

FESTO

Product overview for battery manufacturing





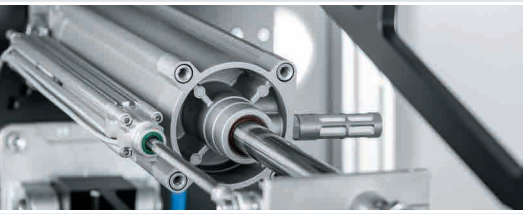
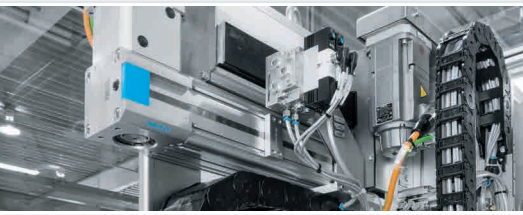
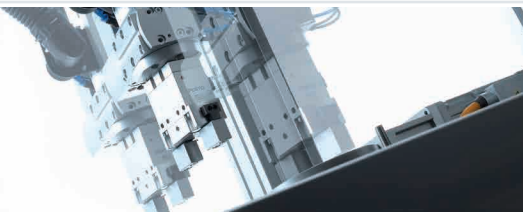
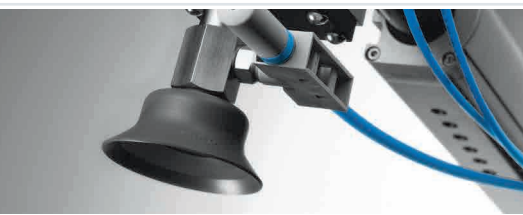




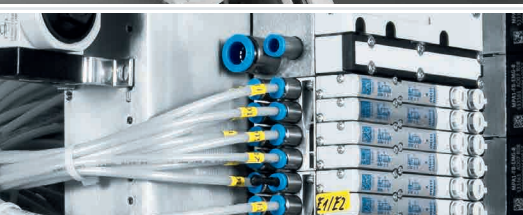
Product overview
for battery manufacturing

Issue 2022/09
All technical data are correct at the time of
going to print.

All content, texts, representations, illustrations
and drawings included in this catalogue are
the intellectual property of Festo SE & Co. KG
and are protected by copyright law. No part of
this publication may be reproduced,
processed, translated or transmitted in any
form or by any means, electronic, mechanical,
photocopying or otherwise, without the prior
written permission of Festo SE & Co. KG.

All technical data are subject to change
according to technical updates.

Festo SE & Co. KG
Postfach
73726 Esslingen
Ruiter Straße 82
73734 Esslingen
Germany

	Editorial	2	⊙
	Pneumatic drives	6	01
	Electric drives	16	02
	Grippers	22	03
	Vacuum technology	28	04
	Valves	32	05
	Valve terminals	36	06
	Sensors	40	07
	Compressed air preparation	48	08
	Pneumatic connection technology	52	09
	Appendix	58	⊙

Festo – the company



The Festo Group

Digitalisation is prompting Festo, the world's leading supplier of automation technology and technical training, to focus its products and services on the smart production of the future. The company therefore also relies on artificial intelligence and machine learning. Established in 1925, this independent family-owned company based in Esslingen a.N., Germany, has been a driving force in automation for over 60 years and its unique offering has made it the world market leader in basic and further technical training.

300,000 customers worldwide in factory and process automation put their trust in the company's pneumatic and electric drive solutions. In addition, Festo Didactic provides state-of-the-art training solutions for around 56,000 industrial companies and educational institutes around the world. The Festo Group achieved sales revenues of €3.36 billion in 2021 and is represented worldwide in 250 locations with a total of 20,700 employees. 7% of its annual turnover is invested in research and development.



At the heart of Europe:

Our Scharnhausen Technology Plant in Germany

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



A central location in the Midwest:

Mason, Ohio/USA

70% of our customers who are supplied by Mason are located within a radius of 1000 kilometres.



In the region for the region:

Jinan/China

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



Festo – your partner for battery production



You produce high-performance batteries.
You need an efficient manufacturing setup.
We offer the right automation solution.

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

The focus is always on you and your specific requirements

Wherever you produce your batteries, Festo is there for you, with the appropriate expertise, the right products and the best service. We have proven ourselves many times over in a multitude of projects for leading battery manufacturers. As a single source supplier for all tasks, we offer an extensive range of copper-free, zinc-free and dry-room-compatible components for battery production.

Product requirements in secondary battery manufacturing

Manufacturing battery cells is a highly sensitive process. On the one hand, the automation components are exposed to challenging ambient conditions such as dry rooms and, on the other hand, they have a direct influence on the quality of the manufactured battery cells due to the emission of particles.



Cleanroom

Products used in cell production must comply with certain cleanliness requirements and in some cases even cleanroom classes in order to minimise the ingress of interfering particles into the production process.

Festo classifies and tests the cleanroom suitability of its products in a standardised procedure in accordance with ISO 14644-14. Cylinders, valves, grippers and drives, all handling, vacuum and compressed air systems, sensors, filters, regulators and fittings from many product series from Festo can be used in ISO class 7 cleanroom environments. Most of them are also suitable for classes 6 and 5, some even for class 4.

Dry room

A dry-room environment with a pressure condensation point of -50°C down to sometimes -80°C is typical for lithium-ion cell production. An appropriate dry-room environment inhibits the hydrophilic tendency of many electrolytes and prevents aggressive hydrofluoric acid from forming through the reaction with atmospheric moisture.

All catalogue products from Festo can be used in the dry room without restriction. This is thanks to the consistent use of water-free lubricants, which do not deteriorate prematurely in dry-room environments and retain their normal lubricating properties. In addition, Festo uses only GRP/CFRP-reinforced polymers in components subject to abrasion and mechanical stress, since their wear and strength are not affected by dry-room environments.

Products free from copper, nickel and zinc

Depending on the application, products in battery cell production must not emit any copper, zinc or nickel particles. Otherwise there is a risk that the quality of the batteries is reduced or even that they are unusable. Festo offers an extensive product range for battery cell production that takes these requirements into account.

Festo has defined an internal guideline for the development of these products, which is binding for the entire company. Its implementation falls under Festo's ISO 9001 certification. Compliance is confirmed by periodic ISO 9001 re-certifications. Battery compliance is specified for all relevant products in the technical data of the catalogue.

Classification	Requirements
F1a	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use.
F5a	Metals with more than 5% by mass of copper, zinc or nickel are excluded from use.

Exceptions from the requirements are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils. In this product overview you will find a summary of the products that meet these criteria.

The fast way: products for battery manufacturing in our Online Shop!

In the Online Shop you will find products for battery production, from copper-, zinc- and nickel-free to dry- and cleanroom compatible according to ISO 14644-1.

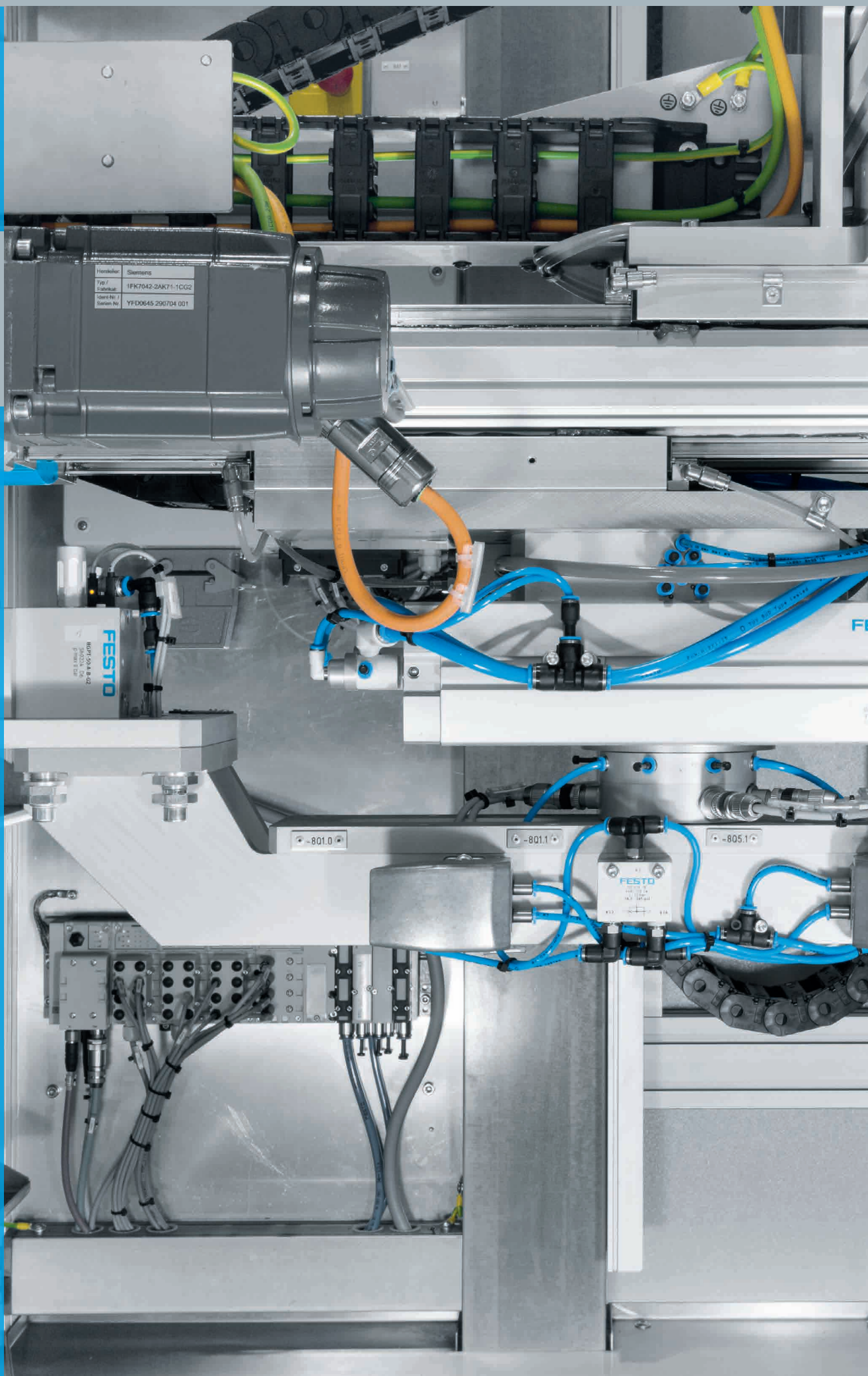
Go to → www.festo.com/onlineshop, click on "product selection" and choose the filter "Battery cell production" under "Specific catalogues" on the left.

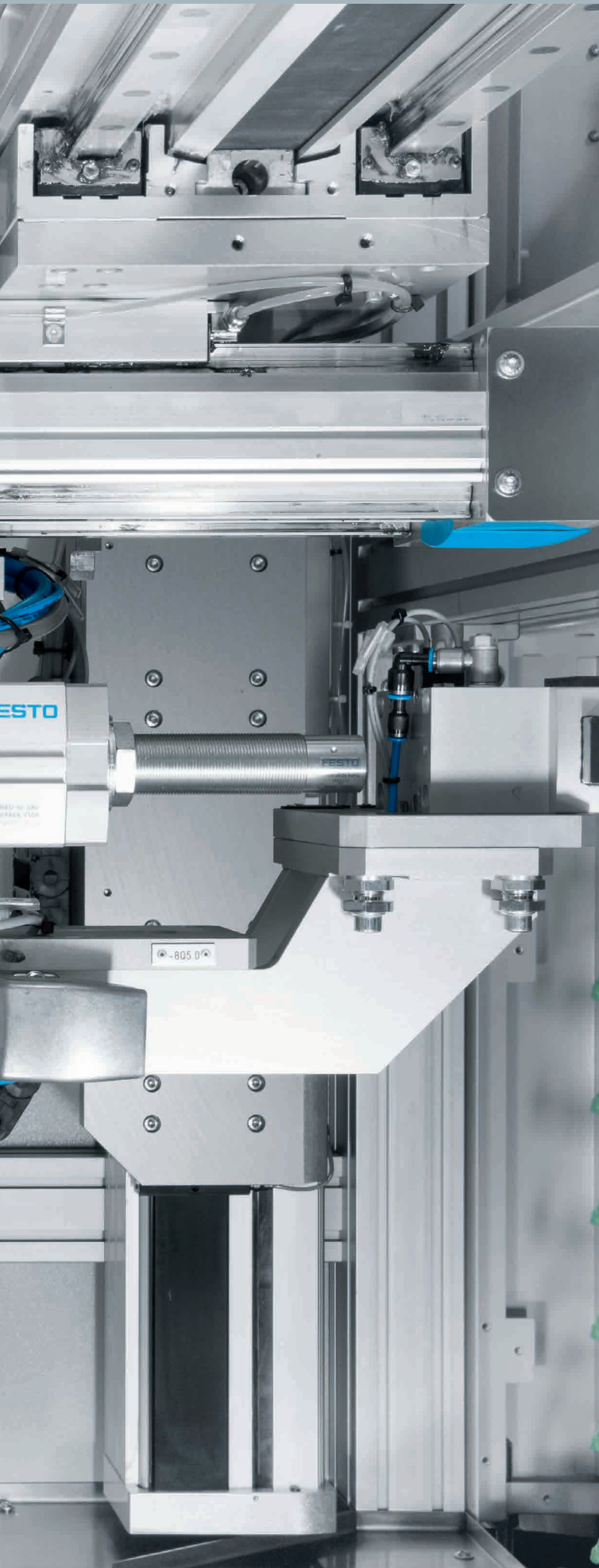
Would you like to find out more about our range of solutions for battery production?

Then visit our website: → www.festo.com/battery

01

Pneumatic drives





Contents

Software tools	8
Round cylinders	9
Tie rod and profile barrel cylinders	10
Compact, short-stroke and flat cylinders	11
Semi-rotary drives with rotary vane	12
Drives with slides	13
Drives with guide rods	13
Clamping modules	14
Accessories for pneumatic drives	14
Customised components – for your specific requirements	15
Telescopic cylinder	15

Product overview

Software tools

01
Pneumatic drives

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 found in their existing compressed air systems, which have generally been in place for years. Up to 60% of energy costs can be saved through optimisation at both the production facility and system level.

