

FESTO

Product overview
Cleanroom



Components for cleanroom technology



Product overview
Cleanroom

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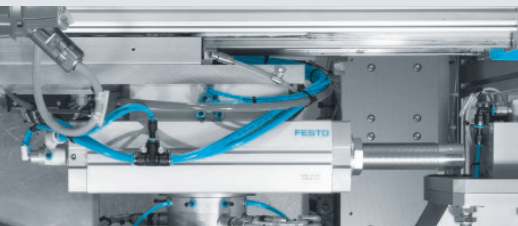
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Introduction

General

In the production environment of the 21st century cleanrooms are playing an ever greater role. In the past, cleanrooms were primarily used as a production environment in the semiconductor industry, but now they are increasingly used in other industries too, such as automotive, pharmaceuticals and the food industry. The objective in all applications is to improve the quality of the manufactured products by ensuring the ambient conditions are controlled and clean.

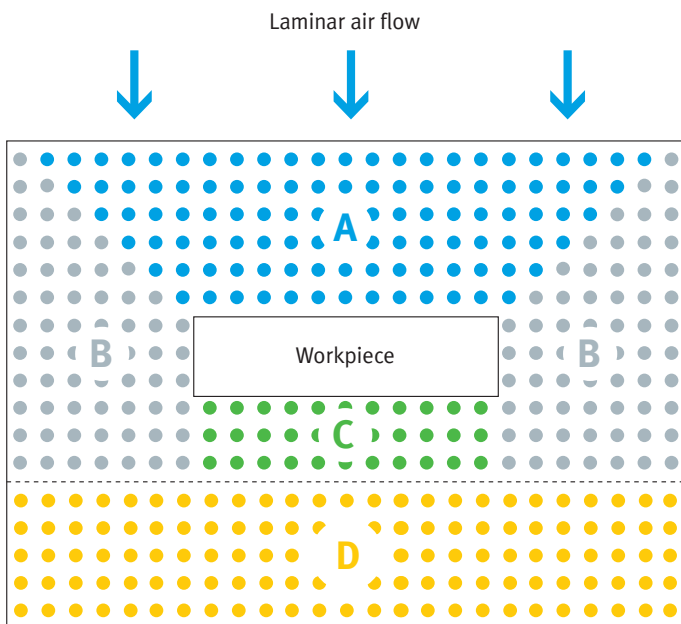
Needs-based, multi-stage solution concept

Cleanroom suitability depends primarily on the installation location and the operating parameters of the product, which means that expert advice about the use of our products is very important. If you have any questions about using our products in your application, please contact us.

If you cannot find any suitable components in our standard product portfolio, we can adapt the products to your requirements.

People are considered to be the biggest emitters of particles. However, with the right equipment they can be effectively separated from the process. This is why particular attention needs to be paid to the machine, its design as well as the components used and their application. These factors play a crucial role in achieving the cleanliness objectives in the production environment. We want to help you to achieve your objectives. In this brochure, we will therefore provide you with an overview of our products for cleanroom applications and give you some information on using them in clean and pure environments.

Whether for cleanroom-specific packaging that reduces time and effort in logistics, modifications that are designed to optimise our products for critical applications, or for complex system solutions that suit your particular budget, you will benefit from our experience in cleanroom technology that we have built up over more than 30 years. We will be happy to share this experience with you.



Using components in the laminar air flow in the cleanroom

- A) Critical area from which particles can come into contact with the workpiece.
- B) Non-critical area from which particles cannot easily come into contact with the workpiece.
- C) Area in which obstructions to the laminar air flow should be minimised to prevent particles being transferred to the workpiece.
- D) Particles from this area are removed by the laminar air flow and cannot come into contact with the workpiece.

Which products are suitable for use in cleanrooms?

Whether a product is suitable for cleanrooms depends on its particle emissions. The ISO 14644 standard clearly describes the characteristics required of a product for it to be used in cleanrooms. And we determine the suitability of our products in accordance with ISO 14644. To do this, we try to select a representative, general operating scenario to assess how suitable products are for the cleanroom. All statements in this product overview refer to the emissions of airborne particles by Festo components, and therefore to the suitability of the components for cleanrooms. We have tested a specific selection of our series products to determine if they are fit to be used in cleanrooms. This cross-section of our product portfolio has been specially selected to enable you to solve the majority of automation solutions. In addition, the components should be available at short notice at any time, anywhere in the world.

Notes:

- Classification in accordance with ISO 14644 is not useful for some products, because they do not emit particles when used correctly (e.g. tubing). However, we list them here because this assessment is the result of our experience and testing.
- The values specified are based on products that were cleaned before they were installed in the cleanroom. Please take this into account when using standard components.
- The values specified for the cleanroom class must be considered as reference values that are based on our selection of typical operating scenarios. This means that the values are not guaranteed.

Pneumatic cylinders → Page 7		
Designation	Type	Recommended cleanroom class
Round cylinder	DSNU	ISO 6
	CRDSNU	ISO 6
Standards-based cylinder	DSBC	ISO 6
	DSBF	ISO 6
Compact cylinder	ADN	ISO 6
	ADN-S	ISO 6
	DPDM	ISO 6
Twin-piston cylinder	DGTZ	ISO 6
Guided drive	DFM-B	ISO 7
	DFM	ISO 7

Valves → Page 15		
Designation	Type	Recommended cleanroom class
Solenoid valve	VUVG	ISO 5
	VUVG-S	ISO 5
	VUVS	ISO 6
	MH1	ISO 5
	MHE, MHP, MHA	ISO 6
Check valve	HGL	ISO 4
Quick exhaust valve	VBQF	ISO 4 ¹⁾
Shut-off valve	HE	ISO 4
Pressure regulator	VRPA	ISO 4
One-way flow control valve	VFOE	ISO 4
	GRLA, GRLZ	ISO 4
Proportional pressure regulators	VPPE	ISO 5
	VEAB	ISO 4
	VEAA	ISO 4
	VPPI	ISO 4

Valve terminals → Page 25		
Designation	Type	Recommended cleanroom class
Valve manifold assembly	VTUS	ISO 6
Valve terminal	VTUG	ISO 5
	MPA-L	ISO 5
	MPA-S	ISO 5
	VTOC	ISO 5
	MH1	ISO 5
Motion Terminal	VTEM	ISO 5

Sensors → Page 33		
Designation	Type	Recommended cleanroom class
Proximity switch	SDBT-MSX	— ²⁾
	SMT-8M-A	— ²⁾
	SMT-10M	— ²⁾
Position transmitter	SDAT-MHS	— ²⁾
	SMAT-8M	— ²⁾
Pressure sensor	SDE5	ISO 4
	SPAE	ISO 4
	SPAN	ISO 4 ³⁾
	SPAN-B	ISO 4 ³⁾
Pressure transmitter	SPTe	ISO 4 ³⁾
Flow transmitter	SFTE	ISO 4
Flow sensor	SFAH	ISO 4 ³⁾

Compressed air preparation → Page 39		
Designation	Type	Recommended cleanroom class
Maintenance units and maintenance equipment	MS4	ISO 7
	MS6	ISO 7
Precision pressure regulator	MS6-LRP	ISO 5

Pneumatic connection technology → Page 51		
Designation	Type	Recommended cleanroom class
Plastic tubing	PUN-H	— ²⁾
	PUN-H-SF	— ²⁾
	PUN-H-F	— ²⁾
	PTFEN	— ²⁾
	PEN	— ²⁾
	PLN	— ²⁾
	PFAN	— ²⁾
	Push-in fitting	QS/QSM
NPQH		ISO 4
NPQE		ISO 4
NPQR		ISO 4
Quick connector	NPCK	— ²⁾
	CK	— ²⁾

1) Variants with better suitability are available on request

2) Element installed statically, no meaningful evaluation possible according to ISO 14644-1

3) Variants with better suitability are available

Introduction

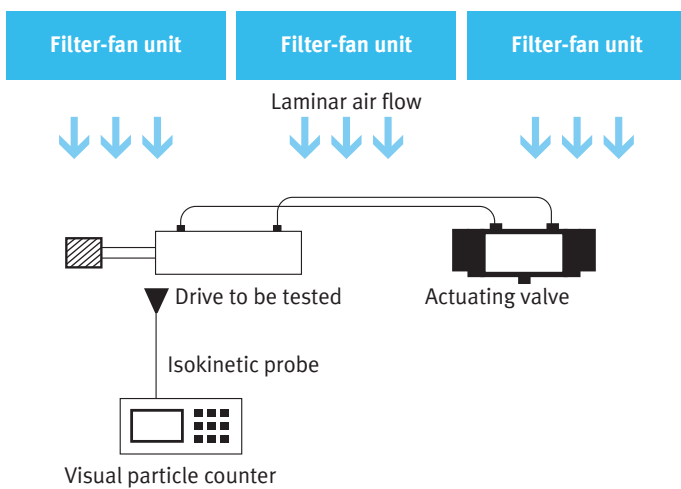
How does Festo test its products?

Products are classified based on their particle emissions in accordance with the ISO 14644 standard. The relevant classification is defined in ISO 14664-1. All Festo products suitable for cleanroom applications conform to the ISO standard. The measurement procedure is focused on those locations where the particle concentration is highest (HPC: high-st particle concentration).

The advantage of this procedure compared to others is that it provides clear conclusions about the particle emission characteristics of our automation components. This particular procedure, during which a measuring probe is used in the laminar and isokinetic air flow, represents the situation in an actual cleanroom environment almost perfectly. The measurement depends entirely on the size of the measured environment, not on the size of the measured object. With this method,

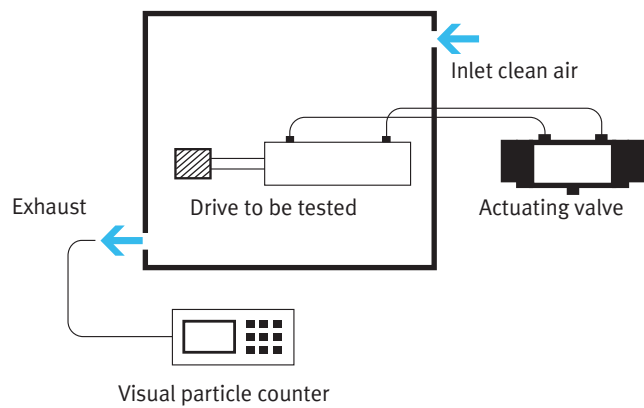
it is also possible to identify locations that are important for particle emission and to draw the relevant conclusions. First, the HPC locations on the product are identified; these are then measured for at least 100 minutes and evaluated. The subsequent statistical analysis of the measurement results is very reliable. Finally, the classification is determined based on the statistical values.

A significant issue with all product measurements is the parameters under which the measurement is conducted. In addition to the environment, it is the so-called representative operating scenario that plays a crucial role. This refers to the parameters that a manufacturer considers representative when the product is being used. The individual operating scenarios make it very difficult to compare products and their allocated classifications from different manufacturers.



Direct measurement

Festo uses direct measurement with HPC. This method is more accurate and more meaningful.



Process with average values

Classification

Festo bases the measurement of external particle emissions on ISO 14644. This is because we believe it is important to have traceable and repeatable measurements. It is the only way in which we can give you advice for your specific requirements. The associated classification with the particle limits is shown below for reference.

In the past, the US Federal Standard FED 209E also played an important part. However, it has been officially withdrawn. The table for FED 209E is shown below as a reference for customers who still make their comparisons based on this standard. This allows you to transfer the values.

ISO 14644-1 standard compared to US Federal Standard FED 209E

ISO classification number (N)	Maximum particle concentration allowed (particles per cubic metre of air ¹⁾)						US Federal Standard 209E
	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1 µm	5 µm	
ISO Class 1	10 ²⁾	⁴⁾	⁴⁾	⁴⁾	⁴⁾	⁵⁾	–
ISO Class 2	100	24 ²⁾	10 ²⁾	⁴⁾	⁴⁾	⁵⁾	–
ISO Class 3	1000	237	102	35 ²⁾	⁴⁾	⁵⁾	1
ISO Class 4	10000	2370	1020	352	83 ²⁾	⁵⁾	10
ISO Class 5	100000	23700	10200	3520	832	^{4), 5), 6)}	100
ISO Class 6	1000000	237000	102000	35200	8320	293	1000
ISO Class 7	³⁾	³⁾	³⁾	352000	83200	2930	10000
ISO Class 8	³⁾	³⁾	³⁾	3520000	832000	29300	100000
ISO Class 9 ⁷⁾	³⁾	³⁾	³⁾	35200000	8320000	293000	–

1) All particle concentrations listed in the table are cumulative frequency related, e.g. the 10200 particles at 0.3 µm for ISO Class 5 include all particles equal to or larger than this particle size.

2) These particle concentrations result in large air sample volumes for classification. The sequential sampling procedure may be used.

3) Information on concentration limits in this area of the table is unsuitable due to a very high particle concentration.

4) Sampling and statistical limitations for particles at low concentrations are not suitable for classification.

5) Limitations of collected sampling for both low concentration particles and particles larger than 1 µm: these are not suitable for classification due to possible particle losses during the sampling procedure.

6) To determine this particle size in conjunction with ISO Class 5, the M descriptor for macroparticles may be adapted and applied together with at least one other particle size.

7) This class is only applicable for the operating state "Production".

