Vacuum generators, electropneumatic VN	 Vacuum generator cartridges VN
Nominal width of Laval nozzle	0.45 ... 3 mm	0.45 ... 2 mm
Ejector characteristics	Standard, high vacuum, high suction rate	Standard, high vacuum, high suction rate
Integrated function	Pneumatic ejector pulse valve, electric on-off valve, open silencer	
Max. vacuum	92 ... 93%	92 ... 93%
Max. suction rate with respect to atmosphere	7.2 ... 186 l/min	7.2 ... 184.4 l/min
Description	• 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 fitting into customised housing for decentralised vacuum generation
online: ➔	vn	vn

Vacuum gripping technology

	 Bernoulli grippers OGGB	 Suction grippers ESG	 Suction cup with connection attachments ESS
Suction cup size		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
Suction cup diameter	60 mm, 100 mm, 140 mm	2 ... 200 mm	2 ... 200 mm
Holding force at nominal operating pressure	6 ... 10 N	0.1 ... 1610 N	0.1 ... 1610 N
Design		Vacuum port on top, vacuum port on the side, with height compensator, with long height compensator	Round, bell-shaped
Information on suction cup materials		BR, FPM, NBR, PUR, VMQ (silicone), Vulkollan®	BR, FPM, NBR, PUR, VMQ (silicone), Vulkollan®
Description	• 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, limp, porous, brittle gripping tasks	• Modular system of suction cup holders and suction cups with over 2000 variants • Optionally with angle compensator, height compensator, filter • 15 suction cup diameters • 6 suction cup shapes • 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
online: ➔	oggb	esg	ess

Vacuum gripping technology

	 Suction cups ESV	 Suction cup with connection attachments VAS, VASB
Suction cup size		
Suction cup diameter	20 ... 200 mm	2 ... 125 mm
Holding force at nominal operating pressure	8.2 ... 1610 N	0.14 ... 700 N
Design	Bell-shaped or round bellows	
Information on suction cup materials	BR, FPM, NBR, PUR, VMQ (silicone), Vulkollan®	NBR, PUR, TPE-U (PU), VMQ (silicone)
Description	• Wearing part for assembled suction cup ESS • Easily interchangeable • Suction cup volume: 0.318 ... 245 cm³ • Min. workpiece radius: 10 ... 680 mm	• Sturdy and reliable • Suction cups with fixed connecting thread • 11 suction cup diameters • Round suction cup, protective bellows • Vacuum port on top, on the side • Screw-in thread
online: ➔	esv	vas

Assembly and connecting components

	 **Suction cup holders ESH**
Design	Vacuum port on top, vacuum port on the side, with height compensator
Description	• With or without height compensator • 6 holder sizes • 8 holder types • 3 tubing connector options
online: ➔	**esh**

Pressure indicators

	 **Vacuum gauge VAM, FVAM**
Type of mounting	Front panel mounting, screw-in
Display range [bar]	–1 ... 9 bar
Pneumatic connection	G1/4, G1/8, R1/4, R1/8
Operating pressure	–1 ... 9 bar
Measurement accuracy class	2.5
Description	• Designs based on DIN EN 837-1, available with red-green range • Pneumatic connection via R or G thread • Double or single scale • Display units bar, in Hg, psi
online: ➔	**vam**

Universal directional control valves

	 NEW **Solenoid valves, for individual connection VUVG** ★	 **Solenoid valves, plug-in VUVG** ★	 **Pneumatic valves VUWG**
Actuation type	Electric	Electric	Pneumatic
Pneumatic connection 1	G1/4, G1/8, M3, M5, M7		G1/4, G1/8, M3, M5, M7
Pneumatic working port	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, 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
Standard nominal flow rate	80 ... 1380 l/min	130 ... 1200 l/min	80 ... 1380 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-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, monostable, closed, 2x3/2-way, monostable, open, 2x3/2-way, monostable, open/closed, 5/2-way, bistable, 5/2-way, monostable, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed
Electrical connection	Plug, via electrical connection box, connection pattern H, horizontal connection, M8x1, A-coded, 2-pin, 3-pin	Via sub-base	
New	• New for 4/2017: space-saving variant for control cabinet installation (outlet at front)		
Description	• Compact universal valve • Connection technology via electrical connection box (E-box) • High flow rate relative to its size • In-line valves can be used as individual valves or manifold valves	• Sub-base valve • For valve terminal VTUG with plug-in	• Compact universal 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 on manifold rail with electrical individual valves
online: ➔	**vuvg**	**vuvg**	**vuwg**

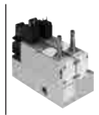
Universal directional control valves

	 **Solenoid valves VUVS** ★	 **Pneumatic valves VUWS**	 **Solenoid valves VMPA1, VMPA14, VMPA2**
Actuation type	Electric	Pneumatic	Electric
Pneumatic connection 1	G1/4, G1/8, G3/8	G1/4, G1/8, G3/8	G1/8, M7
Pneumatic working port	G1/4, G1/8, G3/8, NPT1/4-18, NPT1/8-27, NPT3/8-18, 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	G1/4, G1/8, G3/8, NPT1/4-18, NPT1/8-27, NPT3/8-18, QS-1/4, QS-10, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8	G1/8, M7
Standard nominal flow rate	500 ... 2400 l/min	500 ... 2400 l/min	160 ... 900 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 pressurised, 5/3-way exhausted, 5/3-way closed	2x3/2-way, monostable, closed, 2x3/2-way, monostable, open, 2x3/2-way, monostable, open/closed, 3/2-way, monostable, closed, 3/2-way, monostable, open, 5/2-way, bistable, 5/2-way, monostable, 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	To EN 175301-803, type B, type C		M8x1, plug connector, to EN 60947-5-2, 4-pin
Description	• Universal valve, sturdy and durable • Low-cost with no performance limitations • 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 valve range
online: ➔	**vuvs**	**vuws**	**vmpa1**

Standards-based directional control valves

	 **Solenoid valves VSNC** ★	 **Standards-based valves with central plug VSVA-R5, VSVA-R2** ★	 **Standards-based valves with individual plug VSVA-C1, VSVA-P1** ★	 **Pneumatic valves, ISO 15407-1 VSPA**
Actuation type	Electric	Electric	Electric	Pneumatic
Pneumatic connection 1	G1/4, NPT1/4-18, QS-1/4, QS-10, QS-3/8, QS-5/16, QS-6, QS-8	Sub-base size 1 to ISO 5599-1, size 2 to ISO 5599-1	Sub-base size 18 to ISO 15407-1, size 26 to ISO 15407-1	Sub-base size 18 to ISO 15407-1, size 26 to ISO 15407-1
Standard nominal flow rate	800 … 1350 l/min	400 … 2800 l/min	400 … 1400 l/min	400 … 1100 l/min
Valve function	5/2-way, double solenoid, 5/2-way or 3/2-way, convertible, 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, 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	2x3/2-way, monostable, closed, 2x3/2-way, monostable, open, 2x3/2-way, monostable, open/closed, 5/2-way, bistable, 5/2-way, bistable, dominant signal, 5/2-way, monostable, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed
Electrical connection	Plug connector, to EN 175301-803, to industry standard (11 mm), type A, type B, 3-pin	M8x1, M12x1, central plug, round design, 3-pin, 4-pin	To EN 175301-803, to DIN EN 175301-803, type C, with protective earth conductor, without protective earth conductor	
Description	• NAMUR interface • Rotatable seal for 3/2- or 5/2-way valve • Wide choice of EX solenoid systems • Sturdy and powerful • Extended temperature range • Outstanding value for money • All solenoid coils can be used on an armature tube • The VSNC-...FN variant achieves higher energy efficiency with reduced power consumption	• Corresponds to ISO 5599-1 • Electrical connection with central plug • Robust metal housing • Manifold assembly with mixture of sizes possible	• Corresponds to ISO 15407-1 and to ISO 15218 for pilot valve with interface • Electrical connection via plug connector type C • Robust metal housing • Manifold assembly with mixture of sizes possible	• Conforms to ISO 15407-1 • Pneumatic control • Manifold assembly with mixture of sizes possible
online: ➔	**vsnc**	**vsva**	**vsva**	**vspa**

Application-specific directional control valves

	 **Control blocks VOFA**	 **Solenoid valves MHA1, MHP1**	 **Solenoid valves MHE2, MHP2, MHA2, MHE3, MHP3, MHA3, MHE4, MHP4, MHA4**	 **Fast-switching valves MHJ9, MHJ10**
Design	Piston spool	Poppet valve with spring return	Pressure-relieved poppet valve	Poppet valve without spring return
Valve function	3/2-way, single solenoid, closed, 5/2-way, 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
Operating pressure	3 … 10 bar	–0.9 … 8 bar	–0.9 … 8 bar	0.5 … 8 bar
Ambient temperature	–5 … 50 °C	–5 … 50 °C	–5 … 60 °C	–5 … 60 °C
Pneumatic connection 1	G1/4	QS-3, QS-4, sub-base, prepared for QSP10	G1/4, G1/8, M7, QS-4, QS-6, QS-8, sub-base	QS-4, QS-6, sub-base
Standard nominal flow rate	950 … 1050 l/min	10 … 30 l/min	90 … 400 l/min	50 … 160 l/min
Description	• Redundantly designed valve block, can be used for safe reversing of a hazardous movement • 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 • Safety device in accordance with EU Directive 2006/42/EC (Machinery) • Suitable for use as a press safety valve to EN 692	• 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 • Individual valve with integrated QS fitting • Switching frequencies up to 1000 Hz • Service life › 5 billion switching cycles • Very good repeatability • Use: quick sorting with air jet function
online: ➔	**vofa**	**mh1**	**mh2**	**mhj9**

Manually actuated directional control valves: swivel lever valves

	 **Hand lever valves VHER**
Valve function	4/3-way, pressurised, 4/3-way, exhausted, 4/3-way, closed
Type of control	Direct
Standard nominal flow rate	170 … 3800 l/min
Pneumatic working port	G1/2, G1/4, G1/8, M5
Operating pressure	0 … 10 bar
Description	• Lever in metal or polymer design • Front panel mounting, through holes or mounting holes
online: ➔	**vher**

Manually operated directional control valves: front panel valves

	Front panel valves SVS-3-1/8, SVS-4-1/8, SVOS-3-1/8
Valve function	3/2-way, monostable, closed, 3/2-way, monostable, open, 4/2-way, monostable
Type of control	Direct, piloted
Standard nominal flow rate	120 l/min
Pneumatic working port	G1/8
Operating pressure	3.5 ... 8 bar
Description	• For actuator attachments such as pushbutton actuators, mushroom pushbuttons, mushroom actuators, selector switches, toggle switches, key actuators • Reliable coupling system for rapid assembly and dismantling
online: ➔	svos

Mechanically operated directional control valves: stem actuated valves

	Stem actuated valves VMEF-S
Valve function	3/2-way, single solenoid, closed, 5/2-way, single solenoid
Type of control	Direct
Standard nominal flow rate	750 ... 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure	–0.95 ... 10 bar
Description	• Small and compact for a wide range of pneumatic applications • Outstanding pneumatic performance • Lightweight • Minimal actuating forces
online: ➔	vmef

Mechanically operated directional control valves: roller lever valves

	Roller lever valves VMEF-R
Valve function	3/2-way, monostable, 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	–0.95 ... 10 bar
Description	• Small and compact for a wide range of pneumatic applications • Outstanding pneumatic performance • Lightweight • Minimal actuating forces
online: ➔	vmef

Mechanically operated directional control valves: roller lever valves

	Roller lever valves VMEF-K
Valve function	3/2-way, monostable, 5/2-way, monostable
Type of control	Direct
Standard nominal flow rate	870 ... 1200 l/min
Pneumatic working port	G1/4, G1/8
Operating pressure	–0.95 ... 10 bar
Description	• Small and compact for a wide range of pneumatic applications • Outstanding pneumatic performance • Lightweight • Minimal actuating forces
online: ➔	vmef

Check valves and quick exhaust valves

	Check valves, piloted VBNF	**Quick exhaust valves VBQF**	**Check valves H, HA, HB**
Pneumatic connection 1	QS-6, QS-8	G1/4, G1/8, 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			115 ... 2230 l/min
Standard flow rate exhaust 6->0 bar		850 ... 2500 l/min	
Standard nominal flow rate pressurisation 6->5 bar		350 ... 960 l/min	
Standard nominal flow rate 1 -> 2 from 6 to 5 bar	260 ... 620 l/min		1000 ... 5900 l/min
Operating pressure	0.2 ... 10 bar	0.2 ... 10 bar	–1 ... 12 bar
Operating pressure for entire temperature range	0.2 ... 10 bar		
Description	• Minimal height • High flow rate • Can be rotated horizontally through 360° in assembled state • Manually actuated exhaust possible	• Minimal height • High flow rate • Reduced noise emission • Optionally with silencer • Available with ducted or unducted exhaust air • For higher cycle times	• 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: ➔	vbnf	vbqf	h-qs

