FESTO

RENAULT
Passion for life

Renault Festo Partnership

Renault group recommendations for new project launched

2021

Contents

Content

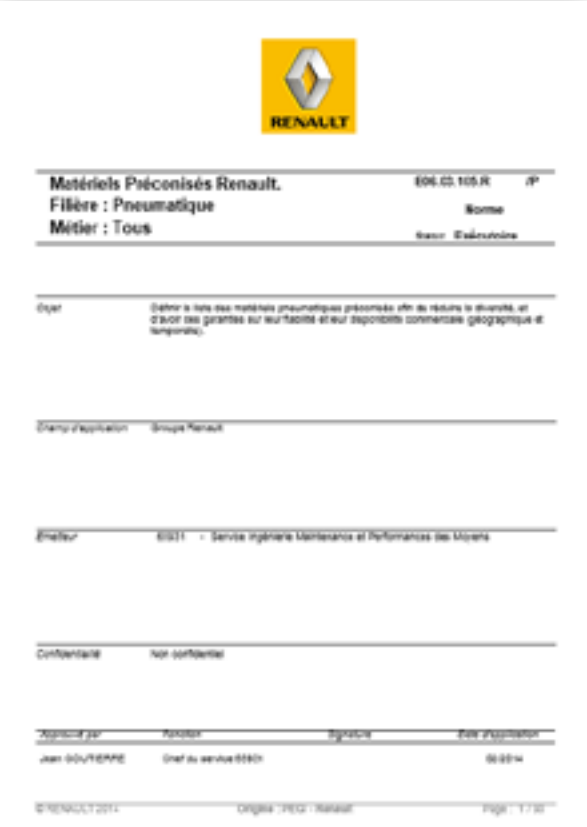
1.1 Purpose of this document

Festo provides more than 30,000 different components. With this wide array of possible choices comes a challenge of selecting the proper components for each application. A variety of questions can arise when choosing product families and specific features.

1.2 How to read this document?

This document was created considering the content of Renault CNOMO documents. The aim is to simplify the choice of Festo components during your automation engineering stages the Renault group projects.
The guide makes focuses on the main uses of Festo products, but depending on the complexity and problematic level, another component could be requested to the Renault project team manager.


Recommended Renault equipment
Sector: Electricity-Automation


Matériels Préconisés Renault.
Filière : Pneumatique
Métier : Tous

CNOMO document	Name of Renault referent	Head of department	Renault department
EB.03.C0.613	Yannick Maillard	Fabrice Bouchez	65940
E06.03.105R/P	David Magontier		65931

2.1 Global overview

Festo is a world leader in pneumatic and automation technologies
- Founded in 1925
- 61 international Festo companies
- Represented in 176 countries
- 16,500 employees worldwide
- Turnover 2.2 Billion € (2013)
- Education rate is 1.5% of turnover
- 28,000 components in countless variants
- Festo products are available worldwide

Joining, rotating, gripping, positioning, connecting, holding, testing and checking discrete materials: these are the automation tasks that Festo's portfolio of products and services is designed to handle.

The standard range includes pneumatic, servo-pneumatic and electrical drive technology, mostly in our modular systems, valves and valve terminals. Sensors, intelligent compact vision systems and controllers ensure perfect communication throughout the control chain. Compressed air preparation, tubing and fittings complete the range.

The Festo brand has been a worldwide symbol of expertise in factory automation for more than 60 years. Festo has also been successfully active in process automation for quite some time. Festo provides centralized and decentralized automation concepts for the production, transport, handling and disposal of gases, fluids, paste-like materials or bulk solids.

For Good Manufacturing Practice (GMP), food or ATEX zones; for high and low temperatures; for harsh and corrosive atmospheres. Optional: FDA and HACCP conformity. Condition monitoring and comprehensive diagnostics concepts based on diagnosable products reduce production downtime to a minimum, as for factory automation.

Didactic – productivity begins with training

Our range covers all current topics in technical education and training. For efficient learning and guaranteed success:
- Technical training packages
- Learning and simulation software
- Courseware
- Modular training factories
- Education consulting

40 years of experience in the area of training and 20 years of experience in process optimization. With experienced instructors and consultants, as well as the right formats and methods, we can achieve sustainable and measurable success for your staff and company.

2.2 What makes us engineers of productivity?

We have a very big goal: your productivity. Our motivation is to achieve this goal together with you. We take advantage of everything possible to make you more successful: our knowledge, our capabilities, our performance, our products and our services. We achieve this goal with four outstanding qualities for which we stand: security, efficiency, simplicity and competency. And this makes us what we are. Experts who don't give up. Professionals who make the working day easier for you. Technicians who always manage to get a bit more out of components and systems.
In a word, this makes us engineers of productivity.

We are pneumatic.
We are electric.
We are 33,000 technology-neutral solutions.

→ WE ARE THE ENGINEERS OF PRODUCTIVITY.

Security
You are on the safe side with Festo. Whether it is about new machinery directives and their implementation or quick, professional problem-solving support, at any time and in any situation, you can always rely on our experienced, global company network. This increases not only your satisfaction, but your productivity as well.

Simplicity
Those who focus on central tasks are productive. We make it as easy as possible for you in your process chain, from selection, configuration and operation to documentation, commissioning, service and repair. Because we know your requirements, you can calmly concentrate on your core business. This saves you time and money.

Efficiency
We give our all for you – in customer support as well as for your technical solution. You have faith in the technical experts and the efficient technologies which ensure that your systems consume less material and energy. Not only are CO2 emissions reduced, the operating costs of the machines and systems also fall. Above all, this increases one thing: your productivity.

Competency
We have experts working at Festo. Experts who know your challenges. Experts who smooth the way to greater productivity for you with dedication, technical and economical know-how and experience – and who are always nearby! These experts and their knowledge are our potential for success – for you! You will notice this from support and development to commissioning and training.

Productive facts & figures:

More than
300,000 industrial customers
33,000 components
15,000 customer-specific solutions annually
21,200 experts
On site in 176 countries
250 branch offices
61 national companies
100 patents annually
54 years of Festo Didactic

2.3 Festo worlwide

We know you have high goals.
We want you to achieve more.
We show you new ways forward.

→ WE ARE THE ENGINEERS OF PRODUCTIVITY.

Worldwide availability? No problem.

Always available and absolutely reliable: we offer innovative products, solutions and services around the world. With over 250 branch offices in 176 countries, we ensure that we are always in close proximity to our customers. That is why experts from Festo can work in close cooperation with you.

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2.4 Our Values

Our Mission: Festo. At the forefront of industrial automation.

"We work with our customers to increase their productivity. We combine our knowledge with a passion for detail, never losing sight of the big picture. We foster sustainable growth and keep the world moving."

Dr. Eberhard Veit
Chairman of the Management Board, Member of the Management Board Technology, Market and Regions

We are ambitious.

As a proudly independent family-owned company, we shape our own destiny and are relentless in our pursuit of success. We have high expectations of ourselves and others and harness the passion and experience of our people to deliver top class performance.

We are determined.

As a driver and shaper of our market, we meet challenges with courage and determination. We make clear decisions and implement them thoroughly. When we make mistakes, we find out why and learn for the future.

We are visionary.

We are determined to develop intelligent and intuitive solutions. For this reason we look beyond our own horizons to learn the current and future challenges of our customers and markets and the actions of our competitors. Our structured cooperation over all disciplines leads to strengths and knowledge in invention and innovation.

We value each other.

Our diversity is a core strength that enriches Festo. To ensure trust we foster openness and mutual respect. We resolve conflicts quickly and cooperatively, we treat each other with respect and learn from each other's perspectives.

We are dependable.

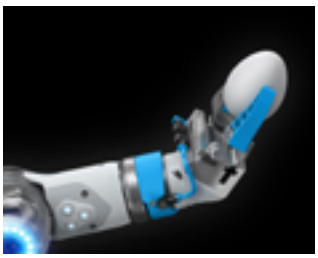
We expect and believe in the personal responsibility of our employees and colleagues. Engagement and dependability are therefore key characteristics of the way we work. When we cannot keep to our commitments we communicate this early and seek alternative solutions.

2.5 Bionic Learning Network – inspired by nature

New inspiration for future automation

Enter the world of bionics: from its natural model to the technical basic principle, the bionics adaptation to industrial application

Adaptive gripper finger DHAS: inspired by the fishtail fin

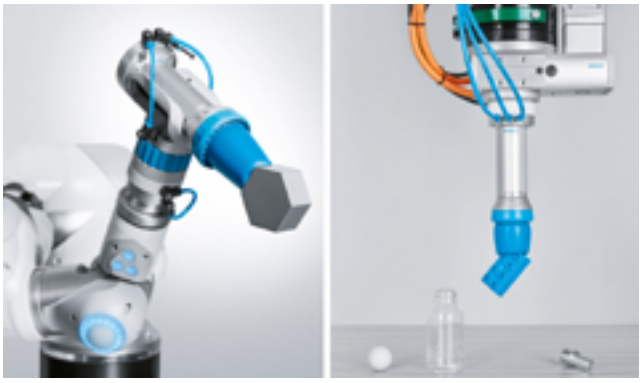


Gripping has always played an important role in the Bionic Learning Network. Nature often provides amazing impulses and new approaches to solutions for industrial applications. Numerous bionic gripping applications have already been developed in the interdisciplinary research work of the network, from which two concepts have been further developed into series products.

Adaptive gripper finger DHAS: inspired by the fishtail fin

The adaptive gripper finger DHAS is based on the amazing behaviour of the fishtail fin. If you press laterally against the fin, it does not bend away from but curves around the pressure point. The developers have technically implemented this so-called FinRay Effect® with the aid of two flexible polyurethane bands that are connected to each other via intermediate bridges.

Whether parallelly or centrically arranged, the stable yet flexible gripper fingers easily adapt to the contour of a workpiece when gripping. This enables gentle and reliable gripping of sensitive objects with irregular surfaces. The DHAS is already being used in the food industry, for example, to sort fruit and vegetables.



Adaptative shape gripper: adaptable like a chameleon's tongue

The adaptive shape gripper DHEF is a further development of the FlexShapeGripper. Its operating principle is derived from the tongue of the chameleon. In order to catch prey, the animal lets its tongue shoot out like a rubber band. Just before the tip of its tongue reaches the insect, it retracts in the middle, while the edges continue to move forwards. This allows the tongue to adapt to the shape and size of the respective prey and firmly enclose it.

The central element of the gripper is a silicone cap filled with slight excess pressure, which is modelled on the chameleon's tongue and wraps itself around the item being gripped in a flexible and form-fitting manner. This allows an object to be enclosed and held. Even picking up several items, such as screws from a bowl, can be realised via a corresponding control with proportional valves.

For more information on these and other Bionic projects, visit the Bionic Learning Network or visit the official Bionic Learning Network YouTube channel

https://www.youtube.com/user/FestoHQ

2.6 Research and Development

Knowledge provides the competitive edge: already today, research at Festo meets the challenges of the production worlds of the future by means of integrated mechatronic solutions – from the intelligent component to the integrated overall system.
«The production of the future is intelligent and adaptive»

Industry 4.0
On the way to the production of the future

Festo has a holistic view of the changes in the production world, considers different perspectives and – in addition to technology – also takes other key points into account, such as the interaction between man and machinery and the issue of training and qualification.

→ **More on the factory of the future: Industry 4.0**

Mechatronic systems

Festo's core competence is mechatronics. This groups together the traditional disciplines of mechanical engineering, electrical engineering and computer science, with the aim of improving the functionality of technical systems. The demand for flexible, adaptive, economic production for tomorrow sets out the challenges for factory and process automation. With its interdisciplinary approaches, mechatronics opens up new technologies, thus enabling Festo to meet these requirements with conviction and confidence.

→ **Festo's understanding of mechatronics**

Advanced technologies

Advanced technologies develop basic knowledge in the traditional disciplines of engineering and in new fields such as micro-nano integration.

→ **More on technologies of the future**

Digital engineering

Highly diverse simulation technologies have evolved from mere tools to become the drivers of innovation and design processes.

→ **Tools and tasks in digital engineering**

Open Innovation

Open Innovation is the declared culture of Festo. Customers, suppliers and research partners are involved in the research process at an early stage, so that added value is created for all parties and ongoing dialogue is promoted between industry and academia.

→ **Innovation through interdisciplinarity**

The Festo Online Shop is much more than just ordering

The Festo online shop support you in almost all phases of your project, whether:
- Selection
- Design
- Ordering
- Follow up your quotations/ orders
- After sales

Integrate you purchasing and product planning processes with Festo

- All product, price, and delivery information on one platform
- Fully integrated into Festo's inventory management system
- Always up-to-date
- Always with the latest order status information

Select products with ease and confidence

With our electronic product catalog, you can quickly and easily find the most suitable product. Simply enter via the search function or the product tree navigation tool. Here you can simply choose the desired technical features step-by-step and thus easily find the right product for your application.
Or, use the other clever selection tools:
- Product finder
- Engineering tools
- Product configurator

Complete product information and configuration

Select and configure products to meet your exact requirements. The most important knowledge is immediately available when you use the function bar on the right-hand side of the product configurator:
- CAD download for all commercially available CAD programs, instantly available even for configurable products
- Accessories
- Documentation and data sheets
- Product illustrations
- Add the component to the basket for up-to-date pricing and availability

Easy ordering with up-to-date prices and delivery times

Put the components you require directly into the basket. This contains all information such as current prices and delivery times and is always accurate because you are directly accessing Festo's inventory control system.
You can add products to the basket using:
- The Festo part number
- The type code
- Your own part number

In addition, you can also choose your preferred method of delivery and whether you would like full or partial shipments.
You have the option to receive an automatic order confirmation as soon as you have placed your order. The order will be instantly saved in the system and the official Festo order number will be displayed.
Product baskets can be imported and exported in CSV format for faster entry and accelerated processes.