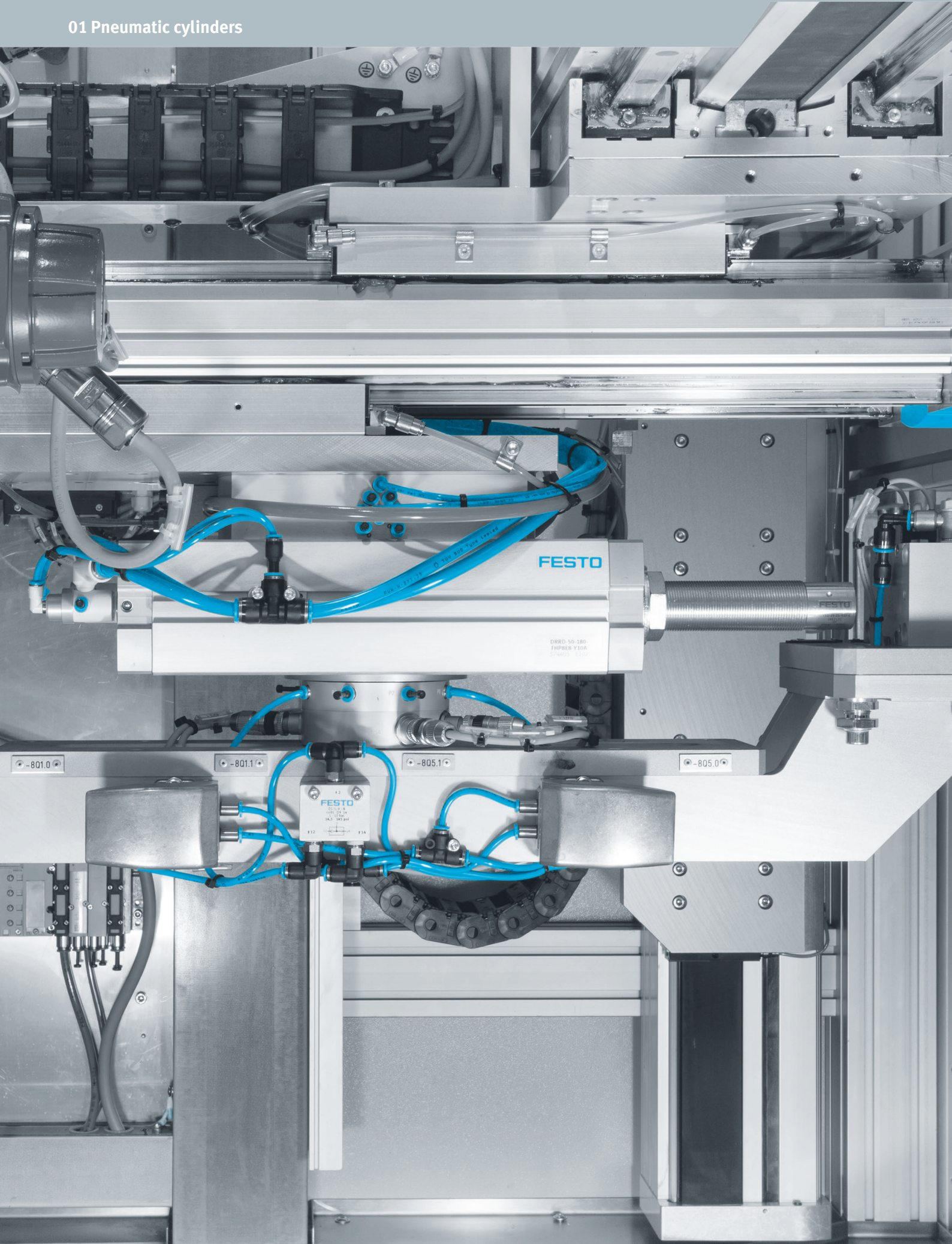
Note:

We do not include the values in accordance with FED 209E in this product overview, because this standard is not a major consideration for Festo.

Introduction

Introduction

01 Pneumatic cylinders



Product overview

Software-Tools

Pneumatic Sizing



Size pneumatic control loop systems quickly and energy-efficiently. In order to survive in a tough competitive environment, many companies are looking for ways to make savings in their production.

Such savings can often be made in their existing compressed air systems, which have generally been in use for years. By optimising the compressed air supply at both plant and system level, up to 60% of energy costs can be saved.

This tool can be found at
[→ www.festo.com/x/pneumatic-sizing](http://www.festo.com/x/pneumatic-sizing)

Air consumption of cylinders

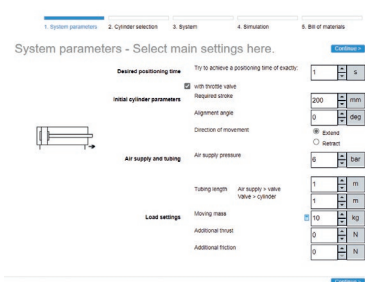


Calculate your system's air consumption.

Calculate your system's air consumption quickly and conveniently. Simply enter all the drives and tubing, set the cycle times and working pressure and the air consumption per minute and per day will be calculated for you. The input table including the result can be exported directly to Excel.

This tool can be found at
[→ www.festo.com/x/air-consumption](http://www.festo.com/x/air-consumption)

Pneumatic simulation



Perfect simulations replace expensive real-life tests.

The tool is an expert system that supports you in the selection and configuration of the entire pneumatic control chain. If one parameter is changed, the program automatically adapts all the others.

This tool can be found at
[→ www.festo.com/x/pneumatic-simulation](http://www.festo.com/x/pneumatic-simulation)

Festo Design Tool 3D



The Festo Design Tool 3D is a 3D product configurator for generating specific CAD product combinations from Festo. The configurator makes your search for the right accessory easier, more reliable and faster.

You can then order the module that has been created as a single order item, either completely pre-assembled or as individual parts in a single box. This considerably reduces your bill of materials, and downstream processes such as product ordering, order picking and assembly are significantly simplified.

This tool can be found at
[→ www.festo.com/x/festo-design-tool](http://www.festo.com/x/festo-design-tool)

CO₂ & TCO Guide




CO₂ values and TCO for your application.

Take a quantum leap in automation technology. By using suitable components from Festo in an intelligent way, you can reduce the energy consumption of your systems and thus specifically lower your production's carbon emissions.

This tool can be found at
[→ www.festo.com/x/co2-tco](http://www.festo.com/x/co2-tco)

Piston rod cylinders >



Round cylinder

	 Standards-based cylinder DSNU	 Round cylinder DSNU	 Standards-based cylinder CRDSNU, CRDSNU-B
Operating mode	Double-acting	Double-acting	Double-acting
Piston diameter	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm, 50 mm, 63 mm	12 mm, 16 mm, 20 mm, 25 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	23 ... 295 N	482.5 ... 1870.3 N	68 ... 295 N
Stroke	1 ... 500 mm	1 ... 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, 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
Cleanroom class	Class 6 to ISO 14644-1	Class 6 to ISO 14644-1	Class 6 to ISO 14644-1
Suitable for the produc- tion of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	
LABS (PWIS) conformity	VDMA24364-B1/B2-L, VDMA24364- Zone III	VDMA24364-B1/B2-L, VDMA24364- Zone III	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • ISO 6432 • Wide range of variants for custom- ised applications • Good running performance and long service life • Self-adjusting pneumatic end-posi- tion cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with female or male thread • For position sensing • Variants recommended for produc- tion systems for manufacturing Li-ion batteries 	<ul style="list-style-type: none"> • Wide range of variants for custom- ised applications • Good running performance and long service life • Self-adjusting pneumatic end-posi- tion cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with female or male thread • For position sensing • Variants recommended for produc- tion systems for manufacturing Li-ion batteries 	<ul style="list-style-type: none"> • ISO 6432 • Corrosion resistant against aggres- sive ambient conditions • Easy-to-clean design • Long service life thanks to optional unlubricated seal • Wide range of variants for custom- ised applications • Self-adjusting pneumatic end-posi- tion cushioning saves time during commissioning and adapts optimally to load and speed changes • For position sensing
online: →	dsnu	dsnu	crdsnu

Product overview




Piston rod cylinders >

Profile and tie rod cylinders

	 Standards-based cylinder DSBC	 Standards-based cylinders, clean design DSBF
Operating mode	Double-acting	Double-acting
Piston diameter	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	483 ... 7363 N	415 ... 7363 N
Stroke	1 ... 2800 mm	1 ... 2800 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
Cleanroom class	Class 6 to ISO 14644-1	Class 6 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	
LABS (PWIS) conformity	VDMA24364-B1/B2-L, VDMA24364-C1-L, VDMA24364-Zone III	VDMA24364-B2-L, VDMA24364-Zone III
Description	<ul style="list-style-type: none"> • ISO 15552 (ISO 6431, VDMA 24562) • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Standard profile with two sensor slots • Wide range of variants for customised applications • Comprehensive range of mounting accessories for just about every type of installation • For position sensing • Variants recommended for production systems for manufacturing Li-ion batteries 	<ul style="list-style-type: none"> • ISO 15552 • Increased corrosion protection • Easy-to-clean design • FDA-approved lubrication and sealing on the basic design • Long service life thanks to optional dry-running seal • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • For position sensing
online: →	dsbc	dsbf

Piston rod cylinders >




Compact, short-stroke and flat cylinders

	 Compact cylinder ADN ★	 Compact cylinder ADN-S ★	 Compact cylinders, multimount DPDM
Operating mode	Double-acting	Double-acting	Double-acting
Piston diameter	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm	6 mm, 10 mm, 16 mm, 20 mm, 25 mm, 32 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	51 ... 7363 N	17 ... 1870 N	9 ... 483 N
Stroke	1 ... 500 mm	5 ... 50 mm	5 ... 50 mm
Cushioning	Elastic cushioning rings/pads at both ends, self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends, no cushioning,	Elastic cushioning rings/pads at both ends
Cleanroom class	Class 6 to ISO 14644-1	Class 6 to ISO 14644-1	Class 6 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B1/B2-L, VDMA24364-Zone III	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • 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 • Variants recommended for production systems for manufacturing Li-ion batteries 	<ul style="list-style-type: none"> • Minimal installation space • Very lightweight • Ideal for small movements • Piston rod with female or male thread • For position sensing • Variants recommended for production systems for manufacturing Li-ion batteries • Sustainable in production thanks to reduced use of materials 	<ul style="list-style-type: none"> • Mounting via through-hole and female thread • Compact design • Piston rod variants • For position sensing • Sustainable in production thanks to reduced use of materials
online: →	adn	adn-s	dpdm

Product overview

Guided drives >

Drives with guide rods

	 Twin-piston cylinder DGTZ	 Guided drive DFM, DFM-B	 Guided drive, NPT DFM
Piston diameter	6 mm, 10 mm, 16 mm, 20 mm, 25 mm, 32 mm	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm	20 mm, 25 mm, 32 mm, 40 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	18.6 ... 966 N	17 ... 754 N	188 ... 754 N
Stroke	10 ... 200 mm	5 ... 400 mm	20 ... 400 mm
Cushioning	Elastic cushioning rings/pads at both ends	Elastic cushioning rings/pads at both ends, pneumatic cushioning, adjustable at both ends, shock absorber, soft characteristic curve	Elastic cushioning rings/pads at both ends, pneumatic cushioning, adjustable at both ends, shock absorber, soft characteristic curve
Position sensing	Via proximity switch	Via proximity sensor	Via proximity switch
Cleanroom class	Class 6 to ISO 14644-1	Class 7 to ISO 14644-1	Class 7 to ISO 14644-1
Suitable for the production of Li-ion batteries		Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	
LABS (PWIS) conformity	VDMA24364 zone III	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Minimal space requirement • Minimal mounting time • High resistance to torques and lateral forces • High rigidity thanks to its guide rods with large diameter and two plain-bearing bushes • Wide range of mounting options • Drive and guide in a single housing • Plain-bearing guide 	<ul style="list-style-type: none"> • Drive and guide in a single housing • High resistance to torques and lateral forces • Plain or recirculating ball bearing guide • Wide range of mounting and attachment options • Wide range of variants for customised applications • Variants recommended for production systems for manufacturing Li-ion batteries 	<ul style="list-style-type: none"> • High resistance to torques and lateral forces • Plain or recirculating ball bearing guide • Wide range of mounting and attachment options • Wide range of variants for customised applications • Drive and guide in a single housing
online: →	dgtz	dfm	dfm

Customised components – for your specific requirements



Actuators with customised features

Can't find the pneumatic actuator you need in our catalogue?

We can offer you customised components that are tailored to your specific requirements.

Common product modifications:

- Materials for special ambient conditions
- Customised dimensions
- Special strokes
- Customised mounting options
- Implementation of special cylinder functions (cylinder/valve combinations, single-acting principle, etc.)

Many additional variants are possible.

Ask your Festo sales engineer, who will be happy to help:

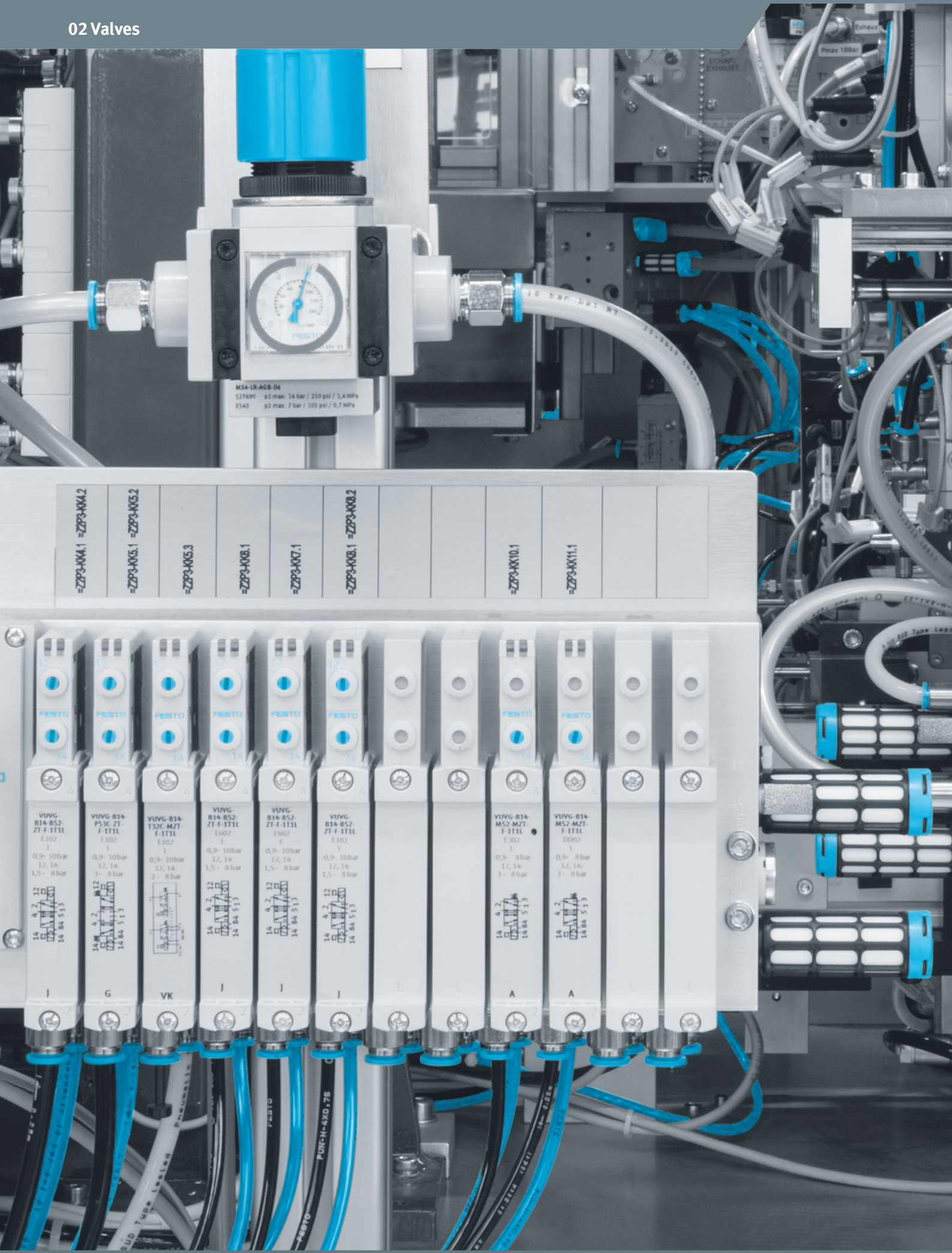
→ www.festo.com/contact

Product overview

01

Pneumatic cylinders

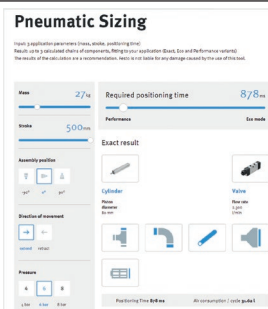
02 Valves



Product overview

Software-Tools

Pneumatic sizing



Size pneumatic control loop systems quickly and energy-efficiently.