Check valves and quick exhaust valves

	 **Check valves, piloted HGL** ★	 **Quick exhaust valves SE, SEU**
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8, M5, QS-10, QS-12, QS-4, QS-6, QS-8	G1/2, G1/4, G1/8, G3/4, G3/8
Standard nominal flow rate		
Standard flow rate exhaust 6->0 bar		550 ... 7500 l/min
Standard nominal flow rate pressurisation 6->5 bar		300 ... 4560 l/min
Standard nominal flow rate 1 -> 2 from 6 to 5 bar	130 ... 1600 l/min	
Operating pressure	0.5 ... 10 bar	0.2 ... 10 bar
Operating pressure for entire temperature range		
Description	• Valve function: piloted non-return function • Pneumatically piloted • Screw-in with male thread • Pilot air connection: M5, G1/8, G1/4, G3/8, QS-4 • Manually actuated exhaust possible with separate accessory	• Valve function: quick exhaust • Shut-off valve, piloted • Screw-in • With or without silencer
online: ➔	**hgl**	**se**

Ball valves and shut-off valves

	 **Hand slide valves VBOH**	 **Shut-off valves HE**	 **Ball valves QH-QS, QHS-QS**
Valve function	3/2-way, bistable	2/2-way bistable, 3/2-way bistable	2/2-way, bistable
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/4, G3/8, M5	QS-10, QS-12, QS-6, QS-8, R1/2, R1/4, R1/8, R3/8	QS-4, QS-6, R1/8
Standard nominal flow rate	236 ... 7691 l/min	270 ... 840 l/min	148 ... 560 l/min
Operating pressure	–0.95 ... 12 bar	–0.95 ... 10 bar	–1 ... 10 bar
Description	• Used as a shut-off function for pressurising and exhausting compressed air systems, for example upstream of service units, 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 • Connection: thread at both ends, push-in connector at both ends, thread/push-in connector • Different mounting options	• 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
online: ➔	**vboh**	**he**	**qh**

Logic valves

	 **OR gates OS**	 **AND gates ZK**
Valve function	OR function	AND function
Pneumatic connection 1	G1/2, G1/4, G1/8, PK-3, PK-4	G1/8, PK-3, PK-4
Standard nominal flow rate	100 ... 5000 l/min	100 ... 550 l/min
Operating pressure	0.001 ... 10 bar	0.001 ... 10 bar
Description	• Pneumatic control system • Mounting via through-holes	• Dual-pressure valve • Connects two input signals in the AND function • Mounting via through-holes
online: ➔	**os**	**zk**

One-way flow control valves

	 **One-way flow control valves VFOH**	 **One-way flow control valves VFOF**	 **One-way flow control valves GRLA, GRLZ, CRGRLA, GRLSA** ★
Valve function	Exhaust 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, supply air one-way flow control function.
Pneumatic connection 1	QS-10, QS-4, QS-6, QS-8	QS-6, QS-8	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
Standard nominal flow rate in flow control direction	180 ... 530 l/min	240 ... 590 l/min	0 ... 4320 l/min
Adjusting element	External hex	Internal hex	Knurled screw, slotted head screw, internal hex
Description	• Easy-to-clean design • Increased corrosion protection • Can be rotated horizontally through 360° in assembled state	• High flow rate • Can be rotated horizontally through 360° in assembled state • Functional combination of one-way flow control valve and piloted check valve • Compact and can be operated from the side	• Flow control valve, flow control at one end • Polymer, metal or stainless steel design • Standard, mini, in-line variants with different flow rates • Functional combination of one-way flow control valve and piloted check valve • Connections: thread at both ends, push-in connector at both ends, threaded/push-in connector
online: ➔	**vfoh**	**vfof**	**grla**

One-way flow control valves

	 **One-way flow control valves GR, GRA**	 **Precision one-way flow control valves GRP**
Valve function	One-way flow control function	One-way flow control function
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/4, G3/8, M3, M5, QS-3, QS-4, QS-6, QS-8	G1/8, PK-3, PK-4
Standard nominal flow rate in flow control direction	29.5 ... 3300 l/min	3.8 ... 75.8 l/min
Adjusting element	Knurled screw	Rotary knob with scale
Description	• Non-return and flow control valve • In-line installation	• Non-return and flow control valve • Mounting on sub-base or for front panel mounting
online: ➔	gra	grp

Flow control valves

	Flow control/silencers VFFK
Valve function	Flow control/silencer function
Pneumatic connection 1	M5, M7, R1/4, R1/8
Standard flow rate 6 -> 0 bar	0 ... 420 l/min
Adjusting element	Knurled screw
Description	• With polymer silencer
online: ➔	vffk

Flow control valves

	 **Exhaust air flow control valves, flow control/silencers GRE, GRU**
Valve function	Flow control/silencer function
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/4, G3/8
Standard nominal flow rate in flow control direction	520 ... 3600 l/min
Standard flow rate 6 -> 0 bar	0 ... 8000 l/min
Adjusting element	Slotted head screw
Description	• Exhaust air flow control valve GRE: sintered metal • Flow control/silencer GRU: polymer
online: ➔	gre

Proportional valves

	 NEW **Proportional pressure regulators VEAA**	 NEW **Proportional pressure regulators VEAB**	 **Proportional flow control valves VPCF**	 **Proportional pressure regulators VPPX**
Valve function	3-way proportional pressure regulator	3-way proportional pressure regulator	3-way proportional flow control valve	3-way proportional pressure regulator
Pneumatic connection 1	QS-4, flange	QS-4, flange	G3/8	G1/2, G1/4, G1/8, sub-base
Pressure regulation range	0.01 ... 10 bar	–1 ... 6 bar		0.1 ... 10 bar
Operating pressure			1 ... 10 bar	
Standard nominal flow rate		≥4.5 l/min	20 ... 1500 l/min	1400 ... 7000 l/min
New	• New series	• New product for 11/2017		
Description	• Silent operation • Very low power consumption • High precision • Integrated piezo technology • Durable • Mounting: via through-holes, H-rail mounting, on mounting plate or sub-base	• Silent operation • Very low power consumption • High precision • Integrated piezo technology • Short switching times • Mounting: via through-holes, H-rail mounting	• Linear characteristic curve for extremely easy programming • ATEX-certified • High dynamic response • Piston spool with integrated sensor • Electrical connection via M12x1 plug, 8-pin	• Pressure regulator with additional sensor input • 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
online: ➔	veaa	veab	vpcf	vppx

Valves

Proportional valves

	 **Proportional pressure regulators VPPM**	 **Proportional pressure regulators VPPE**	 **Proportional directional control valves MPYE**	 **Proportional directional control valves VPPL**
Valve function	3-way proportional pressure regulator	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed	5/3-way, closed	3-way proportional pressure regulator, closed
Pneumatic connection 1	G1/2, G1/4, G1/8, sub-base	G1/8	G1/4, G1/8, G3/8, M5	G1/4, flange
Pressure regulation range	0.02 ... 10 bar	0.02 ... 10 bar		0.2 ... 40 bar
Operating pressure		8 bar	0 ... 10 bar	≤50 bar
Standard nominal flow rate	380 ... 7000 l/min	310 ... 1250 l/min	100 ... 2000 l/min	300 l/min
Description	• Pilot actuated pressure regulator • Multi-sensor control (cascade control) • Integration in valve terminal MPA • User interface with LED displays, LCD display, adjustment/selection buttons • Integrated pressure sensor • Electrical connection via plug connector, round design, 8-pin, M12 or terminal linking	• Pilot actuated pressure regulator • Setpoint input as analogue voltage signal (0 ... 10 V) • Electrical connection via M12x1 plug, 4-pin • Optionally with setpoint module • For simple control tasks	• Controlled piston spool valve • Analogue actuation • Setpoint input as analogue voltage signal (0 ... 10 V) • Suitable for servo-pneumatic applications with SPC11	• For high-pressure applications • Directly actuated piston regulator • Available in three variants: flanged valve, flanged valve with external pilot air supply, in-line valve
online: ➔	**vppm**	**vppe**	**mpye**	**vppl**

Pneumatic control systems

	 **Control blocks for two-hand start ZSB**
Operating pressure	4 ... 8 bar
Type of mounting	Optionally: with through hole, with female thread
Description	• Used wherever manual actuation poses a risk of accident to operating personnel • Safety component in accordance with EU Machinery Directive
online: ➔	**zsb**

Universal valve terminals

	 **Valve manifolds VTUG-S**	 NEW **Valve terminals with multi-pin plug/fieldbus connection VTUG**	 **Valve manifolds VTUS**
Width	10 mm, 14 mm, 18 mm	10 mm, 14 mm, 18 mm	21 mm, 26.5 mm, 31 mm
Standard nominal flow rate	1380 l/min at 18 mm, 380 l/min at 10 mm, 780 l/min at 14 mm	1200 l/min at 18 mm, 330 l/min at 10 mm, 630 l/min at 14 mm	600 ... 2300 l/min
Max. number of valve positions	16	24	16
Electrical actuation	Individual connection	Individual connection, fieldbus, multi-pin plug, IO-Link®, I-Port	Individual connection
Valve terminal design	Fixed grid	Fixed grid	Fixed grid
New		• New for 4/2017: Optimised variants for control cabinet installation	
Description	• Compact with small valves VUVG • 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 multiple connector plate • Part of the VG series • Energy-efficient thanks to reverse operation and targeted pressure reduction.	• Robust valves VUVS with long service life • Individual electrical connection • Pilot air supply in the manifold rail • Comprehensive range of accessories
online: ➔	**vtug**	**vtug**	**vtus**

Universal valve terminals

	 **Valve terminals MPA-L**	 **Valve terminals MPA-S**
Width	10 mm, 14 mm, 20 mm	10 mm, 20 mm
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, 700 l/min at 20 mm
Max. number of valve positions	32	24, 32, 64, 8
Electrical actuation	Fieldbus, multi-pin plug, IO-Link®, I-Port	AS-Interface, fieldbus, multi-pin plug
Valve terminal design	Valve sizes can be mixed	Modular, valve sizes can be mixed
Description	• Maximum modularity • Single granularity • Polymer sub-bases • 3 valve sizes • Tamper-proof fixed restrictor • Fieldbus connection via CPX • IO-Link® capable	• Valve terminals for universal applications • High-performance valves in a sturdy metal housing • Metal linking • Two valve sizes can be combined • Excellent communication thanks to serial linking • Fieldbus connection via CPX • Max. 128 valves
online: ➔	**mpa-l**	**mpa-s**

Standards-based valve terminals

	 **Valve terminals VTSA**
Width	18 mm, 26 mm, 42 mm, 52 mm, 65 mm
Max. standard nominal flow rate	1100 l/min at 26 mm, 1300 l/min at 42 mm, 2900 l/min at 52 mm, 4000 l/min at 65 mm, 550 l/min at 18 mm
Max. number of valve positions	32
Electrical actuation	Ethernet, fieldbus, multi-pin plug, 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**

Application-specific valve terminals

	 **Valve terminals MPA-C**
Width	14 mm
Standard nominal flow rate	780 l/min at 14 mm
Max. number of valve positions	32
Electrical actuation	Multi-pin plug, IO-Link®, I-Port
Valve terminal design	Modular and expandable
Description	• Valve terminal in Clean Design • Easy-to-clean design • High corrosion resistance • IP69K degree of protection • FDA-compliant materials • Redundant sealing system
online: ➔	**mpa-c**

Electrical peripherals

	 **Terminals CPX**	 **Automation systems CPX-E**
Protocol	INTERBUS, DeviceNet, PROFIBUS, CANopen, CC-Link, EtherNet/IP, PROFINET, EtherCAT, ModbusTCP	
Max. address capacity, inputs	64 byte	64 byte
Max. address volume for outputs	64 byte	64 byte
Parameterisation	- Diagnostic behaviour, – Failsafe response, – Forcing of channels, – Signal setup	
Degree of protection	IP65, IP67	IP20
Nominal operating voltage DC	24 V	24 V
Operating voltage range DC	18 ... 30 V	
Description	• Automation platform • Open to all common fieldbus protocols and Ethernet • Integrated diagnostic and maintenance functions • Can be used as stand-alone remote I/O or with valve terminals MPA-S, MPA-L, VTSA/VTSA-F • Choice of polymer or metal housing with individual linking	• 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/0.5 A) • 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
online: ➔	**cpx**	**cpx-e**

Motion Terminal

	 NEW **Motion Terminal VTEM**
Design	Fixed grid
Grid dimension	28 mm
Flow rate	Up to 500 l/min
Electrical actuation	Fieldbus
Pneumatic connection 1	G3/8
Operating/pilot pressure	3 ... 8 bar
Actuation type	Electric
Nominal operating voltage	24 V DC ±25%
Temperature of medium	–5 ... +50 °C
New	• New series
Description	• Many functions in one component – thanks to apps • Combines the benefits of electric and pneumatic components • Maximum standardisation • Reduced complexity and time to market • Increasing profitability and know-how protection • Minimal installation • Increased energy efficiency
online: →	**vtem**