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

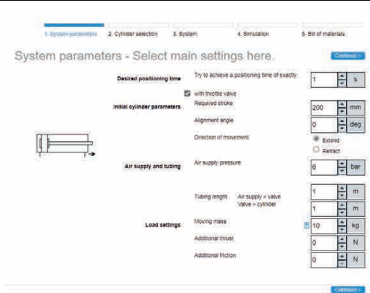
Air consumption of cylinders



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 cylinder >

Round cylinders

	 Standards-based cylinder DSNU	 Round cylinders DSNU	 Round cylinders DSNU-S
Mode of operation	Double-acting	Double-acting	Double-acting
Piston diameter	8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm	32 mm, 40 mm	8 mm, 12 mm, 16 mm, 20 mm, 25 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	30.2 ... 294.5 N	482.5 ... 752.9 N	30.2 ... 294.5 N
Stroke	1 ... 500 mm	1 ... 500 mm	1 ... 200 mm
Cushioning	Elastic cushioning rings/plates at both ends, Self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends, Self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends, Self-adjusting pneumatic end-position cushioning
Suitability 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
Description	<ul style="list-style-type: none"> • ISO 6432 • Wide range of variants for customised applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with female or male thread • For position sensing 	<ul style="list-style-type: none"> • Wide range of variants for customised applications • Good running performance and long service life • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with female or male thread • For position sensing 	<ul style="list-style-type: none"> • Short variant of ISO cylinder DSNU • Quick and easy installation, even in tight spaces • Light weight • Self-adjusting pneumatic end-position cushioning saves time during commissioning and adapts optimally to load and speed changes • Piston rod with male thread • For position sensing • Variants recommended for production systems for manufacturing lithium-ion batteries • Sustainable in production thanks to reduced use of materials
online: →	dsnu	dsnu	dsnu

Product overview

Piston rod cylinder >

Tie rod and profile barrel cylinders





**Standards-based cylinders
DSBC**

Mode of operation	Double-acting
Piston diameter	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
Stroke	1 ... 2800 mm
Cushioning	Pneumatic cushioning, adjustable at both ends, Elastic cushioning rings/plates at both ends, Self-adjusting pneumatic end-position cushioning
Suitability 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
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 lithium-ion batteries
online: →	dsbc

Piston rod cylinder >

Compact, short-stroke and flat cylinders

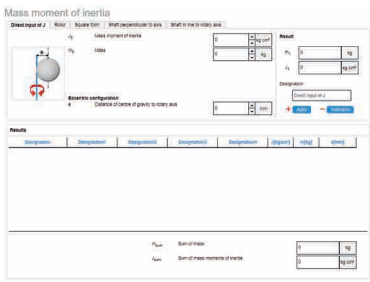
	 <p>Compact cylinders ADN</p>	 <p>Compact cylinder ADN-S</p>
Mode of operation	Double-acting	Double-acting
Piston diameter	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm, 80 mm, 100 mm, 125 mm	6 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	51 ... 7363 N	17 ... 1870 N
Stroke	1 ... 500 mm	5 ... 50 mm
Cushioning	Elastic cushioning rings/plates at both ends, Self-adjusting pneumatic end-position cushioning	Elastic cushioning rings/plates at both ends, No cushioning
Suitability 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
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 lithium-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 lithium-ion batteries • Sustainable in production thanks to reduced use of materials
online: →	adn	adn-s

Product overview

Software tools

01 Pneumatic drives

Mass moment of inertia



Juggling pencils and pocket calculators is now a thing of the past. No matter whether you have discs, blocks, push-on flanges, grippers, etc., this tool does the job of calculating all the mass moments of inertia. Just save, send or print and you're finished.

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

Semi-rotary drives >

Semi-rotary drives with rotary vane



**Semi-rotary drives
DRVS**



Size	6, 8, 12, 16, 25, 32, 40
Theoretical torque at 0.6 MPa (6 bar, 87 psi)	0.15 ... 20 Nm
Permissible mass moment of inertia	6.5 ... 350 kgcm ²
Position sensing	Via proximity switch
Swivel angle	0 ... 270 deg
Suitability 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
Description	<ul style="list-style-type: none"> • Double-acting semi-rotary drive with rotary vane • Lighter than other semi-rotary drives • Fixed swivel angle, adjustable swivel angle possible with the help of accessories • Housing protected against splash water and dust • Sustainable in production thanks to reduced use of materials
online: →	drvs

Drives with guides >

Drives with slides



Mini slides
DGST

Piston diameter	6 mm, 8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 25 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	34 ... 589 N
Stroke	10 ... 200 mm
Cushioning	Short elastic cushioning rings/pads at both ends, Elastomer cushioning, double-sided, stroke not adjustable, Elastic cushioning rings/pads at both ends with fixed stop, External hydraulic cushioning, Elastic cushioning rings/plates at both ends
Position sensing	Via proximity switch
Suitability 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
Description	<ul style="list-style-type: none"> • Powerful twin-piston drive • Shortest mini slide on the market • Precise recirculating ball bearing guide • Versatile mounting options • Version with mirrored supply port configuration and sensor slots for compact assembly available to order using the configurator • Variants recommended for production systems for manufacturing lithium-ion batteries • Sustainable in production thanks to reduced use of materials
online: →	dgst

Drives with guides >

Drives with guide rods



Guided drives
DFM

NEW

Piston diameter	12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 63 mm
Theoretical force at 0.6 MPa (6 bar, 87 psi), advancing	68 ... 1870 N
Stroke	10 ... 200 mm
Cushioning	Elastic cushioning rings/plates at both ends
Position sensing	Via proximity switch
Suitability 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
NEW	<ul style="list-style-type: none"> • New for 01/2022: additional versions
Description	<ul style="list-style-type: none"> • Drive and guide unit in a single housing • High resistance to torques and lateral forces • Plain or recirculating ball bearing guide • Wide variety of mounting and attachment options • Wide range of variants for customised applications • Variants recommended for production systems for manufacturing lithium-ion batteries
online: →	dfm

Product overview

Clamping cylinders >

Clamping modules



Clamping modules
EV

Clamping area	10x30, 15x40, 15x63, 20x75, 20x120, 20x180, Ø40 mm, Ø50 mm, Ø63 mm
Stroke	3 ... 5 mm
Suitability for the production of Li-ion batteries	Metals with more than 5% copper by mass are excluded from use. Exceptions are printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • Compact rodless cylinder with diaphragm • Single-acting, with reset function • Flat design • Hermetically sealed • Pressure plates and foot mounting as accessories
online: →	ev

Cylinder mounting parts and accessories

Accessories for pneumatic drives



Mounting components



Piston-rod attachments



Size	8, 8/10, 12, 12/16, 16, 20, 20/25, 25, 32, 40, 40/50, 50, 50/63, 63, 63/80, 80, 100, 100/125, 125	12, 16, 20, 20/25, 25, 32, 32/40, 40, 50, 50/63, 63, 10x30, 15x40, 15x63, 20x75, 20x120, 20x180, M10, M10x1.25, M12, M12x1.25, M16, M16x1.5, M20x1.5, M27x2, M36x2, M4, M42x2, M48x2, M5, M6, M8
Suitability for the production of Li-ion batteries	Metals with more than 5% copper by mass 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 5% copper by mass are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • Mounting kits • Direct mountings • Foot mountings • Flange mountings • Swivel mountings • Clevis feet, trunnion supports • Multi-position kits • Slot nuts • Centring pins/sleeves 	<ul style="list-style-type: none"> • Rod clevises • Rod eyes • Coupling pieces • Self-aligning rod couplers • Adapter
online: →	n_015001	n_03150

Customised components – for your specific requirements



Drives with customised designs

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

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

Common product modifications:

- Materials for special environmental 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 you:

→ www.festo.com/contact

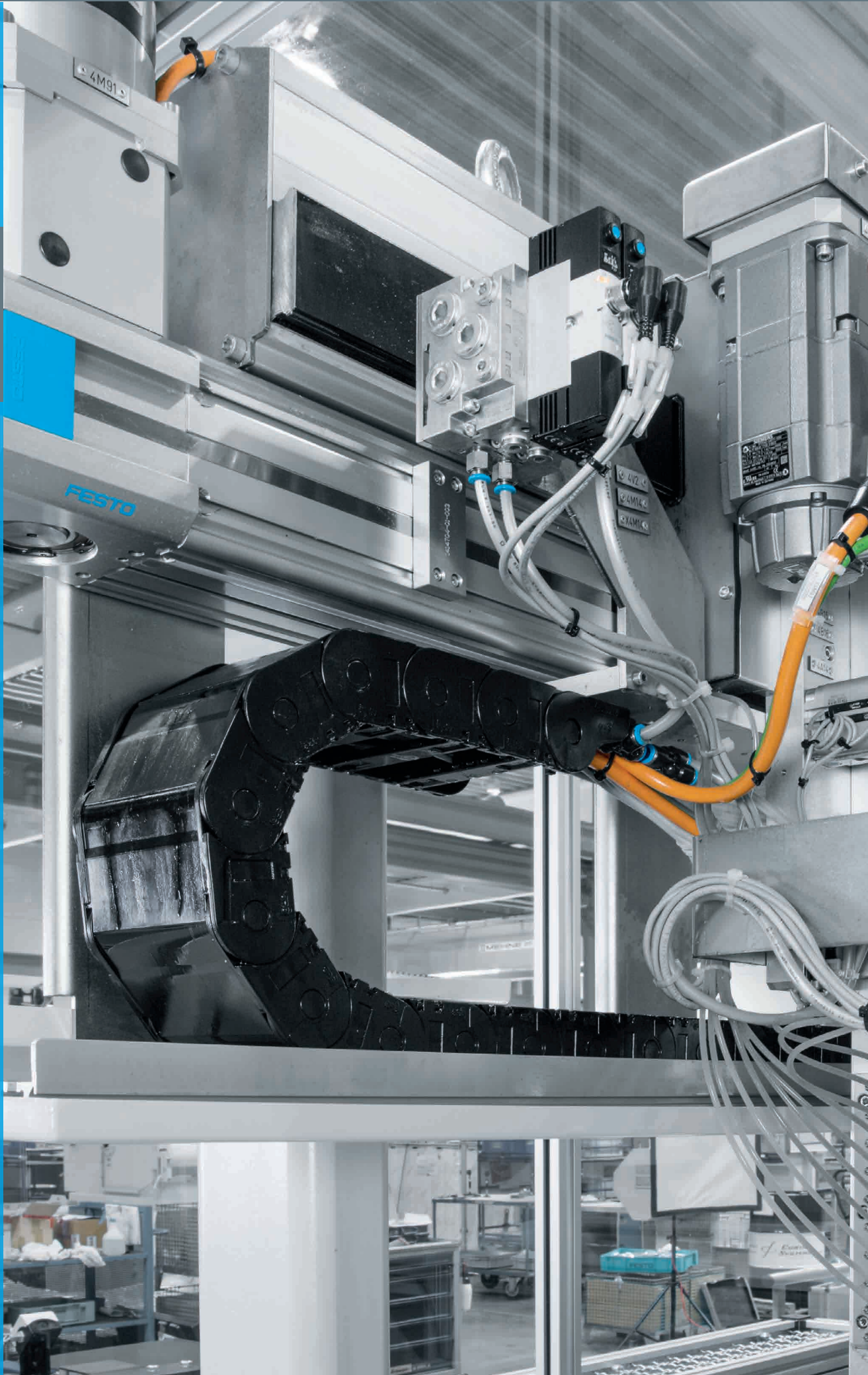
Telescopic cylinder



Festo can also supply special variants like telescopic cylinders on request – please contact us.

02

Electric drives





Contents

Software tools	18
Electric axes	19
Electric cylinders and slides	20
Linear guides	21
Customised components – for your specific requirements	21

Product overview

Software tools

Electric Motion Sizing



Find the right electric or electromechanical servo drive. This is how you can quickly and easily find the right electromechanical drive solution for your application: Electric Motion Sizing, the online sizing and simulation tool for electric drives (servo drives and motors = servo drive package) as well as for electromechanical drive solutions (= electromechanical servo drive package consisting of servo drives and motors as well as mechanics) helps you do this.

This tool can be found at
→ www.festo.com/x/electric-motion-sizing

Simplified Motion Series – Solution Finder



The simplicity of pneumatics is now combined for the first time with the advantages of electric automation thanks to the Simplified Motion Series. These integrated drives are the perfect solution for all users who are looking for an electric alternative for very simple movement and positioning tasks, but don't want the commissioning process for traditional electric drive systems that can often be quite complex.