In order to survive in a tough competitive environment, many companies are looking for ways to make savings in their production.




Such savings can often be made in their existing compressed air systems, which have generally been in use for years. By optimising the compressed air supply at both plant and system level, up to 60% of energy costs can be saved.

This tool can be found at

→ www.festo.com/x/pneumatic-sizing

Electrically and pneumatically actuated directional control valves >

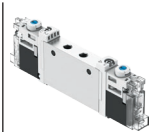
Universal directional control valves

	 Solenoid valve, for individual connection VUVG	 Solenoid valves, plug-in VUVG-T1	 Solenoid valves, plug-in VUVG-B-F1A
Actuation type	Electrical	Electrical	Electrical
Pneumatic connection 1	G1/4, G1/8, M3, M5, M7		
Pneumatic working port	Flange, G1/4, G1/8, M3, M5, M7, QS-1/4, QS-1/8, QS-10, QS-3, QS-3/16, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8	Flange, G1/4, G1/8, M5, M7	Flange
Operating pressure [MPa]	-0.09 ... 1 MPa	-0.09 ... 1 MPa	-0.09 ... 1 MPa
Operating pressure	-0.9 ... 10 bar	-0.9 ... 10 bar	-0.9 ... 10 bar
Standard nominal flow rate	80 ... 1380 l/min	130 ... 1200 l/min	130 ... 510 l/min
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, 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
Electrical connection	2-pin, 3-pin, plug pattern H, horizontal connection, M8x1 A-coded to EN 61076-2-104, plug, via E-box, via electric pilot valve	Via E-box	Via E-box
Cleanroom class	Class 5 to ISO 14644-1	Class 5 to ISO 14644-1	Class 5 to ISO 14644-1
Suitable for the production of Li-ion batteries			Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B1/B2-L, VDMA24364-Zone III	VDMA24364-B2-L, VDMA24364-B1/B2-L	VDMA24364 zone III
Description	<ul style="list-style-type: none"> • Compact valve • Connection technology via E-box • High flow rate relative to its size • In-line valves can be used as individual valves or manifold valves 	<ul style="list-style-type: none"> • Sub-base valve, semi in-line valve • For valve terminal VTUG with multi-pin, fieldbus interface • Variants to EU Explosion Protection Directive (ATEX) 	<ul style="list-style-type: none"> • Sub-base valve • For valve terminal VTUG with multi-pin, fieldbus interface • Recommended for production systems for manufacturing lithium-ion batteries
online: →	vuvg	vuvg	vuvg

Product overview

Electrically and pneumatically actuated directional control valves >

Universal directional control valves



Solenoid valves
VUVG-L-F1A





Solenoid valves
VUVS



Actuation type	Electrical	Electrical
Pneumatic connection 1		1/8 NPT, G1/4, G1/8, G3/8
Pneumatic working port	M5	1/8 NPT, 1/4 NPT, 3/8 NPT, G1/4, G1/8, G3/8, QS-1/2, QS-1/4, QS-10, QS-12, QS-3/8, QS-4, QS-5/16, QS-5/32, QS-6, QS-8
Operating pressure [MPa]	0.15 ... 0.7 MPa	-0.09 ... 1 MPa
Operating pressure	1.5 ... 7 bar	-0.9 ... 10 bar
Standard nominal flow rate	180 ... 195 l/min	500 ... 2400 l/min
Valve function	2x3/2-way, single solenoid, closed, 5/2-way single solenoid	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way pressurised, 5/3-way exhausted, 5/3-way closed
Electrical connection	2-pin, plug pattern H, horizontal connection, plug	3-pin, socket, type B, type C, screw terminal, to EN 175301-803, to industry standard (11 mm)
Cleanroom class	Class 5 to ISO 14644-1	Class 6 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	
LABS (PWIS) conformity	VDMA24364 zone III	VDMA24364-B1/B2-L, VDMA24364-Zone III
Description	<ul style="list-style-type: none"> • Compact valve • Connection technology via E-box • High flow rate relative to its size • In-line valves can be used as individual valves or manifold valves • Recommended for production systems for manufacturing lithium-ion batteries 	<ul style="list-style-type: none"> • Universal valve, sturdy and durable • Low-cost, no limitations with regard to performance • Can be used as individual valves or manifold valves VTUS
online: →	vuvg-f1a	vuvs


Electrically and pneumatically actuated directional control valves >

Application-specific directional control valves

		
	Solenoid valves MHA1, MHP1	Solenoid valves MHE2, MHP2, MHA2, MHE3, MHP3, MHA3, MHE4, MHP4, MHA4
Design	Poppet valve with spring return	Pressure-relieved poppet valve
Valve function	2/2-way, single-solenoid, closed, 2x2/2-way, single-solenoid, closed, 3/2-way, single-solenoid, closed, 3/2-way, single-solenoid, open	3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, single solenoid
Operating pressure [MPa]	-0.09 ... 0.8 MPa	-0.09 ... 0.8 MPa
Operating pressure	-0.9 ... 8 bar	-0.9 ... 8 bar
Ambient temperature	-5 ... 50°C	-5 ... 60°C
Pneumatic connection 1	Sub-base, prepared for QSP10, QS-3, QS-4	Sub-base, G1/4, G1/8, M7, QS-4, QS-6, QS-8
Standard nominal flow rate	10 ... 30 l/min	90 ... 400 l/min
Cleanroom class	Class 5 to ISO 14644-1	Class 6 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • 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 VUUG 	<ul style="list-style-type: none"> • Directly actuated poppet valve • Fast-switching valve: switching times down to 2 ms • Direct mounting, individual sub-base, manifold assembly • Manifold block for 2 ... 10 valves
online: →	mh1	mh2

Pneumatic shut-off valves >

Check valves

		★
	Check valves, piloted HGL	
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8, M5, QS-10, QS-12, QS-4, QS-6, QS-8	
Standard nominal flow rate 1->2 (0.6->0.5 MPa, 6->5 bar, 87->72.5 psi)	130 ... 1600 l/min	
Operating pressure [MPa]	0.05 ... 1 MPa	
Operating pressure	0.5 ... 10 bar	
Cleanroom class	Class 4 to ISO 14644-1	
LABS (PWIS) conformity	VDMA24364-B2-L	
Description	<ul style="list-style-type: none"> • Valve function: piloted non-return function • Screw-in via male thread • Pneumatically piloted • Pilot air connection: M5, G1/8, G1/4, G3/8, QS-4 • Manually operated exhaust with separate accessories possible 	
online: →	hgl	

Product overview

Pneumatic shut-off valves >

Quick exhaust valves



Quick exhaust valves
VBQF

Pneumatic connection 1	G1/4, G1/8, QS-6, QS-8
Standard nominal flow rate, exhaust 0.6->0.5 MPa (6->5 bar, 87->72.5 psi)	850 ... 2500 l/min
Standard nominal flow rate, pressurisation 0.6->0.5 MPa (6->5 bar, 87->72.5 psi)	350 ... 960 l/min
Operating pressure	0.2 ... 10 bar
Cleanroom class	Class 4 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Minimal height • High flow rate • Reduced noise emission • Available with silencer • Available with ducted or unducted exhaust air • For faster cycle times
online: →	vbqf

Pneumatic shut-off valves >


Shut-off valves and ball valves



Shut-off valves
HE

Valve function	2/2-way, bistable, 3/2-way, bistable
Pneumatic connection 1	QS-10, QS-12, QS-6, QS-8, R1/2, R1/4, R1/8, R3/8
Standard nominal flow rate	256.5 ... 834.3 l/min
Operating pressure [MPa]	-0.095 ... 1 MPa
Operating pressure	-0.95 ... 10 bar
Cleanroom class	Class 4 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Shut-off valve, manually operated • Connection: thread at both ends, push-in connector at both ends, thread/push-in connector • Different mounting variants
online: →	he



Pressure regulators

	 <p>Pressure regulator VRPA</p>
Pressure regulation range	1 ... 8 bar
Standard nominal flow rate	80 ... 130 l/min
Pneumatic connection 1	M5, QS-4, QS-6, QS-8, R1/4, R1/8
Pneumatic connection 2	QS-4, QS-6, QS-8
Ambient temperature	0 ... 60°C
Cleanroom class	Class 4 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Regulates operating pressure independently of fluctuating input pressure • With secondary exhaust and with return flow function • Piston regulator with through pressure supply • Higher energy efficiency thanks to motion-specific pressure adjustment • Directly actuated • Optionally with pressure gauge • Connections: push-in connector at both ends, thread/push-in connector • Sustainable operation thanks to reduced pressure level
online: →	vrpa

Product overview





Flow control valves >

One-way flow control valves

	 <p>One-way flow control valves VFOE-L</p>	 <p>One-way flow control valves GRLA, GRLZ, GRLSA, CRGRLA</p>
Valve function	Exhaust air one-way flow control function, supply air one-way flow control function	Exhaust air one-way flow control function, one-way flow control function, supply air one-way flow control function
Pneumatic connection 1	QS-10, QS-4, QS-6, QS-8	Female thread G1/4, for barbed connector I.D. 4 with union nut, 6 with union nut, G1/2, G1/4, G1/8, G3/4, G3/8, M3, M5, PK-3, PK-3 with union nut, PK-4, PK-4 with union nut, PK-6 with union nut, QS-10, QS-12, QS-3, QS-4, QS-6, QS-8
Standard nominal flow rate in flow control direction	85 ... 750 l/min	0 ... 4320 l/min
Adjusting element	Rotary knob with detent	Internal hex, knurled screw, slotted head screw
Cleanroom class	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364 zone III	VDMA24364-B2-L, VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Low-cost solution for standard applications • Simple and reliable adjustment of the speed of a pneumatic cylinder • Extremely easy to assemble • Quick to commission • Compact dimensions 	<ul style="list-style-type: none"> • Functional combination of one-way flow control valve and piloted check valve • Flow control valve, flow control at one end • Polymer, metal or stainless steel design • Standard, mini, in-line variants with different flow rates • Connections: thread at both ends, push-in connector at both ends, thread/push-in connector
online: →	vfoe	grla

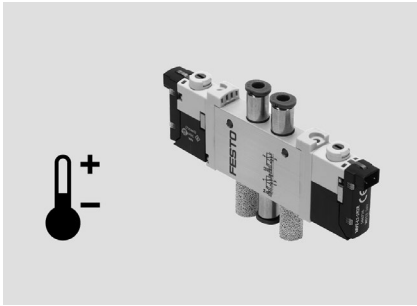
Proportional valves >

Pressure regulators

	 Proportional pressure regulators VPPE ★	 Proportional pressure regulators VEAB	 Proportional pressure regulators VEAA	 Proportional pressure regulators VPPI
Valve function	3-way proportional pressure regulator, 3-way proportional pressure regulator, closed	3-way proportional pressure regulator	3-way proportional pressure regulator	3-way proportional pressure regulator
Pneumatic connection 1	G1/8	Flange, QS-4	Flange, QS-4	G1/8
Pressure regulation range [MPa]	0.002 ... 1 MPa			-0.1 ... 1.2 MPa
Pressure regulation range	0.02 ... 10 bar			-1 ... 12 bar
Operating pressure [MPa]	0.8 MPa			
Operating pressure	8 bar			0 ... 13 bar
Standard nominal flow rate	310 ... 1250 l/min	≥4.5 l/min	≥7 l/min	150 ... 1630 l/min
Cleanroom class	Class 5 to ISO 14644-1	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils			
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364 zone III	VDMA24364 zone III	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Piloted pressure regulator • Setpoint input as analogue voltage signal (0 ... 10 V) • Electrical connection via M12x1 plug, 4- or 5-pin • Optionally with setpoint module • Variant with display with three retrievable presets and digital controller electronics • For simple control tasks • Variants recommended for production systems for manufacturing lithium-ion batteries 	<ul style="list-style-type: none"> • Silent operation • Very low energy consumption • Extremely precise • Integrated piezo technology • Short switching times • Mounting: via through-holes, H-rail mounting 	<ul style="list-style-type: none"> • Silent operation • Very low energy consumption • Extremely precise • Integrated piezo technology • Long service life • Mounting: via through-holes, H-rail mounting, on mounting plate or sub-base 	<ul style="list-style-type: none"> • Select between three predefined and one customer-specific controller preset • With or without display • Low-noise, flexible and highly dynamic • Precise and stable changeover, rapid switching of the setpoint by high-performance moving coil actuator • Control via analogue current or voltage signal, digital pattern for adjustable setpoint values or pulse-width modulation signal
online: →	vppe	veab	veaa	vpqi

Product overview

Customised components – for your specific requirements



Valves with customer-specific features

Can't find the valve you need in our catalogue?

We can offer you customised components that are tailored to your specific requirements.