Proximity sensors, for T-slot

	 **Proximity sensors SMT-8M-A** ★	 NEW **Proximity sensors SMT-8-SL, SMT-8 F, SMT-8G**	 **Proximity sensors CRSMT-8**
Electrical connection	2-wire, 3-wire, 2-pin, 3-pin, cable, cable with plug, M8x1, M12x1, rotatable thread	2 wire, 3-wire, 3-pin, cable, cable with plug, M8x1, plug, rotatable thread	Cable, 3-wire
Operating voltage range DC	5 … 30 V	10 … 30 V	10 … 30 V
Switching element function	N/C contact, N/C contact or N/O contact, switchable, N/O contact	NAMUR, N/O contact	N/O contact
Switching output	NPN, PNP, PNP/NPN switchable, non-contacting, 2-wire	NAMUR, NPN, PNP	PNP
New		• New for 7/2017: Additional versions	
Description	• Measuring principle: magneto-resistive • Short design • Variant EX2 for use in potentially explosive areas • Insertable 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: magneto-resistive • SMT-8-F: in accordance with the ATEX directive for explosive atmospheres • SMT-8G: design ideal for gripper sensing • SMT-8-SL: sturdy thanks to long guides and plug connector directly at the sensor • Variants suitable for use with energy chains and robots • Insertable in the slot lengthwise or from above • 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/sp/crsmt-8 -> “Certificates” tab), resistant to acids, lye and cooling lubricants • Insertable in the slot lengthwise, flush with the cylinder profile • LED switching status indication • Cable length 2.5, 5 m
online: ➔	**smt-8m**	**smt-8**	**crsmt-8**

Proximity sensors, for C-slot

	 **Proximity sensors SMT-10M, SMT-10G** ★
Electrical connection	Cable, cable with plug, M8x1 A-coded to EN 61076-2-104, M12x1 A-coded to EN 61076-2-101, open end, 2-pin, 3-pin, 2-wire, 3-wire
Operating voltage range DC	5 … 30 V
Switching element function	N/O contact
Switching output	NPN, PNP, non-contacting, 2-wire
Description	• Measuring principle: magneto-resistive • Clamped in C-slot, insertable in the slot from above or lengthwise • LED switching status indication • Cable length 0.3, 2.5 m
online: ➔	**smt-10**

Proximity sensors, block design

	 **Proximity sensors SMT-C1**
Electrical connection	M8x1, M12x1, cable, cable with plug, 3-pin, 3-wire, rotatable thread
Operating voltage range DC	10 … 30 V
Switching element function	N/O contact
Switching output	PNP
Description	• Measuring principle: magneto-inductive • For Clean Design standards-based cylinder DSBF with mounting rail for sensors • LED switching status indication
online: ➔	**smt-c1**

Inductive sensors

	 **Inductive sensors SIEN** ★	 **Inductive sensors SIEA**	 **Inductive sensors SIEH**	 **Inductive sensors SIES-8M**
Size	4 mm, 6.5 mm, M12, M12x1, M18, M18x1, M30, M30x1.5, M5x0.5, M8x1	M12, M18, M30, M8	3 mm, M12, M18	Slot 8
Switching output	NPN, PNP		NPN, PNP	NPN, PNP
Switching element function	N/C contact, N/O contact		N/C contact, N/O contact	N/C contact, N/O contact
Electrical connection	M8x1, M12x1, cable, plug connector, 3-pin, 3-wire	M8x1, M12x1, plug connector, 3-pin, 4-pin	M8x1, M12x1, cable, cable with plug, plug connector, 3-pin, 3-wire	M8x1, cable, cable with plug, 3-pin, 3-wire, rotatable thread
Operating voltage range DC	10 ... 30 V	15 ... 30 V	10 ... 30 V	10 ... 30 V
Description	• With standard 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 analogue output • Flush installation • Metric thread	• With increased switching distance • Flush installation • Metric thread • LED switching status indication • Design with stainless steel housing	• Ideally suited for position sensing for electric axes and grippers with T-slot • Flush installation • Switching status indication with 2 LEDs for better visibility regardless of the direction from which it is approached • Single inductive sensor for 8 slot with patented LED status indication
online: →	**sien**	**siea**	**sieh**	**sies**

Position sensors

	 NEW **Position transmitters SDAP-MHS**	 **Position transmitters SDAT-MHS**	 **Position transmitters SMAT-8E**	 **Position transmitters SMAT-8M**
Design type	For T-slot	For T-slot	For T-slot	For T-slot
Position measuring range	0 ... 160000 µm	0 ... 160000 µm	48 ... 52 mm	40 mm
Analogue output	4–20 mA	4–20 mA, 100 mA	0–10 V, 4–20 mA	0–10 V
Electrical connection	M8, cable with plug, 4-pin, rotatable thread	M8, cable with plug, 4-pin, rotatable thread		
New	• New product for 4/2017			
Description	• Only for use with Festo Motion Terminal VTEM • Measuring principle: magnetic Hall • Insertable in the slot from above, screw-clamped • Suitable for use with energy chains and robot lines • LED status displays • Cable length 0.3 m	• Measuring principle: magnetic Hall • Insertable in the slot from above, screw-clamped • Suitable for use with energy chains and robot lines • LED status displays • Cable length 0.3 m • Programmable IO-Link®/ switching output	• Measuring principle: magnetic Hall • Current and voltage signal at the analogue output • Insertable in the slot lengthwise • Suitable for use with energy chains and robot lines • LED status displays • Cable length 2.5, 5 m	• Measuring principle: magnetic Hall • Displacement-proportional analogue output signal • Insertable in the slot, central clamping • Suitable for use with energy chains and robot lines • LED status displays • Cable length 0.3 m
online: →	**sdap**	**sdat**	**smat-8e**	**smat-8 m**

Displacement encoders

	 **Displacement encoders MLO-POT-TLF**	 **Displacement encoders MLO-POT-LWG**
Stroke	225 ... 2000 mm	100 ... 750 mm
Measuring principle of displacement encoder	Analogue	Analogue
Output signal	Analogue	Analogue
Displacement resolution	0.01 mm	0.01 mm
Description	• Conductive plastic potentiometer • Absolute measurement with high resolution • High travel speed and long service life • Plug-in connections	• Connecting rod potentiometer • Absolute measurement with high resolution • Long service life • IP65 degree of protection • Plug-in connections
online: →	**mlo**	**mlo**

Pressure and vacuum sensors

	 **Pressure sensors SDE5** ★	 **Pressure sensors SPAN**	 **Pressure sensors SPAE**
Pressure measuring range	–1 ... 10 bar	–1 ... 16 bar	–1 ... 10 bar
Switching element function	N/C contact, N/O contact, switchable	N/C or N/O contact, switchable	N/C contact, N/O contact, switchable
Pneumatic connection	QS-1/4, QS-4, QS-5/32, QS-6	Male thread G1/8, NPT1/8-27, R1/8, female thread G1/8, M5, QS-4	Cartridge 10, push-in sleeve QS-4, QS-6, QS-3, QS-4, flange
Electrical connection	M8x1, cable, plug connector, round design, to EN 60947-5-2, 3-pin, 3-wire	Plug connector, square design, 4-pin	Cable, open end, 3-wire
Display type		Illuminated LCD	LED display, 2-digit
Description	• Programmable and configurable pressure switch for simple pressure sensing tasks • Threshold/window comparator • Switching point adjustment by teach-in function • Integrated microprocessor • Switching status indicated 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 test, 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 display with blue backlight	• 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) • IO-Link® communication interface
online: →	**sde5**	**span**	**spae**

Pressure and vacuum sensors

	 **Pressure sensors SPAU**	 **Pressure sensors SPAW**	 **Pressure transmitters SPTE**
Pressure measuring range	–1 … 16 bar	–1 … 100 bar	–1 … 10 bar
Switching element function	N/C or N/O contact, switchable	Switchable	
Pneumatic connection	G1/8, M5, M7, NPT1/8-27, QS-4, QS-5/32, QS-6, R1/4, R1/8	Male thread G1/2, female thread G1/4	Cartridge 10, push-in sleeve QS-4, QS-6, QS-3, QS-4, flange
Electrical connection	M8x1, M12x1, plug connector, round design, to EN 60947-5-2, 4-pin	M12x1, plug connector, round design, to EN 60947-5-2, 4-pin, 5-pin	Cable, open end, 3-wire
Display type	Illuminated LCD, LED	4-character alphanumeric, LED indicator	
Description	• 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 versatility thanks to a wide range of pneumatic adaptations and switchable electrical outputs	• Highly robust • For liquid and gaseous media • Quick and easy adjustment of the switching outputs using three push-buttons • Optimal legibility: display housing rotatable 320°, display at an angle of 45°	• Piezoresistive pressure sensor • Measured variable: relative pressure • Cable length 2.5 m • Compact: 8-way wall bracket for manifold mounting
online: →	**spau**	**spaw**	**spte**

Pressure and vacuum sensors

	 **Pressure transmitters SPTW**	 **Pressure sensors SDE1**	 **Pressure sensors SDE3**
Pressure measuring range	–1 … 100 bar	–1 … 10 bar	–1 … 10 bar
Switching element function		Switchable	Switchable
Pneumatic connection	G1/4	G1/8, QS-4, R1/4, R1/8	QS-4, QS-5/32
Electrical connection	M12x1, plug connector, round design, to EN 60947-5-2, 4-pin	M8x1, M12x1, cable with plug, plug connector, round design, to EN 60947-5-2, 3-pin, 4-pin	M8x1, M12x1, cable, cable with plug, plug connector, round design, to EN 60947-5-2, 4-pin, 5-pin
Display type		Illuminated LCD, back-lit LCD	Illuminated LCD
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 • IP67 degree of protection	• Five pressure measuring ranges • Measuring relative or differential pressure • Switching output PNP, NPN and with analogue current or voltage output • LCD or illuminated LCD display • Mounting: via H-rail, via wall/surface bracket, mounting on service unit, front panel mounting • Certification: c UL us Listed (OL), C-Tick	• Five pressure measuring ranges • Measurement of relative or differential pressure or 2 independent supply ports • Switching output 2x PNP or 2x NPN • Numerical and graphical pressure indication • Mounting: via H-rail, via wall/surface bracket, front panel mounting, with through-holes • Certification: C-Tick, ATEX, c UL us Listed (OL)
online: →	**sptw**	**sde1**	**sde3**

Flow sensors

	 NEW **Flow sensors SFAH**	 **Flow sensors SFAW**	 **Flow sensors SFAB**	 **Flow sensors SFAM**
Flow measuring range end value	0.5 … 200 l/min	32 … 100 l/min	10 … 1000 l/min	1000 … 15000 l/min
Operating medium	Compressed air to ISO 8573-1:2010 [6:4:4], nitrogen	Liquid media, water, neutral liquids	Compressed air to ISO 8573-1:2010 [7:4:4], ISO 8573-1:2010 [6:4:4], nitrogen	Compressed air to ISO 8573-1:2010 [7:4:4], nitrogen
Operating pressure	–0.9 … 10 bar	0 … 12 bar	0 … 10 bar	0 … 16 bar
Pneumatic connection	Female thread G1/4, G1/8, for tubing O. D. 4, 6, 8		QS-1/4, QS-10, QS-12, QS-3/8, QS-5/16, QS-6, QS-8	G1, G1 1/2, G1/2, NPT1 1/2-11 1/2, NPT1-11 1/2, NPT1/2-14, manifold module
Electrical connection		M12x1, plug connector, straight, 5-pin, A-coded	M12x1, plug connector, straight, 5-pin	M12x1, plug connector, straight, 5-pin
New	• New product for 11/2017			
Description	• Process, compressed air, forming gas and pneumatic object monitoring, parts handling of ultra-small parts, leak test • Compact design 20x58 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 mounting, wall or surface mounting • Certification: C-Tick	• Stand-alone device or combined with MS series service units • Supplies absolute flow information and accumulated air consumption measurements • Covers large measuring range with great precision thanks to high dynamic response • Large, illuminated LCD display
online: →	**sfah**	**sfaw**	**sfab**	**sfam**