This tool can be found at
→ www.festo.com/x/simplified-motion-series

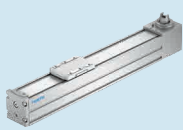


CO2 & TCO Guide



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

Electric axes

	 Toothed belt axes ELGC-TB-KF	 Spindle axes ELGC-BS-KF	 Spindle axes ELGT-BS
Size	45, 60, 80	32, 45, 60, 80	90, 120, 160
Max. feed force Fx	75 ... 250 N	40 ... 350 N	805 ... 1575 N
Repetition accuracy	+/-0.1 mm	+/-0.01 mm, +/-0.015 mm	+/-0.02 mm
Working stroke	200 ... 2000 mm	100 ... 1000 mm	50 ... 1400 mm
Suitability 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
NEW	<ul style="list-style-type: none"> • New for 12/2021: additional versions 	<ul style="list-style-type: none"> • New for 12/2021: additional versions 	
Description	<ul style="list-style-type: none"> • Precision guide rail with high load capacity • Internal guide and toothed belt • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants recommended for production systems for manufacturing lithium-ion batteries 	<ul style="list-style-type: none"> • Internal guide and ball screw drive • Space-saving position sensing • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants recommended for production systems for manufacturing lithium-ion batteries 	<ul style="list-style-type: none"> • Great resilience and rigidity due to double-acting guide • Compact design • With ball screw drive • Optimal ratio between installation space and working space due to the optimised axis design • Simple integration of motors with mounting kits • Optimised for use in the electronics and automotive industry
online: →	elgc-tb	elgc-bs	elgt


Product overview

Electric cylinders and slides

	 Electric cylinder EPCC-BS	 Electric cylinders ESBF	 Mini slides EGSC-BS-KF
Size	25, 32, 45, 60	32, 40, 50, 63, 80, 100	25, 32, 45, 60
Max. feed force F_x	75 ... 1000 N	1000 ... 17000 N	20 ... 250 N
Repetition accuracy	+/-0.02 mm		+/-0.015 mm
Stroke	25 ... 500 mm	30 ... 1500 mm	25 ... 200 mm
Suitability 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
NEW	<ul style="list-style-type: none"> • New for 12/2021: additional versions 		<ul style="list-style-type: none"> • New for 12/2021: additional versions
Description	<ul style="list-style-type: none"> • Low-cost: optimum price/performance ratio • Flexible: wide range of mounting options for the motor • Dynamic: lower internal friction • Non-rotating piston rod with plain-bearing guide, stroke up to 500 mm • Weight-optimised design – ideal for handling systems • Unique: “One-size-down” assembly system for the best use of space in combination with toothed belt/spindle axis ELGC • Variants recommended for production systems for manufacturing lithium-ion batteries 	<ul style="list-style-type: none"> • Available with ball screw drive (size 32 ... 100) or lead screw (size 32 ... 50) • Ball screw: with three spindle pitches for selecting the optimal force-speed ratio • Optional: high corrosion protection, degree of protection IP65, food-safe (see www.festo.com/certificates/ESBF), piston rod extension • Axial or parallel motor mounting • 68 types in stock with short delivery times and modular products for custom variants • Variants recommended for production systems for manufacturing lithium-ion batteries 	<ul style="list-style-type: none"> • Precise guide and ball screw drive • Compact dimensions • Flexible motor mounting • The toothed belt axes, spindle axes ELGC and mini slides EGSC form a scalable modular system for compact automation • Variants recommended for production systems for manufacturing lithium-ion batteries
online: →	epcc	esbf	egsc-bs

Accessories for electric drives >

Linear guides

	 <p>Guide axes ELFC</p>
Size	32, 45, 60, 80
Stroke	100 ... 2000 mm
Guide	Recirculating ball bearing guide
Suitability 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
Description	<ul style="list-style-type: none"> • Driveless linear guide unit with guide and freely movable slide unit • High torsional resistance • Reduced vibrations with dynamic loads
online: →	elfc

Customised components – for your specific requirements

**Drives with customised designs**

Can't find the electromechanical drive you need in our catalogue?

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

Common product modifications:

- Special strokes
- Design for special environmental conditions
- Design optimised for the installation space
- Design with opposing carriages
- Design with absolute encoder

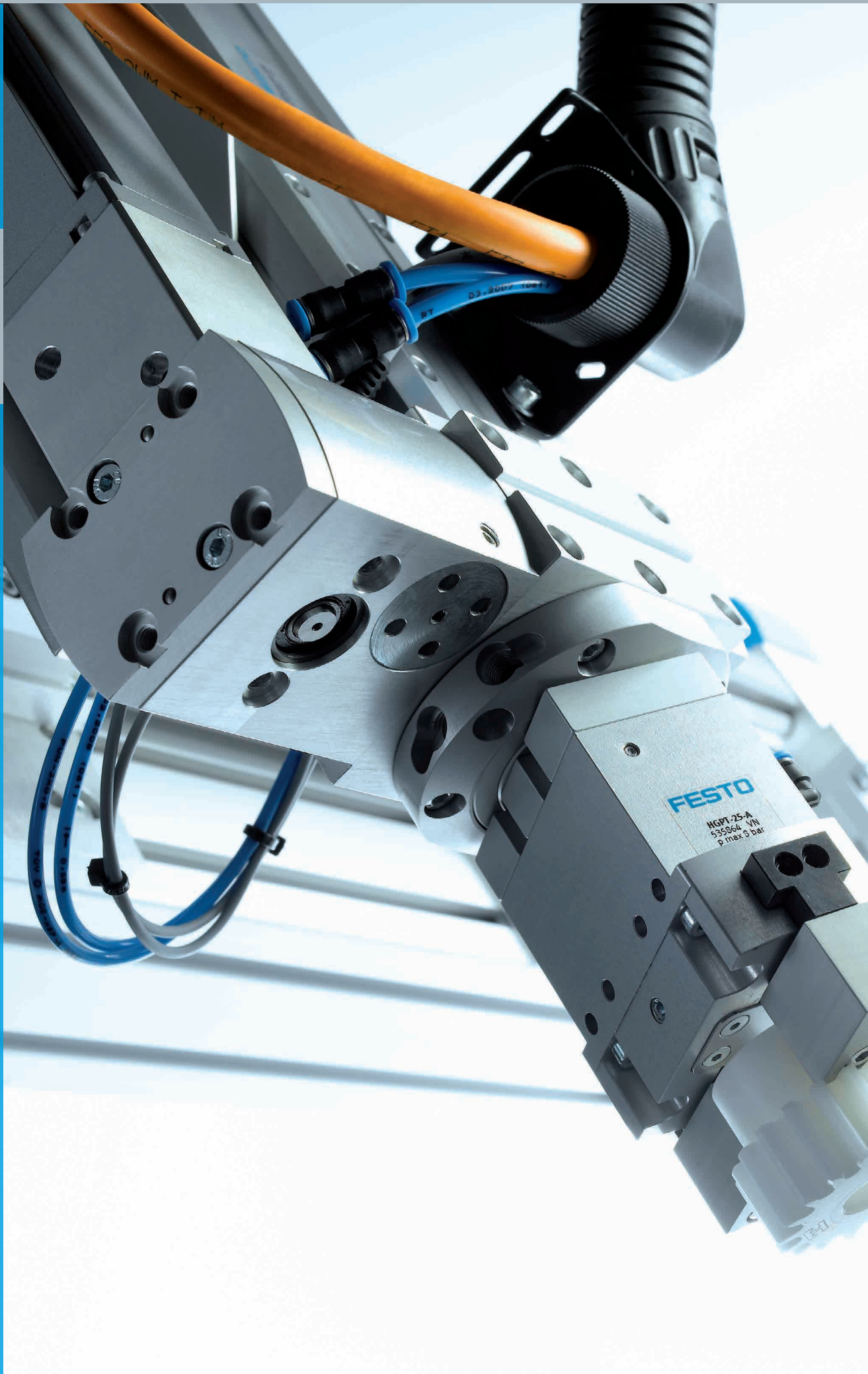
Many additional variants are possible.

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

→ www.festo.com/contact

03

Grippers



Contents

Software tools	24
Parallel grippers	24
Parallel grippers	25
Angle grippers	26
Three-point grippers	26
Radial grippers	27
Accessories for grippers	27

Product overview

Software tools

Product Finder for grippers



A secure grip is a question of the right calculation. In this case, calculation of weight, direction of movement, distances, etc. The software tool immediately determines which type of gripper – parallel, three-point, angle or swivel gripper – and which size best matches your requirements.

- These tools can be found at
- ➔ www.festo.com/x/gripper-parallel
 - ➔ www.festo.com/x/gripper-3-point
 - ➔ www.festo.com/x/gripper-angle
 - ➔ www.festo.com/x/gripper-radial

Mechanical grippers >

Parallel grippers



Parallel gripper
DHPC



Parallel grippers
DHPS



Parallel grippers
HGPD

	Parallel gripper DHPC	Parallel grippers DHPS	Parallel grippers HGPD
Size	6, 10, 16, 20, 25, 32	6, 10, 16, 20, 25, 35	16, 20
Stroke per gripper jaw	2 ... 11 mm	2 ... 12.5 mm	3 ... 4 mm
Total gripping force at 0.6 MPa (6 bar, 87 psi), closing	7.8 ... 442.6 N	25 ... 910 N	94 ... 150 N
Max. force on gripper jaw Fz, static	5 ... 171.5 N	10 ... 450 N	150 ... 250 N
Gripping force backup	During opening, During closing, None	During opening, During closing, None	During opening, During closing, None
Gripper repetition accuracy	0.02 mm	0.02 mm	0.03 mm, 0.04 mm
Position sensing	Via proximity switch	Via Hall sensor, Via proximity switch	Via proximity switch
Suitability 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 5% copper by mass are excluded from use. Exceptions are printed circuit boards, cables, electrical plug connectors and coils	Metals with more than 5% copper by mass are excluded from use. Exceptions are printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • Resilient and precise ball guide • High gripping force and compact size • Max. repetition accuracy • Can be used as a double-acting or single-acting gripper • Single-acting variant or with gripping force retention normally open (NO) or normally closed (NC) • Suitable for external and internal gripping • Wide variety of mounting and attachment options • Sustainable in production thanks to reduced use of materials 	<ul style="list-style-type: none"> • Sturdy and precise T-slot guidance of the gripper jaws • High gripping force and compact size • Max. repetition accuracy • Can be used as a double- and single-acting gripper • Single-acting variant or with gripping force backup, normally open (NO) or normally closed (NC) • Suitable for external and internal gripping • Wide range of adaptation options on the drives 	<ul style="list-style-type: none"> • Ideal for very harsh environments • Precise gripping even at high torque load • Max. gripping force at optimum installation space/force ratio • 8 sizes with total stroke of up to 40 • Can be used as a double- and single-acting gripper • Single-acting variant or with gripping force backup, normally open (NO) or normally closed (NC) • Suitable for external and internal gripping
online: ➔	dhpc	dhps	hgpd

Mechanical grippers >

Parallel grippers



**Parallel grippers, electric
EHPS**

Size	16, 20, 25
Stroke per gripper jaw	10 ... 16 mm
Max. force on gripper jaw Fz, static	200 ... 450 N
Gripper repetition accuracy	0.01 mm, 0.03 mm
Position sensing	Via proximity switch, With Hall sensor, With integrated displacement encoder, Via IO-Link interface
Suitability for the production of Li-ion batteries	Metals with more than 5% copper by mass are excluded from use. Exceptions are printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • Electric version of the pneumatically actuated parallel gripper DHPS • Ideal for use as a front-end actuator thanks to its low dead weight • Controller-free actuation using digital signals • Gripping force (4 settings) adjustable via ratchet switch or via IO-Link® interface • RA1 version with robot connection, enables fast integration in lightweight robot environments
online: →	ehps

Product overview

Mechanical grippers >

Three-point grippers



Three-point grippers
DHDS

Size	16, 32, 50
Stroke per gripper jaw	2.5 ... 6 mm
Total gripping force at 0.6 MPa (6 bar, 87 psi), closing	87 ... 750 N
Gripping force backup	During closing
Gripper repetition accuracy	0.04 mm
Position sensing	Via Hall sensor, Via proximity switch
Suitability for the production of Li-ion batteries	Metals with more than 5% copper by mass are excluded from use. Exceptions are printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • Sturdy and precise T-slot guidance of the gripper jaws • High gripping force and compact size • Max. repetition accuracy • Can be used as a double- and single-acting gripper • Single-acting variant or with gripping force backup, normally closed (NC) • Suitable for external and internal gripping • Wide range of adaptation options on the drives
online: →	dhds

Mechanical grippers >

Angle grippers



Angle grippers
DHWS

Size	10, 16, 25, 32, 40
Total gripping torque at 0.6 MPa (6 bar, 87 psi), closing	30 ... 1362 Ncm
Max. opening angle	40 deg
Gripping force backup	During closing
Gripper repetition accuracy	0.04 mm
Position sensing	Via Hall sensor, Via proximity switch
Suitability for the production of Li-ion batteries	Metals with more than 5% copper by mass are excluded from use. Exceptions are printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • Improved gripper jaw guide • Internal fixed flow control, does away with the need for external flow control in 80% of applications • Slotted guide • Max. repetition accuracy • Can be used as a double- and single-acting gripper • Single-acting variant or with gripping force backup, normally closed (NC) • Suitable for external and internal gripping • Wide range of adaptation options on the drives
online: →	dhws

Mechanical grippers >

Radial grippers



Radial grippers
DHRS

Size	10, 16, 25, 32, 40
Total gripping torque at 0.6 MPa (6 bar, 87 psi), closing	15 ... 660 Ncm
Max. opening angle	180 deg
Gripping force backup	During closing
Gripper repetition accuracy	0.1 mm
Position sensing	Via Hall sensor, Via proximity switch
Suitability for the production of Li-ion batteries	Metals with more than 5% copper by mass are excluded from use. Exceptions are printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • Lateral gripper jaw support for high torque loads • Self-centring • Internal fixed flow control • Max. repetition accuracy • Slotted guide • Can be used as a double- and single-acting gripper • Single-acting variant or with gripping force backup, normally closed (NC) • Wide range of adaptation options on the drives
online: →	dhrs