Common product modifications:

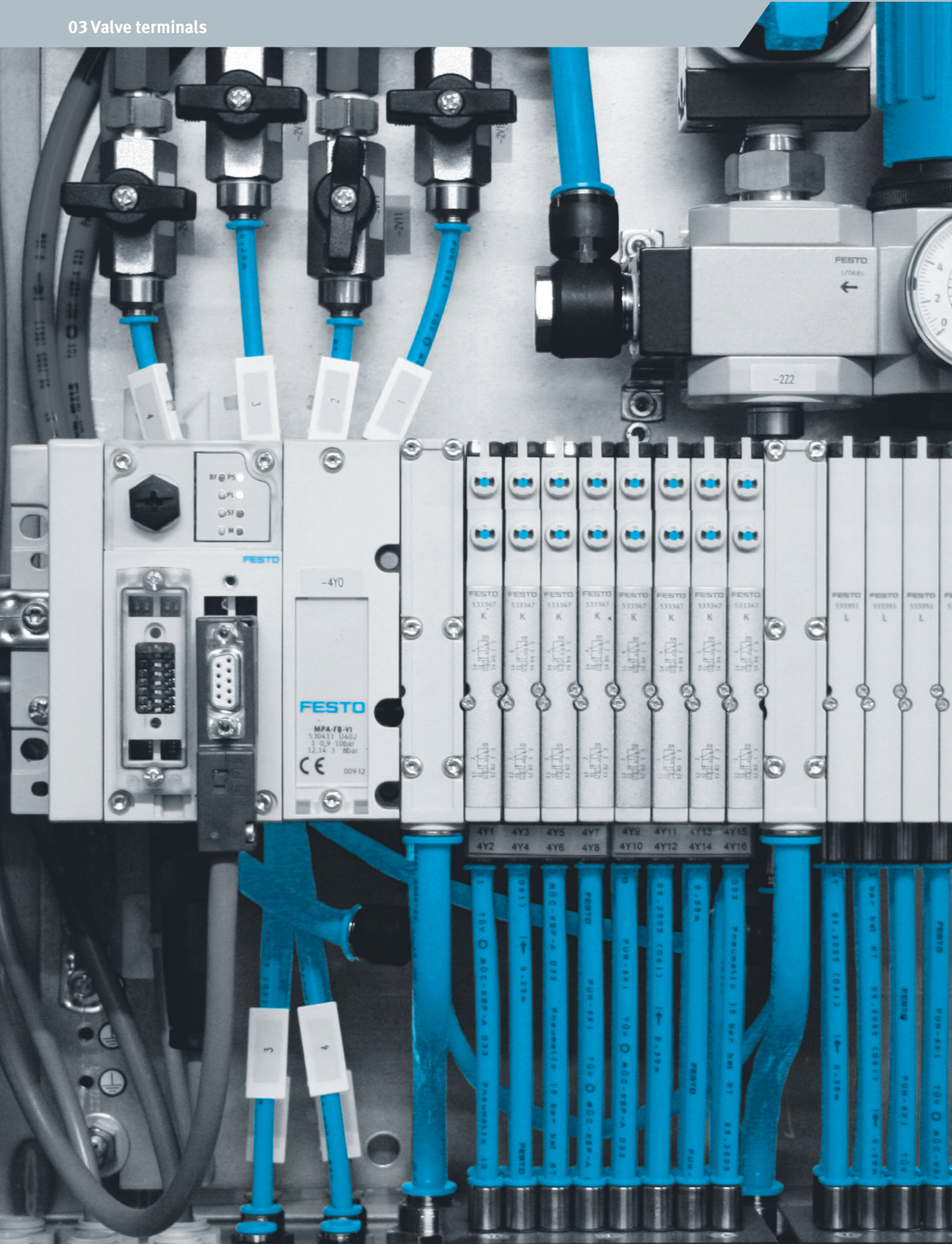
- Coatings for special ambient conditions
- Customised cables: length, pin allocation, pre-assembled with plug
- Modified actuating elements
- Modified connecting thread
- Modified valve sub-bases

Many additional variants are possible.

Ask your Festo sales engineer, who will be happy to help:

→ www.festo.com/contact

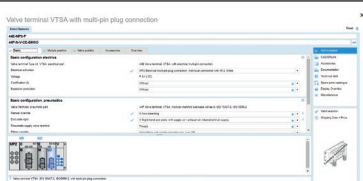
03 Valve terminals



Product overview

Software-Tools

Configurator for valve terminals



Design a product with numerous features reliably and quickly with the help of the configurator.


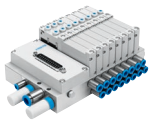
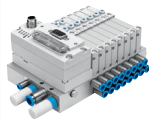
Select all the required product features step-by-step. The use of logic checks ensures that only correct configurations are available for selection.

A dynamic graphic generated on the basis of the configuration provides visual aid for selecting the correct product features.

You can find the configurator for your product at




1. [www.festo.com/catalogue/valve terminal](http://www.festo.com/catalogue/valve%20terminal)
2. Select your desired product
3. Click on the blue button "Configure product"

Universal valve terminals

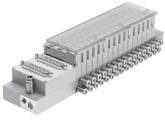

	 Valve manifolds VTUG-S	 Valve terminals with multi-pin plug, fieldbus connection VTUG	 Valve terminal with multi-pin, fieldbus interface VTUG-F1A
Valve size	10 mm, 14 mm, 18 mm	10 mm, 14 mm, 18 mm	10 mm, 14 mm
Valve function	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/ closed, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/ closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/ closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed
Max. standard nominal flow rate	380 l/min at 10 mm, 780 l/min at 14 mm, 1380 l/min at 18 mm	330 l/min at 10 mm, 630 l/min at 14 mm, 1200 l/min at 18 mm	330 l/min at 10 mm, 630 l/min at 14 mm
Max. no. of valve positions	16	24	24
Max. no. of pressure zones	9	13	13
Electrical actuation	Individual connection	AP interface, individual connection, fieldbus, I-Port, IO-Link®, multi-pin plug	AP interface, I-Port, IO-Link®, multi-pin plug
Valve terminal design	Fixed grid	Fixed grid	Fixed grid
Cleanroom class	Class 5 to ISO 14644-1	Class 5 to ISO 14644-1	Class 5 to ISO 14644-1
Suitable for the production of Li-ion batteries			Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B1/B2-L	VDMA24364 zone III
Description	<ul style="list-style-type: none"> • Compact thanks to small VUVG valves • Connection technology easy to change via the E-box • Wide range of valve functions • Also with semi in-line valves 	<ul style="list-style-type: none"> • 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 • Optimised and space-saving variant available for installation in control cabinets • Variants with hot-swap connections: valves can be replaced during operation • Variants recommended for production systems for manufacturing Li-ion batteries 	<ul style="list-style-type: none"> • Recommended for production systems for manufacturing Li-ion batteries • Low-cost fixed grid • Extremely easy assembly • Exchangeable electrical actuation • IO-Link® capable • Part of the VG series • Energy-efficient thanks to reverse operation and targeted pressure reduction
online: →	vtug	vtug	vtug-f1a

Product overview

Universal valve terminals

	 Valve manifolds VTUS	 Valve terminals MPA-L	 Valve terminals MPA-S
Valve size	21 mm, 26.5 mm, 31 mm	10 mm, 14 mm, 20 mm	10 mm, 14 mm, 20 mm
Valve function	2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed	2/2-way, single solenoid, closed, 2x3/2-way, single solenoid, closed, 2x3/2-way, single solenoid, open, 2x3/2-way, single solenoid, open/closed, 3-way proportional pressure regulator, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open, 5/2-way, double solenoid, 5/2-way, single solenoid, 5/3-way, pressurised, 5/3-way, exhausted, 5/3-way, closed
Max. standard nominal flow rate		360 l/min at 10 mm, 670 l/min at 14 mm, 870 l/min at 20 mm	360 l/min at 10 mm, 550 l/min at 14 mm, 700 l/min at 20 mm
Max. no. of valve positions	16	32	8, 24, 32, 64
Max. no. of pressure zones	9	20	3, 7, 9, 17
Electrical actuation	Single connection	Fieldbus, I-Port, IO-Link®, multi-pin plug	AS-Interface, fieldbus, multi-pin plug
Valve terminal design	Fixed grid	Valve sizes can be mixed	Modular, valve sizes can be mixed
Cleanroom class	Class 6 to ISO 14644-1	Class 5 to ISO 14644-1	Class 5 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> Sturdy valves with long service life VUVS Individual electrical connection Pilot air supply in the manifold rail Comprehensive accessories 	<ul style="list-style-type: none"> Maximum modularity System can be extended as required with individual sub-bases and modular tie rods Polymer sub-base 3 valve sizes Tamper-proof fixed flow restrictor Fieldbus interface via CPX IO-Link® capable 	<ul style="list-style-type: none"> Valve terminals for universal applications High-performance valves in a sturdy metal housing Metal links Two valve sizes can be combined Excellent communication thanks to serial links Fieldbus interface via CPX Max. 128 valves
online: →	vtus	mpa-l	mpa-s

Application-specific valve terminals

	 Valve terminals VTOC	 Valve terminals MH1
Valve size	10 mm	10 mm
Valve function	2x3/2-way, single solenoid, closed	2/2-way, single solenoid, closed, 3/2-way, single solenoid, closed, 3/2-way, single solenoid, open
Max. standard nominal flow rate	10 l/min at 10 mm	10 l/min at 10 mm
Operating pressure	0 ... 8 bar	-0.9 ... 8 bar
Electrical actuation	I-Port, IO-Link®, multi-pin	Individual connection, multi-pin
Nominal operating voltage DC	24 V	5 V, 12 V, 24 V
Max. no. of valve positions	24	24
Valve terminal design	Fixed grid	Fixed grid
Cleanroom class	Class 5 to ISO 14644-1	Class 5 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Compact pilot valves • Compact assembly • Greater safety thanks to interlock function • Multi-pin or fieldbus actuation • IO-Link® capable 	<ul style="list-style-type: none"> • Miniaturised poppet valves • Multi-pin or individual electrical connection
online: →	vtoc	mh1

Product overview

Customised components – for your specific requirements



Valve terminals with customised features

Can't find the valve terminal you need in our catalogue?

We can offer you customised components that are tailored to your specific requirements.

Common product modifications:

- Coatings for special ambient conditions
- Customised cables: length, pin allocation, pre-assembled with plug
- Modified actuating elements
- Modified connecting thread
- Modified valve sub-bases

Many additional variants are possible.

Ask your Festo sales engineer, who will be happy to help:

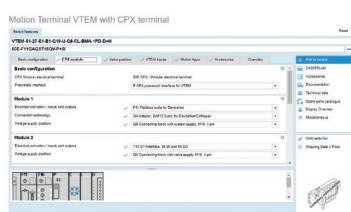
→ www.festo.com/contact



Product overview

Software-Tools

Configurator



Design a product with numerous features reliably and quickly with the help of the configurator.

Select all the required product features step-by-step. The use of logic checks ensures that only correct configurations are available for selection.

You will find the configurator

- at www.festo.com/catalogue/vtem
- Click on the product
- Click on the blue "Configure product" button

Motion Terminal



Motion Terminal
VTEM

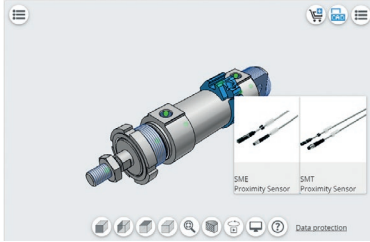
Valve terminal design	Fixed grid
Pitch	28 mm
Max. number of valve positions	8
Valve function	To be assigned via Motion App
Standard nominal flow rate, exhaust 0.6->0.5 MPa (6->5 bar, 87->72.5 psi)	480 l/min
Pneumatic connection 1	G3/8
Operating pressure [MPa]	0.3 ... 0.8 MPa
Operating pressure	3 ... 8 bar
Operating pressure [psi]	43.5 ... 116 psi
Note on operating pressure	0 - 8 bar with external pilot air, vacuum operation only at port 3
Pilot pressure [MPa]	0.3 ... 0.8 MPa
Pilot pressure	3 ... 8 bar
Pilot pressure [psi]	43.5 ... 116 psi
Motion Apps	Leakage diagnostics, Flow control, ECO drive, Positioning, Proportional pressure regulation, Proportional directional control valve, Soft stop, Presetting of travel time, Directional control valve functions, Supply and exhaust air flow control, Model-based proportional pressure regulation, Selectable pressure level
Actuation type	Electrical
Nominal operating voltage DC	24 V
Temperature of medium	5 ... 45°C
Cleanroom class	Class 5 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364 zone III
Description	<ul style="list-style-type: none"> • Many functions for movement, pressure and flow in one component – thanks to apps • Maximum repeat accuracy through digital parameter sets • Simple traceability – ideal for Industry 4.0 • Simple duplicability of the parameters • Increased energy efficiency • Reduced complexity and time to market • Greater profitability and knowledge protection • Predictive maintenance • Minimal installation effort • Sustainable operation with pressure-reduced return stroke and leakage detection
online: →	vtem



Product overview

Software-Tools

Festo Design Tool 3D





The Festo Design Tool 3D is a 3D product configurator for generating specific CAD product combinations from Festo. The configurator makes your search for the right accessory easier, more reliable and faster.

You can then order the module that has been created as a single order item, either completely pre-assembled or as individual parts in a single box. This considerably reduces your bill of materials, and downstream processes such as product ordering, order picking and assembly are significantly simplified.