Opto-electrical sensors

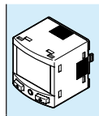
	 **Diffuse sensor, retro-reflective sensor SOEG-RT, SOEG-RS**	 **Through-beam sensor SOEG-E, SOEG-S**	 **Fibre-optic units SOEG-L**	 **Colour sensors SOEC**
Method of measurement	Distance sensor, retro-reflective sensor, diffuse sensor, diffuse sensor with HGA, for transparent objects	Through-beam sensor, receiver, transmitter	Fibre-optic unit	Colour sensor
Working range	0 ... 5500 mm	0 ... 20000 mm	0 ... 250 mm	12 ... 32 mm
Size	20x32x12 mm, 30x30x15 mm, 4 mm, 50x50x17 mm, M12, M12x1, M18, M18x1, M5x0.5	20x32x12 mm, 30x30x15 mm, 50x50x17 mm, M18x1	20x32x12 mm, 30x30x15 mm	50x50x17 mm
Type of light	Infrared, red, red polarised	Infrared, red	Red	White
Switching output	NPN, PNP	NPN, PNP	NPN, PNP	PNP
Description	• Round or block design • Setting option: teach-in via button and via electrical connection • Electrical connection via open cable end or plug connector	• Round or block design • Setting option: teach-in, teach-in via electrical connection, potentiometer • Electrical connection via open cable end or plug connector	• Block design • Setting option: teach-in, teach-in via electrical connection, potentiometer • Electrical connection via open cable end or plug connector	• Diffuse sensor • Block design • Setting option: teach-in, teach-in via electrical connection • Electrical connection via M12x1 plug, 8-pin • Display via 7 LEDs
online: →	soeg	soeg	soeg	soec

Sensors

Opto-electrical sensors

	 **Fibre-optic units SOE4**	 **Fork light barriers SOOF**	 **Fibre-optic cable SOEZ, SOOC**
Method of measurement	Fibre-optic unit	Fork light barrier	Through-beam sensor, fixed focus, fork light barrier, fibre-optic cable, diffuse sensor
Working range	2 ... 2000 mm		2 ... 650 mm
Size		Fork 120x60 mm, 30x35 mm, 50x55 mm, 80x55 mm	M4, M6, M3, M4, M6, rectangle, 19x25x6 mm, 13x19.6x5 mm, 10x10x5 mm, 41x15x7 mm, fork pit, 5x29 mm
Type of light	Red	Red	
Switching output	NPN, PNP	NPN, PNP	
Description	• 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 • Setting option: teach-in • Mounting: H-rail mounting or via through-holes • With protection against mutual interference	• Through-beam sensor with minimal installation effort • Design: polymer or metal • Sturdy housing: high shock and vibration resistance • IP67 degree of protection • Electrical connection via M8x1 plug, 3-pin • Setting option: potentiometer or teach-in • LED displays	• Cable connection, push-in connector
online: →	soe4	soof	soez

Signal converters

	 NEW **Signal converters SCDN**	 **Signal converters SVE4**
Signal range	0–10 V, 0–20 mA	0–10 V +/–0.3, 0–20 mA +/–0.6, 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 output	2x socket, 4-pin, 4-wire	M8x1, plug connector, 4-pin, to EN 60947-5-2
Electrical connection input	Plug connector, 4-pin, 4-wire	M8x1, socket, 4-pin, to EN 60947-5-2
New	• New product for 7/2017	
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: H-rail mounting or via adapter plate • LED switching status indication • Certification: c UL us Listed (OL), C-Tick
online: →	**scdn**	**sve4**

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: teach-in or numerical setting using three-button operation • Integrated air jet function • Multi-coloured LCD display • Mounting: H-rail mounting, wall mounting, through-hole • Certification: C-Tick
online: →	**sopa**

2018/01 – Subject to change ★ Generally ready for shipping ex works in 24 hours → www.festo.com/catalogue/... 133
Products, solutions and services
09

Vision systems

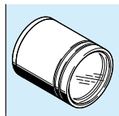
Vision sensors

	 **Code reader SBSC-B, SBSI-B**	 **Object sensors SBSC-Q, SBSI-Q**	 **Colour sensors SBSC-F, SBSI-F**	 **Universal sensors SBSC-U**
Sensor resolution	1280 x 1024 pixels (SXGA), 736 x 480 pixels WideVGA	1280 x 1024 pixels (SXGA), 736 x 480 pixels WideVGA	736x480 pixels (Wide VGA)	1280 x 1024 pixels (SXGA), 736 x 480 pixels WideVGA
Working distance	6 mm – infinite, 30 mm – infinite	6 mm – infinite, 30 mm – infinite	6 mm – infinite, 30 mm – infinite	
Field of view	Depends on the lens chosen, min. 16 mm x 13 mm, min. 5 x 4 mm, min. 8 x 6 mm	Depends on the lens chosen, min. 16 mm x 13 mm, min. 5 x 4 mm, min. 8 x 6 mm	Depends on the lens chosen, min. 5 x 4 mm, min. 8 x 6 mm	Depends on the lens chosen
Frame rate (full image)	40 fps, 50 fps	40 fps, 50 fps	40 fps	50 fps
Max. number of inspection programs	8, 255	8, 255	8, 255	255
Description	• Reading 1D barcodes, 2D matrix codes and directly marked codes • Equipped with position tracking and additional inspection algorithms • High resolution of 1.3 megapixels • Vision sensor with integrated lighting/lens or with CS mount	• Easy quality inspection • 360° position tracking • Quick and powerful recognition algorithms • BLOB function for position sensing, quality inspection or for counting multiple parts in the image • Calliper function for measuring products (distance, edge position) • Vision sensor with integrated lighting/lens or with CS mount	• With detectors for contrast, position tracking based on contour, colour field, grey threshold, brightness, contour matching, pattern matching, edge detection, BLOB, colour value and list • Vision sensor with integrated lighting/lens or with CS mount	• Field of view can be individually determined using a suitable lens • OCR function (Optical Character Recognition) • BLOB function for position sensing, quality inspection or for counting multiple parts in the image • Calliper function for measuring products (distance, edge position) • Calibration function • Vision sensor with CS mount
online: →	**sbsc-b**	**sbsc-q**	**sbsc-f**	**sbsc-u**

Compact vision systems

	 **Compact vision systems SBOA-M**	 **Compact vision systems SBOC-M**	 **Compact vision systems SBOC-Q**
Sensor resolution	640x480 pixels (VGA)	640 x 480 VGA	752x480 pixels WideVGA
Working distance	Depends on the lens chosen	Depends on the lens chosen	Depends on the lens chosen
Field of view	Depends on the lens chosen	Depends on the lens chosen	Depends on the lens chosen
Frame rate (full image)	27 ... 241 fps	241 fps	60 fps
Exposure time	1 ... 1000000 µs	1 ... 1000000 µs	18 ... 200000 µs
Description	• Systainer with compact vision system SBOC-M and accessories	• High-speed camera for diagnostics and commissioning as well as for function monitoring of fast motion sequences • Recording and storage electronics integrated in the camera • For standard lens with C mount connection • Can be networked via Ethernet • Compact dimensions, low weight	• Intelligent field-based camera • Monochrome and colour sensor • For 2D quality inspection, position and rotary orientation detection, reading 1D and 2D codes, reading optical characters (OCR) • Integrated full PLC (CODESYS) • Ethernet and CAN for communicating with higher-order controllers • For standard lens with C mount connection
online: →	**sbox**	**sbox**	**sbox**

Accessories for vision systems

	 NEW **Protective tubes SBAP**	 **Encoder TU**	 **Surface lights, ring lights SBAL**
Type of mounting	Via thread	Via mounting bracket	
New	• New product for 4/2017		
Description	• To protect the sensor against external influences	• For camera system • Cable length 2 m	• External lighting for vision sensor SBSI • Can be connected directly • Plug and work
online: →	**sbap**	**tu**	**sbal**

Accessories for vision systems

	 NEW **Mountings, mounting brackets, swivel mountings SBAM**	 **Lenses SASF**	 **Adapters SBOL**
Type of mounting	Clamped, via through-hole, via thread, via dovetail slot	C mount	Via thread
New	• New product for 4/2017		
Description	• Assembly and mounting attachments for vision sensor SBSI • For external lights SBAL	• For compact vision system SBOA, SBOC, SBOI • Focal length 6, 12, 16, 25, 35 mm	• Spacer ring 5 mm (CS mount to C mount)
online: →	**sbam**	**sasf**	**sbol**

Service unit combinations: MS series

	 **Service unit combinations MSB4, MSB6, MSB9** ★	 **Service unit combinations MSE6-E2M**
Pneumatic connection 1	G1, G1 1/2, G1 1/4, G1/2, G1/4, G1/8, G3/4, NPT1 1/2-11 1/2, NPT1 1/4-11 1/2, NPT1-11 1/2, NPT1/2-14, NPT3/4-14	G1/2
Standard nominal flow rate	750 ... 18000 l/min	
Flow measuring range end value		5000 l/min
Pressure regulation range	0.5 ... 16 bar	
Operating pressure	0 ... 20 bar	4 ... 10 bar
Grade of filtration	0.01 ... 40 µm	
Fieldbus interface		2x socket M12x1/4-pin, D-coded, 2x socket RJ45 push-pull, AIDA, 2x socket SCRJ push-pull, AIDA, Sub-D socket, 9-pin
Description	• Combination of filter regulator, filter, lubricator, on-off valve, soft-start valve • Size 4, 6, 9	• Intelligent pneumatic service unit for optimising the use of compressed air as energy medium • Function: energy saving (2/2-way function DE, V24) • Equipped with measurement, control and diagnostic functions • Identification of production downtime and leakages • Used as process monitoring module • Electrical control via bus node • Size: 6
online: ➔	**msb4**	**mse6**

Regulators: MS series

	 **Precision pressure regulators MS6-LRP, MS6-LRPB**	 **Electric pressure regulators MS6-LRE**
Pneumatic connection 1	G1/2, G1/4, G3/8	G1/2, G1/4
Standard nominal flow rate	800 ... 5000 l/min	2200 ... 7500 l/min
Pressure regulation range	0.05 ... 12 bar	0.3 ... 16 bar
Operating pressure	1 ... 14 bar	0.8 ... 20 bar
Max. pressure hysteresis	0.02 bar	0.25 bar
Description	• As individual device and for manifold assembly • Manifold assembly with through air supply • Good regulation characteristics with minimal pressure hysteresis and primary pressure compensation • High secondary venting • Lockable rotary knob • Available with pressure sensor with display • Size: 6	• With integrated electric drive unit for remotely setting the output pressure • Constant output pressure even in the event of a power failure thanks to the fail-safe function • Available with control unit with display • Optional pressure sensor • With or without secondary venting • Size: 6
online: ➔	**ms6-lrp**	**ms6-lre**

Regulators: individual devices

	 **Precision pressure regulators LRP, LRPS**
Pneumatic connection 1	G1/4, G1/8, for connecting plate Ø 7 mm
Standard nominal flow rate	240 ... 2300 l/min
Pressure regulation range	0.05 ... 10 bar
Operating pressure	1 ... 12 bar
Max. pressure hysteresis	0.02 bar
Description	• Lockable design • Good regulation characteristics with minimal pressure hysteresis and primary pressure compensation • High secondary venting
online: ➔	**lrp**

On-off and soft-start valves: MS series

	 **Soft-start/quick exhaust valves MS6-SV-E, MS6-SV-D**	 **Soft-start/quick exhaust valves MS6-SV-C, MS9-SV-C** ★
Pneumatic connection 1	G1/2	G1/2
Standard nominal flow rate	4300 ... 5700 l/min	4300 ... 16550 l/min
Operating pressure	3 ... 10 bar	3 ... 16 bar
Actuation type	Electric	Electric
Description	• Reliable 2-channel exhausting with self-monitoring up to Performance Level e and category 4 to EN ISO 13849-1 • For reducing pressure quickly and reliably and for building up pressure gradually • SIL 3 • Adjustable pressure build-up time • Optionally with silencer • Supply voltage 24 V DC • Size: 6	• Single-channel venting up to Performance Level c and category 1 to EN ISO 13849-1 • 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 • Size 6, 9
online: ➔	**ms6-sv-e**	**ms6-sv-c**

On-off and soft-start valves: individual devices

	Shut-off valves HE-LO
Pneumatic connection 1	G1, G1/2, G3/4, G3/8
Standard nominal flow rate	5200 ... 10000 l/min
Operating pressure	1 ... 10 bar
Actuation type	Manual
Description	• For shutting off the compressed air supply whilst simultaneously venting systems powered by compressed air • Can be locked in the closed position • Screwed into piping, through-holes for wall mounting • To OSHA 29 CFR 147
online: ➔	**he-lo**

Air dryers: 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**

Pressure booster

	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 • Short filling times • Long service life • Compact design • Available with sensing option
online: ➔	**dpa**

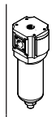
Pressure indicators

	Pressure gauge PAGN	Pressure gauge MA	Flanged pressure gauges FMA
Type of mounting	In-line installation	In-line installation	Front panel mounting
Display range [bar]	0 ... 16 bar	0 ... 25 bar	0 ... 16 bar
Pneumatic connection	Cartridge 10, R1/8	G1/4, G1/8, M5, QS-4, QS-6, QS-8, R1/4, R1/8	G1/4
Operating pressure	0 ... 16 bar	0 ... 25 bar	0 ... 16 bar
Measurement accuracy class	1.6, 2.5, 4	1.6, 2.5, 4, 5	1.6, 2.5
Description	• Pneumatic connection via QSP-10 • Mounting via retaining clamp • Display units bar, psi	• Designs based on DIN EN 837-1, available 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
online: ➔	**pagn**	**ma**	**fma**