Document and order tracking

The order tracking facility enables you to track all of your orders at any time, whether you ordered by phone, fax, or e-mail. This way you always know where your order is, thus adding to your planning security.
- Find your orders with the help of your order number, the Festo order number, or very conveniently via a search for part numbers and time period
- All orders corresponding to your customer number will be displayed, keeping you up to date about your colleagues' orders as well
- Click the "Details" column to see the status of each item in your order
- By clicking on the delivery number, you can automatically access the order tracking of the shipping carrier

Register now and start enjoying the benefits right away!

We look forward to your registration. If you have any questions about the online shop, then why not watch our guided tour? It takes you step-by-step through the extensive range of products and services offers in our online shop.

Guided tour: www.festo.com/en/tour

Up-to-date and comprehensive

Convenient and flexible

Fast and logical

Reliable and correct

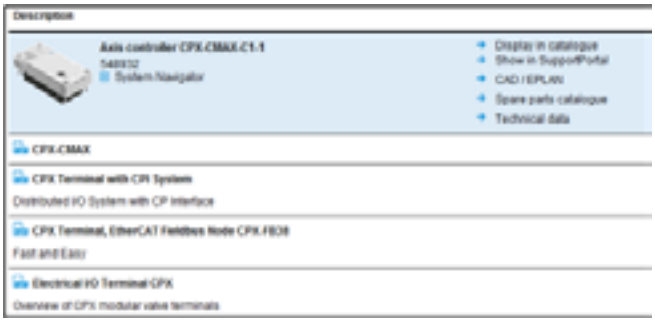
Simple and direct

Trackable and transparent

Access to all product information

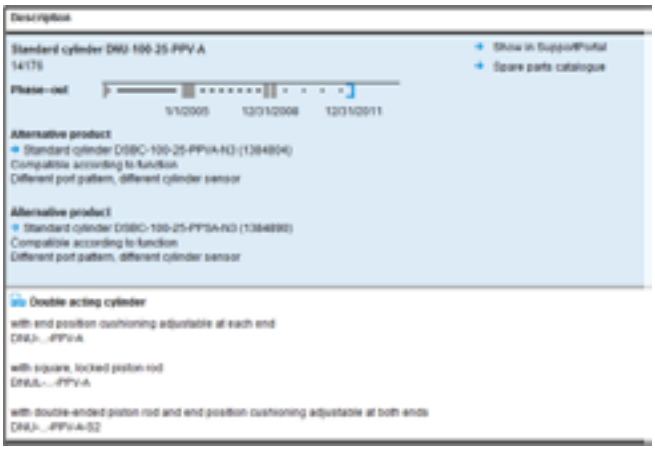
For a lifetime. Don’t expect anything less.

The Festo support portal is your central platform for accessing all product information – for the entire life cycle of your product.
Easily access product overviews, catalogs, and manuals for all Festo components.



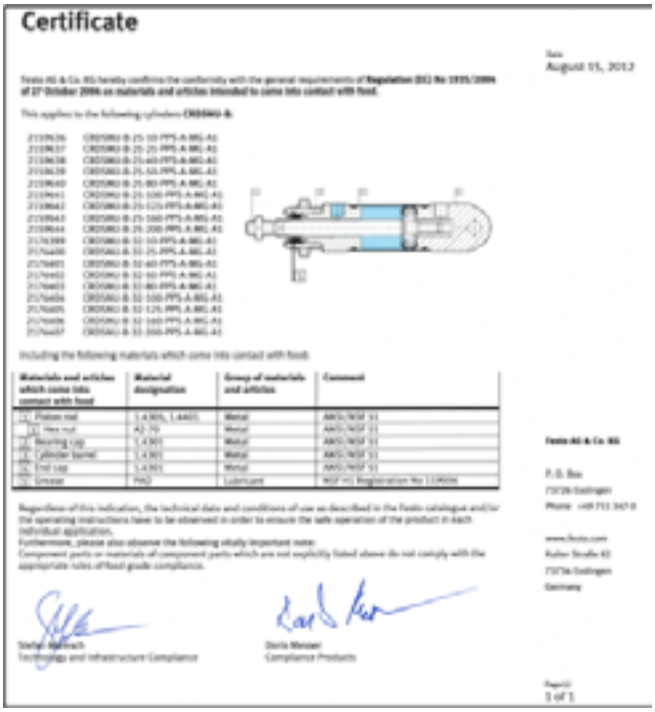
Technical documentation – even for older products

The support portal also contains data relating to products that are no longer available for purchase. The system navigator shows you how individual components in the system are related to one another, thereby supporting you during commissioning and troubleshooting. The Festo product key gives you exclusive access to all of the data available for a particular product. Information relating to the product life cycle and references to alternative products complete the after sales support service portfolio.



Component certifications

Many components are designed for critical applications that require certifications for food safety, machine safety, or various other compliance criteria. Certifications and manufacturer’s declarations for associated components are accessible in the support portal for supporting HACCP and safety documentation.


Certificate

Visit the support portal today!
http://www.festo.com/supportportal

Partner to the automotive and Tier 1 supplier industry

The support portal also contains data relating to products that are Festo – partner throughout the entire production process:
- Understanding the processes from the press shop through to engine and trans- mission production
- Developing solutions – collaborative engineering
- Creating synergies – everything from a single source

Your objective: Optimising process costs, ensuring productivity

Our solution: Partner throughout the entire production process

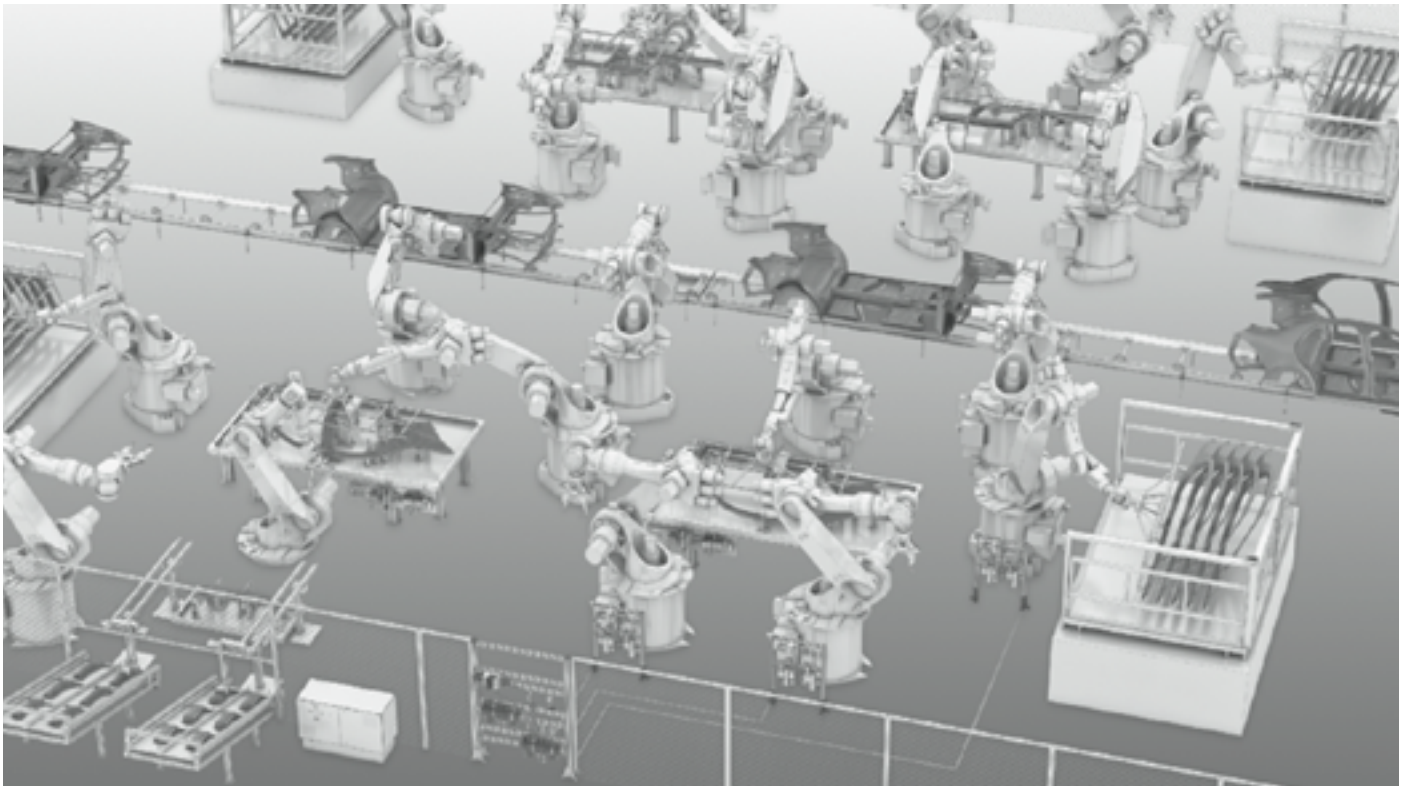
With over 50 years of experience in standard components and application- optimised automation technology, Festo can be relied on by car manufacturers and suppliers. No matter where in the world you are planning to base your pro- duction, Festo will support you with short communication channels, rapid availability of components and prompt assistance when you urgently need it.
– Competent sales and application experts (Key Account Management)
– Fast worldwide networking of application knowledge
– Tailor-made thanks to customer involvement in R&D (innovative products based on ISO standards)

Competitive edge thanks to innovation and differentiation

– Innovative products optimised to your requirements (e.g. CPX terminal in metal design)
– Complete solution from a single source (e.g. drive concepts for welding guns)
– Added value for your processes through the continuous improvement of services from engineering to operation (e.g. Energy Saving)

Catalogues and release lists:

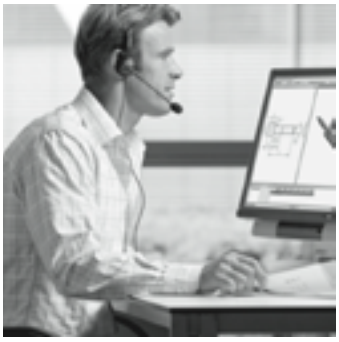
For the convenience of suppliers and manufacturers in the automotive industry, Festo produces manufacturer- specific catalogues as well as factory and project-specific release lists.
Talk to our specialists.



Your partner – press shop to final assembly

Regardless of which of the various automotive production processes you focus on, you will undoubtedly come across Festo. This may be in the form of intelligent solutions that offer far more than just components and sub-systems, such as precisely targeted support and service to lastingly increase the productivity and availability of your sys- tems. This process knowledge makes us an ideal partner.
Judge for yourself.

Developed in cooperation:
catalogues and release lists
The company or project-based cata- logues and release lists from Festo are useful for suppliers and manufacturers. They are created in collaboration with end users and are constantly updated and available to download

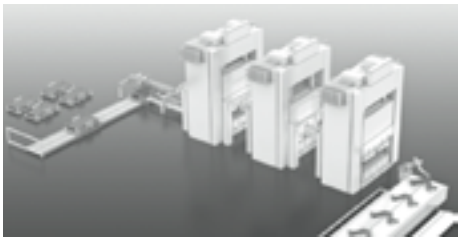


Your worldwide contacts
Here is a list of all the contacts for the automotive sector that we have compiled for you.

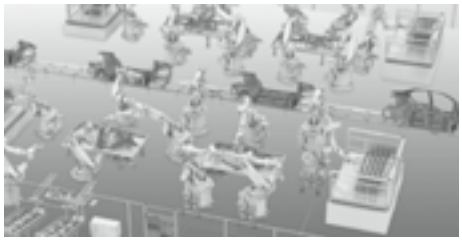
Efficient from the very beginning: sizing software
Energy saving potential can be realised and oversizing can be avoided during the system design phase, while our soft- ware tools for electric and pneumatic drive systems can accelerate your return on investment. At the same time, com- ponents and drive systems are optimally matched to your application.

Knowing what's going to happen be- forehand: condition monitoring
Ever increasing cost pressures demand shorter cycle times and greater system availability – with optimised energy effi- ciency. System monitoring and prevent- ive maintenance are ways to deal with this – even from a long way away. You will find the right solutions at Festo.