This tool can be found at
[→ www.festo.com/x/festo-design-tool](http://www.festo.com/x/festo-design-tool)


Proximity switches >

T-slot proximity switches

	 Proximity switch SDBT-MSX ★	 Proximity switch SMT-8M-A ★
Electrical connection, connection type	Cable, cable with plug	Cable, cable with plug
Electrical connection, connection technology	M8x1 A-coded to EN 61076-2-104, open end	M12x1 A-coded to EN 61076-2-101, M8x1 A-coded to EN 61076-2-104, open end
Operational voltage range DC	10 ... 30 V	5 ... 30 V
Switching element function	NC or NO, switchable	NC, NC or NO switchable, NO
Switching output	PNP/NPN switchable	NPN, PNP, PNP/NPN switchable, contactless, 2-wire
Cleanroom class	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Measuring principle: magnetic Hall • Auto teach-in: automatic teach-in of the switching point at system start-up • Programmable: PNP/NPN, NO/NC and switching window range between 2 ... 15 mm • Inserted in the slot from above, secured with screw • LED status indicators • Cable length 0.3 ... 5 m 	<ul style="list-style-type: none"> • Measuring principle: magneto-resistive • Can be used universally • Individually configurable or pre-assembled • 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
online: →	sdbt	smt-8m



Proximity switches >

Round slot proximity switch





	 <p>Proximity sensor SMT-10M</p>	★
Electrical connection, connection type	Cable, cable with plug	
Electrical connection, connection technology	M12x1 A-coded to EN 61076-2-101, M8x1 A-coded to EN 61076-2-104, open end	
Electrical connection, number of pins/cores	2, 3	
Operational voltage range DC	5 ... 30 V	
Switching element function	N/O contact	
Switching output	NPN, PNP, contactless, 2-wire	
Cleanroom class	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	
LABS (PWIS) conformity	VDMA24364-B2-L	
Description	<ul style="list-style-type: none"> • Measuring principle: magneto-resistive • Can be used universally • Individually configurable or pre-assembled • Insertable in the slot from above, flush with the cylinder profile • LED switching status indication • Cable length 0.3, 2.5 m 	
online: →	smt-10M	

Product overview

Position sensors



	 <p>Position transmitter SDAT-MHS</p>	 <p>Position transmitter SMAT-8M</p>
Design	For T-slot	For T-slot
Sensing range	0 ... 160000 µm	52000 µm
Analogue output	0 - 10 V, 4 - 20 mA	0 - 10 V
Electrical connection, connection type	Cable with plug	Cable with plug
Electrical connection, connection technology	M8x1, A-coded, to EN 61076-2-104	M8x1, A-coded, to EN 61076-2-104
Electrical connection, occupied pins/wires	4	4
Cleanroom class	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Measuring principle: magnetic Hall • Analogue output 0 ... 10 V or 4 ... 20 mA • Programmable IO-Link®/switching output • Inserted in the slot from above, secured with screw • LED status indicators • Cable length 0.3 m • Suitable for T-slot 	<ul style="list-style-type: none"> • Measuring principle: magnetic Hall • Analogue output 0 ... 10 V • Very compact design makes the unit especially well suited to work with pneumatic grippers, compact air cylinders and any application that needs to be performed in a tight space • Inserted in the slot from above, secured with screw • LED status indicators • Cable length 0.3 m • Suitable for T-slot
online: →	sdat	smat-8m

Pressure and vacuum sensors

	 Pressure sensors SDE5 ★	 Pressure sensors SPAN, SPAN-B ★	 Pressure sensors SPAЕ	 Pressure transmitter SPTЕ
Pressure measuring range [MPa]		-0.1 ... 1.6 MPa	-0.1 ... 1 MPa	-0.1 ... 1 MPa
Pressure measuring range	-1 ... 10 bar	-1 ... 16 bar	-1 ... 10 bar	-1 ... 10 bar
Pressure measuring range [psi]		-14.5 ... 232 psi	-14.5 ... 145 psi	-14.5 ... 145 psi
Switching element function	N/C, N/O, switchable	NC or NO, switchable	N/C, N/O, switchable	
Switching output	NPN, PNP	2 x PNP or 2 x NPN switchable, PNP/NPN switchable	PNP/NPN switchable	
Pneumatic connection	QS-1/4, QS-4, QS-5/32, QS-6	Male thread 1/8 NPT, male thread G1/8, R1/8, female thread G1/8, M5, for tubing O.D. 4	Flange, cartridge 10, push-in sleeve QS-4, QS-6, QS-3, QS-4	Flange, cartridge 10, push-in sleeve QS-4, QS-6, QS-3, QS-4
Electrical connection	3-wire, 3-pin, cable, plug, to EN 60947-5-2, round design. M8x1		3-wire, cable, open end	3-wire, cable, open end
Display type		Illuminated LCD	LED display, 2-digit	
Cleanroom class	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1
Suitable for the production of Li-ion batteries		Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Programmable and configurable pressure switch for simple pressure sensing tasks • Threshold/window comparator • Switching point adjustment via teach-in function • Integrated microprocessor • Switching status indication by an LED visible from all sides • Certification: c UL us Listed (OL), C-Tick 	<ul style="list-style-type: none"> • For monitoring compressed air and non-corrosive gases • For network monitoring, regulator monitoring, leak testing, object detection • Relative measurement method based on a piezoresistive measuring cell • Serial communication integrated using IO-Link® 1.1 • Compact design 30 x 30 mm • High-contrast, blue backlit display 	<ul style="list-style-type: none"> • Electronic pressure sensor with piezoresistive pressure measuring cell, integrated signal processing, numeric pressure indicator in percent, operating key and a switching output, PNP/NPN switchable • Display of minimum and maximum measured value • All parameters entered can be transferred to other SPAEs (replicator function) • Communication interface for IO-Link® 	<ul style="list-style-type: none"> • Piezoresistive pressure sensor • Measured variable: relative pressure • Cable length 2.5 m • Compact: 8-bracket wall mount for manifold assembly
online: →	sde5	span	spae	spte

Product overview


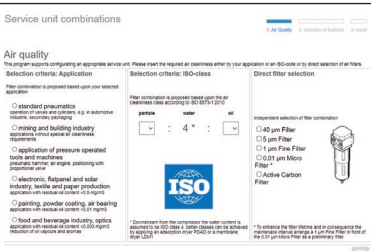
Flow sensors

	 Flow transmitter SFTE	 Flow sensors SFAH
Flow measuring range	0 ... 10 l/min	0.002 ... 200 l/min
Operating medium	Nitrogen, compressed air to ISO 8573-1:2010 [6:4:4]	Argon, nitrogen, compressed air to ISO 8573-1:2010 [6:4:4]
Operating pressure	-0.9 ... 10 bar	-0.9 ... 10 bar
Pneumatic connection	Female thread M5, for push-in connector O.D. 3, 4	Female thread G1/4, G1/8, for tubing O.D. 4, 6, 8
Switching output		2 x PNP or 2 x NPN switchable
Electrical connection, connection type	Cable, cable with plug	Plug
Electrical connection, connection technology	M8x1 A-coded to EN 61076-2-104, open end	Plug pattern L1J, M8x1 A-coded to EN 61076-2-104
Cleanroom class	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Compact design • Universal flow detection • Easy installation • Reliable pick & place application for extremely small workpieces 	<ul style="list-style-type: none"> • Process air, compressed air, forming gas and pneumatic object monitoring, handling ultra-small parts, leak test • Compact design 20 x 58 mm • Clear 2-line display • Mounting: H-rail mounting, wall or surface mounting, front panel mounting • Serial communication integrated using IO-Link® 1.1
online: →	sfte	sfah




Product overview

Software-Tools

<p>Air consumption</p>		<p>Calculate your system's air consumption quickly and conveniently. Simply enter all the drives and tubing, set the cycle times and working pressure and the air consumption per minute and per day will be calculated for you. It includes a feature for exporting the input table together with the result directly to Excel.</p> <p>This tool can be found at www.festo.com/x/air-consumption</p>
<p>Configurator</p>		<p>Design a product with numerous features reliably and quickly with the help of the configurator. Select all the required product features step-by-step. The use of logic checks ensures that only correct configurations are available for selection. A dynamic graphic generated on the basis of the configuration provides a visual aid for selecting the correct product features.</p> <p>This tool can be found at www.festo.com/x/service-unit-sizing</p>


Service units for compressed air >

Series MS-B

	<p>Service unit MS4-EM1FR, MS6-EM1FR</p>
<p>Size</p>	<p>4, 6</p>
<p>Pressure indicator</p>	<p>G1/8 prepared, with pressure gauge</p>
<p>Operating pressure [MPa]</p>	<p>0.1 ... 1 MPa</p>
<p>Operating pressure</p>	<p>1 ... 10 bar</p>
<p>Standard nominal flow rate</p>	<p>1500 ... 5300 l/min</p>
<p>Type of mounting</p>	<p>Optional:, cable installation, with mounting bracket, with accessories</p>
<p>Cleanroom class</p>	<p>Class 7 to ISO 14644-1</p>
<p>LABS (PWIS) conformity</p>	<p>VDMA24364-B1/B2-L</p>
<p>Description</p>	<ul style="list-style-type: none"> • Combination of on/off valve and filter regulator • With manual or fully automatic condensate drain • For filtered and unlubricated compressed air supply • Supply pressure can be switched on or off • Output pressure is infinitely adjustable within the pressure regulation range • Grid dimensions 40, 62 mm (size 4, 6)
<p>online: →</p>	<p>ms4-em1fr</p>


Service units for compressed air >

MS series

	 <p>Service units MSB4, MSB6</p>	★
Pneumatic connection 1	G1/2, G1/4, G1/8	
Standard nominal flow rate	750 ... 5500 l/min	
Pressure regulation range	0.5 ... 12 bar	
Operating pressure	0.8 ... 20 bar	
Grade of filtration	0.01 ... 40 µm	
Cleanroom class	Class 7 to ISO 14644-1	
LABS (PWIS) conformity	VDMA24364-B1/B2-L	
Description	<ul style="list-style-type: none"> • Combination of filter regulator, filter, lubricator, on/off valve, soft-start valve • Grid dimension 40, 62, 90 mm (size 4, 6, 9) 	
online: →	msb4	

Filter regulators/lubricators >

MS series

	 <p>Service units MSB4-FRC, MSB6-FRC</p>	★
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8	
Standard nominal flow rate	850 ... 4800 l/min	
Pressure regulation range	0.3 ... 12 bar	
Operating pressure	0.8 ... 20 bar	
Grade of filtration	5 µm, 40 µm	
Cleanroom class	Class 7 to ISO 14644-1	
LABS (PWIS) conformity	VDMA24364-B1/B2-L	
Description	<ul style="list-style-type: none"> • Filter, regulator and lubricator functions in a single unit • High flow rate and highly efficient in removing contaminants • Good regulation characteristics with minimal pressure hysteresis • Grid dimensions 40, 62 mm (size 4, 6) 	
online: →	msb4-frc	

Product overview

Filter regulators >

Series MS-B




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



Pneumatic connection 1	G1/2, G1/4
Standard nominal flow rate	1500 ... 5300 l/min
Pressure regulation range [MPa]	0.03 ... 0.7 MPa
Pressure regulation range	0.3 ... 7 bar
Grade of filtration	5 µm, 40 µm
Operating pressure [MPa]	0.1 ... 1 MPa
Operating pressure	1 ... 10 bar
Cleanroom class	Class 7 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Attractively priced basic component focused on the most important technical functions • Lightweight and sturdy thanks to modern polymer materials • Compatible with the MS series for the perfect combination of low-cost basic functionality and high-end function requirements • Stable control behaviour • With or without pressure gauge • Rotary knob with detent • With integrated secondary exhausting and primary exhausting with return flow function • MS4, MS6: directly actuated piston regulator • Grid dimensions 25, 40, 62 mm (sizes 2, 4, 6)
online: →	ms4-lfr




Filter regulators >

MS series

		Filter regulators MS4-LFR, MS6-LFR	★
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8		
Standard nominal flow rate	850 ... 7200 l/min		
Pressure regulation range	0.3 ... 16 bar		
Operating pressure	0.8 ... 20 bar		
Grade of filtration	5 µm, 40 µm		
Cleanroom class	Class 7 to ISO 14644-1		
LABS (PWIS) conformity	VDMA24364-B1/B2-L		
Description	<ul style="list-style-type: none"> • MS4-LFR, MS6-LFR: directly actuated diaphragm regulator • Good control characteristics with minimal pressure hysteresis and primary pressure compensation • Good particle and condensate separation • With or without secondary exhausting • High flow rate • Lockable rotary knob • Return flow option for exhausting from output 2 to input 1 already integrated • Variants to EU Explosion Protection Directive (ATEX) • Grid dimension 40, 62, 90, 124 mm (size 4, 6, 9, 12) • With or without pressure gauge 		
online: →	ms4-lfr		

Compressed air filters >

MS series

			
	Filter MS4-LF, MS6-LF	Fine filters MS4-LFM-B, MS6-LFM-B	Micro filters MS4-LFM-A, MS6-LFM-A
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8	G1/2, G1/4, G1/8, G3/8	G1/2, G1/4, G1/8, G3/8
Standard nominal flow rate	1000 ... 4100 l/min		
Operating pressure	0 ... 20 bar	0 ... 20 bar	0 ... 20 bar
Grade of filtration	5 µm, 40 µm	0.01 µm, 1 µm	0.01 µm, 1 µm
Cleanroom class	Class 7 to ISO 14644-1	Class 7 to ISO 14644-1	Class 7 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Good particle and condensate separation • High flow rate with minimal pressure drop • Available with manual, semi-automatic, fully automatic, or fully automatic, electrically actuated condensate drain • Grid dimension 40, 62, 90, 124 mm (size 4, 6, 9, 12) 	<ul style="list-style-type: none"> • High-efficiency filter for exceptionally clean compressed air • Removal of oil aerosols from compressed air • Available with differential pressure indicator for indicating filter contamination • Available with electronic filter pollution indicator • Grid dimension 40, 62, 90, 124 mm (size 4, 6, 9, 12) 	<ul style="list-style-type: none"> • High-efficiency filter for exceptionally clean compressed air • Removal of oil aerosols from compressed air • Available with differential pressure indicator for indicating filter contamination • Available with electronic filter pollution indicator • Grid dimension 40, 62, 90, 124 mm (size 4, 6, 9, 12)
online: →	ms4-lf	ms4-lfm-b	ms4-lfm-a

Product overview

Pressure regulators >

Series MS-B






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



Pneumatic connection 1	G1/2, G1/4
Standard nominal flow rate	1800 ... 6000 l/min
Pressure regulation range	0.3 ... 7 bar
Operating pressure [MPa]	0.1 ... 1 MPa
Operating pressure	1 ... 10 bar
Cleanroom class	Class 7 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Attractively priced basic component focused on the most important technical functions • Lightweight and sturdy thanks to modern polymer materials • Compatible with the MS series for the perfect combination of low-cost basic functionality and high-end function requirements • Stable control behaviour • With or without pressure gauge • Rotary knob with detent • With integrated secondary exhausting and primary exhausting with return flow function • MS4, MS6: directly actuated piston regulator • Grid dimensions 25, 40, 62 mm (sizes 2, 4, 6) • Sustainable operation thanks to reduced pressure level
online: →	ms-lr-b