Pressure indicators

	Vacuum gauge VAM, FVAM
Type of mounting	Front panel mounting, screw-in
Display range [bar]	–1 ... 9 bar
Pneumatic connection	G1/4, G1/8, R1/4, R1/8
Operating pressure	–1 ... 9 bar
Measurement accuracy class	2.5
Description	• Designs based on DIN EN 837-1, available with red-green range • Pneumatic connection via R or G thread • Double or single scale • Display units bar, in Hg, psi
online: ➔	**vam**

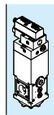
Pneumatic components for high-pressure applications



Micro filters
PFML

Size	90, 186
Grade of filtration	0.01 µm
Operating pressure	0 ... 50 bar
Description	• For high-pressure applications • Food-safe, see www.festo.com/sp/pfml -› “Certificates” tab
online: ➔	**pfml**

Pneumatic components for high-pressure applications

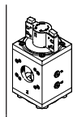


Electric pressure regulators
PREL

NEW

Pneumatic connection 1	G1
Pressure regulation range	0.4 ... 40 bar
Operating pressure	0 ... 50 bar
Max. pressure hysteresis	0.1 bar
New	• New for 4/2017: Additional versions
Description	• For high-pressure applications • Food safe, see www.festo.com/sp/prel -› “Certificates” tab • Size 186 mm
online: ➔	**prel**

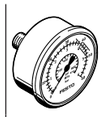
Pneumatic components for high-pressure applications



On-off valves
PVEL

Pneumatic connection 1	Via SAE flange
Operating pressure	0 ... 50 bar
Actuation type	Manual, pneumatic
Description	• Food-safe, see www.festo.com/sp/pvel -› “Certificates” tab • For high-pressure applications • Size 124 mm
online: ➔	**pvel**

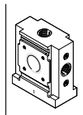
Pneumatic components for high-pressure applications



Pressure gauge
PAGL

Type of mounting	In-line installation
Display range [bar]	0 ... 60 bar
Pneumatic connection	G1/4
Operating pressure	0 ... 60 bar
Measurement accuracy class	1.6
Description	• For high-pressure applications • Display units bar, psi, MPa
online: ➔	**pagl**

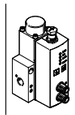
Pneumatic components for high-pressure applications



Branching modules
PMBL

Pneumatic connection 3	G1
Pneumatic connection 4	G1
Operating pressure	0 ... 50 bar
Description	• For high-pressure applications • Food-safe, see www.festo.com/sp/pmbl -› “Certificates” tab • Sizes: 90 mm, 186 mm
online: ➔	**pmbl**

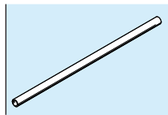
Pneumatic components for high-pressure applications



Proportional directional control valves
VPPL

Valve function	3-way proportional pressure regulator, closed
Pneumatic connection 1	G1/4, flange
Pressure regulation range	0.2 ... 40 bar
Operating pressure	≤50 bar
Standard nominal flow rate	• 300 l/min
Description	• For high-pressure applications • Directly actuated piston regulator • Available in three variants: flanged valve, flanged valve with • external pilot air supply, in-line valve
online: ➔	**vppl**

Standard O. D. tubing

	 **Plastic tubing PUN-H, PUN-H-T, PUN-H-DUO** ★	 NEW **Plastic tubing PTFEN**	 **Plastic tubing PEN**	 **Plastic tubing PAN**
Outside diameter	2 … 16 mm	4 … 16 mm	4 … 16 mm	4 … 16 mm
Inside diameter	1.2 … 11 mm	2.9 … 11 mm	2.7 … 10.8 mm	2.5 … 12 mm
Temperature-dependent operating pressure	–0.95 … 10 bar	–0.95 … 15 bar	–0.95 … 10 bar	–0.95 … 35 bar
Ambient temperature	–35 … 60 °C	–20 … 150 °C	–30 … 60 °C	–60 … 100 °C
New		• New product for 7/2017		
Description	• Polyurethane • High resistance to microbes and hydrolysis • Food-safe, see www.festo.com/sp/pun-h -› “Certificates” tab • Suitable for energy chains • Also available as DUO plastic tubing • Operating media: compressed air, vacuum, water	• Polytetrafluoroethylene • Food-safe, see www.festo.com/sp/ptfen -› “Certificates” tab • High resistance to chemicals • High temperature resistance • Operating media: 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 media: compressed air, vacuum, water	• Polyamide • High thermal and mechanical load capacities • Highly resistant to microbes • Operating media: compressed air, vacuum
online: ➔	**pun-h**	**ptfen**	**pen**	**pan**

Standard O. D. tubing

	 **Heavy-duty tubing PAN-R**	 **Plastic tubing PLN**	 **Plastic tubing PFAN**	 **Customised tubing PAN, PEN, PLN, PUN**
Outside diameter	4 … 28 mm	4 … 16 mm	3 … 12 mm	3 … 16 mm
Inside diameter	2.5 … 23 mm	2.9 … 12 mm	2.3 … 8.4 mm	2.1 … 12 mm
Temperature-dependent operating pressure	–0.95 … 35 bar	–0.95 … 14 bar	–0.95 … 16 bar	0.95 … 16 bar
Ambient temperature	–30 … 80 °C	–30 … 80 °C	–20 … 150 °C	35 … 80 °C
Description	• Polyamide • For applications with a high pressure range • Highly resistant to microbes • Operating media: compressed air, vacuum	• Polyethylene • High resistance to chemicals, microbes and hydrolysis • Food-safe, see www.festo.com/sp/pln -› “Certificates” tab • Resistant to most cleaning agents and lubricants • Operating media: compressed air, vacuum, water	• Perfluoroalkoxy alkane • Pneumatic tubing with resistance to high temperatures and chemicals • Food-safe, see www.festo.com/sp/pfan -› “Certificates” tab • High resistance to chemicals, microbes, UV radiation, hydrolysis and stress cracks • Operating media: compressed air, vacuum, water	• Individual lengths: delivered in units of 25, 50, 100, 200, 500 m • Minimum quantity: 3000 m • Individual design: labelled with your company name and/or your part number • Easy to recognise and handle: individual colour selection • Choose from 9 basic colours; further colours available on request • Simple to order with the configurator
online: ➔	**pan-r**	**pln**	**pfan**	**Tubing**

Spiral tubing

	 **Spiral plastic tubing PUN-S, PUN-S-DUO**	 **Spiral plastic tubing PPS**
Outside diameter	4 … 12 mm	6.3 … 7.8 mm
Inside diameter	2.6 … 8 mm	4.7 … 6.2 mm
Working length	0.5 … 6 m	7.5 … 15 m
Temperature-dependent operating pressure	–0.95 … 10 bar	–0.95 … 21.2 bar
Ambient temperature	–35 … 60 °C	–30 … 80 °C
Description	• Polyurethane • Also available as DUO plastic tubing • Operating media: compressed air, vacuum • Highly resistant to UV radiation and stress cracks	• Polyamide, brass, galvanised steel • Pre-assembled with 2 rotatable connectors and captive sealing rings OL • Highly resistant to microbes • Operating media: compressed air, vacuum, water
online: ➔	**spiral**	**pps**

Push-in fittings

	 NEW **Push-in fittings, standard QS, QSF, QSS, QSSF, QSC, QSH, QSL, QSLL, QSLF, QSLV, QST, QSTF, QSTL, QSW, QSX, QSY, QSYL, QSYLV, QSYTF** ★	 **Push-in fittings NPQH**	 **Push-in fittings/ connectors, resistant to media NPQP**	 **Push-in fittings, stainless steel CRQS, CRQSL, CRQSS, CRQST, CRQSY**
Pneumatic connection 1	Male thread G1/2, G1/4, G1/8, G3/4, G3/8, M5, R1/2, R1/4, R1/8, R3/8, female thread G1/2, G1/4, G1/8, G3/8, push-in sleeve QS-10, QS-12, QS-16, QS-4, QS-6, QS-8, for tubing O. D. 10 mm, 12 mm, 16 mm, 4 mm, 6 mm, 8 mm	Male thread G1/2, G1/4, G1/8, G3/8, M5, M7, female thread G1/4, G1/8, push-in sleeve QS-10, QS-12, QS-14, QS-4, QS-6, QS-8, for tubing O. D. 10 mm, 12 mm, 14 mm, 4 mm, 6 mm, 8 mm	Push-in sleeve QS-10, QS-12, QS-4, QS-6, QS-8, for tubing O. D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm, R1/2, R1/4, R1/8, R3/8	Male thread M5, R1/2, R1/4, R1/8, R3/8, for tubing O. D. 10 mm, 12 mm, 16 mm, 4 mm, 6 mm, 8 mm
Pneumatic connection 2	Female thread G1/2, G1/4, G1/8, G3/8, push-in sleeve QS-10, QS-12, QS-16, QS-4, QS-6, QS-8, for tubing O. D. 10 mm, 12 mm, 16 mm, 22 mm, 4 mm, 6 mm, 8 mm	Push-in sleeve QS-10, QS-12, QS-14, QS-4, QS-6, QS-8, 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, 16 mm, 4 mm, 6 mm, 8 mm
Temperature-dependent operating pressure	–0.95 ... 14 bar		–0.95 ... 10 bar	
Operating pressure	–0.95 ... 14 bar	–0.95 ... 20 bar		–0.95 ... 10 bar
Ambient temperature	–20 ... 80 °C	0 ... 150 °C	–20 ... 60 °C	–15 ... 120 °C
New	• New for 4/2017: Additional versions			
Description	• Standard series • Wide range of variants: large selection for maximum flexibility in standard applications • PBT and nickel-plated brass • Operating media: compressed air, vacuum, (water)	• Solid-metal brass, chemically nickel-plated • High corrosion and chemical resistance • Highly resistant to temperatures and pressure • Food-safe, see www.festo.com/sp/npqh -› “Certificates” tab • Operating media: compressed air, vacuum, water	• Polypropylene • Low-cost alternative to stainless steel: resistant to most cleaning agents in combination with tubing PLN • For use with extreme media influences • Food-safe, see www.festo.com/sp/npqp -› “Certificates” tab • Operating media: compressed air, vacuum	• Maximum corrosion resistance (corrosion resistance class 4 to Festo standard 940 070) and chemical resistance • Food-safe, see www.festo.com/sp/crqs -› “Certificates” tab • Operating media: compressed air, vacuum, (water) • Stainless steel
online: ➔	qs	npqh	npqp	crqs

Barbed fittings

	 **Quick connectors NPCK**
Nominal size	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
Operating pressure	–0.95 ... 12 bar
Ambient temperature	–20 ... 120 °C
Description	• Stainless steel design • Food-safe, see www.festo.com/sp/npck -› “Certificates” tab • Fulfils all Clean Design requirements • Straight shape • Operating media: compressed air, vacuum, water
online: ➔	npck

Threaded fittings

	 **Threaded fittings NPFC**	 **Reducers, sleeves, double nipples D, E, ESK, FR, G, LJK, QSP10, TJK**
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	G1, G1/2, G1/4, G1/8, G3/4, G3/8, M5, R1/2, R1/4, R1/8, 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	G1, G1/2, G1/4, G1/8, G3/4, G3/8, M5, M7, R1/2, R1/4, R1/8, R3/8
Operating pressure	–0.95 ... 50 bar	
Ambient temperature	–20 ... 150 °C	
Description	• Nickel-plated brass • Sleeve • Reducing sleeve • Extension • Double nipple • Reducing nipple • L-, T-, Y- or X-fitting • Operating media: compressed air, vacuum	• Brass or aluminium • Reducing nipple • Double nipple • Distributor block • Sleeve • Operating media: compressed air, vacuum
online: ➔	npfc	esk

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, CQA, CQC, CQD, CQH, CQL, CQO, CQSR, CQT
Pneumatic connection 1	Male thread G1, G1/2, G3/4, G3/8, female thread G1/2, push-in sleeve CQ-12, CQ-15, CQ-18, CQ-22, CQ-28, QS-16, for pipe/tubing O. D. 12 mm, 15 mm, 18 mm, 22 mm, 28 mm
Pneumatic connection 2	Female thread G1/2, 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 size	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
online: ➔	**cq**