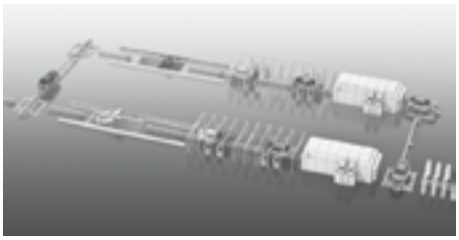
www.festo.com/automotive



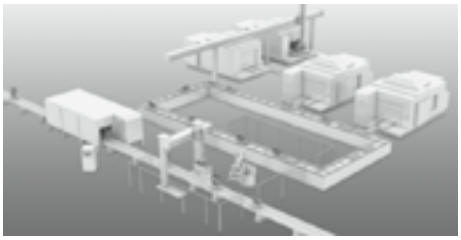
Press shop



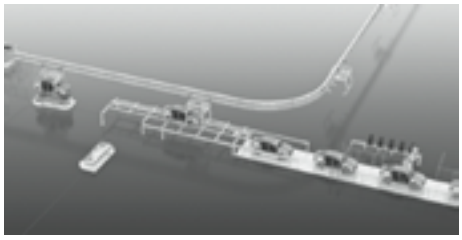
Body shop



Painting systems



Engine and transmission production

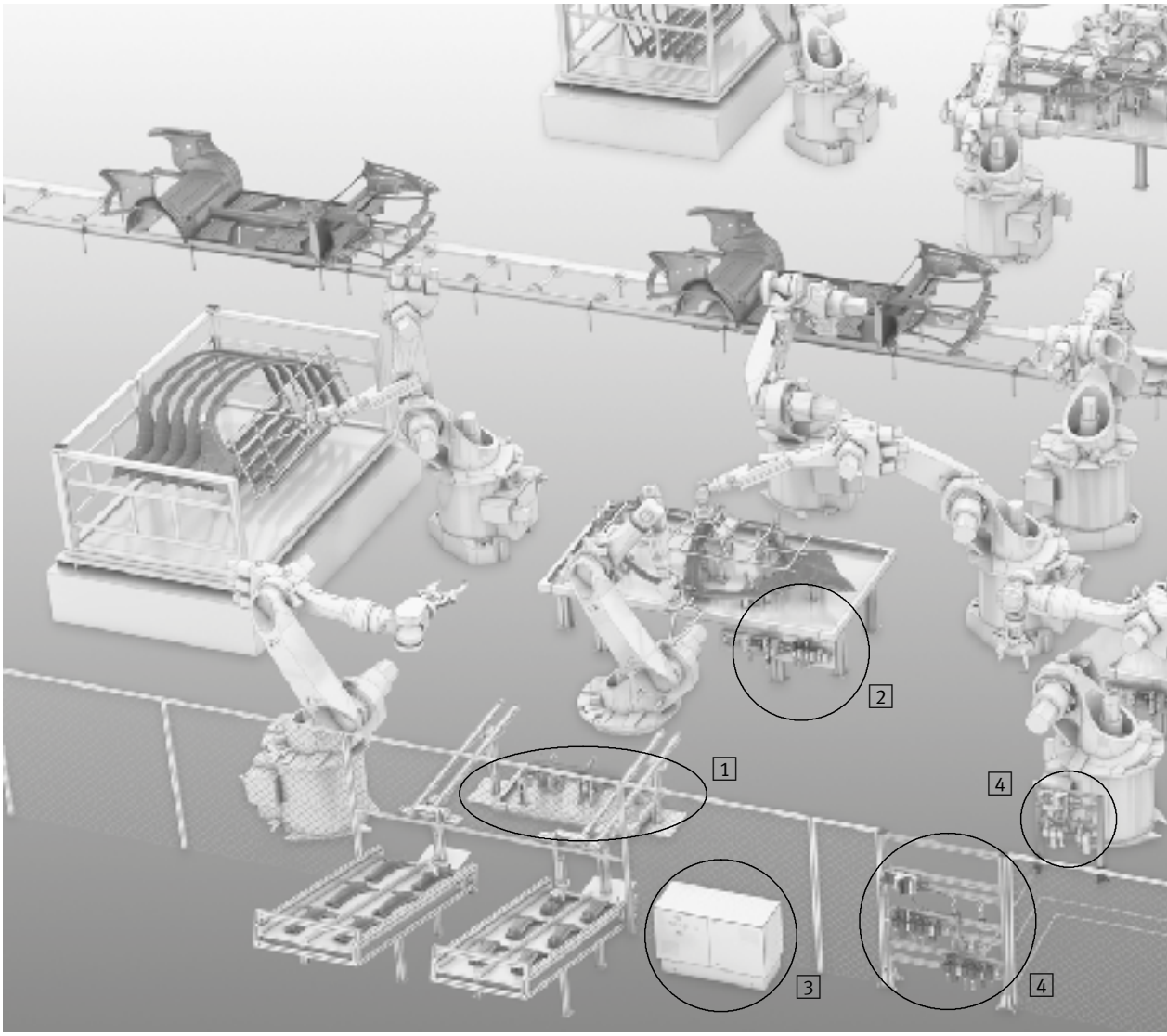


Final assembly

Suppliers

Ready-to-install solutions

Faster to your goal, more effective in operation!
Speed up your automation from start to operation.
Concentrate on your core business. Gain time, reduce costs and increase the reliability of your production process. With ready-to-install solutions from Festo.



1
Handling systems

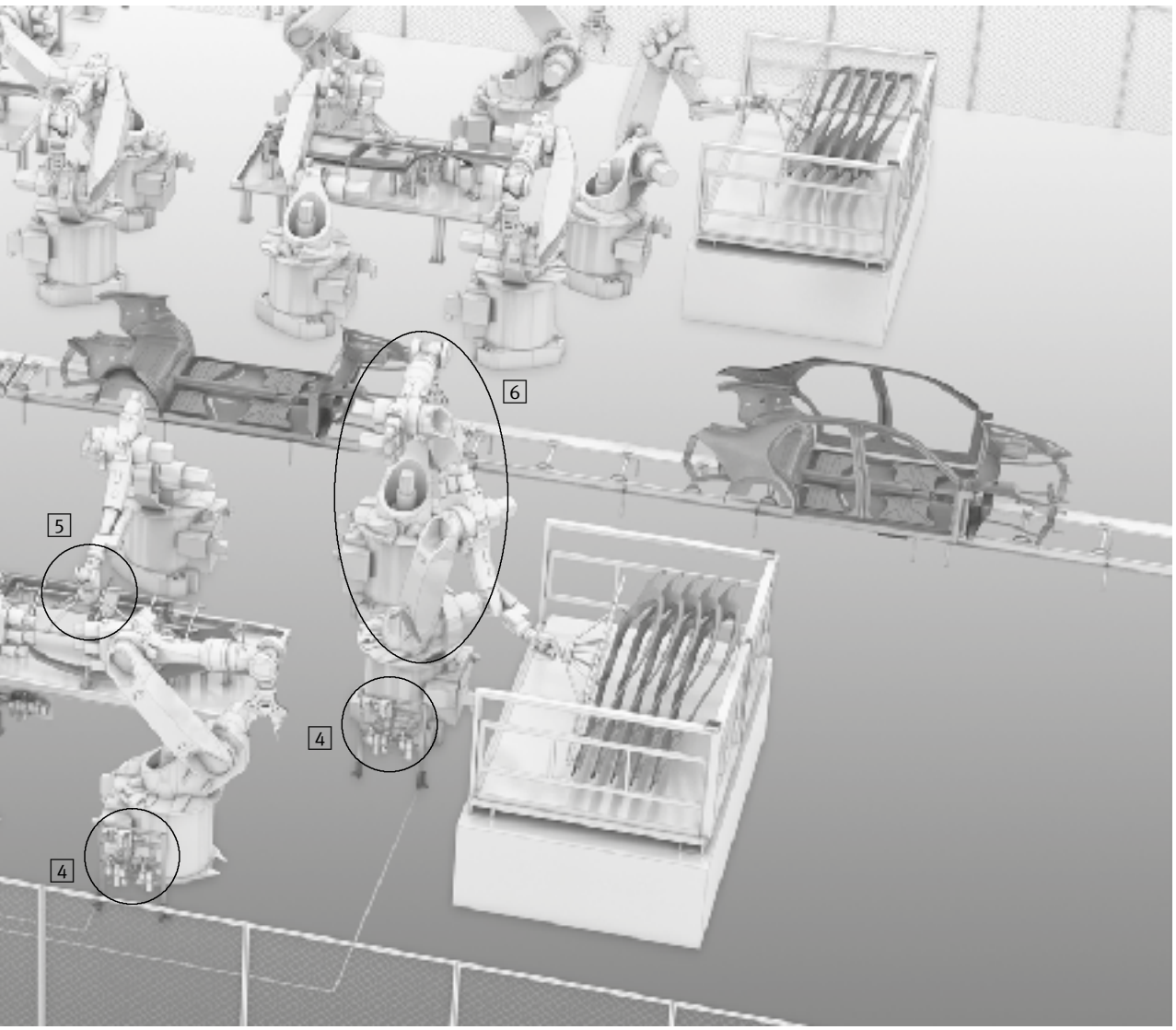
– standard handling systems: variety of movements in 2d and 3d
– heavy-duty axis egc-hd for high torques and forces in all 2d and 3d handling systems
– advanced handling systems: highly dynamic with optimum working space coverage. Free path movements in 3d using the tripod
– front unit for rotating, gripping and vacuum: dynamic, light- weight, precise and/or powerful. From highly accurate to adaptive and for minimum gripping cycles

2
Mounting plates

– Function-specific pre-assembly of pneumatic and electrical components on support plates
– Tubing and wiring included
– Defined interfaces for simple mounting directly in the system

3
Control cabinets

– Made to measure
– Individually configured
– Tailored to the requirements of the automotive and Tier 1 supplier industry
– Design and sizing included
– Control package CMCA: for free 3D path control of advanced handling systems
– Complete package with kinematics and basic parameterisation of the entire system, supplied ready for installation



4
Hall/robot installation plate (HIP/RIP)

– Controls and monitors the com- pressed air and coolant supplies of welding cells and welding ro- bots
– Design tailored precisely to the installation space
– Application-specific, technical equiment
– Complies with standards and directives as well as product re- leases
– Precise implementation of specific requirements in the body-in-white environment

5
Modules

– Pneumatic and electrical components assembled to create a function unit
– Can be combined from around 30,000 catalogue components
– Including connections for direct integration in machines

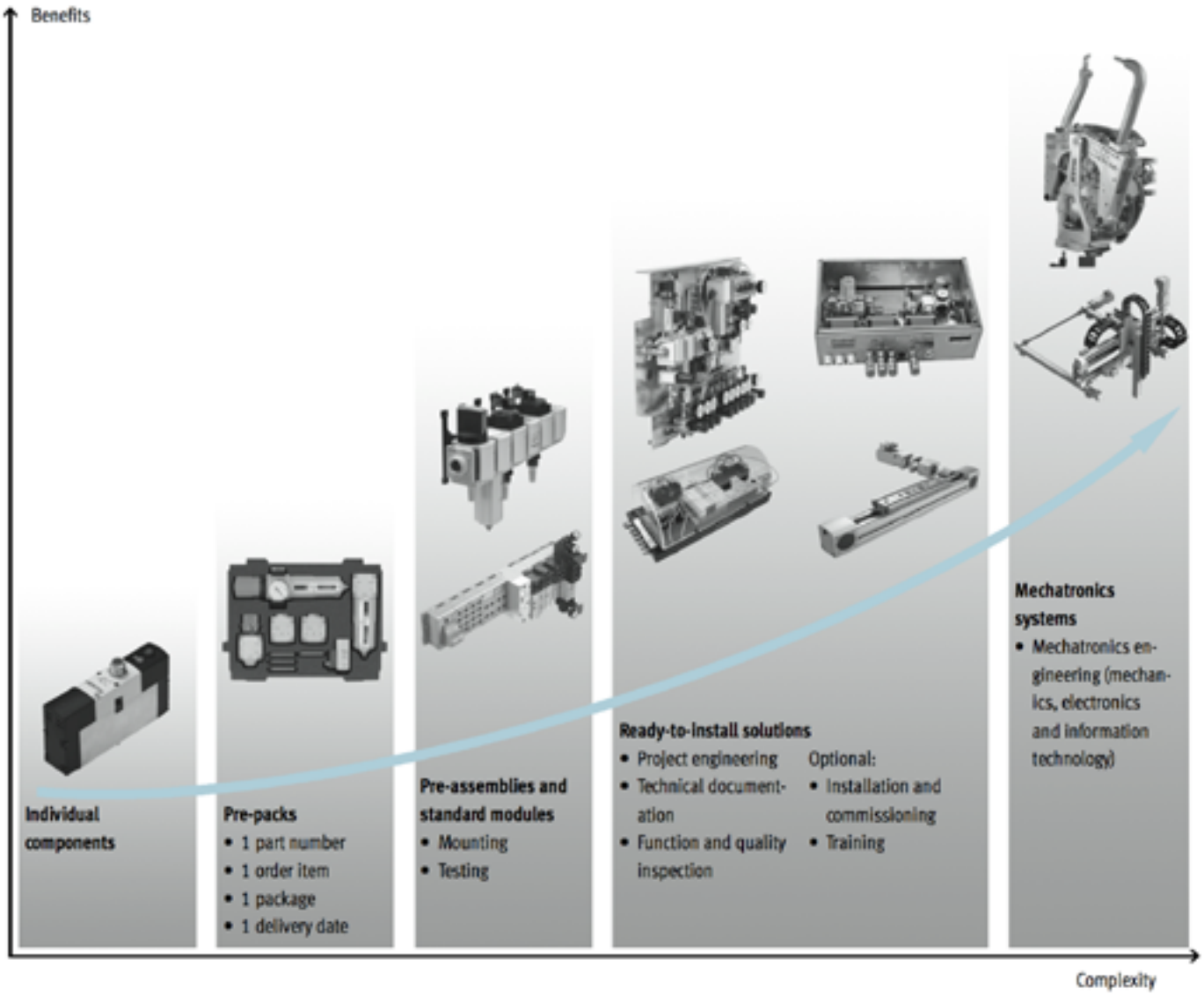
6
Services for servopneumatic welding guns

The service package from Festo for:
– Simple commissioning
– Efficient operation
– Fast error correction
Find out more about the servopneumatic welding guns from page
-› page 20

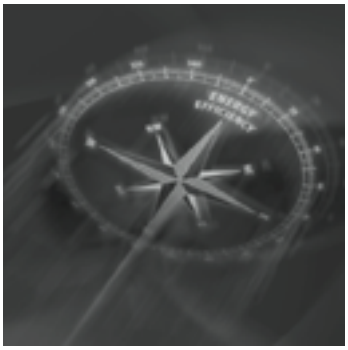
Find out more at
www.festo.co.uk/ready-to-install

Ready-to-install solutions

From simple modules to complex systems
With its ready-to-install solutions, Festo offers its customers the opportunity to streamline their processes and concen- trate exclusively on their core compet- ence. Benefit from our expertise: custom- ised solutions that ensure maximum productivity and process reliability. From simple pre-pack and pre-assembly solu- tions to complex, ready-to-install sys- tems, everything is precisely tailored to your requirements and fully tested.
Festo offers continuous support along the entire value-creation chain. Our special- ists' automation and engineering know- how takes the pressure off you right from the design phase. Festo can take care of sizing technical parameters, selecting components, drawing circuit diagrams, CAD design and creating parts lists. You end up with a solution based on the latest technological standards and re- duce your development times and pro- cess costs. A further advantage is that all the system components required can be ordered with just one part number, redu- cing your ordering and logistical costs.
We deliver a fully assembled, tested and documented system. Defined electrical, pneumatic and mechanical interfaces en- sure simple and reliable assembly and commissioning. Festo can of course also install and commission your system, thereby guaranteeing maximum reliabil- ity in terms of operation and optimum adjustment.
Whatever systems you require, Festo has the appropriate answer to your requirements from simple, small-scale solutions through to complex systems, e.g.
- Modules
- Service unit combinations
- Mounting plates
- Hall installation plates
- Robot installation plates
- Control cabinets
- Pneumatic control systems
- Handling systems
- Integrated solutions