Pressure regulators >



MS series

	 Pressure regulators MS4-LR, MS6-LR	 Pressure regulators MS4-LRB, MS6-LRB	 Precision pressure regulators MS6-LRP, MS6-LRPB
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8	G1/2, G1/4	G1/2, G1/4, G3/8
Standard nominal flow rate	1000 ... 7500 l/min	300 ... 7300 l/min	800 ... 5000 l/min
Pressure regulation range	0.3 ... 16 bar	0.3 ... 16 bar	0.05 ... 12 bar
Operating pressure [MPa]	0.08 ... 1.4 MPa		0.1 ... 1.4 MPa
Operating pressure	0.8 ... 20 bar	0.8 ... 20 bar	1 ... 14 bar
Cleanroom class	Class 7 to ISO 14644-1	Class 7 to ISO 14644-1	Class 5 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • High flow rate with minimal pressure drop • Good control characteristics with minimal pressure hysteresis and primary pressure compensation • With or without secondary exhausting • Lockable rotary knob • Optional pressure sensor and rotary knob pressure gauge • Grid dimension 25, 40, 62, 90 mm (size 2, 4, 6, 9) 	<ul style="list-style-type: none"> • To build up a regulator manifold with through air supply for pressure ranges that can be adjusted independently of one another • Good control characteristics with minimal pressure hysteresis and primary pressure compensation • Lockable rotary knob • With or without secondary exhausting • Integrated return flow option for exhausting from output 2 to input 1 • Optional pressure sensor and rotary knob pressure gauge • Variants to EU Explosion Protection Directive (ATEX) • Grid dimensions 40, 62 mm (size 4, 6) 	<ul style="list-style-type: none"> • As individual device and for manifold assembly • Manifold assembly with through air supply • Good control characteristics with minimal pressure hysteresis and primary pressure compensation • High secondary exhausting • Lockable rotary knob • Optional pressure sensor and rotary knob pressure gauge • Width dimensions 62 mm (size 6)
online: →	ms4-lr	ms4-lrb	ms6-lrp

Product overview




On/off and soft-start valves >

Series MS-B

	 Soft-start valves MS4-EDE-B, MS6-EDE-B ★	 On/off valves MS4-EE-B, MS6-EE-B ★
Design	Poppet valve, solenoid actuated	Poppet valve, solenoid actuated
Pneumatic connection 1	G1/2, G1/4	G1/2, G1/4
Operating pressure [MPa]	0.3 ... 0.7 MPa	0.3 ... 0.7 MPa
Operating pressure	3 ... 7 bar	3 ... 7 bar
Standard nominal flow rate	2000 ... 5000 l/min	2000 ... 5000 l/min
Exhaust air function	Cannot be throttled	
Electrical connection	Type C, to EN 175301-803	Type C, to EN 175301-803
Cleanroom class	Class 7 to ISO 14644-1	Class 7 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Very compact and extremely lightweight series for use close to the process directly in the machine • Electrically operated 3/2-way valve for slowly pressurising and exhausting pneumatic systems • The switching pressure can be precisely controlled with a solenoid valve • Adjustable switching time delay • Built-in connections into which the tubing can be directly inserted • Detenting and non-detenting manual override • Supply voltage 24 V DC • With solenoid coil, without plug socket • Grid dimensions 40, 62 mm (size 4, 6) 	<ul style="list-style-type: none"> • Very compact and extremely lightweight series for use close to the process directly in the machine • Electrically operated 3/2-way valve for pressurising and exhausting pneumatic systems • Ducted exhaust air possible via threaded connection with silencer • Detenting and non-detenting manual override • Supply voltage 24 V DC • With solenoid coil, without plug socket • Grid dimensions 40, 62 mm (size 4, 6)
online: →	ms-ed-e-b	ms-ee-b

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	 On/off valves MS4-EM1, MS6-EM1 ★
Pneumatic connection 1	G1/2	G1/2	G1/2, G1/4, G1/8, G3/8
Standard nominal flow rate	4300 ... 5700 l/min	4300 ... 5700 l/min	1200 ... 8700 l/min
Operating pressure	3 ... 10 bar	3 ... 10 bar	0 ... 18 bar
Actuation type	Electrical	electrical	Manual
Safety integrity level (SIL)	Exhausting/SIL 3, prevention of unexpected start-up (pressurisation)/SIL 3		
Performance Level (PL)	Exhausting/category 3, Performance Level d, exhausting/up to category 4, Performance Level e, prevention of unexpected start-up (pressurisation)/category 3, Performance Level d, prevention of unexpected start-up (pressurisation)/up to category 4, Performance Level e	Exhausting / Category 1, Performance Level c, Prevention of unexpected start-up (pressurising) / Category 1, Performance Level c	
Cleanroom class	Class 7 to ISO 14644-1	Class 7 to ISO 14644-1	Class 7 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • With safety functions • For reducing pressure quickly and reliably and for building up pressure gradually • Adjustable pressure build-up time • Optionally with silencer • Supply voltage 24 V DC • Grid dimensions 62 mm (size 6) 	<ul style="list-style-type: none"> • With safety functions • For reducing pressure quickly and reliably and for building up pressure gradually • Adjustable pressure build-up time • Adjustable switch-through pressure • Supply voltage 24 V DC • Grid dimensions 62, 90 mm (size 6, 9) 	<ul style="list-style-type: none"> • Manual 3/2-way valve for pressurising and exhausting pneumatic systems • A silencer can be attached or the exhaust air can be ducted at port 3 • Switching position is immediately recognisable • Optionally with pressure gauge and pressure sensor • Variants to EU Explosion Protection Directive (ATEX) • Grid dimension 40, 62, 90, 124 mm (size 4, 6, 9, 12)
online: →	ms6-sv-e	ms6-sv-c	ms4-em1

Product overview



On/off and soft-start valves >

MS series

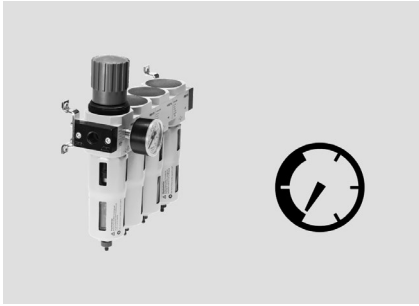
			
	On/off valves MS4-EE, MS6-EE	★	Soft-start valves MS4-DE, MS6-DE
Pneumatic connection 1	G1/2, G1/4, G1/8, G3/8		G1/2, G1/4, G3/8
Standard nominal flow rate	1000 ... 7000 l/min		1000 ... 6450 l/min
Operating pressure	4 ... 18 bar		4 ... 18 bar
Actuation type	Electrical		electrical
Cleanroom class	Class 7 to ISO 14644-1		Class 7 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L		VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Electric 3/2-way valve for pressurising and exhausting pneumatic systems • A silencer can be attached or the exhaust air can be ducted at port 3 • Supply voltage 24 V DC, 110, 230 V AC • Optionally with pressure gauge and pressure sensor • With solenoid coil, without plug socket • Variants to EU Explosion Protection Directive (ATEX) • Grid dimension 40, 62, 90, 124 mm (size 4, 6, 9, 12) 		<ul style="list-style-type: none"> • 2/2-way valve for slowly pressurising pneumatic systems with electrically switchable pressure switchover point • Supply voltage 24 V DC, 110, 230 V AC • Switchable pressure switching point • For advancing the actuators slowly and reliably into the initial position • For avoiding sudden and unexpected movements • Adjustable pressure build-up time • Variants to EU Explosion Protection Directive (ATEX) • Grid dimension 40, 62, 124 mm (size 4, 6, 12)
online: →	ms4-ee		ms4-de

Compressed air distributors >

MS series

			
	Branching modules MS4-FRM, MS6-FRM	★	Distributor blocks MS4-FRM-FRZ, MS6-FRM-FRZ
Pneumatic connection 1	G1/4, G1/2, G1/2, G1/4, G1/8, G3/8		G1/4, G1/2
Standard nominal flow rate in main flow direction 1->2	1200 ... 14700 l/min		4050 ... 14600 l/min
Operating pressure	0 ... 20 bar		0 ... 20 bar
Cleanroom class	Class 7 to ISO 14644-1		Class 7 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L		VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Optionally with integrated non-return function and pressure sensor • Outlet at top and bottom • Can be used as an intermediate distributor for varying air qualities • Optionally with pressure sensor • Grid dimensions 40, 62, 90, 124 mm (size 4, 6, 9, 12) 		<ul style="list-style-type: none"> • Slim pneumatic distributor • Outlet at top and bottom • Can be used as an intermediate distributor for varying air qualities • Can be used as an adapter between two pressure regulators with large rotary knob with pressure gauge of size 4 • Grid dimensions 40, 62 mm (size 4, 6)
online: →	ms*-frm		ms*-frm-frz

Customised components – for your specific requirements



Components for compressed air preparation with customised designs

Can't find the compressed air preparation components you need in our catalogue?

We can offer you customised components that are tailored to your specific requirements.

Common product modifications:

- Modified pressure range
- Rotary knob: in a special colour, with protection against rotation
- Fitting: integrated throttling port, special thread
- Tubing with special printing
- Pressure gauge with red/green range

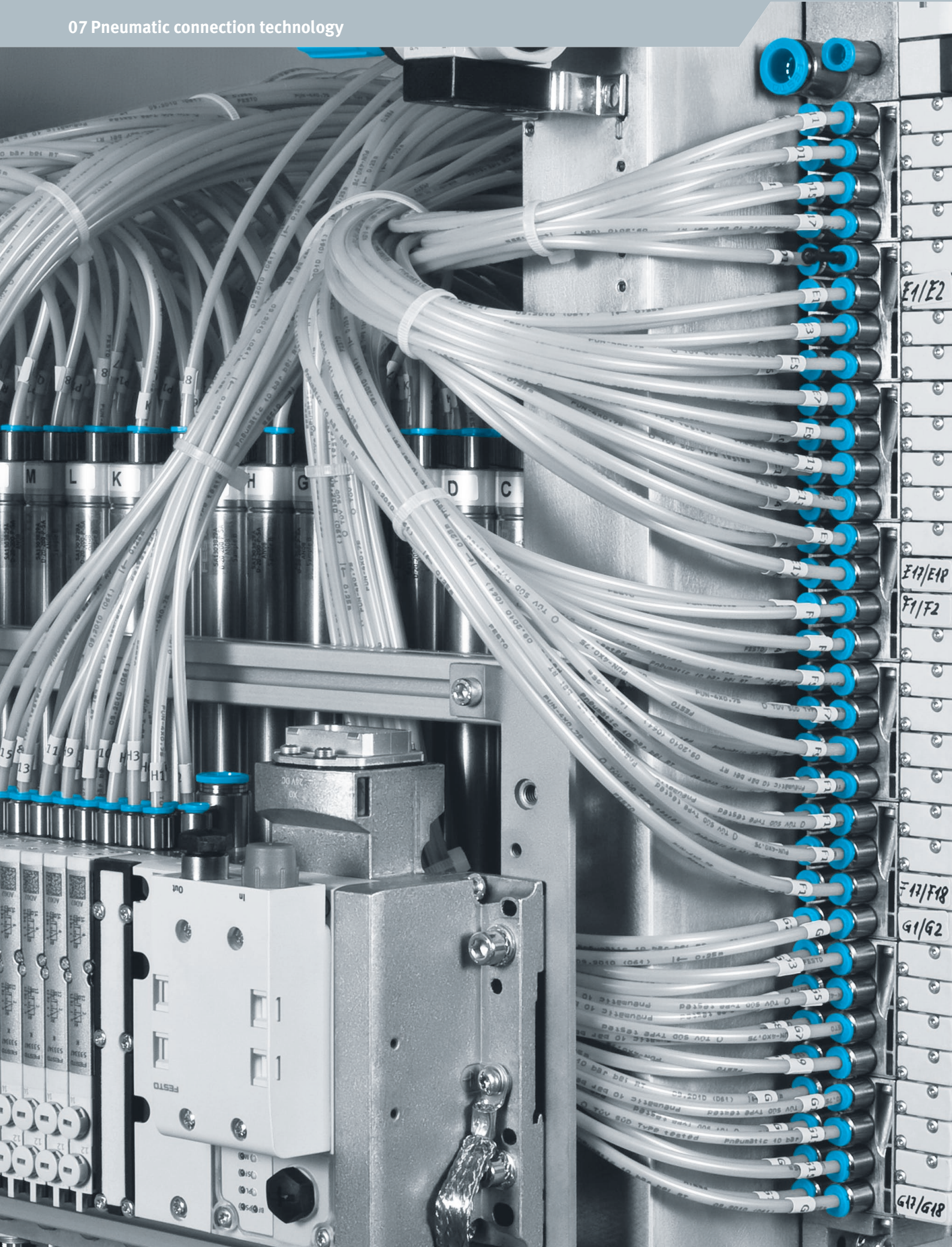
Many additional variants are possible.

Ask your Festo sales engineer, who will be happy to help:

→ www.festo.com/contact

Product overview



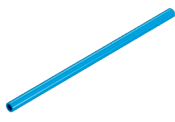
07 Pneumatic connection technology



Product overview




Pneumatic tubing >

Standard O.D. pneumatic tubing

	 Plastic tubing PUN-H, PUN-H-DUO	 Plastic tubing PUN-H-SF	 Plastic tubing PUN-H-F
Outside diameter	2 ... 16 mm	4 ... 25 mm	6 ... 16 mm
Inside diameter	1.2 ... 11 mm	2.3 ... 15.3 mm	4 ... 11 mm
Temperature-dependent operating pressure [MPa]	-0.095 ... 1 MPa	-0.095 ... 1.3 MPa	-0.095 ... 1 MPa
Temperature-dependent operating pressure	-0.95 ... 10 bar	-0.95 ... 13 bar	-0.95 ... 10 bar
Temperature-dependent operating pressure [psi]	-13.775 ... 145 psi	-13.775 ... 188.5 psi	-13.775 ... 145 psi
Ambient temperature	-35 ... 60°C	-35 ... 80°C	-35 ... 60°C
Cleanroom class	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils		
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Polyurethane • High resistance to microbes and hydrolysis • Suitable for energy chains • Cleanroom-compatible combination with fitting NPKA • Also available as DUO tubing • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PUN_H 	<ul style="list-style-type: none"> • Polyurethane • High resistance to microbes and hydrolysis • For food safety certificates, see www.festo.com/certificates/PUN_H_F • Suitable for energy chains • Kink-resistant yet still flexible thanks to increased wall thickness • Operating medium: compressed air, vacuum, water 	<ul style="list-style-type: none"> • Polyurethane • High resistance to microbes and hydrolysis • For food safety certificates, see www.festo.com/certificates/PUN_H_F • Cleanroom-compatible combination with fitting NPKA • Operating medium: compressed air, vacuum, water
online: →	pun-h	pun-h-sf	pun-h-f