Couplings

	 **Quick coupling sockets, quick coupling plugs NPHS-D6, NPHS-S6**	 **Quick coupling sockets, quick coupling plugs KD, KD1, KD2, KD3, KD4, KD5, KS, KS1, KS2, KS3, KS4, KS5**
Pneumatic connection 1	Male thread G1/2, G1/4, G3/8, female thread G1/2, G1/4, G3/8, for plug-in nipple I. D. 9 mm	Male thread G1/2, G1/4, G1/8, G3/8, M3, M5, female thread G1/2, G1/4, G1/8, G3/8, M5, CK-3, CK-4, CK-6, CK-9, CN-2, N-6, N-9
Standard nominal flow rate	875 ... 2083 l/min	44 ... 1350 l/min
Ambient temperature	–20 ... 80 °C	–10 ... 80 °C
Description	• Safety coupling • Shut-off at one end • Releasing sleeve made of metal or polymer • Exhaust the air on the connector side without releasing the coupling • Combination of coupling and hand slide valve • Can be used as an on-off valve	• Quick connection coupling for standard applications without safety function • Shut-off at one or both ends • With male or female thread or with barbed fitting or quick connector • Nickel-plated brass, PP • Operating media: compressed air, vacuum
online: ➔	**nphs**	**kd1**

Products, solutions and services
09

Connecting cables, universal

Connecting cables NEBU ★

Electrical connection, connection type	Socket, cable, plug connector
Electrical connection, cable outlet	Straight, angled, can be adjusted in 15° steps
Electrical connection, design	Round
Electrical connection, connection technology	M8x1 A-coded, G7/8 coded to NFPA/T3.5.29 R1-2007, M12x1 A-coded, open end
Electrical connection, number of pins/wires	3, 4, 5, 8
Cable length	0.1 ... 30 m
Description	• Designs for static, standard, energy chain and robot applications • Versions with switching status indication • Designs for connecting sensors and actuators
online: →	**nebu**

Products, solutions and services
09

Electronic controllers

	 **Controllers CECC-D, CECC-LK, CECC-S**	 **Controllers CECX-X-C1, CECX-X-M1**
Operating voltage	19.2 – 30 V DC, 20.4 – 30 V DC	19.2 – 30 V DC
CPU data	400 MHz processor	64 MB DRAM, 400 MHz processor
Fieldbus interface	CAN bus	CAN bus
Ethernet, connector plug	RJ45	RJ45, socket, 8-pin
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 250 kHz • Ethernet 10/100 Mbps • USB interface for data transfer • CECC-LK with CANopen, IO-Link®, I-Port and Modbus TCP protocol	• Modular master controller with CODESYS or motion controller with CODESYS and SoftMotion • Programming to standard IEC 61131-3 • Three plug-in slots for optional modules • Optional: communication module for PROFIBUS
online: →	**cecc**	**cecx-x**

Electrical peripherals

	 **Input modules CTSL**	 **Fieldbus modules CTEU**	 **Terminals CPX**
Max.no. of inputs	16	128	Digital 512, analogue 32
Max.no. of outputs		128	Digital 512, analogue 18
No. of module positions		32	Max. 9 electric input/output modules
Electrical actuation	IO-Link®, I-Port	CANopen, DeviceNet®, AS-Interface, CC-LINK®, PROFIBUS, EtherCAT®, EtherNet/IP, PROFINET, CPI-B, I-Port	Fieldbus, integrated controller
Description	• For installation system CTEL • For recording sensor input signals • Display of the input statuses for each input signal via an assigned LED • Diagnostic LED for short circuit/overload in sensor supply	• For valve terminals VTUB-12, VTUG, MPA-L, CPV, VTOC • Can be expanded into 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 • Can be used as stand-alone remote I/O or with valve terminals MPA-S, MPA-L, VTSA/VTSA-F • Choice of polymer or metal housing with individual linking
online: →	**ctsl**	**cteu**	**cpx**

Control technology and software

Electrical peripherals

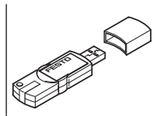
	 **Terminals CPX-E**	 **Measuring modules CPX-CMIX**
Max.no. of inputs	64 bytes	
Max.no. of outputs	64 bytes	
No. of module positions		9
Electrical actuation		
Description	• Modern control system with high performance • Fieldbus master interfaces, EtherCAT® master, fieldbus slave interfaces, PROFINET, EtherNet/IP, PROFIBUS, EtherCAT digital input modules (16DI), digital output modules (8DO/0.5 A) • 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	• Pneumatics and electrics – movement and measurement on one platform • Innovative measurement technology for piston rod drives, rodless drives, rotary drives • Control 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-e**	**cpx-cmix**

Operator units

	 **Operator units CDPX**
Display	Colour TFT
Display size	13.3", 7", 4.3", 10.4"
Recipe memory	32000 byte
Display resolution	480 x 272 pixels, SVGA, 800 x 600 pixels, WVGA, 800 x 480 pixels, WXGA, 1280 x 800 pixels
Ethernet interface	RJ45 10/100 MBd
Description	• Powerful processors combined with wide-screen technology • Remote access, remote control • FTP and HTTP servers • Open for web and multimedia applications • With touch screen
online: →	**cdpx**

Products, solutions and services
09

Software

	 **Software (FluidDraw P5®)** **GSWF-P5**
Description	• Quick and easy creation of pneumatic circuit diagrams • Comprehensive library of pneumatic and electrical symbols • User-specific product databases and translation tables • Terminal plans, cable diagrams, cable lists, parts lists • Sizing function for preparing simple control cabinet and system layouts • Consistent equipment identification • Multi-level project tree
online: ➔	**gswf-p5**

Documentation

	 **Manuals and descriptions** **GDCW, GDCP, GDCC, GSIB, P. BE, P. BP**
Description	• For software • For control blocks • For motors and controllers • For valve terminals and electrical peripherals • For vision systems
online: ➔	**Documentation**

Other pneumatic devices

Silencers

	 **Silencers AMTE** ★	 **Silencers U** ★	 **Silencers UC**	 **Silencers UO**
Information on silencer insert materials	Bronze	PE, Bronze	PE	PE
Pneumatic connection	G1, G1/2, G1/4, G1/8, G3/4, G3/8, M3, M5, NPT1/2-14, NPT1/4-18, NPT1/8-27, NPT3/8-18, UNF10-32	G1, G1/2, G1/4, G1/8, G3/4, G3/8, NPT3/4-14, 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, M7
Noise level	55 ... 95 dB(A)	70 ... 85 dB(A)	58 ... 68 dB(A)	
Description	• Long or short design • Metal version • Operating medium: compressed air • High temperature-resistance up to 80 °C • Slim overall width • Wide range of variants • Can be used universally	• Compact design, plastic or die-cast • Barbed fitting or threaded connection • Operating medium: compressed air	• Plastic 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
online: ➔	**amte**	**u**	**uc**	**uo**

Air reservoirs

	 **Air reservoirs CRVZS**
Volume	0.1 l, 0.4 l, 0.75 l, 10 l, 2 l, 20 l, 5 l
Information on air reservoir materials	High-alloy stainless steel
Conforms to standard	AD 2000
Condensate drain connection	G3/8
Description	• Corrosion-resistant • Can be used to compensate pressure fluctuations, and act as accumulators in the event of sudden air consumption • Providing large quantities of compressed air for supplying fast pulsing drives • With port for condensate drain in some cases • Food-safe, see www.festo.com/sp/crvzs -› “Certificates” tab • Designs to EU Pressure Equipment Directive EN 286-1 • Operating media: compressed air, vacuum
online: ➔	**crvzs**

Air guns

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

Products, solutions and services
09

Pilot valves

	 **Solenoid valves VSNC** ★	 **Solenoid valves VOFC**	 **Solenoid valves VOFD**
Valve function	5/2-way, double solenoid, 5/2-way or 3/2-way, convertible, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	3/2-way closed, single solenoid, 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	1.5 ... 10 bar	0 ... 8 bar	0 ... 12 bar
Ambient temperature	–20 ... 60 °C	–25 ... 60 °C	–50 ... 60 °C
Pneumatic connection 1	G1/4, NPT1/4-18, QS-1/4, QS-10, QS-3/8, QS-5/16, QS-6, QS-8	G1/2, G1/4, M5, NPT1/4-18, port pattern to NAMUR	G1/4, M5, NPT1/4-18, port pattern to NAMUR
Standard nominal flow rate	800 ... 1350 l/min	766 ... 2686 l/min	52 ... 1900 l/min
Explosion prevention and protection	II 2G, II 2D, for zone 1, 2, 21, 22, Ex t IIIC T80 °C Db, EPL Db (IEC-EX), Ex ia IIC T6 Ga, EPL Ga (IEC-EX)	II 2G, II 2D, for zone 1, 2, 21, 22, Ex ia IIIC T85 °C, T125 °C Db, EPL Db (IEC-EX), EPL Db (KR), Ex ia IIC T6, T5 Gb, EPL Gb (IEC-EX), EPL Gb (KR)	For zone 1, 2, 21, 22
Description	• NAMUR interface • Rotatable seal for 3/2- or 5/2-way valve • Wide choice of EX solenoid systems • Sturdy and powerful • Extended temperature range • Outstanding value for money • All solenoid coils can be used on an armature tube • The VSNC-...FN variant achieves higher energy efficiency with reduced power consumption	• Suitable for process automation, for applications 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 TÜV approval up to SIL3 acc. to IEC 61508	• Suitable for process automation, for applications 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 TÜV approval up to SIL4 acc. to IEC 61508
online: ➔	**vsnc**	**vofc**	**vofd**

Sensor boxes

	 **Sensor boxes SRBC** ★	 **Sensor boxes SRBG**	 **Sensor boxes SRBE**
Information on materials – housing	Die-cast aluminium	PBT	Die-cast aluminium
Operating voltage range AC	0 ... 250 V		0 ... 250 V
Operating voltage range DC	0 ... 175 V	6 ... 60 V	0 ... 60 V
Measuring principle	Inductive, magnetic reed, mechanical/electrical, for proximity sensor	Inductive	Inductive, magnetic reed, mechanical/electrical, for proximity sensor
Switching element function	N/C contact, N/O contact, toggle switch, single-pole	N/C contact, N/C contact or N/O contact, switchable, N/O contact	N/C contact, N/O contact, toggle switch, single-pole, toggle switch, double-pole
Description	• Pre-assembled mounting adapter for ease of installation • Trip cams can be set easily without additional tools • Sturdy, corrosion-resistant design, ideal for use in harsh operating conditions • Clearly visible 3D position indicator allows rapid detection of the current position of the quarter turn actuator	• Compact housing with M12 plug connection • Direct mounting on quarter turn actuators to VDI/VDE 3845 • AS-Interface® version with extended addressing • Intrinsically safe version to ATEX and SIL 2 to IEC 61508	• Trip cams can be set easily without additional tools • Sturdy, corrosion-resistant design, ideal for use in harsh operating conditions • Clearly visible 3D position indicator allows rapid detection of the current position of the quarter turn actuator
online: ➔	**srbc**	**srbg**	**srbe**

Sensor boxes

	 **Limit switch attachments SRAP**	 **Limit switch attachments DAPZ**
Information on materials – housing	Wrought aluminium alloy	
Operating voltage range AC		4 ... 250 V
Operating voltage range DC	15 ... 30 V	4 ... 250 V
Measuring principle	Magnetic Hall	Inductive, mechanical/electrical
Switching element function		N/C contact, N/O contact, changeover switch
Description	• Based on standard VDI/VDE 3845 (NAMUR) • Analogue • For monitoring the position of quarter turn actuators • Sensors based on 2D Hall technology	• Drive interface to standard VDI/VDE 3845 (NAMUR) • With inductive or mechanical/electrical sensing
online: ➔	**srap**	**dapz**

Positioners

	 **Positioners CMSX** ★
Standard nominal flow rate	50 ... 130 l/min
Ambient temperature	–5 ... 60 °C
Reference value	0–10, 0–20 mA, 4–20 mA
Operating voltage range DC	21.6 ... 26.4 V
Operating pressure	3 ... 8 bar
Safety information	Safety position: In the case of a broken cable or a failure in the operating voltage, the regulating action is opening/closing
Degree of protection	IP65
Type of mounting	On flange ISO 5211, via accessories
Information on housing materials	PC
Description	• Digital electropneumatic positioner for single- or double-acting pneumatic quarter turn actuators and double-acting pneumatic linear actuators • No air consumption in the adjusted state • Safety function in the case of a power failure: Fail-safe or fail-freeze function (opening/closing or blocking)
online: →	cmsx

Linear actuators

	 **Linear actuators with displacement encoder DFPI**	 **Linear actuators with displacement encoder DFPI-NB3P**	 **Copac linear actuators DLP**
Design	Piston rod, cylinder barrel	Piston rod, cylinder barrel	Piston rod
Mode of operation	Double-acting	Double-acting	Double-acting
Size of valve actuator	100, 125, 160, 200, 250, 320	100, 125, 160, 200, 250, 320	80, 100, 125, 160, 200, 250, 320
Stroke	40 ... 990 mm	40 ... 990 mm	40 ... 600 mm
Flange hole pattern	F07, F10, F14		
Operating pressure	3 ... 8 bar	3 ... 8 bar	2 ... 8 bar
Ambient temperature	–20 ... 60 °C	–20 ... 80 °C	–20 ... 80 °C
Description	• Integrated air supply • Optionally with integrated displacement encoder or fully integrated positioner • IP65, IP67, IP69K, NEMA4 • ATEX certification	• Mounting interfaces to ISO 15552 • Sturdy tie rod design • Optionally with integrated displacement encoder or fully integrated positioner • IP65, IP67, IP69K, NEMA4 • ATEX certification	• NAMUR port pattern for solenoid valves to VDI/VDE 3845 • Integrated air supply • ATEX certification
online: →	dfpi	dfpi	dlp