Accessories for grippers

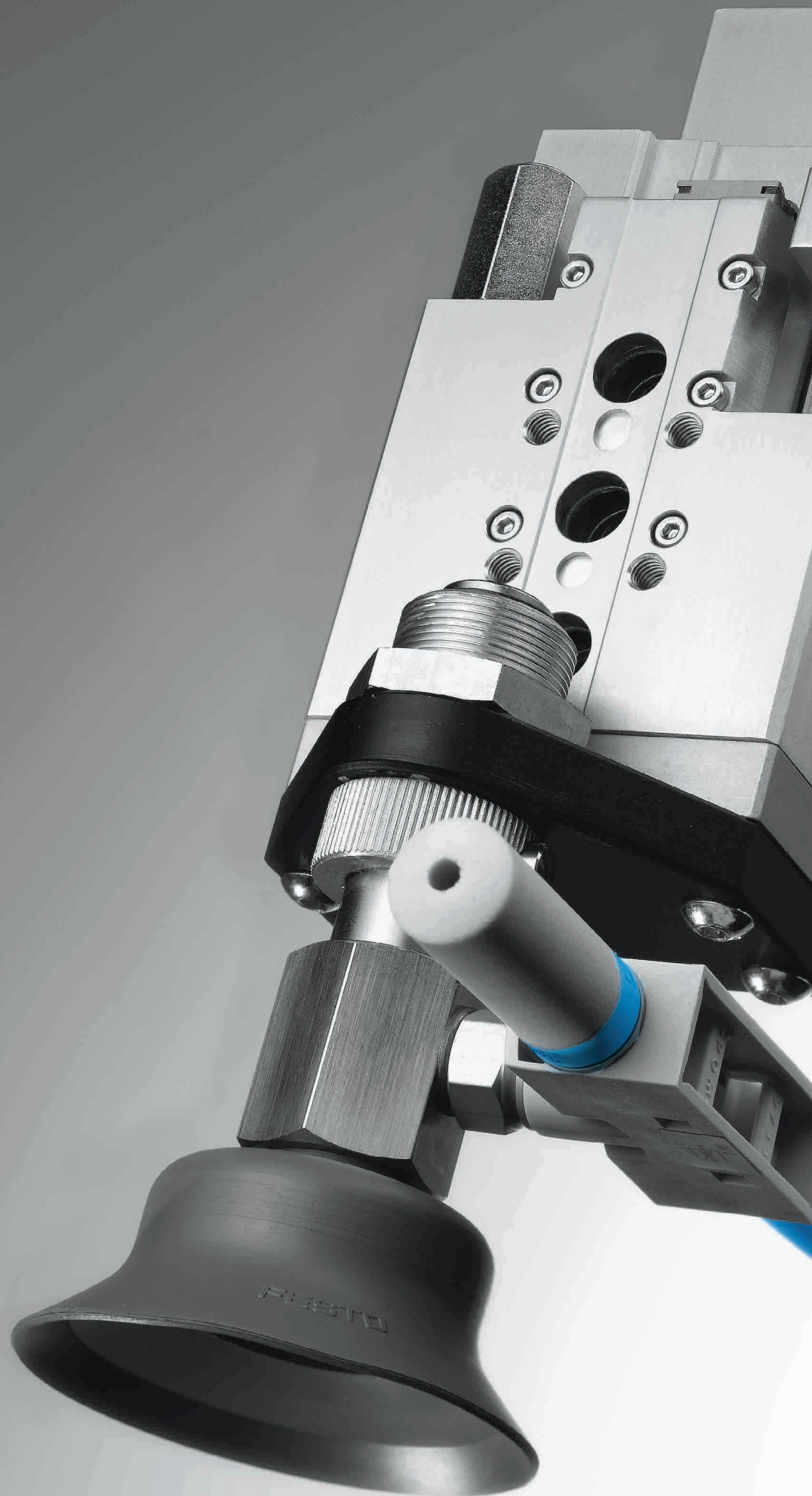


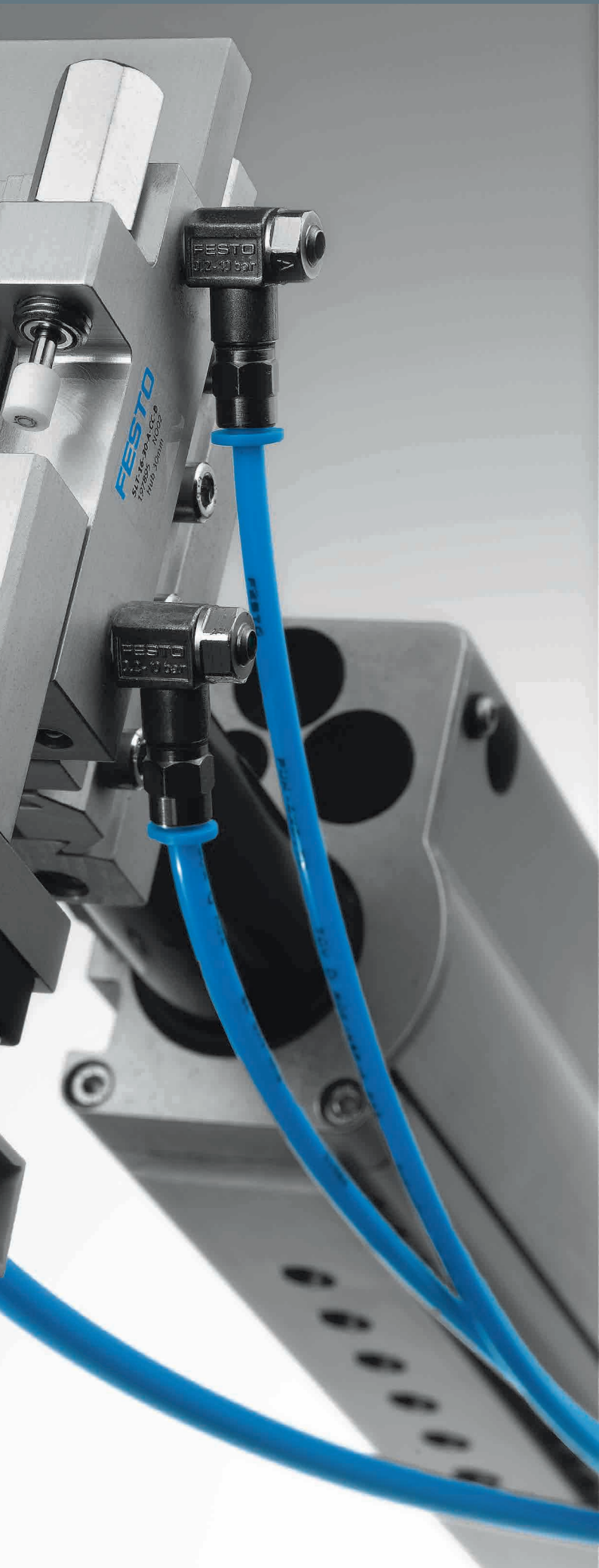
Adaptive gripper fingers
DHAS-GF

Size	60, 80, 120
Suitability 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
Description	<ul style="list-style-type: none"> • Self-adapting to different workpiece shapes • Adaptive gripper fingers for gentle and flexible gripping using the Fin Ray Effect® modelled on a fish's tail fin • For workpiece diameters from 6 to 120 mm
online: →	dhas

04

Vacuum technology





Contents

Software tools	30
Vacuum-specific accessories	30

Product overview

Software tools

Vacuum design



Which suction cup is used for which surface and which movement?
 Don't experiment – calculate!
 The vacuum selection program helps you select the right suction cups, tubing and venturi nozzles. It also calculates the distribution of the forces acting on the individual suction cups, as well as the evacuation time.
 This software tool even enables a distinction to be made between linear and rotary movements.

This tool can be found at
 → www.festo.com/x/vacuum-sizing

Accessories for vacuum >

Vacuum-specific accessories



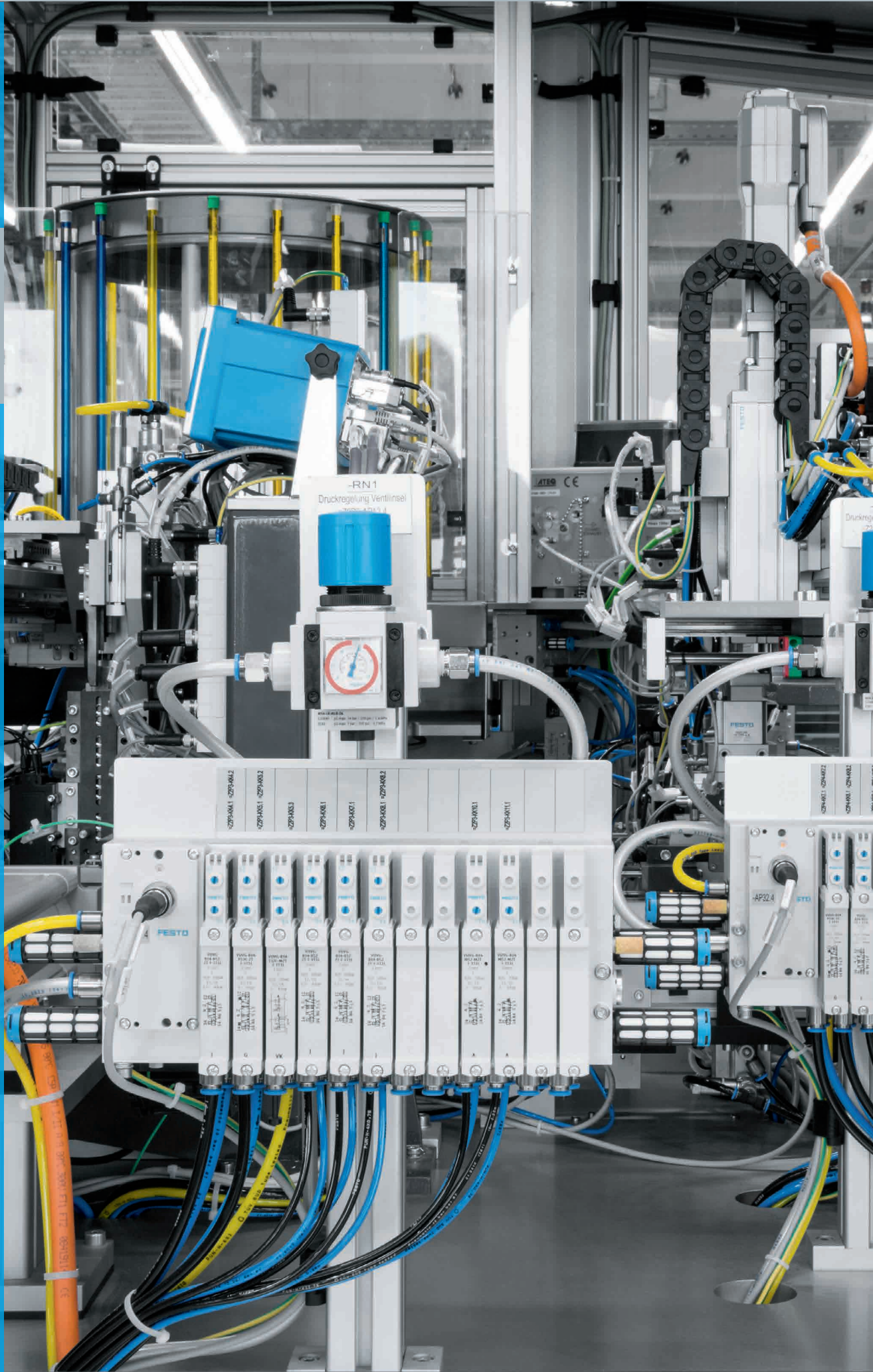
Length compensator
VAL

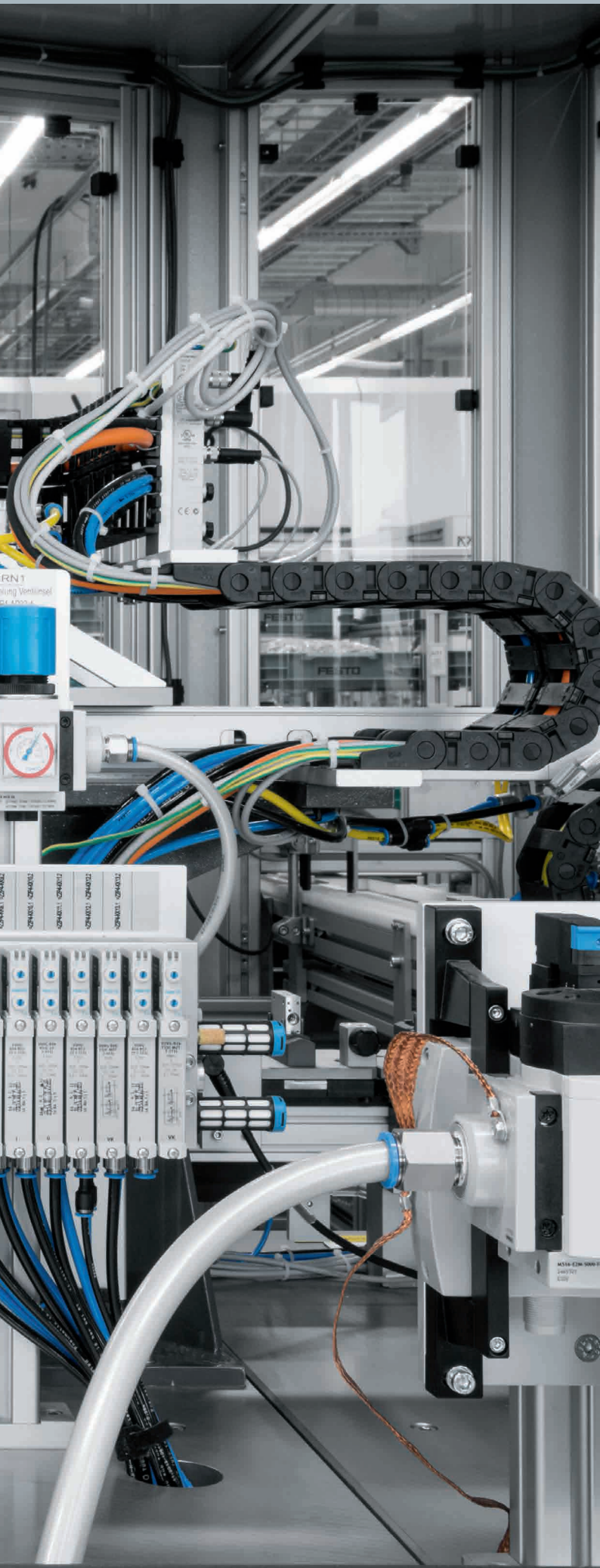


Vacuum connection	M5, G1/8, G1/4
Type of mounting	With male thread M16x1, With male thread M22x1.5, With male thread M26x1.5
Suitability for the production of Li-ion batteries	Metals with more than 1% by mass of copper, zinc or nickel are excluded from use. Exceptions are nickel in steel, chemically nickel-plated surfaces, printed circuit boards, cables, electrical plug connectors and coils
Description	<ul style="list-style-type: none"> • For suction cup VAS/VASB • Vacuum port M5, G1/8, G1/4 • To compensate for a possible excess stroke of the handling device • To compensate for tolerance differences in the workpiece thickness
online: →	val

05

Valves






Contents

Software tools	34
Universal directional control valves	34
One-way flow control valves	35
Customised components – for your specific requirements	35

Product overview

Software tools

Pneumatic dimensioning





Dimension pneumatic control chains quickly and energy-efficiently. In order to survive in the tough competitive environment, many companies are looking for potential savings in their production. They also find these in their compressed air systems and plants, most of which have been in place for years. Up to 60% energy costs can be saved here through optimisation at hall and plant level.