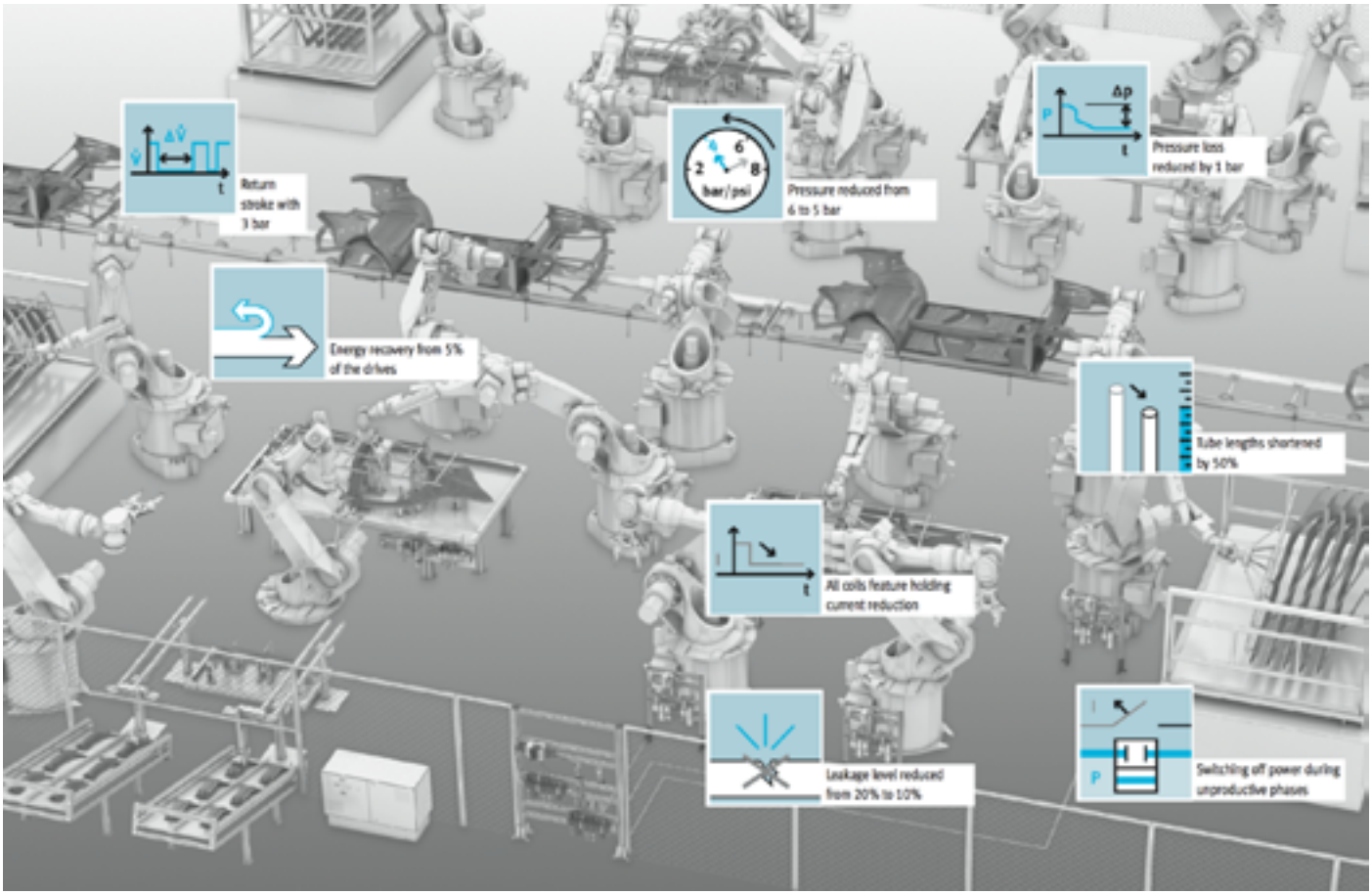
Energy efficiency in the automotive industry



Festo offers an integrated approach to optimising the energy efficiency of machines and systems in the automotive industry.

Judge for yourself:

https://www.festo.com/cms/en-gb_gb/15560.htm



Energy saving	=	53% ↘
Costs	=	€3,000 ↘
CO_2 reduction per year	=	13 t ↘

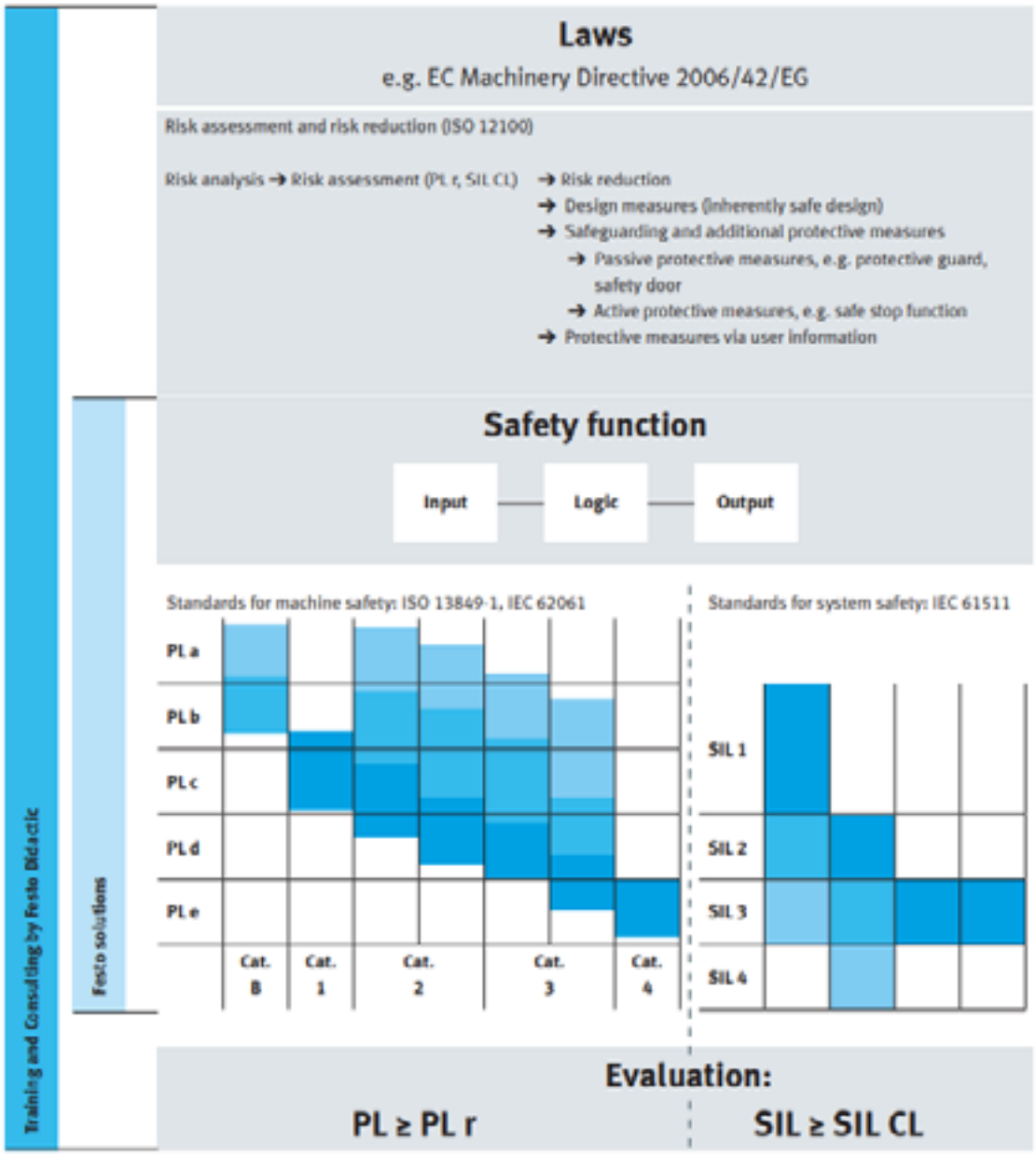
Your partner for safety

Machines have to be designed in a way that protects people, animals, property and the environment from harm. The goal is to prevent physical damage of any type.

Using safety-oriented pneumatic and electric components from Festo provides you with the security of implementing safety measures in compliance with the EC Machinery Directive.

Safety@Festo

There are legal requirements around the world to ensure that machines can be safely built and operated. Almost all regulations stipulate a risk assessment to be able to identify risks. These can be used to determine and implement measures aimed at minimising risk.



Objectives: safe machines and protection of personnel

Objectives: standardised processes + «check lists» + adequate risk reduction

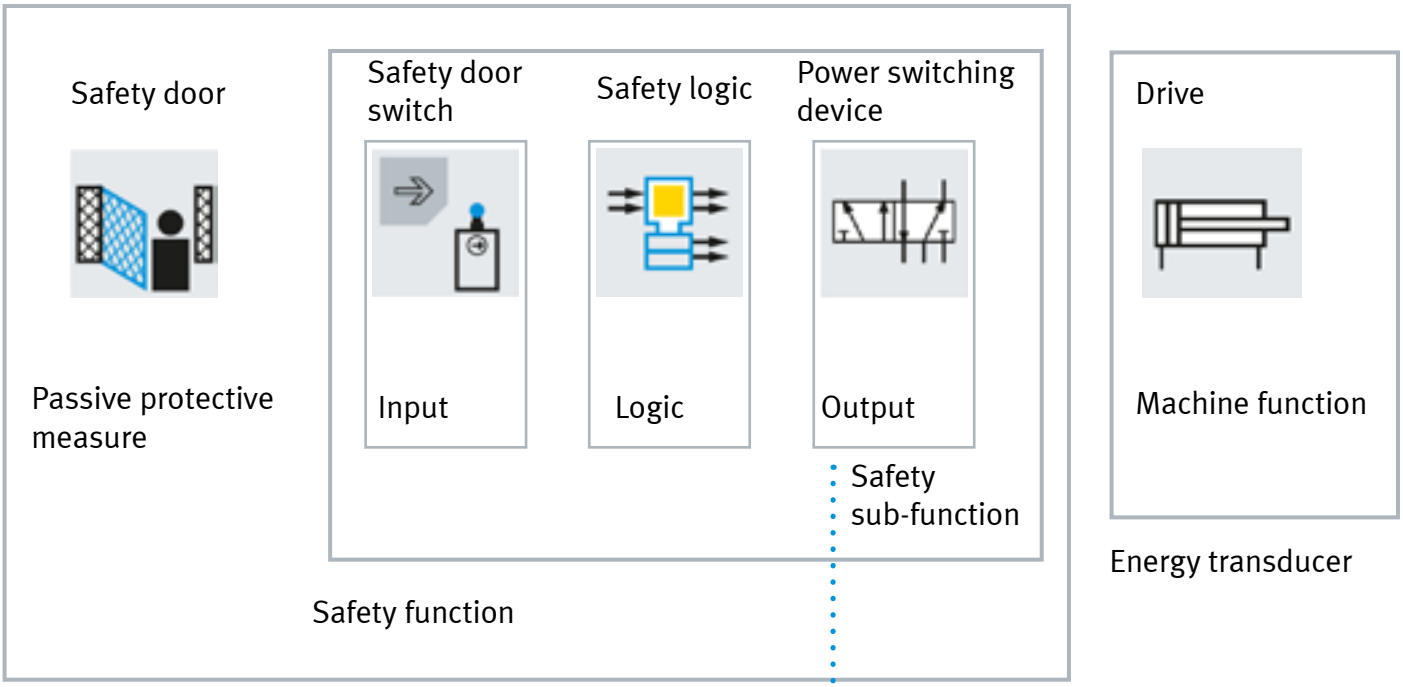
Objective: Standardscompliant implementation of active protective measures

Objective: proof of adequate risk reduction through active protective measures

Festo offers many safety solutions for the entire control chain in the area of electrics and pneumatics, for input, logic and output.

Overall safety function

The overall safety function is a protective measure for risk reduction that can be used to reach or maintain a safe machine state. It takes specific risk events or situations into account.
An example is the separation of the operator from the hazard zone. To allow the operator access, the hazardous drive movement is stopped and the drive is then maintained The overall safety function thus consists of, as a minimum, a passive protective measure, the sensor (input), the logic (safety relay unit) and the valve combination (output).



Important: the safety sub-function
Safety sub-functions are part of a safety function.
A safety sub-function is performed by a component or a group of components of this safety function.

Typical example:
The disconnection from the power supply by a power switching device such as valve, motor controller or contactor (relay).