Quarter turn actuators

	 NEW **Quarter turn actuators DFPD** ★	 **Quarter turn actuators DAPS**
Design	Rack and pinion	Scotch yoke system
Mode of operation	Double-acting, single-acting	Double-acting, single-acting
Size of valve actuator	10, 20, 40, 80, 120, 160, 240, 300, 480	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, F0507, F0710, F1012	F03, F04, F05, F07, F10, F12, F14, F16, F25
Operating pressure	2 ... 8 bar	1 ... 8.4 bar
Ambient temperature	–50 ... 150 °C	–50 ... 150 °C
New	• New for 11/2017: Additional versions	
Description	• Uniform torque characteristic across the entire rotation angle 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 • Increased corrosion protection	• High break-away torques • Approved in accordance with Directive 2014/34/EU (ATEX) • Flange hole pattern to ISO 5211 • Mounting hole pattern to VDI/VDE 3845 • Optionally with handwheel as a manual emergency override • Corrosion-resistant, stainless steel version
online: →	dfpd	daps

Ball valves and ball valve units

	 NEW **Ball valves VZBD**	 NEW **Ball valves VZBE**	 NEW **Ball valves VZBF**	 NEW **Ball valves VZBM**
Design	2-way ball valve	2-way ball valve, 3-way ball valve, L-shaped hole, T-shaped hole	2-way ball valve	2-way ball valve, 3-way ball valve, L-shaped hole, T-shaped hole
Actuation type	Mechanical	Mechanical	Mechanical	Mechanical
Nominal size 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
Process valve connection	Clamp to ASME-BPE, clamp to DIN 32676 series B, welding end to ASME-BPE, welding end to ISO 1127	NPT1, NPT1 1/2, NPT1 1/4, NPT1/2, NPT1/4, NPT2, NPT2 1/2, NPT3, NPT3/4, NPT3/8, NPT4	Flange to ANSI B16.5 class 150	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp3/4, Rp3/8
Flow rate Kv	3.5 ... 436.3 m3/h	5 ... 435.2 m3/h	8.5 ... 2078.3 m3/h	5.9 ... 243 m3/h
Temperature of medium	–20 ... 200 °C	–20 ... 200 °C	–20 ... 200 °C	–20 ... 130 °C
New	• New product for 4/2017	• New product for 4/2017	• New product for 4/2017	• New for 11/2017: Additional versions
Description	• Electropolished surfaces SFV4 • Stainless steel design • PTFE seal with minimal dead space • The high-performance ball valve for the pharmaceutical and cosmetics industry • FDA-compliant seal to FDA 21 CFR 177.1550	• 2-way or 2-way manual, with hand lever • 3-way, L-shaped or T-shaped hole as horizontal design • Stainless steel design • Pipe thread to ASME B1.20.1	• Thread to ANSI B 16.5. class 150 • Static discharge assured • Stainless steel design • API 607 Fire Safe approval • Easy to service	• Pipe thread to EN 10226-1 • Brass design
online: →	vzbd	vzbe	vzbf	vzbm

Ball valves and ball valve units

	 **Ball valves VAPB**	 **Ball valves VZBC**	 **Ball valve actuator units VZBC**	 **Ball valves VZBA**
Design	2-way ball valve	2-way ball valve	2-way ball valve, quarter turn actuator	2-way ball valve, 3-way ball valve, L-shaped hole, T-shaped hole
Actuation type	Mechanical	Mechanical	Pneumatic	Mechanical
Nominal size DN	15, 20, 25, 32, 40, 50, 63	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
Process valve connection	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3/4, Rp3/8	Ring housing with threaded flange	Ring housing with threaded flange	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3, Rp3/4, Rp3/8, Rp4, weld-on ends/weld-on ends
Flow rate Kv	5.9 ... 535 m3/h	19.4 ... 1414 m³/h	19.4 ... 1414 m³/h	7 ... 1414 m³/h
Temperature of medium	–20 ... 150 °C	–10 ... 200 °C	–10 ... 200 °C	–10 ... 200 °C
Description	• Automatable 2-way ball valve • Brass design • Blow-out proof shaft • Manual operation possible using hand lever • Connecting thread to DIN 2999 • Mounting flange to ISO 5211	• Automatable 2-way ball valve with compact flange • Stainless steel design • Short installation 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	• Ball valve actuator unit with double-acting or single-acting semi-rotary drive • Stainless steel ball valve in compact design • NAMUR port pattern for solenoid valves/sensor boxes to VDI/VDE 3845 • Flow is fully opened or closed in both directions • Use in zone 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 DIN 2999 • Mounting flange to ISO 5211 • Use in zone 1, 21, 2, 22
online: ➔	**vapb**	**vzbc**	**vzbc**	**vzba**

Ball valves and ball valve units

	 **Ball valve actuator units VZBA**	 **Ball valve actuator units VZPR**	 **Ball valves QH**
Design	2-way ball valve, 3-way ball valve, L-shaped hole, quarter turn actuator, T-shaped hole	2-way ball valve, quarter turn actuator	Ball valve
Actuation type	Pneumatic	Electrical, pneumatic	Manual
Nominal size DN	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, Rp3/4, Rp3/8, Rp4, weld-on ends/weld-on ends	Rp1, Rp1 1/2, Rp1 1/4, Rp1/2, Rp1/4, Rp2, Rp2 1/2, Rp3/4, Rp3/8	
Flow rate Kv	7 ... 1414 m³/h		
Temperature of medium	–10 ... 200 °C	–20 ... 150 °C	
Description	• Ball valve actuator unit with double-acting or single-acting quarter turn actuator • Stainless steel ball valve • NAMUR port pattern for solenoid valves/sensor boxes to 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 • Brass ball valve • NAMUR port pattern for solenoid valves/sensor boxes to VDI/VDE 3845 • Flow is fully opened or closed in both directions	• Shut-off valve, manually operated • In-line installation • Female thread at both ends • With hand lever • Pipe thread to ISO 2281
online: ➔	**vzba**	**vzpr**	**qh**

Angle seat valves

	 **Angle seat valves VZXF** ★	 NEW **Angle seat valves VZXA**
Design	Poppet valve with spring return	Poppet valve with piston drive, poppet valve with diaphragm drive
Valve function	2/2-way, single solenoid, closed	2/2
Actuation type	Pneumatic	Pneumatic
Nominal size DN	15, 20, 25, 32, 40, 50	
Nominal size	12 ... 45 mm	
Process valve connection	G1, G1 1/2, G1 1/4, G1/2, G2, G3/4, NPT1, NPT1 1/2, NPT1 1/4, NPT1/2, NPT2, NPT3/4	
Flow rate Kv	3.3 ... 43 m3/h	6 ... 50.1 m3/h
Medium pressure	–0.9 ... 40 bar	0 ... 30 bar
Temperature of medium	–40 ... 200 °C	–10 ... 180 °C
New		• New for 7/2017: Additional versions
Description	• Sturdy design • Stainless steel and gunmetal process valves with stainless steel, brass or aluminium drives • For operating pressures up to 40 bar • Safety position “closing” • Different actuator sizes and housing materials • Selection of different seat and shaft seals • Flow direction is freely selectable • For liquids, gases and other easily contaminated media • Easy-to-clean design	• Highly flexible, extremely high flow rates • Long service life • 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
online: ➔	**vzxf**	**vzxa**

Process automation

Solenoid-actuated media valves

	 **Solenoid valves VZWD** ★	 **Solenoid valves VZWM** ★	 **Solenoid valves MN1H**
Design	Directly actuated poppet valve	Poppet valve with diaphragm seal	Diaphragm valve
Actuation type	Electric	Electric	Electric
Nominal size	1 ... 6 mm	13 ... 50 mm	13 ... 40 mm
Process valve connection	G1/4, G1/8, NPT1/4, NPT1/8	G1, G1 1/2, G1 1/4, G1/2, G1/4, G2, G3/4, G3/8	G1, G1 1/2, G1/2, G1/4, G3/4, G3/8
Flow rate Kv	0.06 ... 430 l/min	1.6 ... 31000 l/min	2000 ... 30500 l/min
Medium pressure	0 ... 90 bar	0.5 ... 10 bar	0.5 ... 10 bar
Temperature of medium	–10 ... 80 °C	–10 ... 60 °C	–10 ... 60 °C
Description	• Extensive pressure range • Directly actuated poppet valve • 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	• Piloted diaphragm valve • Brass design • Can only be used for gaseous media • Adjustable closing cushioning, in-line mounting or through-hole
online: ➔	**vzwd**	**vzwm**	**mn1h-2**

Solenoid-actuated media valves

	 **Solenoid valves VZWP**	 **Solenoid valves VZWF** ★	 **Reverse jet pulse valves VZWE-E, VZWE-F**
Design	Piloted piston poppet valve	Diaphragm valve, force pilot operated	Angled version, straight version with flange, diaphragm valve
Actuation type	Electric	Electric	Electric
Nominal size	13 ... 25 mm	13.5 ... 50 mm	20 ... 76 mm
Process valve connection	G1, G1/2, G1/4, G3/4, G3/8, NPT1, NPT1/2, NPT1/4, NPT3/4, NPT3/8	G1, G1 1/2, G1 1/4, G1/2, G1/4, G2, G3/4, G3/8, NPT1, NPT1 1/2, NPT1 1/4, NPT1/2, NPT1/4, NPT2, NPT3/4, NPT3/8	Flange diameter 60, 75, 89, G1, G1 1/2, G2, G2 1/2, G3/4
Flow rate Kv	1.5 ... 12250 l/min	1.8 ... 29900 l/min	15 ... 210 m3/h
Medium pressure	0.5 ... 40 bar	0 ... 10 bar	0.35 ... 8 bar
Temperature of medium	–10 ... 80 °C	–10 ... 80 °C	
Description	• 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	• High flow rates • Large nominal diameters with relatively small solenoids • No pressure difference required • Can also be used in vacuum technology	• High flow rates • For mechanically cleaning filters and dust filter systems • Fast opening and closing times • Sturdy pilot system
online: ➔	**vzwp**	**vzwf**	**vzwe**

Pneumatically actuated media valves

	 NEW **Pinch valves VZQA**	 **Pneumatic valves VLX**
Design	Pneumatically actuated pinch valve	Diaphragm valve
Actuation type	Pneumatic	Pneumatic
Nominal size DN	6, 15, 25	
Nominal size		13 ... 25 mm
Process valve connection	G1, G1/2, G1/4, NPT1, NPT1/2, NPT1/4, clamp to ASME-BPE type A, clamp to ASME-BPE type B, clamp to DIN 32676 series A	G1, G1/2, G1/4, G3/4, G3/8
Flow rate Kv	0.7 ... 18 m3/h	2400 ... 14000 l/min
Medium pressure	0 ... 6 bar	1 ... 10 bar
Temperature of medium	–5 ... 150 °C	–10 ... 80 °C
New	• New for 4/2017: Additional versions Nominal diameter DN25	
Description	• Modular design • Quick and easy replacement of the diaphragm • Selection of different materials for housing and connector caps • Different connection cap designs (G and NPT thread, clamp ferrule to DIN 32676 and ASME-BPE) • For critical, abrasive and viscous media • Up to 2 million switching cycles • FDA-compliant materials • Easy-to-clean design • Flow direction is freely selectable	• Poppet valve • Indirectly actuated • Brass design • In-line mounting
online: ➔	**vzqa**	**vlx**

Control cabinets

	 Factory automation	 Process automation	 Control cabinets for control systems
Technical data	• Simple to complex control cabinet designs • Application-specific combination of components • Fully tested, with test certificate • Ready-to-install • Complete documentation • Design conforms to: – EN 60204-1 – ATEX zone 1 and 21 (pneumatic only), ATEX zone 2 and 22 (electric and electropneumatic) – UL-508 A • Implementation of safety functions • Different bus technologies	• Simple to complex control cabinet designs • Application-specific combination of components • Different operating voltages • Fully tested, with test certificate • Ready-to-install • Complete documentation • Design conforms to: – EN 60204-1 – ATEX zone 1 and 21 (pneumatic only), ATEX zone 2 and 22 (electric and electropneumatic) – UL-508 A • Implementation of safety functions • Wide range of bus technologies • Compliance with special cleanliness and hygiene requirements • Special materials • Protected against the ingress of liquids and foreign matter • Heating or cooling elements • Intrinsically safe valve terminal technology • Hot swap inspection window	• Simple to complex control cabinet designs • 1 ... 31 axes • Application-specific combination of components • Use of the latest innovations and technologies • Fully tested, with test certificate • Ready-to-install • Complete documentation • Design conforms to: – EN 60204-1 – ATEX zone 1 and 21 (pneumatic only), ATEX zone 2 and 22 (electric and electropneumatic) – UL-508 A • Implementation of safety functions • Wide range of bus technologies
Description	• Control cabinets made to measure • Pneumatic, electric, combined • Individually configured • Adapted to requirements in industrial automation • Design and sizing included	• Control cabinets made to measure • Pneumatic, electric, combined • Individually configured • Adapted to requirements in process automation • Design and sizing included	• Made-to-measure control cabinets for handling systems • Software package for third-party devices included • Individually configurable • Adapted to requirements for handling solutions ➔ Seite 100
online: ➔	**ready-to-install**	**ready-to-install**	**ready-to-install**