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



Electrically and pneumatically actuated directional control valves >

Universal directional control valves

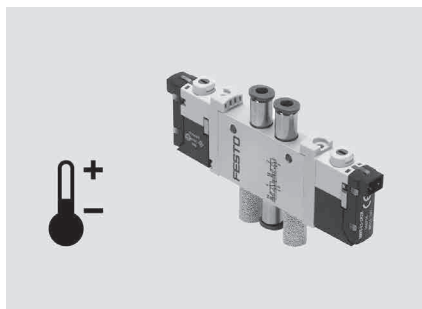
	 Solenoid valves, for individual connection VUUG	 Solenoid valves, plug-in VUUG-T1-F1A ★
Actuation type	Electric	Electric
Pneumatic working port	M5	Flange
Operating pressure [MPa]	0.15 ... 0.7 MPa	-0.09 ... 1 MPa
Operating pressure	1.5 ... 7 bar	-0.9 ... 10 bar
Standard nominal flow rate	180 ... 195 l/min	130 ... 510 l/min
Valve function	2x3/2-way, monostable, closed, 5/2-way, monostable	2x3/2-way, monostable, closed, 2x3/2-way, open, monostable, 2x3/2-way, open/closed, monostable, 5/2 double solenoid, 5/2-way, monostable, 5/3-way, pressurised, 5/3 exhausted, 5/3 closed
Electrical connection	2-pin, Plug pattern H, horizontal connection, Plugs	Via sub-base
Suitability 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
Description	<ul style="list-style-type: none"> • Compact universal valve • Connection technology via electrical connection box (E-box) • High flow rate relative to its size • In-line valves can be used as individual valves or manifold valves 	<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

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</p>
Valve function	Exhaust air one-way flow control function, Supply air one-way flow control function	One-way flow control function
Pneumatic connection 1	QS-10, QS-12, QS-4, QS-6, QS-8	G1/2, G1/4, G1/8, G3/8, M5
Standard nominal flow rate in flow control direction	85 ... 1200 l/min	95 ... 2100 l/min
Adjusting element	Rotary knob with detent	Slotted head screw
Suitability 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
Description	<ul style="list-style-type: none"> • Low-cost solution for standard applications • Simple and reliable adjustment of pneumatic cylinder speed • Extremely easy assembly • Fast commissioning • 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

Customised components – for your specific requirements



Valves with customised designs

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

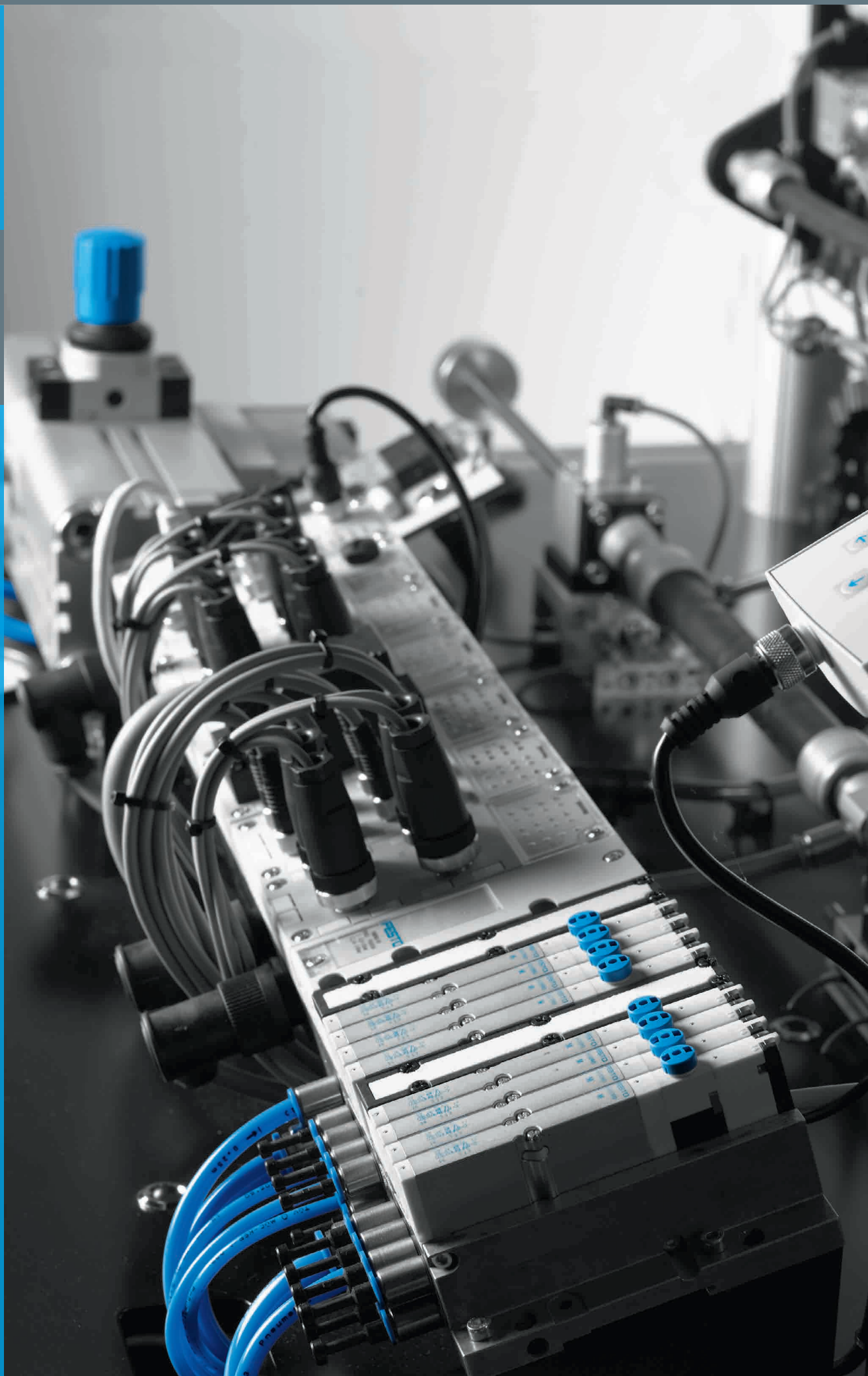
Many additional variants are possible.

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

→ www.festo.com/contact

06

Valve terminals





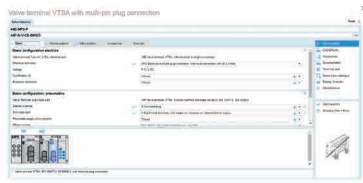
Contents

Software tools	38
Universal valve terminals	38
Customised components – for your specific requirements	39

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 a visual aid for selecting the correct product features.

- You can find the configurator for your product
1. at www.festo.com/catalogue/ventilinsel
 2. Select the product you want
 3. Click on the blue „Configure product“ button

Universal valve terminals



**Valve terminal with multi-pin, fieldbus interface
VTUG-F1A**

Valve size	10 mm, 14 mm
Valve function	5/3 closed, 2x3/2-way, monostable, closed, 2x3/2-way, open/closed, monostable, 5/3-way, pressurised, 5/2 double solenoid, 2x3/2-way, open, monostable, 3/2 open, single solenoid, 5/2-way, monostable, 3/2-way, closed, monostable, 5/3 exhausted
Max. standard nominal flow rate	330 l/min at 10 mm, 630 l/min at 14 mm
Max. no. of valve positions	24
Max. no. of pressure zones	13
Electrical actuation	AP interface, I-Port, IO-Link®, Multi-pin plug
Valve terminal design	Fixed grid
Suitability 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
Description	<ul style="list-style-type: none"> • Recommended for production systems for manufacturing lithium-ion batteries • Low-cost fixed grid • Extremely easy assembly • Exchangeable electrical control • IO-Link® capable • Part of the VG series • Energy-efficient thanks to reverse operation and targeted pressure reduction
online: →	vtug-f1a

Customised components – for your specific requirements



Valve terminals with customised designs

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

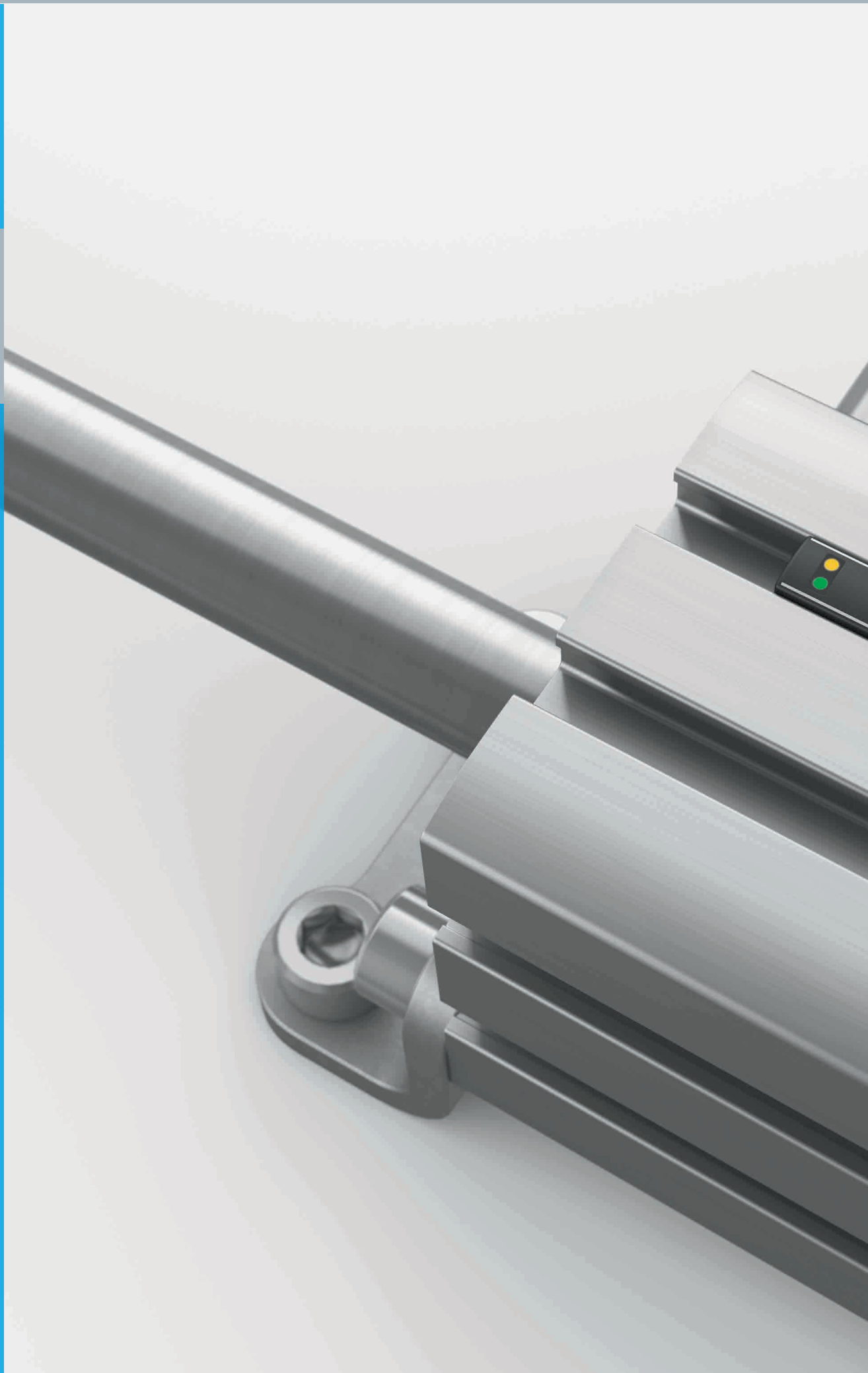
Many additional variants are possible.

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

→ www.festo.com/contact

07

Sensors





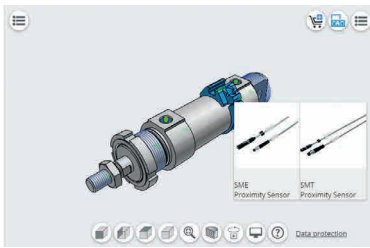
Contents

Software tools	42
Proximity switches for T-slot	42
Proximity switches for round slot	43
Inductive sensors	43
Pressure and vacuum sensors	44
Flow sensors	45

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 >

Proximity switches for T-slot

	 Proximity sensors SDBT-MSX	 Proximity sensors SMT-8M-A	 Proximity sensors SDBT-MSB	 Proximity sensors SMT-8G
Electrical connection, connection type	Cable	Cable	Cable	Cable
Electrical connection, connection technology	Open end	Open end	Open end	Open end
Operating voltage range DC	10 ... 30 V	5 ... 30 V	10 ... 30 V	10 ... 30 V
Switching element function	N/C or N/O contact, switchable	N/C contact, N/O contact	N/O contact	N/O contact
Switching output	PNP/NPN, switchable	NPN, PNP, Non-contacting, 2-wire	NPN, PNP, Non-contacting, 2-wire	NPN, PNP
Suitability 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	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
NEW	• New product, 04/2022			
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 Insertable in the slot from above, screw-clamped LED status indicator Cable length 0.3 ... 5 m 	<ul style="list-style-type: none"> Measuring principle: magneto-resistive For universal use Individually configurable or pre-assembled Inserted in the slot from above, flush with the cylinder profile LED switching status indication LED operating reserve indication Cable length 0.1 ... 30 m 	<ul style="list-style-type: none"> Measuring principle: magneto-resistive Insertable in the slot from above, screw-clamped LED switching status indication Cable length 0.3, 2 m 	<ul style="list-style-type: none"> Measuring principle: magneto-resistive SMT-8G: design ideal for gripper sensing Insertable in the slot lengthwise or from above LED switching status indication Cable length 0.3, 2.5, 5 m
online: →	sdbt	smt-8m	sdbt	smt-8g

Proximity switches >

Proximity switches for round slot

	 Proximity switch SMT-10M	 Proximity sensor SDBC-MSB	 Proximity switch SMT-10G
		★	
Electrical connection, connection type	Cable	Cable	Cable
Electrical connection, connection technology	Open end	Open end	Open end
Electrical connection, number of pins/wires	2, 3	2, 3	3
Operating voltage range DC	5 ... 30 V	10 ... 30 V	10 ... 30 V
Switching element function	N/O contact	N/O contact	N/O contact
Switching output	NPN, PNP, Non-contacting, 2-wire	NPN, PNP, Non-contacting, 2-wire	NPN, PNP
Suitability 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
Description	<ul style="list-style-type: none"> • Measuring principle: magneto-resistive • For universal use • Individually configurable or pre-assembled • Inserted in the slot from above, flush with the cylinder profile • LED switching status indication • Cable length 0.3, 2.5 m 	<ul style="list-style-type: none"> • Measuring principle: magneto-resistive • Insertable in the slot from above, screw-clamped • LED switching status indication • Cable length 0.3, 2 m 	<ul style="list-style-type: none"> • Measuring principle: magneto-resistive • SMT-10G: design ideal for gripper sensing • Insertable in the slot lengthwise or from above • LED switching status indication • Cable length 0.3, 2.5 m
online: →	smt-10M	sdbc	smt-10