Normal operation

- Safety door switch
- Light curtain
- Two-hand control

Special operation, e.g. collaborating operation

- Laser scanner
- Camera system

Set-up and service operation

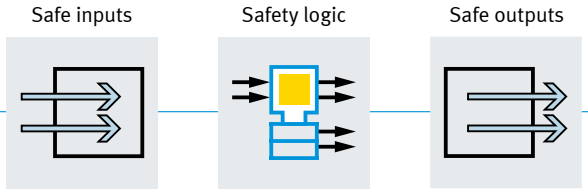
- Mode selector switch
- Enabling button
- Safety shut-off mat

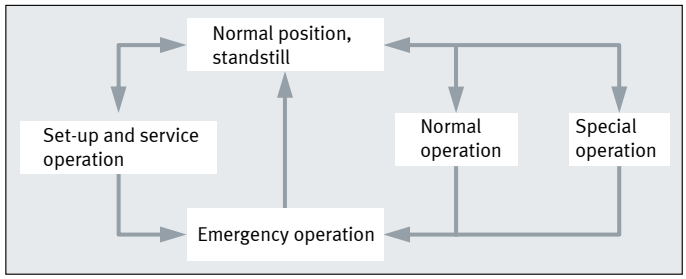
Emergency operation

- Emergency stop device

Monitoring functions

- Limit switch
- Measuring system
- Pressure switch
- Switching position monitoring
- Position monitoring





Output

Output

Pneumatic drive technology
in accordance with VDMA standard sheet 24584

Electric drive technology
in accordance with ISO 61800-5-2

Safety sub-functions that affect systems


SDE –
Safe de-energization


SEZ – Safe energization


PUS (LOTO) – Prevention of unexpected start-up, lockout-tagout

Safety sub-functions that affect drives


STO – Safe torque off


PUS – Prevention of unexpected start-up


SS1 – Safe stop 1


SSC – Safe stopping and closing


SOS –
Safe operating stop


SS2 – Safe stop 2


SDI – Safe direction


SSB – Safe stopping and blocking (in mechanics)


SB – Safe blocking (not part of the VDMA 24584)


SBC – Safe brake control

Safety sub-functions that affect drives

STO – Safe torque off

SS1 – Safe stop 1

SOS –
Safe operating stop

SS2 – Safe stop 2

SDI – Safe direction


SSB – Safe stopping and blocking (not part of ISO 61800-5-2)

SBC – Safe brake control

Monitoring safety sub-functions


SLS –
Safely limited speed


SLT – Safely limited torque (force)


SET – Safe equilibrium of torque

Monitoring safety sub-functions

SLS –
Safely limited speed

SLT – Safely limited torque

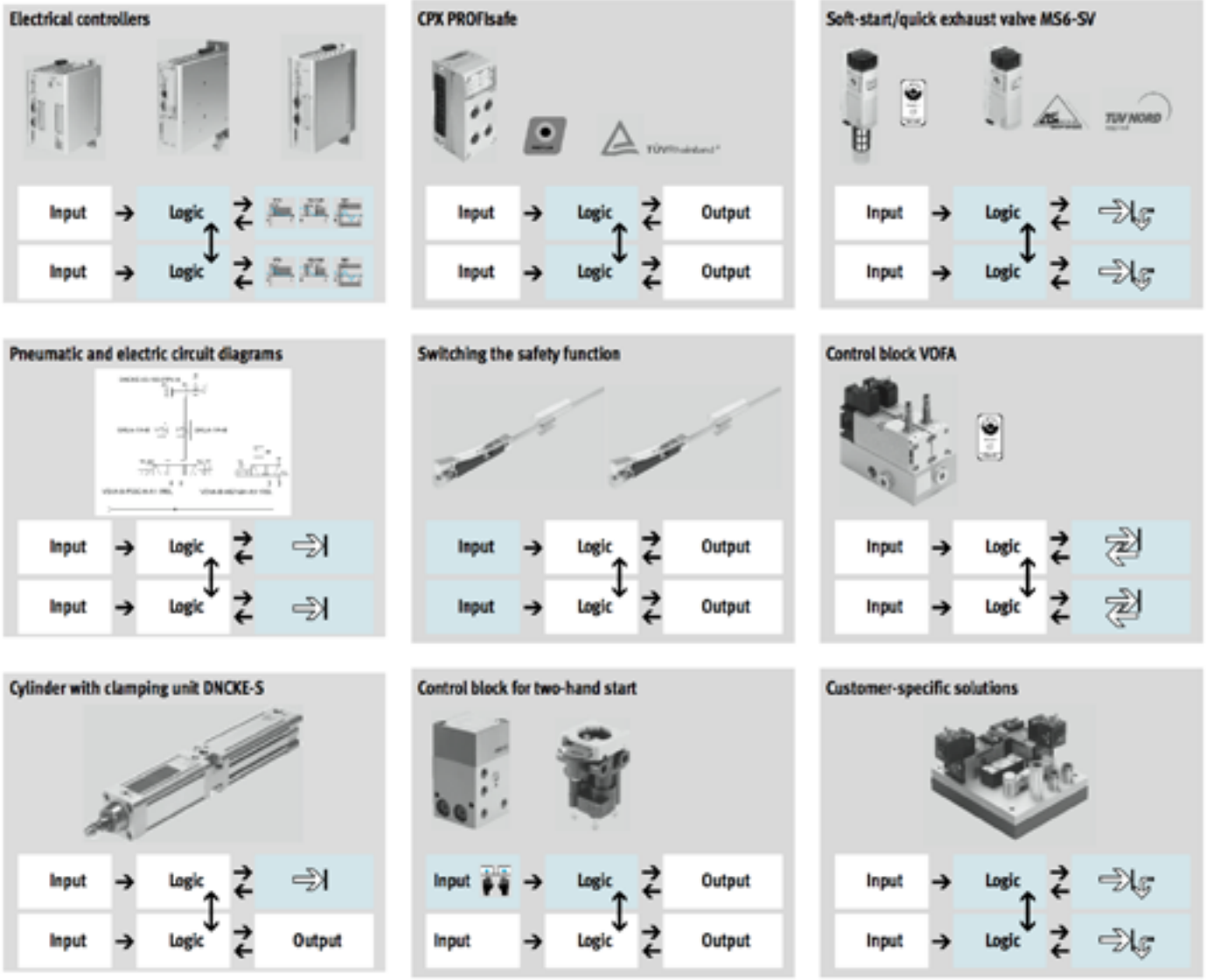
Reduce risk think preventatively

Quality has many different facets for Festo, one of which is the safe use of machinery. Our safety-related automation technology therefore gives you the certainty that your workplace is as safe as possible.

Straightforward and helpful:

Our safety solutions range from individual products and customer-specific solutions to suggestions for circuits and training courses. Festo Didactic offers training and consulting services on standards and directives as well as risk assessment through to the assessment of technical safety measures.

Here are a few examples of technical safety measures in the automotive industry



Function blocks in accordance with DIN EN ISO 13849-1

Functions covered by Festo products

Our specialists are available worldwide for further requirements.
www.festo.com/safety

Festo parameter library
This provides you with safety-related parameters for Festo components in line with VDMA 66413

Industry 4.0 / IoT
Products and solutions

Industry 4.0 and the Internet of Things (IoT) impresses Original Equipment Manufacturers (OEM) and end users alike. Production and the digital world come together, making factory automation more flexible, increasing energy efficiency, linking logistics processes more closely, optimising the value chain – and all this is happening in process automation too.

The Internet of Things (IoT), smart factories, cyber-physical systems and big data are driving the project of the future - solutions must be ever faster, more diverse, more flexible and more intelligent. Calls for greater availability, energy efficiency and just-in-time production are becoming louder.

Festo is playing a major role in shaping the Industry 4.0 trend, and emphasises the following aspects in particular:

Politics and standardisation: Festo is a member of the "Industry 4.0" initiative of the German Federal Government, and is involved in all key standards associations and initiatives on this topic.

Research at Festo

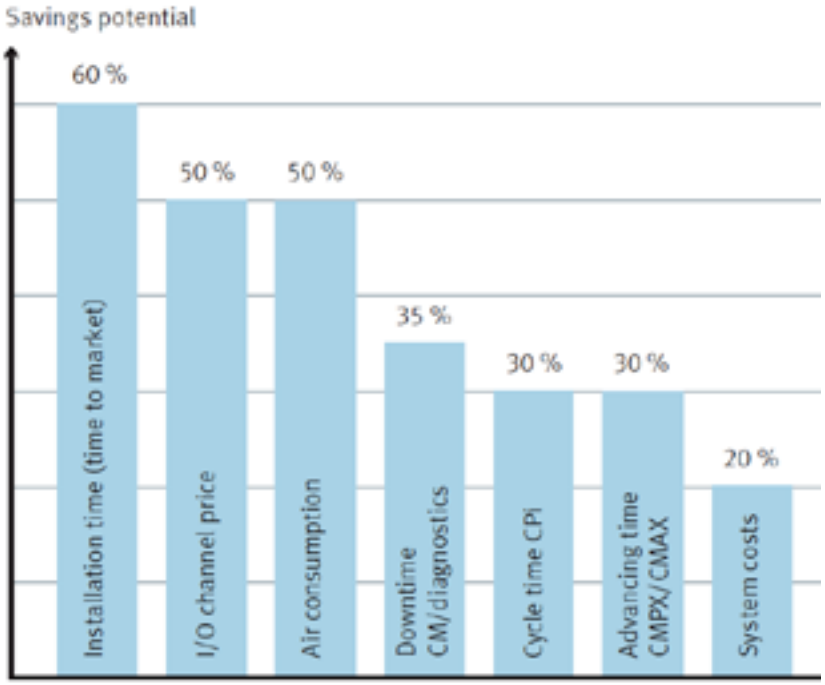
https://www.festo.com/group/en/cms/10260.htm

Recommended products

Function integration is the way forward

Valve terminals are becoming the automation platform of the 21st century. And that is exactly why an electrical platform is needed which meets all requirements with maximum modularity. Enter the CPX as remote I/O.

Function integration is the key to savings through intelligent automation
With CPX, you can integrate pneumatic and electrical control chains easily, quickly, flexibly and seamlessly into all automation concepts and company-specific standards, resulting in several benefits:
- Reduced overall cost
- Overall parts reduction
- Advanced diagnostic functions
- Additional technical capabilities
- Energy savings through distributed systems and reductions in pneumatic connections
- Easier maintenance
- Smaller footprint, reducing space and saving installation cost

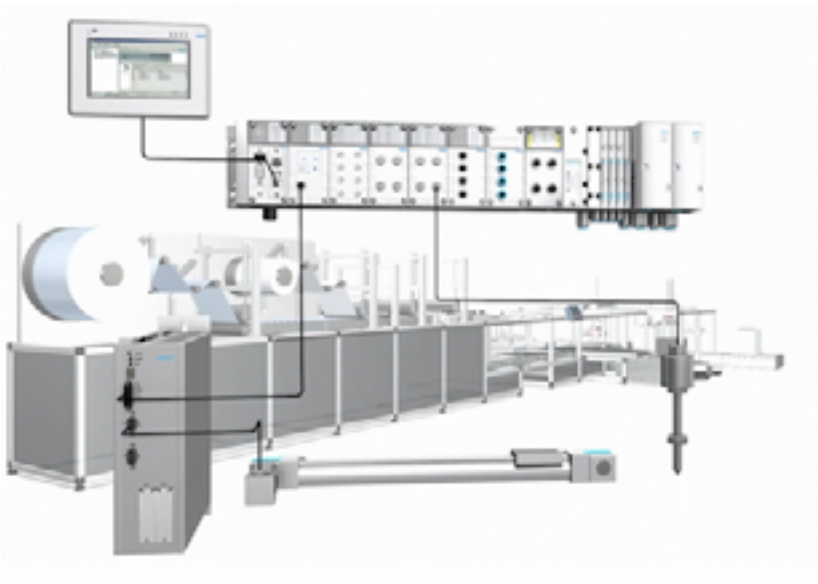


Traditional automation installations

- Networked racks for distributed I/O
- Hard-wired valve manifolds
- External pressure sensors and regulators
- Proportional valve technologies (I/P) through analog outputs
- Hundreds of wiring and pneumatic connections
- Diagnostics limited to input and output cards

Festo integrated automation

- Networked automation platform or stand-alone with integrated PLC
- I/O integrated into CPX and CTEL platforms
- Valves controlled through bus rather than hard-wired, eliminating wiring connections for valves.
- Diagnostics down to the individual valve
- Integrated proportional valve technology – control system pressures through the network!