Pneumatic tubing >



Standard O.D. pneumatic tubing

	 Plastic tubing PTFEN	 Plastic tubing PEN	 Customer-specific tubing PAN, PEN, PLN, PUN
Outside diameter	4 ... 16 mm	4 ... 16 mm	4 ... 16 mm
Inside diameter	2.9 ... 11 mm	2.7 ... 10.8 mm	2.7 ... 12 mm
Temperature-dependent operating pressure [MPa]	-0.095 ... 1.5 MPa	-0.095 ... 1 MPa	
Temperature-dependent operating pressure	-0.95 ... 15 bar	-0.95 ... 10 bar	-0.95 ... 14 bar
Temperature-dependent operating pressure [psi]	-13.775 ... 217.5 psi	-13.775 ... 145 psi	
Ambient temperature	-20 ... 150°C	-30 ... 60°C	-30 ... 80°C
Cleanroom class	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B2-L, VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Polytetrafluoroethylene • For food-safe grade, see www.festo.com/certificates/PTFEN • Highly resistant to chemicals • High temperature resistance • Operating medium: compressed air, vacuum 	<ul style="list-style-type: none"> • Polyethylene • High resistance to chemicals and very high resistance to hydrolysis • Resistant to most cleaning agents and lubricants • Suitable for energy chains • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PEN_S 	<ul style="list-style-type: none"> • 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 use: individual colour selection • Choose from 9 basic colours; further colours available on request • Select, size and order quickly, easily and reliably with the configurator
online: →	ptfen	pen	pan

Product overview



Pneumatic tubing >

Standard O.D. pneumatic tubing

	 Plastic tubing PLN	 Plastic tubing PFAN
Outside diameter	4 ... 16 mm	3 ... 12 mm
Inside diameter	2.9 ... 12 mm	2.3 ... 8.4 mm
Temperature-dependent operating pressure [MPa]	-0.095 ... 1.4 MPa	-0.095 ... 1.6 MPa
Temperature-dependent operating pressure	-0.95 ... 14 bar	-0.95 ... 16 bar
Temperature-dependent operating pressure [psi]	-13.775 ... 203 psi	-13.775 ... 232 psi
Ambient temperature	-30 ... 80°C	-20 ... 150°C
Cleanroom class	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B2-L	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Polyethylene • High resistance to chemicals, microbes and hydrolysis • Food-safe see www.festo.com/certificates/PLN • Resistant to most cleaning agents and lubricants • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PLN 	<ul style="list-style-type: none"> • Perfluoroalkoxy alkane • Pneumatic tubing with resistance to high temperatures and chemicals • For food-safe grade, see www.festo.com/certificates/PFAN • High resistance to chemicals, microbes, UV radiation, hydrolysis and stress cracks • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/PFAN
online: →	pln	pfan

Pneumatic fittings >



Pneumatics push-in fittings

		
	Push-in fittings/connectors, standard series QS, QSC, QSF, QSH, QSL, QSS, QST, QSW, QSX, QSY	Push-in fittings/connectors NPQH
Pneumatic connection 1	Push-in sleeve Ø 4 mm, push-in sleeve Ø 6 mm, push-in sleeve Ø 8 mm, push-in sleeve Ø 10 mm, push-in sleeve Ø 12 mm, push-in sleeve Ø 16 mm, male thread G1/2, G1/4, G1/8, G3/4, G3/8, M5, R1/2, R1/4, R1/8, R3/8, female thread G1/2, G1/4, G1/8, G3/8, for tubing O.D. Ø 10 mm, 12 mm, 16 mm, 4 mm, 6 mm, 8 mm	Push-in sleeve Ø 4 mm, push-in sleeve Ø 6 mm, push-in sleeve Ø 8 mm, push-in sleeve Ø 10 mm, push-in sleeve Ø 12 mm, push-in sleeve Ø 14 mm, male thread G1/2, G1/4, G1/8, G3/8, M5, M7, female thread G1/4, G1/8, for tubing O.D. Ø 10 mm, 12 mm, 14 mm, 4 mm, 6 mm, 8 mm
Pneumatic connection 2	Push-in sleeve Ø 4 mm, push-in sleeve Ø 6 mm, push-in sleeve Ø 8 mm, push-in sleeve Ø 10 mm, push-in sleeve Ø 12 mm, push-in sleeve Ø 16 mm, female thread G1/2, G1/4, G1/8, G3/8, for tubing O.D. Ø 10 mm, 12 mm, 16 mm, 22 mm, 4 mm, 6 mm, 8 mm	Push-in sleeve Ø 4 mm, push-in sleeve Ø 6 mm, push-in sleeve Ø 8 mm, push-in sleeve Ø 10 mm, push-in sleeve Ø 12 mm, push-in sleeve Ø 14 mm, for tubing O.D. Ø 10 mm, 12 mm, 14 mm, 4 mm, 6 mm, 8 mm
Design	45° angle, 45° angle, long, blanking plug, L-shape, L-shape, 2-way, parallel, L-shape, long, L-shape, additional connection female thread lengthwise, L-shape, additional push-in connection lengthwise, bulkhead, T-shape, X-shape, Y-shape, straight shape	Blanking plug, L-shape, L-shape, long, bulkhead, T-shape, screw plug, Y-shape, straight shape
Temperature-dependent operating pressure	-0.95 ... 14 bar	
Operating pressure for full temperature range	-0.95 ... 14 bar	-0.95 ... 20 bar
Ambient temperature	-20 ... 80°C	0 ... 150°C
Cleanroom class	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1
LABS (PWIS) conformity	VDMA24364-B1/B2-L	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Standard series • Wide range of variants: large selection for maximum flexibility in standard applications • PBT and nickel-plated brass • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/QS • Straight shape, L-shape, T-shape, at 45° angle, X-shape, Y-shape, push-in bulkhead connector 	<ul style="list-style-type: none"> • Solid-metal brass, chemically nickel-plated • High corrosion and chemical resistance • Highly resistant to temperatures and pressure • Food-safe see www.festo.com/certificates/NPQH • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/NPQH • Straight design, L-shape, T-shape, Y-shape, push-in bulkhead connector
online: →	qs	npqh

Product overview

Pneumatic fittings >



Pneumatics push-in fittings

	 Push-in fittings/connectors NPQE-F1A	 Push-in fittings/connectors NPQR
Pneumatic connection 1	Male thread G1/4, G1/8, M5, M7	Male thread G1/2, G1/4, G1/8, G3/8, M5, M7, for tubing O.D. Ø 10 mm, 12 mm, 14 mm, 16 mm, 4 mm, 6 mm, 8 mm
Pneumatic connection 2	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. 10 mm, 12 mm, 14 mm, 16 mm, 4 mm, 6 mm, 8 mm
Design	Straight shape	L-shape, bulkhead, T-shape, screw plug, Y-shape, straight shape
Temperature-dependent operating pressure		
Operating pressure for full temperature range	-0.95 ... 8 bar	-0.95 ... 16 bar
Ambient temperature	-5 ... 60°C	-20 ... 150°C
Cleanroom class	Class 4 to ISO 14644-1	Class 4 to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
LABS (PWIS) conformity	VDMA24364 zone III	VDMA24364-B2-L
Description	<ul style="list-style-type: none"> • Economical push-in fittings for pneumatic applications • Recommended for production plants for manufacturing lithium-ion batteries • Tapered thread to JIS B0203 and compatible with pressure-tight media to DIN EN 10226 • Operating medium: compressed air, vacuum • Straight shape, L-shape, T-shape, Y-shape 	<ul style="list-style-type: none"> • Very easy to clean thanks to chamfered O-ring and reduced number of edges where dirt can accumulate • Optimal price/performance ratio ideal for applications from a single source • Maximum corrosion resistance (corrosion resistance class CRC 4 to Festo standard 940 070) and chemical resistance • High temperature resistance • Stainless steel • Operating medium: compressed air, vacuum, water • Straight design, L-shape, T-shape, Y-shape, push-in bulkhead connector
online: →	npqe	npqr

07 Pneumatic connection technology

Pneumatic fittings >

Barbed fittings

	 Fittings NPCK	 Quick connectors CK
Nominal width	2 ... 6.2 mm	2 ... 11.7 mm
Pneumatic connection 1	Male thread G1/4, G1/8, G3/8, M5	Male thread G1/2, G1/4, G1/8, G3/8, M5
Pneumatic connection 2	For tubing O.D. 10 mm, 4 mm, 6 mm, 8 mm	For tubing O.D. Ø 4 mm, 6 mm, 8 mm, for barbed connector I.D. Ø 13 mm with union nut, 3 mm with union nut, 4 mm with union nut, 6 mm with union nut, 9 mm with union nut
Design	Straight shape	Straight shape
Operating pressure for full temperature range	-0.95 ... 12 bar	-0.95 ... 10 bar
Ambient temperature	-20 ... 120°C	-10 ... 60°C
Cleanroom class	Element installed statically, no meaningful evaluation possible according to ISO 14644-1	Element installed statically, no meaningful evaluation possible according to ISO 14644-1
Suitable for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils	
LABS (PWIS) conformity	VDMA24364-B2-L, VDMA24364-Zone III	VDMA24364-B1/B2-L
Description	<ul style="list-style-type: none"> • Stainless steel design • Food grade see www.festo.com/certificates/NPCK • Fulfils all clean design requirements • Operating medium: compressed air, vacuum, water. Water according to manufacturer's declaration see www.festo.com/certificates/NPCK • Straight shape 	<ul style="list-style-type: none"> • Bulkhead quick connector • Sealing cap for plastic tube fittings and barbed connectors • Multiple distributor • Union nut for CK tube fitting • Operating medium: compressed air, vacuum, (water) • Aluminium, steel, POM or zinc • Straight design, L-shape, T-shape
online: →	npck	ck

Product overview



Tips for cleanroom design

Tips for cleanroom design – which principles are appropriate for automation?

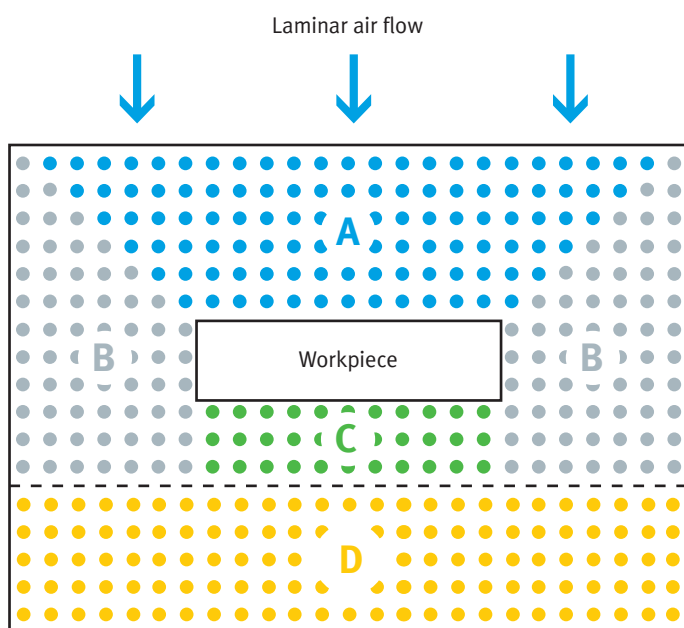
These tips are our recommendations for general and product-specific design principles for machines in cleanroom environments. They should be taken into account when preparing a solution for your application requirements.

We have divided them into three categories:

- 1) General considerations
- 2) Design decisions and product selection
- 3) Important factors for using the products

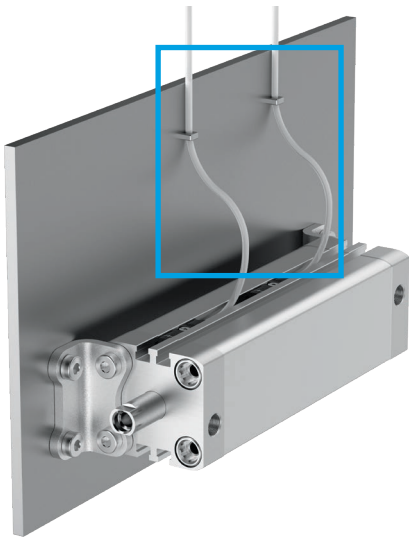
1) General considerations

- Minimise sliding friction as much as possible. For example, use roller guides instead of plain-bearing guides.
- Try to integrate several tasks into one solution. Reduce the number of parts to a minimum and where possible use single parts instead of several parts.
- Other measures:
 - Cover potential particle sources.
 - Enclose all moving parts and isolate them from the workpiece as much as possible.
 - Use a precisely positioned air flow to remove particles.
- Position your automation equipment so any particle emissions will be in non-critical areas.

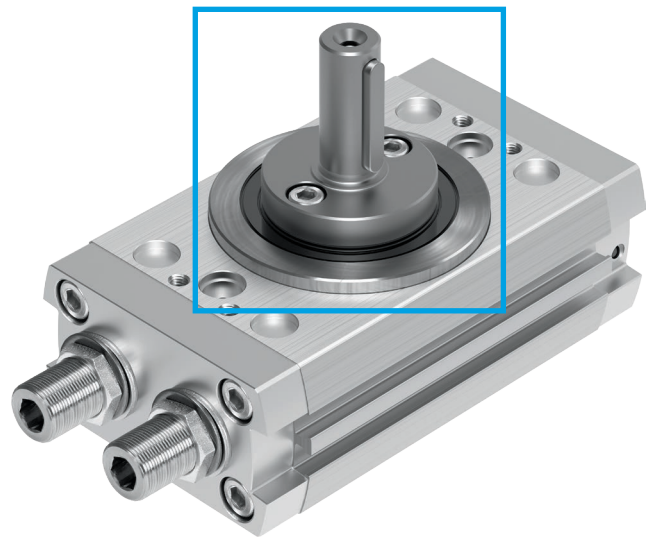


- A) Critical area from which particles can come into contact with the workpiece.
- B) Non-critical area from which particles cannot easily come into contact with the workpiece.
- C) Area in which obstructions to the laminar air flow should be minimised to prevent particles being transferred to the workpiece.
- D) Particles from this area are removed by the laminar air flow and cannot come into contact with the workpiece.

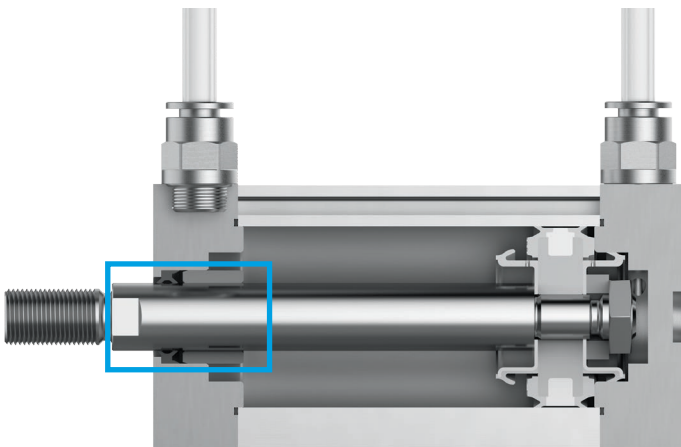
2) Design decisions and product selection



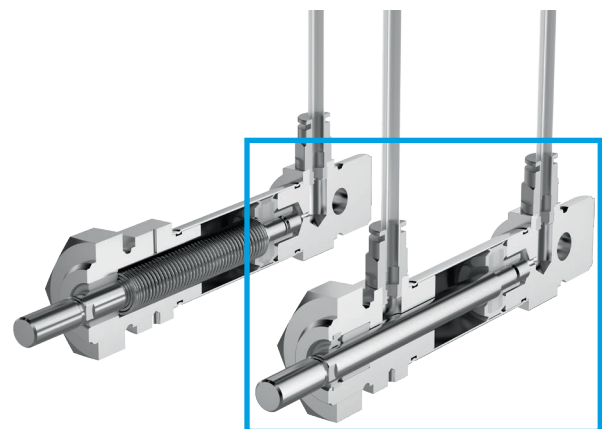
The right wiring and tubing will prevent particle emissions caused by friction.