Product overview




Inductive sensors



**Proximity switch
SIES-8M**

Size	Slot 8
Switching output	NPN, PNP
Switching element function	N/C contact, N/O contact
Operating voltage range DC	10 ... 30 V
Suitability 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
Description	<ul style="list-style-type: none"> • Ideally suited for position sensing for electric axes and grippers with T-slot • Flush mounting • Switching status indication with 2 LEDs for better visibility regardless of the direction from which it is approached • Single inductive sensor for 8 slot with patented LED status indicator
online: →	sies

Pressure and vacuum sensors

	 Pressure sensors SPAN	★  Pressure sensors SPAE	 Pressure transmitters SPTe
Pressure measuring range [MPa]	-0.1 ... 1 MPa	-0.1 ... 1 MPa	-0.1 ... 1 MPa
Pressure measuring range	-1 ... 10 bar	-1 ... 10 bar	-1 ... 10 bar
Pressure measuring range [psi]	-14.5 ... 145 psi	-14.5 ... 145 psi	-14.5 ... 145 psi
Switching element function	N/C or N/O contact, switchable	N/C contact, N/O contact, Switchable	
Switching output	2 x PNP or 2 x NPN, switchable, PNP/NPN, switchable	PNP/NPN, switchable	
Pneumatic connection	Female thread G1/8, M5, For tubing O.D. 4 mm, Male thread G1/8, R1/8	Cartridge 10 mm, Push-in sleeve QS-4, QS-6	Cartridge 10 mm, Push-in sleeve QS-4, QS-6
Electrical connection		3-wire, Cable, Open end	3-wire, Cable, Open end
Display type	Illuminated LCD	LED indicator, 2-digit	
Suitability 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
Description	<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 30x30 mm • High-contrast display with blue backlight 	<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 (replicating function) • Communication interface 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 mounting
online: →	span	spae	spte

Product overview

Flow sensors



**Flow transmitters
SFTE**



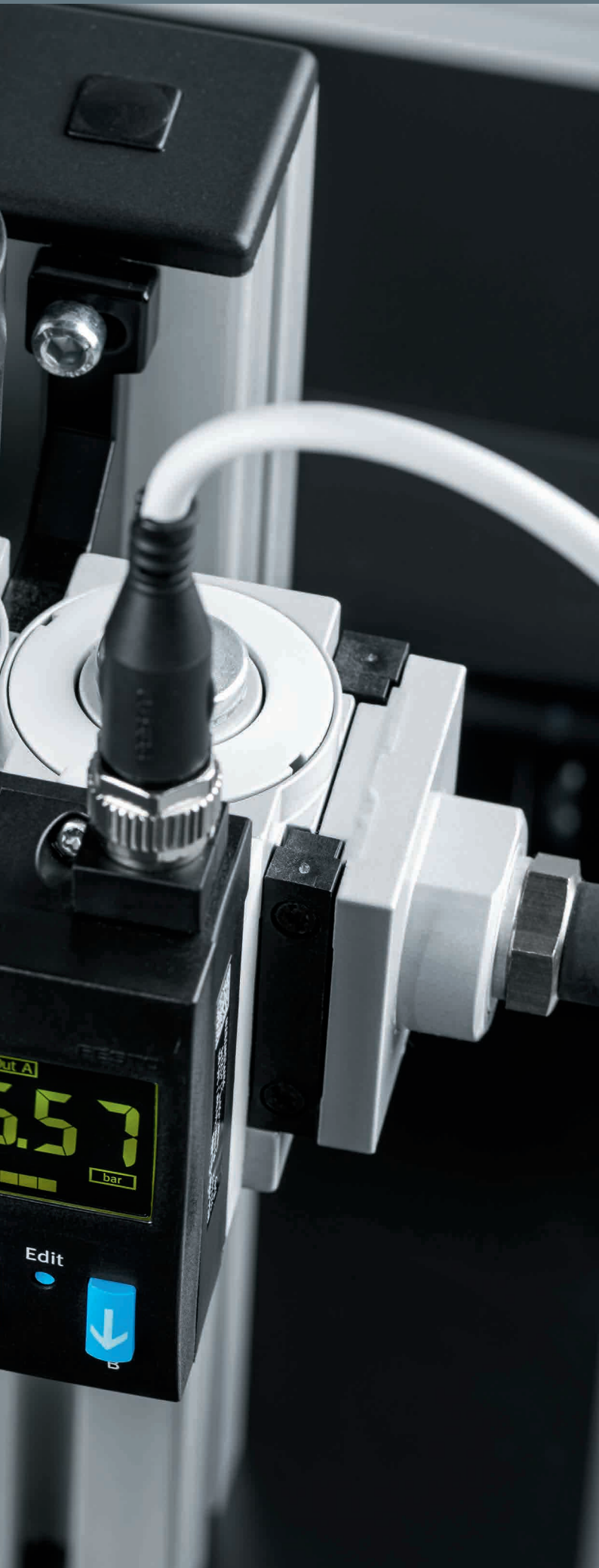
**Flow sensors
SFAH**

Flow measuring range	0 ... 10 l/min	0.002 ... 200 l/min
Operating medium	Nitrogen, Compressed air ISO 8573-1:2010 [6:4:4]	Argon, Nitrogen, Compressed air ISO 8573-1:2010 [6:4:4]
Operating pressure	-0.9 ... 10 bar	-0.9 ... 10 bar
Pneumatic connection	Female thread M5	Female thread G1/4, G1/8, For tubing O.D. 4 mm, 6 mm, 8 mm
Switching output		2 x PNP or 2 x NPN, switchable
Electrical connection, connection type	Cable	Plugs
Electrical connection, connection technology	Open end	Connection pattern L1, M8x1, A-coded, to EN 61076-2-104
Suitability 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
Description	<ul style="list-style-type: none"> • Compact design • Universal flow detection • Simple installation • Reliable pick & place application for extremely small workpieces 	<ul style="list-style-type: none"> • Process air, compressed air, forming gas consumption and pneumatic object monitoring, handling ultra-small parts, leak test • Compact design 20x58 mm • Clear 2-line display • Mounting: H-rail mounting, wall or surface mounting, front panel mounting • Serial communication integrated using IO-Link® 1.1
online: →	sfte	sfah

08

Compressed air preparation




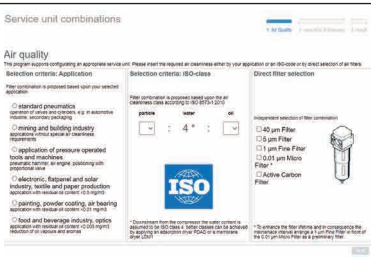


Contents

Software tools	50
MS basic series	50
Customised components – for your specific requirements	51

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

Pressure regulators >

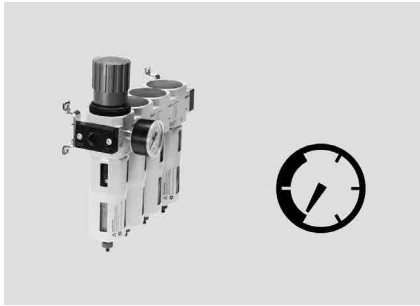
MS basic series



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

Pneumatic connection 1	M5, QS-6
Standard nominal flow rate	170 ... 350 l/min
Pressure regulation range	0.5 ... 7 bar
Operating pressure [MPa]	0.1 ... 1 MPa
Operating pressure	1 ... 10 bar
Suitability 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
Description	<ul style="list-style-type: none"> • Competitively priced basic component focused on the most important technical functions • Lightweight and sturdy thanks to modern polymer materials • Compatible with the MS series for the ideal combination of low-cost basic functionality and high-end functional requirements • Stable control response • With or without pressure gauge • Rotary knob with latch • With integrated secondary exhausting and primary exhausting with return flow function • MS2: Directly operated diaphragm regulator • MS4, MS6: directly actuated piston regulator • Grid dimension 25, 40, 62 mm (sizes 2, 4, 6) • Sustainable operation thanks to reduced pressure level
online: ➔	ms-lr-b

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

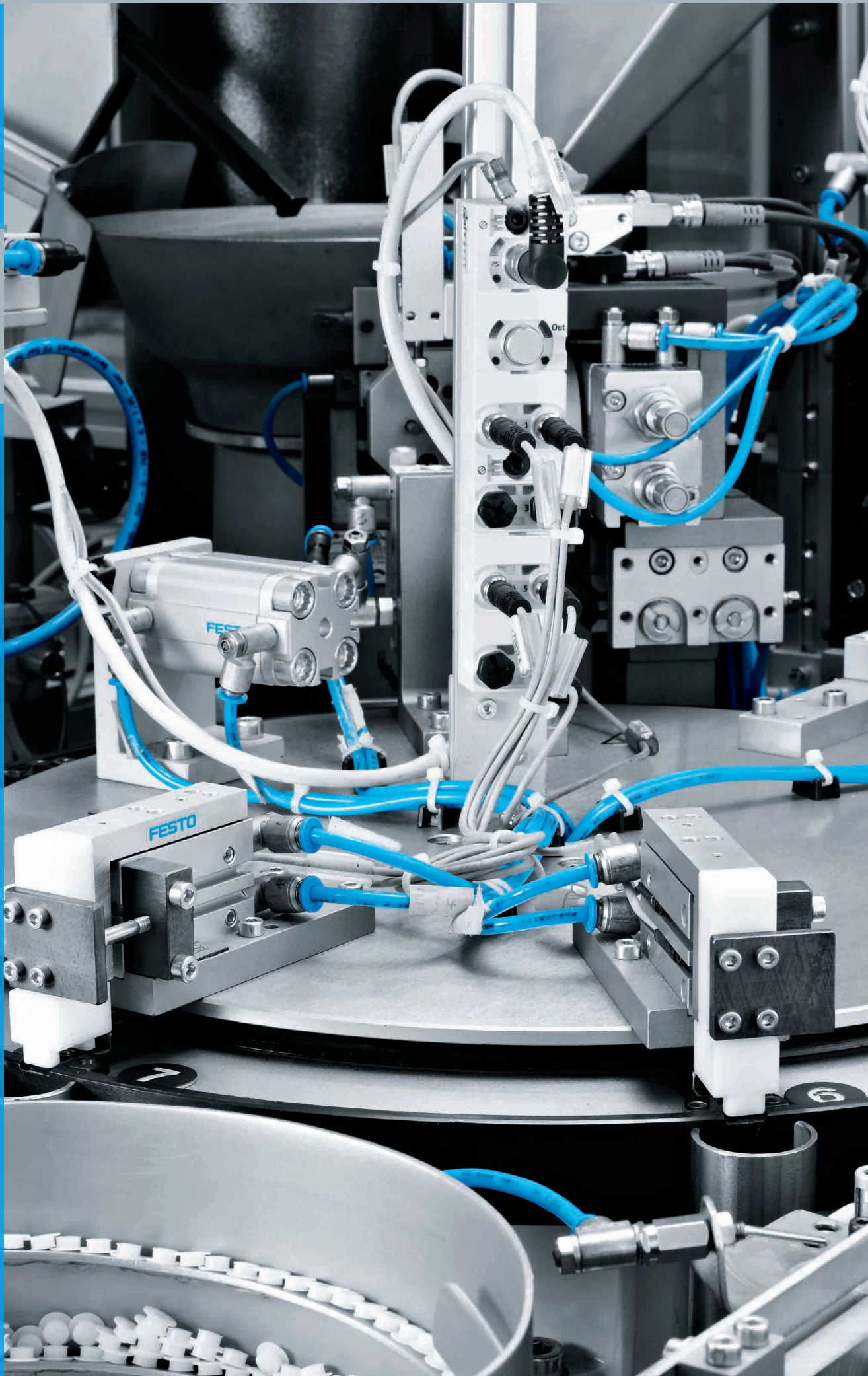
Many additional variants are possible.