8.1 CPX automation platform

CPX – the ideal platform for electrical peripherals.
Perfect as a valve terminal partner or as remote I/O:
electrical, open and direct

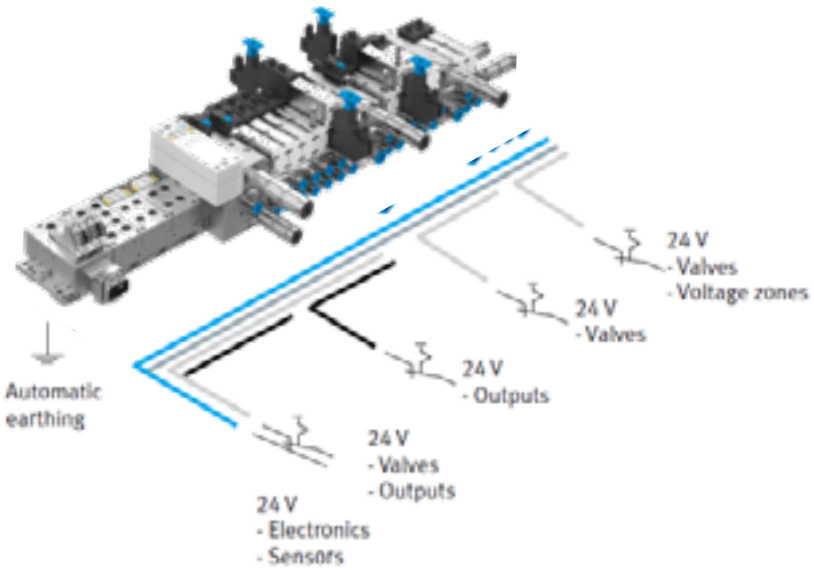
Perfect networking for universal communication
- Open to all Fieldbus protocols such as Ethernet/IP, DeviceNet, Profibus, Profinet, Modbus TCP and more

Two variants of subbase and connection block
- Metal version for mounting in harsh environments
- Polymer version for use in other areas

Incredible variety of I/O modules
- Expandable to up to 10 I/O modules
- Digital, analog and pressure modules
- Up to 144 inputs locally, up to 512 decentralized

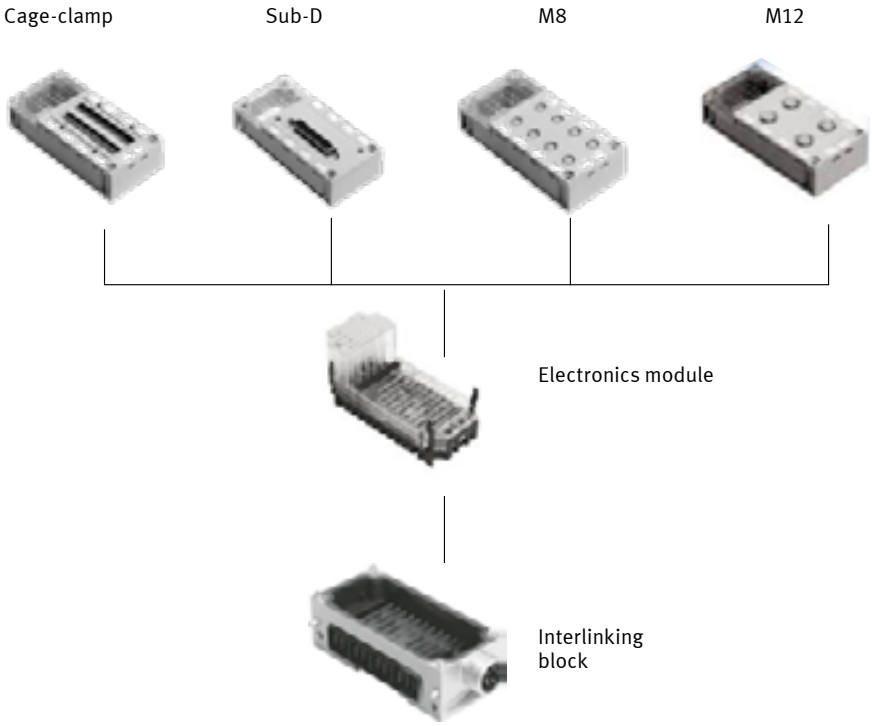
Combine this directly with the operating process elements
- Pilot or process valves
- Control valves for cylinders, grippers, vacuum
- Pressure regulators for proportional control systems
- Servo-pneumatic positioning systems
- Electric drives and axes

Voltage zone concept for safe and reliable machine status
- Safer thanks to voltage zones which can be separately switched off
- Additional power supply and galvanic isolation of the outputs
- High power supply
- Fail-safe function built in
- ProfiSafe switch-off module: shuts down internal valve supply and 2 independent, safe external outputs



Maximum modularity and flexibility

- 10 alternative connections in versions with IP20/ IP65/IP67 – quick and easy to install and compatible with company-specific standards
- M8/M12/D-sub/quick connector accessories
- Modular system for any M8/M12 connecting cables
- Heavy duty, robust and reliable
- Choice of plastic or metal threads
- Perfect for direct machine mounting and adaptation to the machine concept



	CPX-4DE	CPX-8DE	CPX-16DE	CPX-L-16DE	CPX-8DE-D	CPX-16DE-D	CPX-4DA	CPX-FVDA-P	CPX-F8DE-P	CPX-L-8DE-8DA	CPX-2AE-U-I	CPX-4AE-U-I	CPX-4AE-I	CPX-4AE-P	CPX-4AE-TC/T	CPX-2AA-U-I	VTSA	MPA-L	MPA-S	MPA diagnostics	Pressure sensor MPA
	Digitial I/O									**Analog I/O**							**Pneumatics**				
Undervoltage							■	■	■	■						■	■	■	■	■	■
Short circuit - signal							■	■	■	■					■	■	■			■	
Short circuit - supply	■	■	■	■	■	■			■	■	■	■	■		■	■	■			■	
Wire break											■	■	■				■			■	
Lower limit											■	■	■	■	■	■					■
Upper limit											■	■	■	■	■	■					■
Parameritization errors											■	■	■	■	■	■					
Condition monitoring																				■	■
Sensor overload												■		■							
Measuring range exceeded												■									

No diagnostics

Module-oriented diagnostics

Module/channel-oriented diagnostics

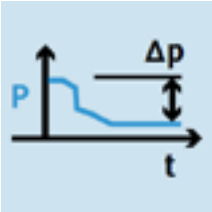
Mainly used by Renault
Please ask to your Festo Local contact the synthesis document dedicated to your project

Compressed air preparation is well worth it!

The right compressed air preparation system significantly increases the long service life of components and systems – as well as the process and product reliability.

Anyone who wants to improve process reliability and machine availability must start at the very beginning – and first analyze the compressed air supply in detail. Particles, water and oil are the natural enemies of perfectly prepared compressed air. They have an adverse effect on the components and cost additional energy.

9.1 Energy saving tips with compressed air preparation



- Switch off the air supply whenever possible, for example during production downtimes, at the end of shifts and during breaks etc
- Thoroughly check the application of filters, since each filter stage reduces the flow rate and increases the pressure drop
- The timely replacement of filter elements in the service units prevents unnecessary flow resistances
- Use multiple distributors instead of stringing T branches together. The pressure drop with in-line T-connectors is higher than in a multiple distributor

- Reduce the overall pressure of the equipment if possible
- Use pressure boosters whenever a high pressure level is required at certain points in the system. This allows you to reduce the overall pressure of the system rather than maintain a high pressure for the entire system, allowing you to save energy costs
- Decentralized compressed air preparation directly at the system reduces the danger of contamination to the components. Moisture, contamination and oil have a negative effect on seals and the initial lubrication of components
- Monitor all air consumption. Counter measures can only be taken if you know how much compressed air is used

Air quality standards to ISO 8573-1:2010

Compressed air quality is generally categorized into the following quality classes in accordance with ISO 8573-1:2010:
1. Quality class of solid contamination
2. Quality class for water content
3. Quality class for overall oil content

Compressed air qualities to ISO 8573-1:2010

Class	Maximum Number of Particles per m3			Mass Concentration	Water		Oil
	0.1 – 0.5 µm	0.5 – 1 µm	1 – 5 µm	mg/m3	Vapor pressure dew point °C	Liquid g/m3	Total oil content (liquid, aerosol and mist) mg/m3
0	As stipulated by the equipment user, stricter requirements than class 1						
1	≤ 20,000	≤ 400	≤ 10	_	≤ -70	_	0.01
2	≤ 400,000	≤ 6,000	≤ 100	_	≤ -40	_	0.1
3	_	≤ 90,000	≤ 1,000	_	≤ -20	_	1
4	_	_	≤ 10,000	_	≤ +3	_	5
5	_	_	≤100,000	_	≤ +7	_	_
6	_	_	_	≤ 5	≤ +10	_	_
7	_	_	_	5 – 10	_	≤ 0.5	_
8	_	_	_	_	_	0.5 – 5	_
9	_	_	_	_	_	5 – 10	_
X	_	_	_	>10	_	> 10	> 10

Safety with the MS-Series

The following table gives an overview of the safety functions that can be integrated in the MS series air preparation unit.

Product	Description	Picture	Protection against unexpected start-up	Exhausting	Controlling pressure build-up
MS-EM/EM1	Lockable/exhausting on/off valve				
MS-DL	Pneumatic soft/start				
MS-EE	Electrically activated on/off valve				
MS6-SV-c	Soft-start and quick-exhaust, single channel design Safety PLc				
MS6-SV-d	Soft-start and quick-exhaust, dual channel design Safety PLd				
MS6-SV-e	Soft-start and quick-exhaust, dual channel design, with self-diagnostic Safety PLe				

Integrated Sensor solutions

The MS series sets new standards in enhanced safety, machine availability and efficient energy usage. This is thanks to the many functions you can integrate effortlessly.

Flow sensor SFAM

The SFAM flow sensor can easily be integrated into the MS-series air preparation unit.
Extremely precise within an enormous measuring range of up to 15,000 l/min
Absolute flow rate information and consumption values
teasure air consumption and detect potential leaks

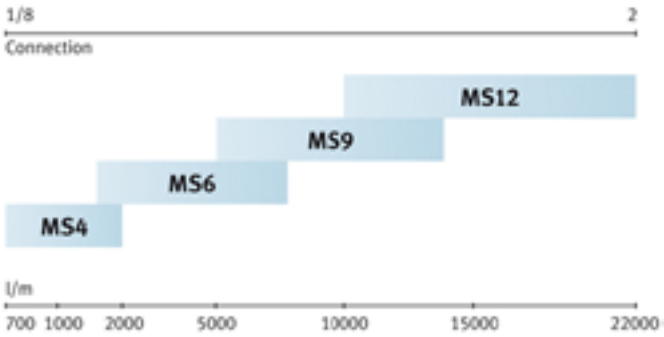
Energy Efficiency modules MSE6-E2M: stop/start modules.

The Energy efficiency modules C2M, D2M and E2M includes pressure and flow rate sensor for a better monitoring of the air consumption.

- Combination of pressure sensor, flow sensor and2/2-way valve “Stop/start valve”
- Profinet Connection
- Leakage detection, and condition monitoring through sensors
- Pressure regulation for Standbye mode on C2M

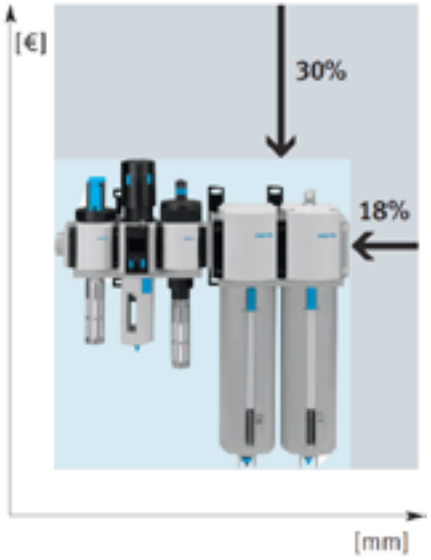
Power that pays for itself

The high flow rates and compact dimensions of the MS series mean it is often possible to install one size smaller than comparable air preparation units. The MS12 offers flow rates of up to 22,000 l/min for some individual units. This ensures that there is no undersupply of air to actuators and even begins to match the performance of central compressed air preparation systems.



Combines optimum flow rate and compact design

Simply choose a smaller size. An intelligent mix of sizes is one of the hallmarks of the MS series and offers you crucial advantages. Our mix provides combinations optimized in terms of both installation space and cost. An example is the combination of MS6 and MS9. With the combined service unit shown in the diagram for requirements of 6 bar, a flow rate of 6,500 l/min and a grade of filtration of 0.01 µm, you can save up to 30% of the component costs and up to 18% on space!



Original design: MS9 as standard

A clever mix: MS6 and MS9
MS6 = standard devices EM, LFR, EE
MS9 =Fine and micro filter LFM-B and LFM-A

9.2 Summary of MS-Series components

9.2.1 Manual on/off Valve

Category	Name	Description	Picture	Documentation
Manual on/off valve	EM	• Manual • Available with Size MS4, MS6, MS9 and MS12 Specifications : **- Quarter turn actuator, 3 ways, 3 ports** - Closed position lockable with a padlock Use : **- For the isolation of circuit, with draining**		MS-START-UP-EX-HAUST-VALVES (en) MS-START-UP-EX-HAUST-VALVES (fr)

9.2.2 Electric on/off Valve

Category	Name	Description	Picture	Documentation
Electrical On/off valve	EE	• Electric On/Off • Available with Size MS4, MS6, MS9 and MS12. • Install after filter-regulators, regulators, or filters . This helps extend filter and regulator life **Specifications :** **- 3/2 way valve for supply.** **- With non-locking manual override** **Use :** **- For pressure supply or exhaust in case of emergency stop.** **- Must be equipped with a silencer.** • Use 542582 (MS6-EE-1/2-10V24 + MSSD EB M12 MONO for 0...10 bar applications) • Use 527682 (MS6-EE-1/2-V24-S + MSSD EB M12 MONO for 0...16 bar applications)		MS-START-UP-EX-HAUST-VALVES (en) MS-START-UP-EX-HAUST-VALVES (fr)

9.2.3 Pneumatic Soft Start Valve

Category	Name	Description	Picture	Documentation
Pneumatic soft-start valve	DL	• Pneumatic soft-start for slow pressure build-up upon pressurization • Available with Size MS4, MS6 and MS12 **Specifications :** **- Pneumatically actuated soft start valve.**		MS-START-UP-EX-HAUST-VALVES (en) MS-START-UP-EX-HAUST-VALVES (fr)

9.2.4 Electric Soft Start Valve

Category	Name	Description	Picture	Documentation
Electric soft-start valve	DE	• Electric soft-start • Allows slow pressure build-up upon electrical activation • Available with Size MS4, MS6 and MS12 **Specifications :** **- Electrically actuated soft start valve.**		MS-START-UP-EX-HAUST-VALVES (en) MS-START-UP-EX-HAUST-VALVES (fr)

9.2.5 Electric Soft Start Valve

Category	Name	Description	Picture	Documentation
Electric Soft Start + Safety exhaust valve	SV-C	• Soft-start/quick exhaust valve • Performance level **PLc** • Red/green gauge using part • Available in Size MS6 and MS9 Specifications : -**Built-in assembly of an exhaust valve and soft start valve, with internal pilot air.** -**With non-locking manual override** Use : MS6-SV-C-1/2-10V24F - **On the 7 bar circuit with 40 µm filtration** - **Mounting on air supply panels after the filters and regulators.**		MS - SV (en) MS-SV (fr)
Electric Soft Start + Safety exhaust valve	SV-D	• Soft-start/quick exhaust valve • Performance level **PLd** • Red/green gauge using part • Available in Size MS6		MS-SV (en) MS-SV (fr)
Electric Soft Start + Safety exhaust valve	SV-E	• Soft-start/quick exhaust valve • Performance level **PLe** • Red/green gauge using part • Available in Size MS6		MS-SV (en) MS-SV (fr)