Mounting plates and assemblies

	 Mounting plates	 Assemblies
Technical data	• Customised support plate shape • Support plate available in different materials • Application-specific combination of components • Fully assembled, connected and wired • Defined interfaces • Ready-to-install • Fully tested, with test certificate • Complete documentation • Design conforms to: – EN 60204-1 – ATEX zone 1 and 21 (pneumatic only), ATEX zone 2 and 22 (electric and electropneumatic) – UL-508 A • Implementation of safety functions	• Combination of various pneumatic and/or electrical components to create a single unit • Application-specific combination of components • Accessories mounted on sub-assembly • Use of the latest innovations and technologies • Ready-to-install • Fully tested, with test certificate • Complete documentation • Design conforms to: – EN 60204-1 – ATEX zone 1 and 21 (pneumatic only), ATEX zone 2 and 22 (electric and electropneumatic) – UL-508 A • Implementation of safety functions
Description	• Machine-specific pre-assembly of pneumatic and electric components on support plate • Tubing and wiring included • Defined interfaces for simple installation directly in the system	• Pneumatic and electric components pre-assembled to create a function unit • Can be combined from around 30000 catalogue components • Connections included • For integration in machines
online: ➔	**ready-to-install**	**ready-to-install**

Integration solutions

	 **Manifold duct plates**	 **Cartridge solutions**	 **Sheet-metal constructions and special housings**	 **Function blocks**
Technical data	• Freely selectable manifold duct plate shape • Combination of over 30000 catalogue components • High density of components • No tubing • Variable positioning of mechanical, pneumatic and electrical interfaces • Integration of customised components • Available with protective cover • Fully tested • Ready-to-install • Complete documentation • Implementation of safety functions	• Space-saving thanks to extremely compact design • Pneumatic functions integrated in a single compact housing • Housing in different materials • No tubing required • Minimal cabling required • Significant design freedom • Variable integration options on and within the machine • Sturdy design • Fully tested • Ready-to-install • Complete documentation	• Sheet-metal structures – Customised shape and size – Reduced weight and number of assembly parts • Special housing – Customised shape – Customised dimensions – Different materials – Compact, space-optimised format – Protection against environmental influences and unauthorised access • In combination – Alternative to conventional control cabinets – Variable integration options on and within the machine – Short tubing and cable lengths – Attractive design	• No tubing required thanks to drilled ducts • Housing available in different materials • Customised design of the pneumatic interfaces for the system • Ideal for a small number of components and variable connection options • Extremely economical, even for small quantities
Description	• Ideal for a large number of pneumatic connections in an extremely compact space • No tubing • Compact • Easy to service • Immune to malfunction	• Integration of various pneumatic functions in one component • No need for single housings • Ideal for applications that require a highly compact design	• Reduced weight thanks to optimal use of materials with sheet-metal constructions • Protection against environmental influences and unauthorised access • Ideally combined as a control cabinet directly in the system	• Compressed air supply for pneumatic components via drilled ducts • Ideal for a small number of pneumatic components and variable connection options • Compact and easy to service
online: ➔	**ready-to-install**	**ready-to-install**	**ready-to-install**	**ready-to-install**

Function-specific systems

	 **Servo press kits YJKP**
Working stroke	100 ... 400 mm
Press force	0 ... 17 kN
Feed speed	0 ... 250 mm/s
Accuracy in ± % FS	0.25% FS
Protocol	Modbus® TCP, EtherNet/IP, TCP/IP
Description	• Modular system kit comprising operating software GSAY, electric cylinder with spindle drive ESBF, motor EMMS-AS, motor controller CMMP-AS, force sensor and controller CECC-X together with the required accessories • Less expensive than conventional press-fitting systems • Pre-installed operating software GSAY offers precisely the required application-specific functions • Commissioning made easy: parameterisation instead of programming • For top quality: real-time monitoring of the press-fitting operation and clear visualisation of the force/displacement curves • Fit for Industry 4.0 thanks to the OPC UA interface at the controller
online: ➔	**yjkp**

After Sales and Technical Support Services

	 **Commissioning**	 **Maintenance**
Services	• Mechanical, pneumatic and electrical integration and configuration of Festo automation solutions • Configuration and parameterisation • Optimisation with test run • Data backup and documentation • Technical guidance and briefing of staff responsible for the machine	Implementation of the following preventive maintenance measures to DIN 31051: • Inspections – Checking for damage and wear characteristics – Checking mechanical, pneumatic and electrical connections and connectors – Checking lubrication – Checking compressed air preparation – Carrying out component-specific inspections • Maintenance – Lubrication/relubrication of guides – Tightening connectors – Replacement of air filters – Replacement of silencers – Carrying out component-specific preventive maintenance tasks • Repair – Troubleshooting – Solution finding – Error elimination – Elimination of leakages – Replacement or repair of components
Description	• Support with professional commissioning of Festo automation solutions • Competent briefing of staff responsible for the machine	• Preventive and corrective maintenance • Directly on your system • For high machine availability and rapid assistance should the worst happen
online: →	**www.festo.com/services**	**www.festo.com/services**

After Sales and Technical Support Services

	 **Repair service**	 **Technical support**
Services	• Inspection • Analysis of economic efficiency • Repair or replacement of faulty components or wearing parts • Leakage testing • Functional test	• Technical advice: answering technical questions or solving technical problems – Online support – Hotline support • Technical customer service: Technical support on site – Remote support – On-site support
Description	• Extended service life • Reduced costs	• Your technical questions answered • Technical support on site
online: →	**www.festo.com/services**	**www.festo.com/services**

Energy Saving Services

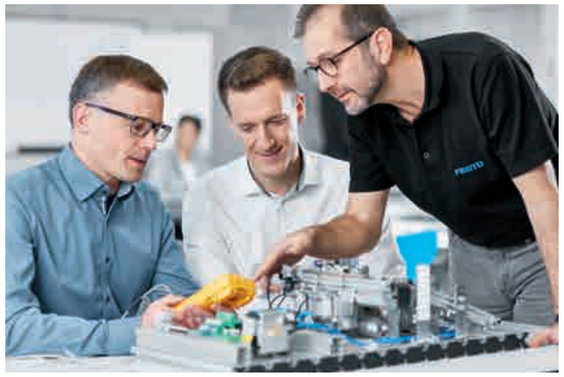
	 **PreAudit**	 **Energy analysis of compressed air generation**	 **Compressed air quality analysis**	 **Pressure drop measurement**
Services	• Energy analysis – assessment • Compressed air quality analysis • Pressure drop measurement • Compressed air consumption analysis • Leakage detection – quick check • Machine analysis for energy efficiency – quick check • Comprehensive report on the analysis with weighted recommendations on what to do next	• Measurement of compressor operating times as well as load/idling times • Power consumption measurement • Flow measurement/consumption measurement • Pressure measurement (level and band width) • Estimate of leakage volume • Comparison of energy consumption and compressed air volume supplied	• Inspection of decentralised air preparation at point of usage • Measurement of residual oil content up to class 2 (ISO 8573-1:2010) • Measurement of pressure dew point up to class 2 (ISO 8573-1:2010) • Analysis of measurement results and recommendation of improvement measures (if applicable) • Documentation of all measurement results • 3 hours on-site service (max. 3 measurements; additional time on request)	• Measurement of the pressure in the compressor room (input), in production (draw off) and storage of the results • Recording of the pressure drop using multiple pressure sensors with data loggers • Evaluation and comparison of the pressure profiles • Controlled pressure reduction following evaluation • Demonstration of pressure fluctuations in production
Description	• Implementation of the Festo Energy Saving Services to DIN ISO 11011 • Analysis of your compressed air system by experts on site • Important advice and recommendations on the topic of energy efficiency – immediate identification of worthwhile measures	• Energy Saving Service to DIN ISO 11011 • Determine a clear consumption profile • Information about the output reserves of the compressed air system • Measurement during operation	• Energy Saving Service to DIN ISO 11011 • Ensure optimum compressed air quality • Increase service life of components • Minimise unexpected production downtimes • Class 1 on request	• Energy Saving Service to DIN ISO 11011 • Record the pressure drop in the system • Up to 8% energy saving in generated compressed air through pressure reduction
online: →	**www.festo.com/services**	**www.festo.com/services**	**www.festo.com/services**	**www.festo.com/services**

Energy Saving Services

	 **Compressed air consumption analysis**	 **Leakage detection and elimination**	 **Machine analysis for energy efficiency**
Services	• Install and remove the measuring equipment using standard components (fittings, tubing, etc.) • Measure the flow rate, consumption and pressure with machine running and when idle • Determine and analyse the different characteristics – Consumption per machine cycle – Average consumption per minute – Average pressure – Max./min. pressure – Max./min. rate of air flow • Documentation of measurement results including graphical representation of measurement results, optionally available as PDF file or colour printout • 3 hours on-site service (additional time on request)	• Detection of compressed air leakages using highly sensitive ultrasound detectors during operation • Checking of the complete compressed air system from the compressor to the pneumatic application • Classification of the leakages according to size and cost • Documentation of faulty components as well as of the type and cause of the fault • Leakage report containing: – Recommended measures – Spare parts required – Estimation of repair time – Prioritisation of measures – Assessment as to whether repair can be carried out while machine is in operation • Information on optimisation options • Documentation of measures carried out • Online access to all results and repair data via the Energy Saving Assessment Portal	• Identification and analysis of the pneumatic applications of relevance to energy consumption • Measurement of flow rate, consumption and pressure of the relevant compressed air applications • Establishing and recommending optimisation measures • Estimation of the costs and savings, including the predicted amortisation time • Installation and removal of the measuring equipment with standard components (fittings, tubing, etc.) • Measure the flow rate, consumption and pressure with machine running and when idle • Documentation of the measurement results including graphical representation
Description	• Energy Saving Service to DIN ISO 11011 • Determination of exact compressed air consumption • Optimal configuration of compressed air supply • No pressure drop due to undersupply • No unnecessary energy costs due to oversupply	• Energy Saving Service to DIN ISO 11011 • Detection and repair of leakages in production plants • Immediate energy and operating cost savings	• Energy Saving Service to DIN ISO 11011 • Reviewing of systems with respect to possible energy optimisation potential • Documentation of the analysed compressed air applications
online: ➔	**www.festo.com/services**	**www.festo.com/services**	**www.festo.com/services**

Festo is a global leading supplier of automation technology and, together with Festo Didactic, the international market leader for technical training solutions. As an integral part of the Festo Group, Festo Training and Consulting is rooted in the world of automation, and industry is just part of its DNA. We work closely with Festo Automation and operate in the same segments as our customers. This provides us with in-depth insights into our customers' challenges and enables us to offer tailored and practical training courses for industry. Our main focus is on the core business of automation technology.

Overview of topics



- Pneumatics
- Hydraulics
- PLCs (programmable logic controllers)
- Electrical engineering/electronics
- Process automation
- Handling systems
- Water management
- Maintenance
- Supply chain management
- Lean production
- Process optimisation
- Service and sales competence
- Industry 4.0

Training offered

- Public seminars
- Company-specific training courses
- Consulting
- Coaching
- Competency programmes
- Business games
- Learning needs analysis, certification, blended learning concepts

Our competency – From practical experts for practical users

- Industry-focused
- Global
- Customer-oriented
- Over 50 years in operation
- Certified to DIN ISO 29990:2010 as a learning service provider

- Practical learning with state-of-the-art equipment and systems
- Trainers with many years of practical experience
- In-depth knowledge of training methods and principles

- 2,900 courses annually
- 39 languages
- 42,000 participants worldwide

Would you like more detailed information about Festo Didactic's programme or courses in your area?
Simply ask your local contact person or find out more at
➔ **www.festo-tac.com**

What must be taken into account 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.

When using pneumatic components, ensure that they are operated using correctly prepared compressed air without aggressive media and that they comply with environmental specifications (e. g. climate).

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

Unauthorised conversions or modifications to products and systems from Festo constitute a safety risk and are thus not permitted. Festo does not accept any liability for the resulting damages.

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.
- You are unsure about the product's suitability for the planned application.
- You are unsure about the product's suitability for use in safety-oriented applications.

All technical data is correct at the time of going to print.

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