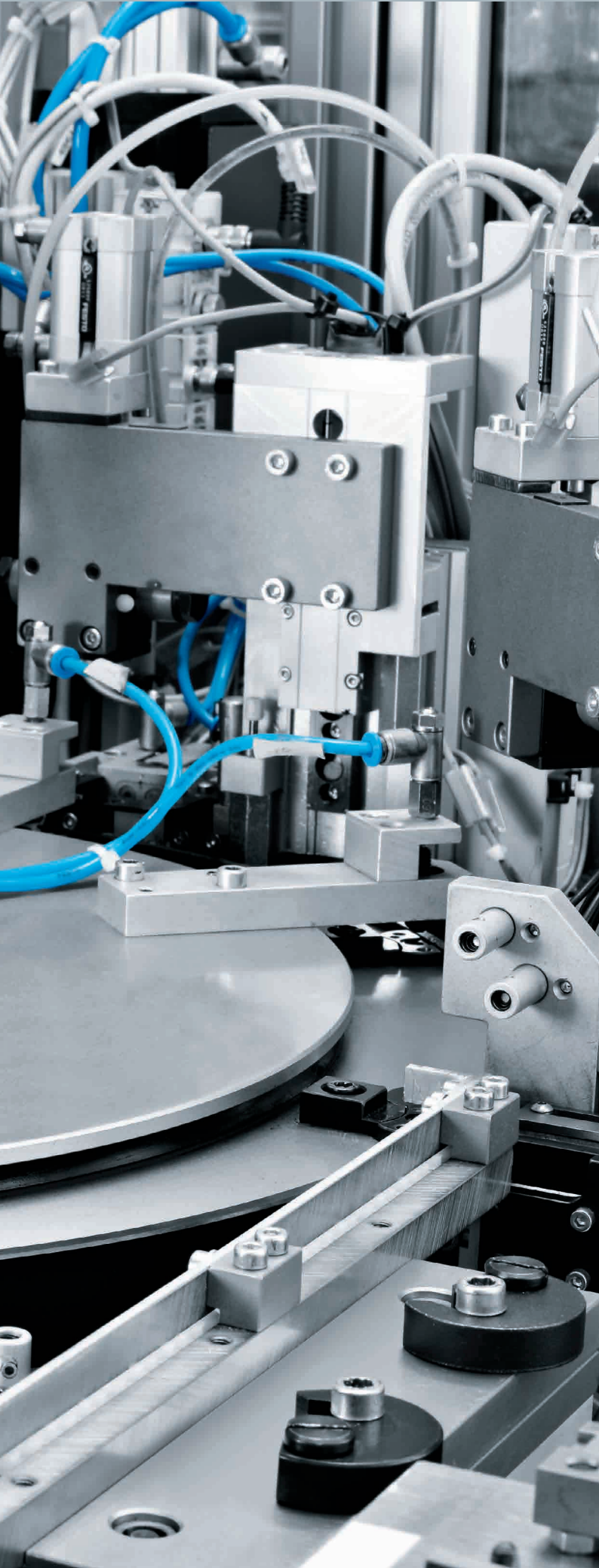
Ask your Festo sales engineer, who will be happy to help you:

→ www.festo.com/contact

09

Pneumatic connection technology



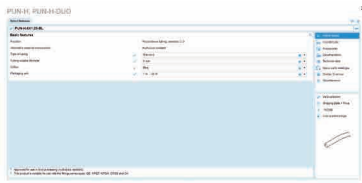



Contents

Software tools	54
Standard O.D. tubing	54
Push-in fittings	55
Barbed fittings	55
Threaded fittings	56


Product overview

Software tools

<p>Configurator for tubing</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. You will find the configurator for your desired product</p> <ul style="list-style-type: none"> • at www.festo.com/catalogue/tubing • Select your desired product • Click on the blue „Configure product“ button
<p>Festo Design Tool 3D</p>		<p>The Festo Design Tool 3D is a 3D product configurator for generating specific CAD product combinations from Festo.</p> <p>The configurator makes your search for the right accessory easier, more reliable and faster.</p> <p>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.</p> <p>This considerably reduces your bill of materials, and downstream processes such as product ordering, order picking and assembly are significantly simplified.</p> <p>This tool can be found at → www.festo.com/x/festo-design-tool</p>

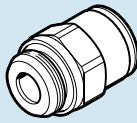
Tubing >

Standard O.D. tubing

	 <p>Plastic tubing PUN-H, PUN-H-DUO</p>	★
<p>Outside diameter</p>	<p>3 ... 16 mm</p>	
<p>Inside diameter</p>	<p>2.1 ... 11 mm</p>	
<p>Temperature-dependent operating pressure [MPa]</p>	<p>-0.095 ... 1 MPa</p>	
<p>Temperature-dependent operating pressure</p>	<p>-0.95 ... 10 bar</p>	
<p>Temperature-dependent operating pressure [psi]</p>	<p>-13.775 ... 145 psi</p>	
<p>Ambient temperature</p>	<p>-35 ... 60°C</p>	
<p>Suitability for the production of Li-ion batteries</p>	<p>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</p>	
<p>Description</p>	<ul style="list-style-type: none"> • Polyurethane • High resistance to microbes and hydrolysis • Food grade see www.festo.com/certificates/PUN_H • Suitable for use with energy chains • Clean room-compatible combination with fitting NPKA • Also available as DUO plastic tubing • Operating medium: compressed air, vacuum, water 	
<p>online: →</p>	<p>pun-h</p>	

Fittings >

Push-in fittings



NEW

Push-in fittings/connectors
NPQE-F1A

Pneumatic connection 1	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm, Male thread G1/4, G1/8, M3, M5, M7, R1/4, R1/8
Pneumatic connection 2	For tubing O.D. 10 mm, 12 mm, 4 mm, 6 mm, 8 mm
Operating pressure for entire temperature range	-0.95 ... 8 bar
Ambient temperature	-5 ... 60°C
Suitability 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
NEW	<ul style="list-style-type: none"> • New product, 11/2021
Description	<ul style="list-style-type: none"> • Economical push-in fittings for pneumatic applications • Recommended for production facilities for manufacturing of lithium-ion batteries • Tapered thread in accordance with JIS B0203 and compatible with pressure-tight media to DIN EN 10226 • Operating medium: compressed air, vacuum
online: →	npqe

Fittings >

Barbed fittings





Quick connectors
NPCK

Nominal size	2 ... 6.2 mm
Pneumatic connection 1	Male thread G1/4, G1/8, G3/8, M5
Pneumatic connection 2	For tubing O.D. 10 mm, 4 mm, 6 mm, 8 mm
Operating pressure for entire temperature range	-0.95 ... 12 bar
Ambient temperature	-20 ... 120°C
Suitability 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
Description	<ul style="list-style-type: none"> • Stainless steel design • Food grade see www.festo.com/certificates/NPCK • Fulfills all clean design requirements • Straight shape • Operating medium: compressed air, vacuum, water
online: →	npck

Product overview

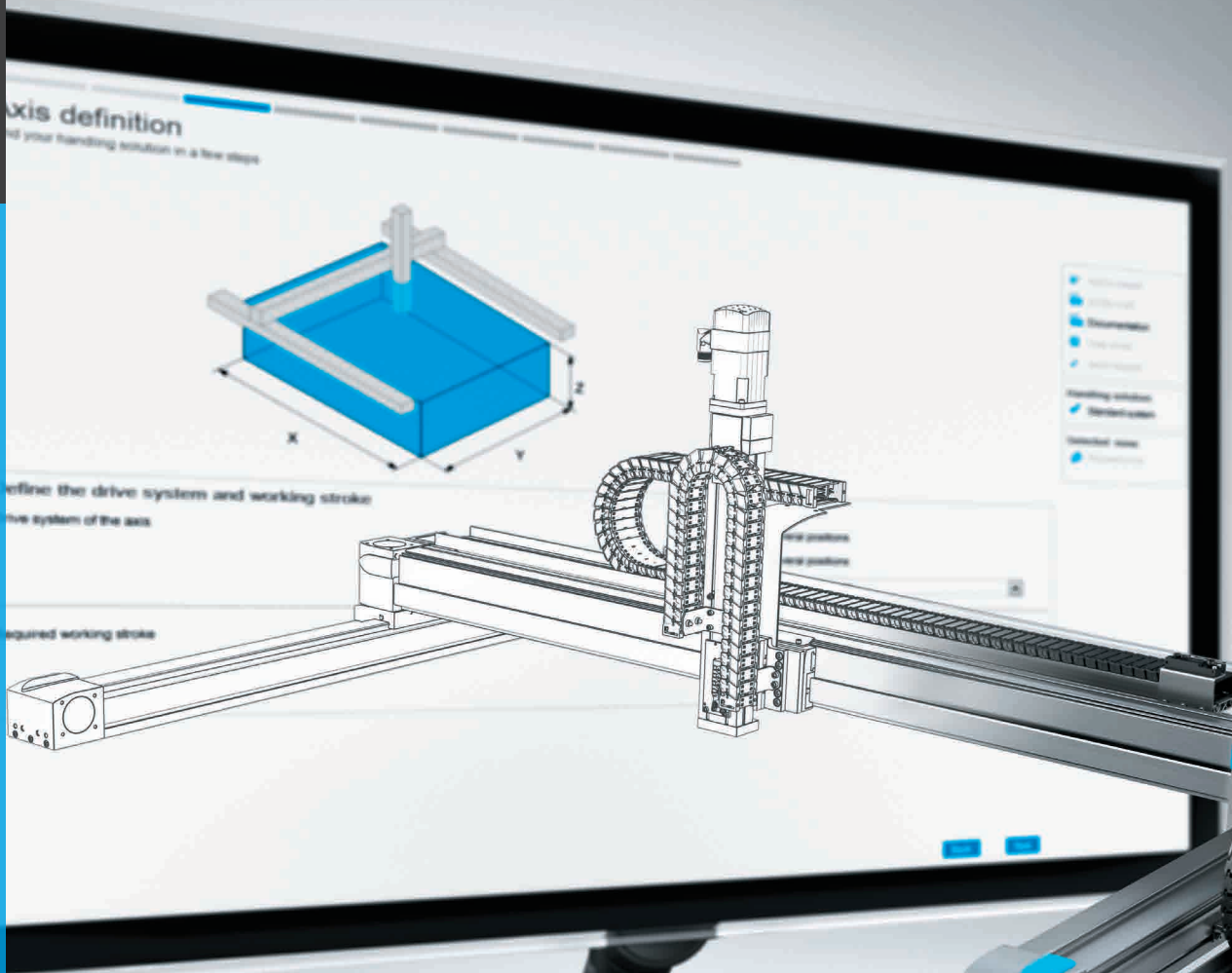
Fittings >

Threaded fittings

	 <p>Blanking plugs B</p>	 <p>Threaded fittings NPFC</p>
Pneumatic connection 1	Male thread G1/4, G1/8, M5, M7	G1/8
Pneumatic connection 2		G1/8
Suitability 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
Description	<ul style="list-style-type: none"> • Aluminium, stainless steel • With sealing ring • Variants recommended for production systems for manufacturing lithium-ion batteries 	<ul style="list-style-type: none"> • Brass, nickel-plated • Sleeve • Extension • Double nipple • Reducing nipple • L-, T-, Y- or X-fitting • Operating medium: compressed air, vacuum
online: →	b-1	npfc

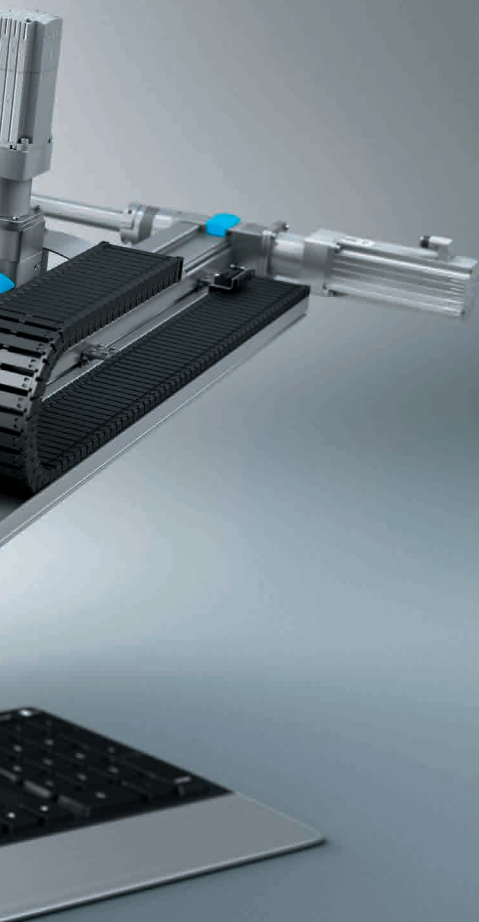


Appendix



Contents

Sales and service network – International	60
What must be taken into account when using Festo products?	63
Trademark notices	64



Sales and service network – International

Argentina

Festo S.A.
Edison 2392
1640 Buenos Aires
P +54 810 555 33786
F +54 810 444 3127
ventas.ar@festo.com

Australia

Festo Pty. Ltd. Head Office
Browns Road 179-187
Noble Park
3174 Melbourne
P +61 397 9595-55
F +61 397 9597-87
info_au@festo.com

Austria

Festo Gesellschaft m.b.H.
Linzer Straße 227
1140 Vienna
P +43 1 910 75-100
F +43 1 910 75-250
automation.at@festo.com

Belarus

IUP Festo
Masherov avenue 78
Office 201
220035 Minsk
P +375 17 204 85 58
F +375 17 204 85 59
info_by@festo.com

Belgium

Festo Belgium nv
Leuvensesteenweg 248J
Everest Office park
1800 Vilvoorde
P +32 2 702 32 11
F +32 2 702 32 09
info_be@festo.com

Brazil

Festo Brasil Ltda
Rua Guisepe Crespi 76
Jd. Santa Emília
04183-080 São Paulo
P +55 11 5013 1600
F +55 11 5013 1801
linhadireta.br@festo.com

Bulgaria

Festo EOOD
Bul. Christopher Kolumb 9
1592 Sofia
P +359 2 960 07 12
F +359 2 960 07 13
festo_bg@festo.com

Canada

Festo Inc.
Explorer Drive 5300
L4W 5G4 Mississauga
P +1 905 614 4600
F +1 877 393 3786
info_ca@festo.com

Chile

Festo S.A.
Av. Américo Vespucio 2680
9020000 Santiago de Chile
P +56 2 2690 2801
F +56 2 2690 2860
info.cl@festo.com

China

Festo (China) Ltd.
Yunqiao Road, No.1156
201206 Shanghai
P +86 21-60815100
F +86 21 58540300
sales.cn@festo.com

China

Festo Ltd.
Castle Peak Road, No. 497
6/F New Timely Factory
Building, Kowloon, HK
999077 HongKong
P +852 3904 20 91
F +852 2745 91 43
sales_hk@festo.com

Colombia

Festo S.A.S.
Autopista Medellín Km 6.3
Costado Sur
250208 Tenjo, Cundinamarca
P +57 60 1 865 77 88
F +57 1 865 7729
ventas.co@festo.com

Croatia

Festo d.o.o.
Nova Cesta 181 A
10000 Zagreb
P +385 1 619 1969
F +385 1 619 1818
info_hr@festo.com

Czech Republic

Festo, s.r.o.
Modřanská 543/76
14700 Prague
P +420 261 09 96 11
F +420 241 77 33 84
info_cz@festo.com

Denmark

Festo A/S
Islevdalvej 180
2610 Rødovre
P +45 70 21 10 90
F +45 70 21 10 99
sales_dk@festo.com

Estonia

Festo OY AB Eesti Filiaal
Karjavalja 10
12918 Tallinn
P +372 666 1560
info.ee@festo.com

Finland

Festo Oy
Mäkituvantie 9
01511 Vantaa
P +358 9 87 06 51
F +358 9 87 06 52 00
info.fi@festo.com

France

Festo E.U.R.L.
Rue du Clos Sainte-Catherine 8
ZA des Maisons Rouges
94360 Bry-sur-Marne
P +33 1 48 82 64 00
F +33 1 48 82 64 01
info_fr@festo.com

Germany

Festo Vertrieb GmbH & Co. KG
Festo Campus 1
73734 Esslingen
P +49 711 347-1111
F +49 711 347-2244