9.2.6 Filter Regulator

Category	Name	Description	Picture	Documentation
Filter-Regulators	LFR	• Filter-regulator • Available with Size MS4, MS6, MS9 and MS12 **Specifications :** **- 40 µm, without flange, manual condensate drain.** **- Plastic bowl with ball guard for sizes 1/4" to 1/2"** **- Metal bowl for sizes 3/4" and more** **- Without manometer** **Use :** **- As an input module, for all kind of applications**		MS-LFR (en) MS-LFR (fr)

9.2.7 Regulator

Category	Name	Description	Picture	Documentation
Filter-Regulators	LFR	• Diaphragm pressure regulator. • Available with Size MS4, MS6, MS9 and MS12 **Specifications :** **- Diaphragm regulator, regulation between 0,2 and 8 bar** **- Automatic exhaust** **- With manometer** **Use :** **- For installation before valves** **- For all kind of pneumatic applications**		MS-LR (en) MS-LR (fr)

9.2.8 Precision Regulator

Category	**Name**	**Description**	**Picture**	**Documentation**
Precision regulators	LRP	• Precision pressure regulator • Hysteresis 0.02 bar Max • Available with Size MS6 **Specifications :** **- Diaphragm regulator, regulation between 0,2 and 8 bar** **- Accuracy: ± 0,05 bar.** **Use :** **- Remote control of regulators for power circuits**		MS-LR (en) MS-LR (fr)

9.2.9 Distributor block

Category	Name	Description	Picture	Documentation
Distributors	FRM	• Distributor block. • Condition monitoring through sensors and switches • Available with Size MS4, MS6, MS9 and MS12 MS-FRM (en) MS-FRM (fr) **Use :** **- For secondary derivation.** **- For the mounting of pressure control components.**		MS-FRM (en) MS-FRM (fr)

9.2.10 Filter

Category	Name	Description	Picture	Documentation
Filters	LF	40 and 5 micron filters Available with Size MS4, MS6, MS9 and MS12 **Specifications :** **- Without flange, manual condensate drain.** **- Plastic bowl with ball guard for sizes 1/4" to 1/2"** **- Metal bowl for sizes 3/4" and more** **Use :** **- For all kind of applications**		MS-FILTERS (en) MS-FILTERS (fr)

9.2.11 Micro-Filter

Category	Name	Description	Picture	Documentation
Micro-Filters	LFM	1 and 0.01 micron filters Available with Size MS4, MS6, MS9 and MS12 **Specifications :** **- Differential filter indicator via display** **Use :** **- For the pressurizing ad measuring circuits** **- 0,01 µm micro filters should always be mounted after 5 µm fine filters ,independently from the main circuit filtered at 40µm**		MS-FILTERS (en) MS-FILTERS (fr)

9.2.12 Lubricators

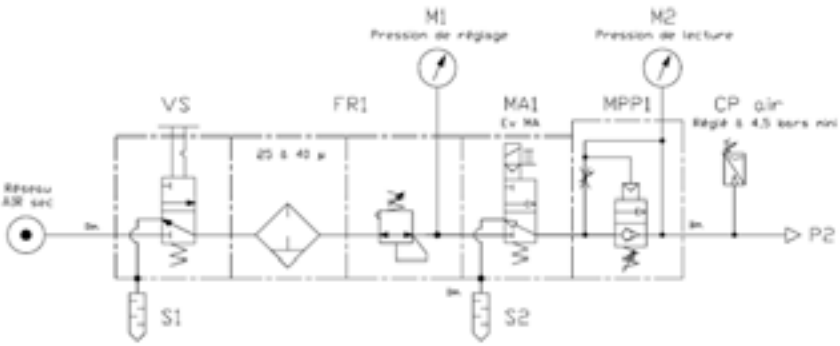
Category	Name	Description	Picture	Documentation
Lubricators	LOE	1 and 0.01 micron filters Available with Size MS4, MS6, MS9 and MS12 **Specifications :** **- Air lubrication for individual components with recommended lubrication (pneumatic motors, screwdrivers)** **- A recovering filter must be mounted on exhaust ports** **- Pneumatic actuators lubrication is forbidden** **Use :** **- Maximum lubrication distance : 8 m**		MS-LOE (en) MS-LOE (fr)

9.2.13 Energy Efficiency Module

Category	Name	Description	Picture	Documentation
Energy efficiency	E2M	• Combination of pressure sensor, flow sensor and2/2-way valve “Stop/start valve” • Profibus and Profinet connection • Leakage detection, and condition monitoring through sensors • Available with Size MS6		MSE6-E2M (en) MSE6-E2M (fr)
Energy efficiency	C2M	• Same feature as E2M + pressure regulation during standbye Mode • Profinet connection		MSE6 (en)
Energy efficiency	D2M	• Same feature as E2M without fieldbus connection • Must be used as a slave for Festo CPX		MSE6 (en)

9.3 Air unit preparations in standard

The technical support department at Renault Techno-center have defined new standard air unit preparations as below:



According to the Cnomo standard of Renault called: GE06-0008

Standard air units for all applications at Renault

Technical features

Type	TTA-MSB6	TTA-MSB6-PLATE	TTA-MSB6-PRO-FILE	TTTA-MSB9	TA-MSB9-PLATE	TTA-MSB9-PROFILE
Part Nr	8034709	8034711	8034713	8034710	8034712	8034714
Mounting	Bracket	Plate	Plate + profile	Bracket	Plate	Platine + Profile
Theoretical flow rate (before outlet)	3.700l/min			10.000l/min		
Operationg pressure	3...7 bar			3,5...7bar		
Ambient temperature						
Pneumatic connection	G 1/2"	G 1/2"	G 1/2" G 3/4" (5+1 outlets)	G 1"	G 1"	G 1" G 3/4" (5+1 outlets)
Operating voltage	24 V DC					
Size (LxHxP) mm	363 X 336 X 184	500 X 300 X 187	1111 X 500 X 187	502 X 451 X 202	700 X 500 X 205	1315 X 700 X 205
						

Datasheet for MSB6 configuration

PRE-ASSEMBLY 8034709

Pos	Ref.	Type	Designation	Qty
	8034709	**Global reference**		
1	526082	MS6-AGD	Sub-base MS6-AGD	1
2	532799	MS6-MV	Module connectr MS6-MV	3
3	541268	MS6-WPB	Mounting bracket MS6-WPB	3
4	526074	MS6-EM1- 1/2-S	On/off valve MS6-EM1-1/2-S	1
5	589898	MS6-LFR-1/2-D6-E-R-M-RG-AS	Filt.regulator MS6-LFR-1/2-D6-E-R-M-RG-AS	1
6	529853	MS6-FRM-1/2	Branch module MS6-FRM-1/2	2
7	8070844	MS6-SV-1/2-C-10V24P-S-CS	Soft-start/quick exhaust valve	1
8	8001479	MS6-SV-C-MK	Covering of adjustment screws	1
9	3571	B-1/2	Blanking plug B-1/2	3
10	197633	D-1/4 I-1/2 A	Reducing nipple	1
11	2224	O-1/4	Sealing ring O-1/4	1
12	8030299	NPFC-E1-2G14-FM	Fitting	1
13	3577	D-1/8I-1/4A	Reducing nipple	1
14	8030217	NPFC-L-R14-G14-MF	Elbow fitting	1
15	8035544	SPAN-P10R-G18M-PN-PN-L1	Pressure sensor	1
16	8000326	SASC-P4-A-M8-A	Electrical adaper SASC-P4-A-M8-A	1

Datasheet for MSB9 configuration

PRE-ASSEMBLY 8034709

Pos	Ref.	Type	Designation	Qty
	8034710	**Global reference**		
1	552956	MS9-AGF	Sub-base MS9-AGF	1
2	552949	MS9-WPB	Mountng bracket MS9-WP	3
3	552950	MS9-MV	Module connectr MS9-MV	3
4	562952	MS9-EM-G-S-VS	On/off valve MS9-EM	1
5	562531	MS9-LFR-G-D6-E-U-M-RG-BAR-AS	Filt.regulator MS9-LFR	1
6	564145	MS9-FRM-G-VS	Branch module MS9-FRM	2
7	562176	MS9-SV-G-C-10V24P-S	Soft s/qu.exh.v MS9-SV with no-detending	1
8	1457669	MS9-SV-C-MK	Cover for adjustment screws	1
9	8069238	NPFC-R-G1-G34-MF	Reducing nipple	1
10	8069234	NPFC-R-G34-G14-MF	Reducing nipple	1
11	2224	O-1/4	Sealing ring	1
12	8030299	NPFC-E1-2G14-FM	Extension	1
13	8030217	NPFC-L-R14-G14-MF	Elbow fitting	1
14	8030308	NPFC-R-G14-G18-MF	Reducing nipple	1
15	8035544	SPAN-P10R-G18M-PN-PN-L1	Pressure sensor	1
16	8000326	SASC-P4-A-M8-A	Electric adapter	1

9.4 Silencers

Name	Description	Picture	Documentation
Silencers U, UC	• Port thread M3, M5, G1/2, G1/4, G1/8, G3/8, G3/4, G1 • Noise level 65 ... 84 dB(A)		SILENCERS (en) SILENCERS (fr)
Silencers UOS-1	• For soft-start and exhaust valve MS6-SV-D and E • For “reliable exhausting” as per ISO 13849-1		
Filter silencers LFU	• With cartridge and drain recover		LFU (en) LFU (fr)

9.5 Pressure gauges

Name	Remarks	Picture	Documentation
MA	40mm or 50mm face R1/8 or R1/4 pneumatic connection Pressure ranges to 2.5, 10, or 16 bar (36, 145, or 232 PSI) Option : Red/green gauge		MA (en) MA (fr)

9.6 Filter cartridge

Name	Remarks	Picture	Documentation
Cartridge LF	Available with Size MS4, MS6, MS9 and MS12 40, 5,1 and 0.01 micron filters and activated carbon filters		CARTRIDGE (en) MS-FILTERS (fr)

9.7 Pressure boosters and compressed air reservoirs

CRVZS reservoirs and DPA Pressure boosters
Save energy through smart compressed air usage

- CRVZS reservoirs can store compressed air at a high usage location can help reduce pressure drops of the machine
- This can improve machine performance and eliminate the need for larger piping or more compressors
- CRVZS pressure boosters can store vacuum for more efficient vacuum operations
- A DPA pressure booster can increase the pressure of the line. If only a small number of applications require higher pressure, this allows you to supply the machine with substantially lower pressure and boost pressure for the needed applications
- Depending on the application, this can lead to substantially reduced total air consumption

Compressed air systems can have wide pressure fluctuations during a process. Smart air distribution and use of components such as pressure boosters and air reservoirs can help eliminate the impact of pressure drops on machine performance.

Name	Description	Picture	Documentation
CRVZS	316 Stainless Steel air reservoir Volume: 0.1 ... 20 l liters		CRVZS (en) CRVZS (fr)
DPA	Twin-piston pressure booster Adjustable or pre-set pressure ratio (up to 2:1) Supply pressure 2 ... 10 bar Output pressure 4 ... 16 bar Flow rate 300 ... 3000 Nl/min		DPA (en) DPA (fr)
DPA-CRVZS	• DPA with integrated CRVZS reservoir DPA 40 to 100 CRVZS 2 to 20		

9.8 Pressure sensors

Name	Description	Picture	Documentation
SPAN	• Pressure/vacuum sensor • Illuminating LCD Red/blue display • IO-Link • Compact design 30x30mm		SPAN (en) SPAN (fr)
SPAU	• Pressure/vacuum sensor • Relative pressure measurement • Illuminating LCD Red/blue display • IO-Link		SPAU (en) SPAU (fr)
SPAW	• 9 pressure ranges : -1...1 bar to 0...100 bar • Pressure sensor for fluids and gazes • With 4-digit LED display		SPAW (en)
PEV	• Pressure switch • Pressure 0 ... 11 bar • Air connection female thread 1□4 • M12-4 pin connector • Adjustable switching point		PEV (en) PEV (fr)

9.9 Air gap sensors

SOPA Air Gap Sensor

Precise and easy to use
Lightweight, compact and highly precise, this pneumatic solution offers impressive scope for integration: SOPA features a control module, compressed air regulation, measurement air switch-off and air jet function as well as up to four measuring modules. All in all, an attractively priced solution for low tolerances. The air gap sensor SOPA senses exactly in the µm range whether the workpiece is lying flat or resting against other workpieces before clamping and whether the machining tool is exactly aligned on the spindle.

Name	Remarks	Picture	Documentation
Air gap sensor SOPA	• Pneumatic sensing principle • Setting : teach in via displays and buttons • Multi-coloured illuminated LCD display		SOPA (en) SOPA (fr)

9.10 Flow sensors

Flow sensors are ideal for monitoring compressed air consumption and leakage detection in production

SFAM Flow Sensor

Safe and convenient
SFAM supplies absolute flow-rate data with threshold values - always precise, thanks to its extremely wide measuring range. The blue display with its very high contrast allows convenient adjustment of the switching point.
The advantage for you: No need to carry out conversions of flow rates.

- **Right or left?**
  This unidirectional flow sensor offers a choice of flow direction -left to right or right to left.
- **Flexible installation**
  The SFAM has a compact design and takes up little space.
- **Easy to combine with MS6/MS9 service units**

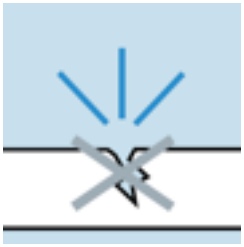
Name	Description	Picture	Documentation
SFAH	• Flow sensor • 0.05 ... 50 l/min • Analog and discrete outputs • Integrated digital display • IO-Link		SFAH (en) SFAH (fr)
SFAM	• Flow measuring ranges from 10 to 15,000 l/min. 0-10V or 4-20 mA analog outputs. 2X PNP or 2X NPN discrete outputs • Display with highly luminous LED for optimized visualization • Compatible and can be integrated • Continuous monitoring of air consumption		SFAM (en)

Better Connections!