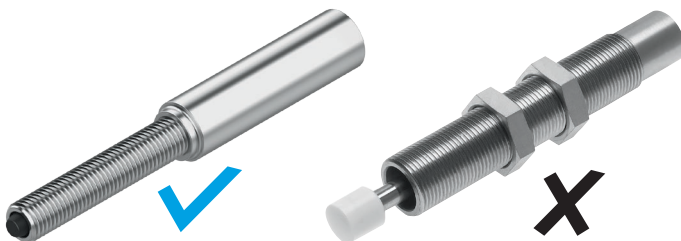
Use rotary drives wherever possible, as they are easier to seal than linear drives.



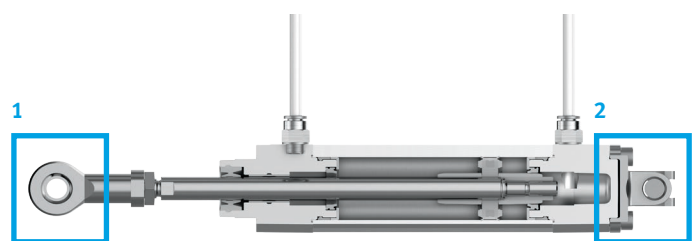
You should avoid high-force impacts in the end position. That's what cylinder cushioning is for. Adjustable and self-adjusting variants PPV and PPS significantly reduce particle emissions.



Use double-acting drives wherever possible. This will prevent increased particle emissions at the exhaust opening and the piston rod seal. Air leaking at the piston rod can be aspirated with an additional vacuum port.

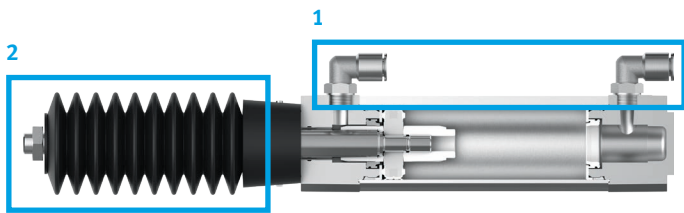


Use polymer shock absorbers. This will eliminate particle emissions from metal abrasion and oil mist, which can occur when using hydraulic cushioning.

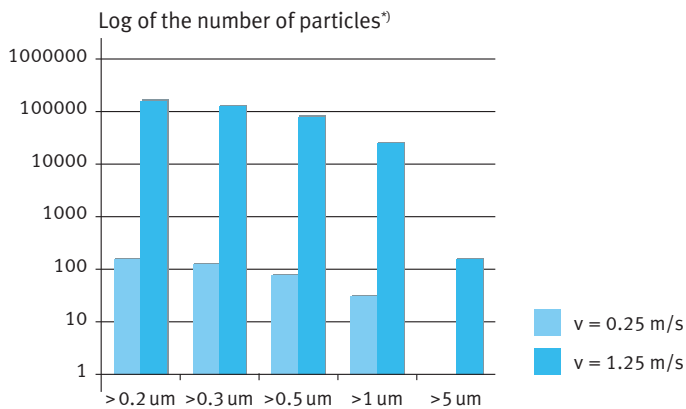


Avoid designs with rod eyes [1], self-aligning rod couplers, rotatable flanges [2] and swivel flanges. These mechanical components generate friction and thus particle emissions that are not taken into account in catalogues and datasheets.

Tips for cleanroom design

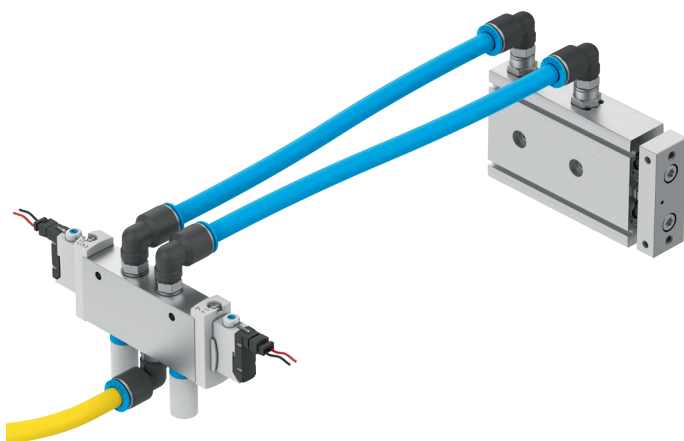


Use push-in fittings [1]. When correctly mounted, they are generally leak-free. Protective bellows [2] prevent the emission of particles, and vacuum ports reliably extract emissions at the piston rod seal.

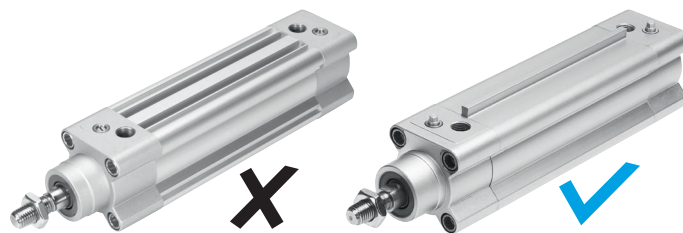


^{*)} Sample measurement at a round cylinder DSNU

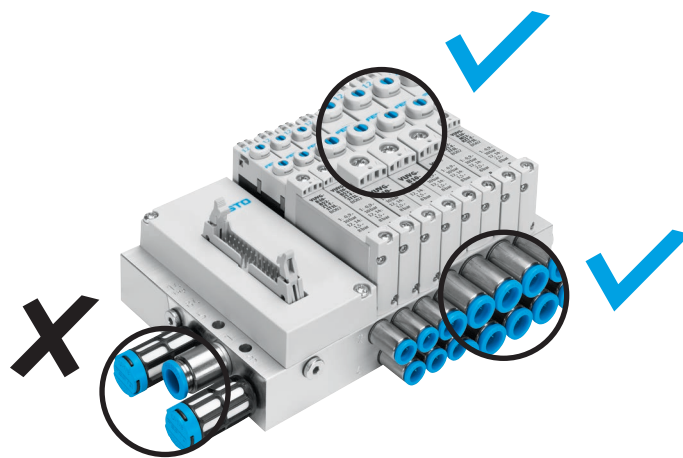
Try to reduce the speed of the drive as much as possible, as this will reduce friction and emissions. Remember that reduced speed means reduced number of particles!



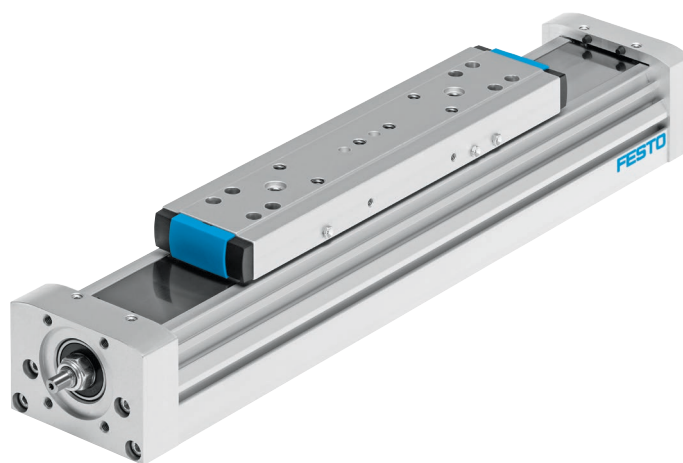
If particle emissions cannot be avoided with conventional operation, then change the operating mode of the cylinder to vacuum.



Use products with smooth surfaces and clean design. This prevents deposits of particles that could be discharged later.

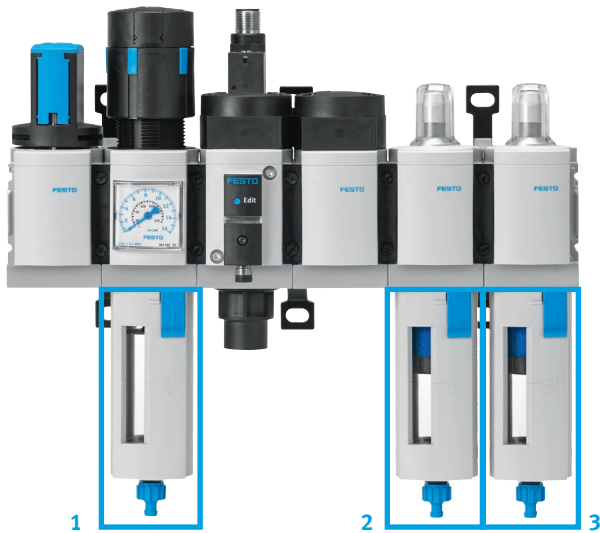


Carefully mount the fittings on the valve terminals, duct the exhaust air and remove it from the clean environment. Do not use silencers.

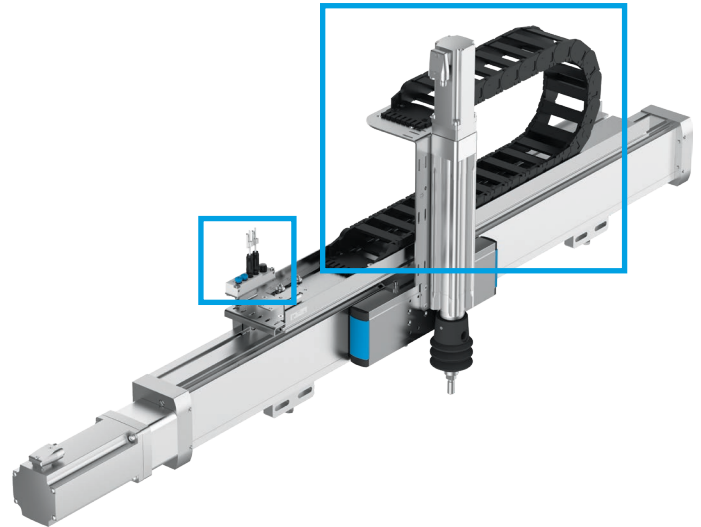


Use spindle axes with internal guides rather than electric drives. Here too, vacuum ports will help to eliminate particle emissions from the working area and improve the cleanroom class.

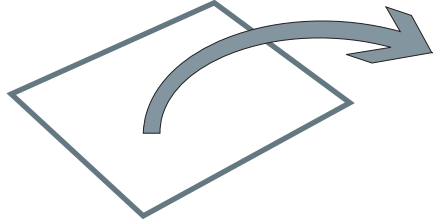
Tips for cleanroom design



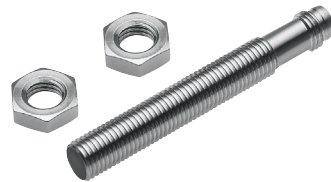
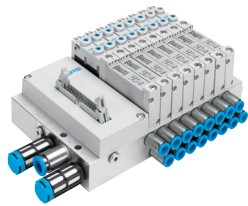
Install a filter cascade to keep the air as pure as possible [1 ... 3], e.g. with 40 µm, 5 µm and 1 µm. In addition, you can use finer filters behind the service unit MS, if necessary.



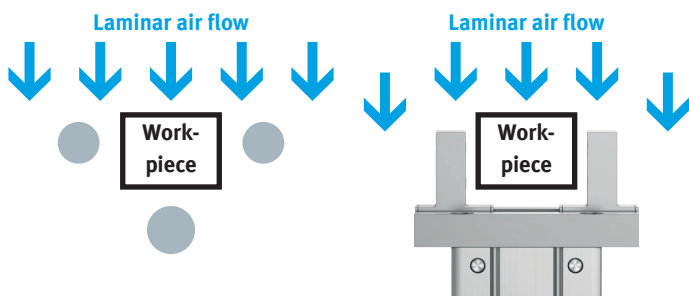
Position handling systems under the workpiece so particles will not fall on the product. Use special energy chains for the cleanroom.



Try to install valve terminals and other control components away from the working area.



Use stainless steel screws, washers and nuts.



Ensure that the laminar air in your design flows from the top to the bottom and position the automation equipment so that the air reaches the product from the side or from below. This will enable an undisturbed air flow; the particles will fall down and not land on the product. This also applies to the grippers.

Tips for cleanroom design

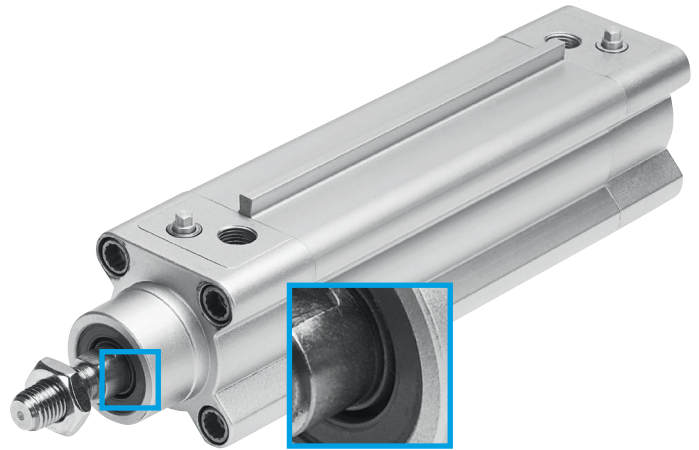
3) Other important factors for using products

General:

Consider potential sources of hydrocarbons or gases released by materials that are used in equipment and processes (cleaning agents, packaging materials etc.).

If necessary, avoid contamination with metal particles, such as copper, zinc and nickel. Festo offers a range of products that contain a reduced amount of these critical metals.

Make sure that there are no unconventional sources of contamination in your production process, such as reaction layers of chemical compounds, hydrocarbons, humidity or other impurities.



Check drives regularly for contamination and clean them. This prevents additional particle emissions.

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