Hungary

Festo Kft.
Csillaghegyi út 32-34
1037 Budapest
P +36 1 436 51 11
F +36 1 436 51 01
info_hu@festo.com

India

Festo India Private Limited
237B, Hosur Road,
Bommasandra Industrial Area
560099 Bengaluru
P +91 (0) 1800 425 0036 / 1800 121
0036
sales.in@festo.com

Indonesia

PT. Festo
Jl. Tekno V Blok A/1 Sektor XI, Kawasan
Industri BSD, Banten
15314 Serpong Tangerang
P +62 804 1 2 33786
F +62 804 1 4 33786
sales_id@festo.com

Iran

Festo Pneumatic S.K.
Special Karaj Road
6th street, 16th avenue, # 2
1389793761 Teheran
P +98 21 44 52 24 09
F +98 21 44 52 24 08
info@festo.ir

Ireland

Festo Limited
Sandyford Park Unit 5
D18VH99 Dublin
P +353 (0)1 295 49 55
sales_ie@festo.com

Israel

Festo Pneumatic Israel Ltd.
Hakadar st. 3
7178633 Modi'in
P +972(8)6246666
F +972(8)6246677
info_il@festo.com

Sales and service network – International

Italy

Festo SpA
Via Enrico Fermi 36/38
20057 Assago
P +39 02 45 78 81, +39 02 45794
350
F +39 02 488 06 20, +39 02 4884
2012
info_it@festo.com, contatti@festo.
com

Japan

Festo K.K.
Hayabuchi 1-26-10
224-0025 Yokohama
P +81 45 593 56 10
F +81 45 593 56 78
info.jp@festo.com

Jordan

Festo DMCC
Zahar St. 13
11953 Amman
P +962-6-5563646
F +962-6-5563736
info_mena@festo.com

Kazakhstan

Festo Branch Kazakhstan
Ul. Karmysova 92
050010 Almaty
P +7 727 233 08 32
F +7 727 233 07 89
info@festo.kz

Korea

Festo Korea Co., Ltd.
Mullae-ro 28-gil 25
Young City N Tower 12F
07298 Seoul
P +82-1666 0202
saleskr@festo.com

Latvia

Festo SIA
Gunāra Astras 8b
1082 Riga
P +371 67 57 78 64
F +371 67 57 79 46
info_lv@festo.com

Lithuania

Festo, UAB
V. Krevės pr. 129
50312 Kaunas
P +370 37 3213 14
F +370 37 32 13 15
info.lt@festo.com

Malaysia

Festo Sdn Bhd
Jalan Teknologi 14A
Taman Sains Selangor 1, Kota
Damansara, Selangor
47810 Petaling Jaya
P +60 3 6144 1122
F +60 3 6141 6122
csc_my@festo.com

Mexico

Festo Pneumatic, S.A.
Av. Ceylán 3
Col. Tequesquínahuac, Tlalnepantla
54020 Estado de México
P 800 337 8669
ventas.mexico@festo.com

Netherlands

Festo B.V.
Schieweg 62
2627 AN Delft
P +31 15 251 88 90
F +31 15 251 88 67
sales.nl@festo.com

New Zealand

Festo Ltd.
Fisher Crescent 20
Mt. Wellington
1062 Auckland
P +64 9 574 10 94
F +64 9 574 10 99
info_nz@festo.com

Nigeria

Festo Automation Ltd.
Badejo Kalesanwo Street 6
C. Woermann Building, Matori Industrial Estate
100253 Lagos
P +234 2930812
F +234 2930813
enquiry.ng@festo.com

Norway

Festo AS
Ole Deviks vei 2
0666 Oslo
P +47 22 72 89 50
F +47 22 72 89 51
sales_no@festo.com

Peru

Festo S.R.L.
Av. Circunvalación del Golf Los Incas
134
Torre II Oficina 401
01 Lima
P +51 1 219 69 60
F +51 1 219 69 71
ventas.pe@festo.com

Philippines

Festo Inc.
West Service Road KM18
South Superhighway
1700 Paranaque City, Metro Manila
P +63 1800 10 12 33786
F +65 1800 10 14 33786
festoph@festo.com

Poland

Festo Sp. z o.o.
ul. Mszczonowska 7
05-090 Raszyn
P +48 22 711 41 00
F +48 22 711 41 02
info_pl@festo.com

Portugal

Festo – Automação, Unipessoal, Lda.
Rua Manuel Pinto De Azevedo 567
Apartado 8013
4109601 Porto
P +351 22 615 6150
F +351 22 615 6189
info.pt@festo.com

Romania

Festo S.R.L.
Strada Sfântul Constantin 17
010217 Bucharest
P +40 21 403 95 00
F +40 21 310 24 09
festoro@festo.com

Russia

000 Festo-RF
Michurinskiy prosp. 49
119607 Moscow
P +7 495 737 34 00
F +7 495 737 34 01
info.ru@festo.com

Serbia

Festo Srbija
Omladinskih brigada 90v
(poslovni centar Airport City)
11070 Belgrade
P +381 (011) 7853 900
F +381 (011) 7853 911
info@festo.rs

Singapore

Festo Pte. Ltd.
Kian Teck Way 6
628754 Singapore
P +65 6285 8585 (Sales) / +65 6415
6700 (General)
F +65 6415 6900
sales.sg@festo.com

Slovakia

Festo spol. s r.o.
Gavlovičová ul. 1
83103 Bratislava
P +421 2 49 10 49 10
F +421 2 49 10 49 11
info_sk@festo.com

Slovenia

Festo d.o.o.
Blatnica 8
1236 Trzin
P +386 1 530 2100
F +386 1 530 2125
info_si@festo.com

South Africa

Festo (Pty) Ltd.
Electron Avenue, Isando 18-26
P.O. Box 255
1600 Johannesburg
P +27 11 971-5500
F +27 11 974-2157
sales.za@festo.com

Sales and service network – International

Spain

Festo Automation, S.A.U.
Avinguda de la Granvia 159
Hospitalet de Llobregat
08908 Barcelona
P +34 901243660
F +34 902243660
info_es@festo.com

Sweden

Festo AB
Stillmansgatan 1
212 25 Malmö
P +46 40 38 38 00
F +46 40 38 38 10
sales_se@festo.com

Switzerland

Festo AG
Gass 10
5242 Lupfig
P +41 44 744 5544
F +41 44 744 5500
info.ch@festo.com

Taiwan

Festo Co., Ltd.
Gong 8th Road, No.9
Gong 2nd Industrial Park, Linkou Dist.
244010 New Taipei City
P +886 2 2601-9281
F +886 2 2601-9286
info_tw@festo.com

Thailand

Festo Ltd.
Kanchanapisek Road 202
Ramintra, Khannayao
10230 Bangkok
P +66 1 800 019 051 / +66 0 2092
3700
F +66 1 800 019 052
sales_th@festo.com

Turkey

Festo San. ve Tic. A.S.
Universite Cad. 45
Tuzla
34953 Istanbul
P +90 444 1 378
F +90 216 585 00 50
info_tr@festo.com

Ukraine

DP Festo
Borysohlibska 11
04070 Kiev
P +380 44 233 6451
F +380 44 463 7096
orders_ua@festo.com

United Arab Emirates

Festo DMCC
Swiss Tower, unit 505
Cluster Y, JLT
Dubai
P +962 6 5563646
F +962 6 5563736
info_mena@festo.com

United Kingdom

Festo Limited
Caswell Road 55
Applied Automation Centre
NN4 7PY Northampton
P +44 800 626 422
info.gb@festo.com

United States

Festo Corporation / Didactic Inc.
Columbia Road 7777
45039 Mason
P +1 (513) 486-1050
sales-support.didactic.us@festo.com
/ services.didactic@festo.com

Venezuela

Festo C.A.
Av. 23 esquina con calle 71
N° 22-62, Edif. Festo, Sector Paraíso
4001 Maracaibo
P +58 261 759 1120
F +58 261 759 1417
info_ve@festo.com

Vietnam

Festo Company Limited
Floor 2, HQ Tower, No. 9, Tran Nao
Street, Quarter 3 An Khanh Ward, Thu
Duc City
700000 Ho Chi Minh City
P +84 28 3514 5600
F +84 28 3514 5601
sales_vn@festo.com

What must be taken into account when using Festo products?

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

The pneumatic components must be supplied with correctly prepared compressed air free of aggressive media.

Take the ambient conditions at the place of use into consideration. Corrosive, abrasive and dusty environments (e.g. water, ozone, grinding dust) will reduce the service life of the product.

Check the resistance of the materials of Festo products to the media used and surrounding media.

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

Unauthorised conversions or modifications to products and systems from Festo constitute a safety risk and are thus not permitted.

Festo does not accept any liability for the resulting damages.

You should contact Festo if one of the following applies to your application:

- The ambient conditions and conditions of use or the operating medium differ from the specified technical data.
- The product is to perform a safety function.
- A risk or safety analysis is required.
- You are unsure about the product's suitability for use in the planned application.
- You are unsure about the product's suitability for use in safety-oriented applications.

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

All content, texts, representations, illustrations and drawings included in this catalogue are the intellectual property of Festo SE & Co. KG and are protected by copyright law.

No part of this publication may be reproduced, processed, translated or transmitted in any form or by any means, electronic, mechanical, photocopying or otherwise, without the prior written permission of Festo SE & Co. KG.

All technical data is subject to change according to technical updates.

ABB® is a registered trademark of ABB Asea Brown Boveri Ltd. in certain countries.

Allen-Bradley® is a registered trademark of Rockwell Automation, Inc. in certain countries.

ANSI® is a registered trademark of the American National Standards Institute, Incorporated in certain countries.

AS-Interface® is a registered trademark of Verein zur Förderung busfähiger Interfaces für binäre Aktuatoren und Sensoren e. V. in certain countries.

ASME® is a registered trademark of the American Society of Mechanical Engineers in certain countries.

Beckhoff® is a registered trademark of Hans Beckhoff in certain countries.

Cage Clamp® is a registered trademark of WAGO Kontakttechnik GmbH & Co. KG in certain countries.

CANopen® is a registered trademark of CAN in AUTOMATION - International Users and Manufacturers Group e.V. in certain countries.

CC-LINK® is a registered trademark of Mitsubishi Electric Corporation in certain countries.

CIROS® is a registered trademark of Dortmunder Initiative zur rechnerintegrierten Fertigung (RIF) e.V. in certain countries.

CODESYS® is a registered trademark of 3S-Smart Software Solutions GmbH in some countries.

DeviceNet® is a registered trademark of ODVA, Inc. in certain countries.

EasyIP® is a registered trademark of Novagraaf Nederland B.V. in certain countries.

ECOLAB® is a registered trademark of Ecolab USA, Inc. in certain countries.

EHEDG European Hygienic Engineering & Design Group® is a registered trademark of Stichting Ehedg in certain countries.

EnDat® is a registered trademark of Dr. Johannes Heidenhain GmbH in certain countries.

ePLAN electric P8® and ePLAN fluid® are registered trademarks of EPLAN Software & Service GmbH & Co. KG in certain countries.

EtherCAT® is a registered trademark of Beckhoff Automation GmbH in certain countries.

Ethernet POWERLINK® is a registered trademark of ABB ASEA BROWN BOVERI LTD COMPANY in certain countries.

EtherNet/IP® is a registered trademark of ODVA, Inc. in certain countries.

Excel® is a registered trademark of Microsoft Corporation in certain countries.

Fin Ray® is a registered trademark of EvoLogics GmbH in certain countries.

HACCP - Hazard Analysis Critical Control Points® is a registered trademark of Rizzo Graziana in certain countries.

HARAX® is a registered trademark of HARTING Electric GmbH & Co. KG in certain countries.

HIPERFACE® is a registered trademark of Sick Stegmann GmbH in certain countries.

International Electrotechnical Commission® is a registered trademark of the International Electrotechnical Commission in certain countries.

INTERBUS® is a registered trademark of Phoenix Contact GmbH & Co. KG in certain countries.

IO-Link® is a registered trademark of Profibus Nutzerorganisation e.V. in certain countries.

JohnsonDiversey® is a registered trademark of S.C. Johnson & Son, Inc. in certain countries.

Loctite® is a registered trademark of Henkel IP & Holding GmbH in certain countries.

Makrolon® is a registered trademark of Covestro Deutschland AG in certain countries.

Microsoft® is a registered trademark of Microsoft Corporation in certain countries.

MITSUBISHI® is a registered trademark of Mitsubishi Corporation in certain countries.

Modbus® is a registered trademark of Schneider Electric USA, Inc. in certain countries.

NAMUR® is a registered trademark of NAMUR - Interessengemeinschaft Automatisierungstechnik der Prozessindustrie e.V. in certain countries.

ODVA® is a registered trademark of ODVA, Inc. in certain countries.

OPC UA® is a registered trademark of the OPC Foundation in certain countries.

PROFIsafe® is a registered trademark of Siemens Aktiengesellschaft in certain countries.

Rockwell Automation® is a registered trademark of Rockwell Automation, Inc. in certain countries.

SERCOS interface® is a registered trademark of SERCOS International e.V. in certain countries.

SIMATIC® is a registered trademark of Siemens Aktiengesellschaft in certain countries.

SucoNet® is a registered trademark of Eaton Electrical IP GmbH & Co. KG in certain countries.

Systainer® is a registered trademark of TTS Tooltechnic Systems AG & Co. KG in certain countries.

Teflon® is a registered trademark of The Chemours Company FC in certain countries.

TORX® is a registered trademark of Acument Intellectual Properties, LLC in certain countries.

TwinCAT® is a registered trademark of Beckhoff Automation GmbH in certain countries.

UL® is a registered trademark of Underwriters Laboratories Inc. in certain countries.

VDMA® is a registered trademark of Verband Deutscher Maschinen- und Anlagenbau (VDMA) e.V. in certain countries.

Viton® is a registered trademark of The Chemours Company FC in certain countries.

Vulkollan® is a registered trademark of Covestro Deutschland AG in certain countries.

Windows® is a registered trademark of Microsoft Corporation in certain countries.

The above-mentioned trademarks are registered/applied-for trademarks of the respective trademark holder in certain countries. All other trademarks not listed here are the property of their respective owners in some countries.

Product overview
for battery manufacturing

136139 (EN)
Subject to change
2022/09

www.festo.com