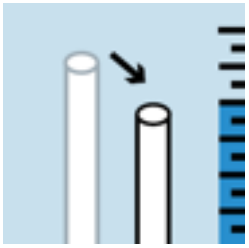
Very economical since the right solutions are always available.
You tell us your requirements, Festo provides the right combination. The wide variety of materials Festo uses with different characteristics and resistance properties mean Festo can address virtually all requirements. From chemical resistant to high temperature, from food industry compatibility to resistant to heat, Festo has the right tubing and fittings combination for every application.

Saving energy by reducing leakages

The longest product service life can be obtained if the right combination of materials and sealing systems is used, taking into account their various temperature, pressure and ambient conditions.



- Appropriate tubing material for the environment prevents chemical, physical and microbial damage
- Cut tubing to length only with appropriate tools
- Fittings with modern sealing rings and support function ensure tight and reusable screw connections



- The correct sizing of the length and diameter of tubing reduces the pressure drop and the volume of pressurized and exhaust air

10.1 Tubing – the flexible transmission

Component tubing is indispensable in connecting pneumatic valves, cylinders and decentralized compressed air preparation systems because of its flexibility and low space requirement. Festo offers a full tubing range, optimized for special requirements.

PUN/PUN-H
Suitable for a wide range of tasks and attractively priced.
- Flexible thanks to highly resistant materials
- Easy to install thanks to optimized bending radii
- High level of abrasion resistance in dynamic applications

PUN-VO
Very safe in areas where there is a risk of fire thanks to flame-retardant properties.
- The tubing has been tested to DIN 5510-2.

PUN-VO-C
Ideal for applications involving welding spatter.
- Tubing wall thickness of 2 mm for all diameters.

PAN-VO
Safe even in the immediate vicinity of welding spatter.
- double-walled tubing : Outer : PVC, Inner : Polyamide

Summary of recommended tubing

Name		Description	Picture	Documentation
PUN-H (Polyu-rethane)	• General applications • Blue for power circuits, black for logic circuits	• General applications • Outside diameter 3 ... 16 mm • Temperature-dependent operating pressure -0.95 ... 10 bar • Ambient temperature -35 ... 60 °C		OD-TUBING (en) OD-TUBING (fr)
PUN-V0 (Polyu-rethane)	• Single layer tubing, sparkle resistant • Red for air, Green for water	• Outside diameter 6 ... 16 mm • Temperature-dependent operating pressure -0.95 ... 10 bar • Ambient temperature -35 ... 60 °C • Resistant to sparkles		
PUN-V0-C (Polyu-rethane)	• Single layer tubing, sparkle resistant, flame retardant • Red for air, Green for water **For using in proximity to welding appli-cations**	• Outside diameter 4 ... 16 mm • Temperature-dependent operating pressure -0.95 ... 10 bar • Ambient temperature -35 ... 60 °C • Resistant to sparkles, flame retardant		
PAN-V0 (Polyamide+PVC)	• Double layer tubing, highly sparkle resistant • Blue for power circuits, black for logic circuits **For using in proximity to welding appli-cations**	• Outside diameter 4 ... 12 mm • Temperature-dependent operating pressure -0.95 ... 12 bar • Ambient temperature -30 ... 90 °C • Resistant to sparkles		

10.2 Push-in fittings

Overview of Festo fittings

These fittings are equally well suited to vacuum or compressed air. Steel retaining claws secure the tubing without damaging its surface. Vibration and pressure surges are safely absorbed. The tubing can be released by pressing in the release ring. The claw is then lifted away from the tubing. This push-in/ clamp function is used in many types of fitting.

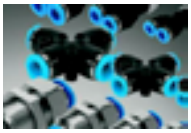
QS - Thousands of variants for maximum flexibility
- QS fittings come in thousands of configurations, ensuring the right fitting is available for each application
- Ideally suited for end of line packaging

NPQM - The smart alternative to stainless steel
- Only slightly more expensive than QS fittings, the NPQM is fully made in metal
- Flame retardant properties

NPQH - The perfect fitting for the sparkling areas
- NPQH is more chemical resistant and built for high temperatures
- Resistant to welding splatters

Fitting properties	QS- G	NPQM	NPQH
Body materials	Nickel-plated brass, NBT	nickel-plated brass	15 µm anodized nickel-plated brass
Clamping disc	Stainless steel	Stainless steel	Stainless steel
Temperature range	-10...80°C	-20...70°C	0...150°C
Operating pressure (Temperature dependent)	-0.95...14 bar	-0.95...16 bar	-0.95...16 bar
Connection sizes	M3, M5, M7, G1/8 to G1/2,	M5, M7, G1/8 to G1/2	M5, M7, G1/8 to G1/2
Chemical resistant	+	+	+ +
Suitable for welding area	No	Yes	Yes
Documentation	QS (en) QS (fr)	NPQM (en) NPQM (fr)	NPQH (en) NPQH (fr)

10.3 Recommended tubing and fitting combinations

	Applications and environmental influences	Recommended tubing	Recommended fitting
	Maximum flexibility in standard applications thanks to an extremely wide range of options for combining the different types	Standard applications PUN-H	Standard applications PUN-H
	Its flame retardant properties provides a high level of safety in areas where there is a risk of fire. The tube has been tested according to DIN 5510-2.	Flame retardant PUN-V0	Flame retardant NPQM
	Ideal for application involving welding splatters. Reliable thanks to a tubing wall thickness of 2mm for all diameters.	Resistant to welding splatters PUN-VO-C	Resistant to welding splatters NPQH NPQM
	Safe, even in the immediate vicinity of welding spatter thanks to the double walled tubing.	Resistant to welding splatters , High temperature PAN-VO	Resistant to welding splatters , High temperature NPQH NPQM

10.4 Functional fittings

Functional fittings provide additional features besides joining tubing to a threaded connection. There are many types of functional fittings offered by Festo:

On/off valves
Enable local shut-offs for individual tubing supplies

Flow control valves
Adjust actuator speeds by using flow control valves

Pilot operated check valves
Prevent unwanted movements by requiring a secondary pneumatic source to operate, typically for safety reasons

Quick exhaust valves
Allow faster movements of actuators by exhausting right at the application, rather than back through the valve

Check valves
Prevent return flow through the use of an inline check-valve

Manual overide
During maintenance, for the exhaust of the pressure in the cylinder

Push-in fitting, self-sealing
Allows the flow direction in only one way

Flow control valves
Adjust the flow rate in one tubing

Tubing cutter
For a straitgh cut of the tubings and pipes, ensure a better sealing

Recommended functional fittings

Name	Remarks	Comment	Picture	Documentation
HE Shut-off valve	• Use 2/2 for shutting off supply or 3/2 to also exhaust downstream	• Connection 6, 8, 10, 12 mm, G1/8, G1/4, G3/8, G1/2, • Flow rate 0 ... 840 l/min • 2/2 or 3/2 with exhaust		QH, HE (en) QH, HE (fr)
QH Ball valve	• 2/2 way valve for shutting air circuit	• Connection 6, 8, 10, 12 mm, G1/8, G1/4, G3/8, G1/2, • Flow rate 0 ... 84000 l/min		QH, HE (en) QH, HE (fr)
GRxA Flow control valve	• Flow controls limit the flow rate of the exhaust • No flow restriction on supply	• Connection G 1/4, G 3/8, G 1/2, G3/4, G1, G1 1/2 • Push-in connector 3, 4, 6, 8, 10, 12 mm • Flow rate 0 ... 1,400 l/min • Non-return and flow control valve.		GRx (en) GRx (fr)
H, HA, and HB Check valves	• Use type H for tubing connections • Use type HA/HB for threaded connections	• Connection 4, 6, 8, 10, 12 mm, M5, G1/8, G1/4, G3/8, G1/2, • Flow rate 0 ... 2230 l/min		H, HAB, HGL (en) H, HAB, HGL (fr)
HGL pilot-operated check valves	• Male thread for direct mounting on cylinder • Female thread for supply and pilot	• Connection M5, G1/8, G1/4, G3/8, G1/2 • Push in connector 4, 6, 8 , 10, 12 mm • Flow rate 0 ... 1600 l/min • Non return valve with external pilot air		H, HAB, HGL (en) H, HAB, HGL (fr)
HAB Manual override	• Used for maintenance • Exhaust the pressure out of the cylinder	• Connection G1/8, G1/4, G3/8, G1/2 • Flow rate 165 l/min		H, HAB, HGL (en) H, HAB, HGL (fr)
QSK Push-in fitting, Self-sealing	• The fitting is closed when no tubing connected	• Connection G1/8, G1/4, G3/8, G1/2 • Push in connector 4, 6, 8 , 10 , 12 mm • Non return valve included		QSK (en) QSK (fr)
GR Flow control valve	• Flow controls limit the flow rate of the supply • No flow restriction on the exhaust	• Connection G1/8, G1/4, G3/8, G1/2, G3/4 • Flow rate 0 ... 3300 l/min • Non-return and flow control valve.		GR/GRA (en) GRx (fr)
ZRS Tubing cutter	• Pipe and tubing cutter • For a straight cut	• For all Polyurethane tubing with diameter inferior to 12 mm		ZRS (en) ZRS (fr)
SE(U) Quick exhaust valves	• Allows faster cylinder speed • With (SEU) or without silencer (SE)	• Connection G1/8, G1/4, G3/8, G1/2, G3/4 • Flow rate 300 ... 4650 l/min • Noise level 100 db (SE), 85 db (SEU)		SEU (en) SEU (fr)
VRPA pressure regulator	• Adjusts the pressure in the cylinder chamber	• Connection M5, R1/8, R1/4 • Push in connector 4, 6, 8 mm • 80 ... 130 l/min 1...8 bar		VRPA (en)

A wealth of variants and installation options

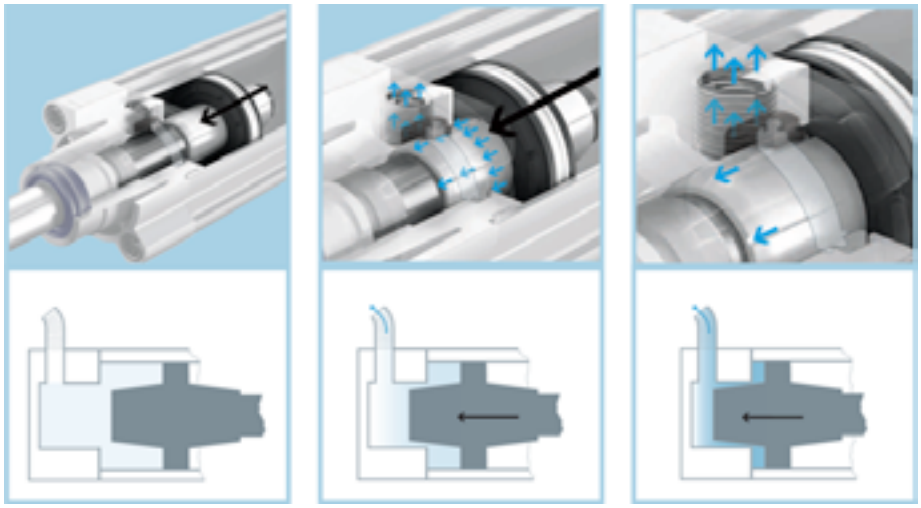
The latest generation actuators from Festo are full of innovations. Particularly noteworthy are PPS self-adjusting cushioning, Clean Design actuators, and wiper seal variants.

PPS Cushioning System

The self-adjusting pneumatic cushioning PPS – unique to Festo!
- PPS cushioning is achieved by the unique cushioning piston ports that allow the air to be optimally vented.
- This makes it entirely unnecessary to set the cushioning manually and enables a dynamic yet gentle movement into the cylinder's end position, even with changing loads
- Unintentional user adjustment is no longer possible as the cushioning automatically adjusts itself to the load and speed
- The adjustment screw is eliminated, removing a potential dirt trap and making the actuator easier to clean

Longitudinal slots allow the air to escape, permitting dynamic and gentle movement into the end position, even under changing loads.

Available for ADN, DSNU, DSBC, DSBG, (detailed in following pages)



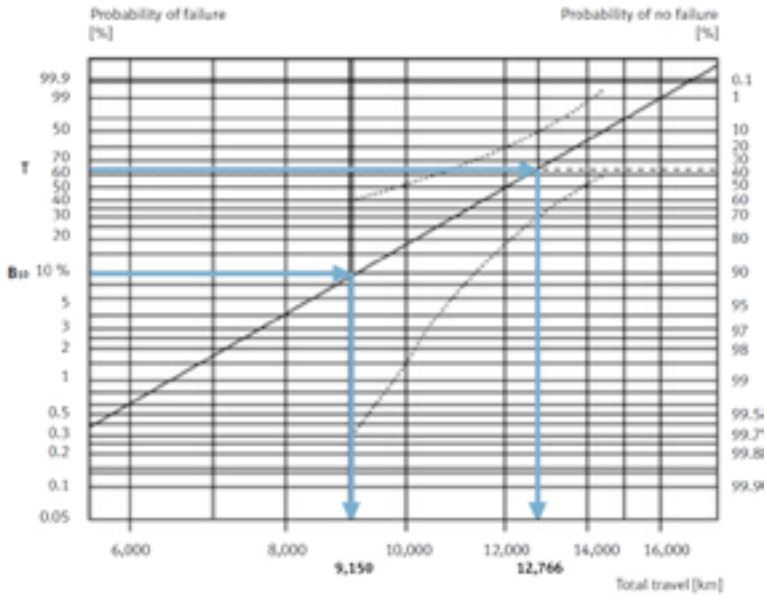
Products with a long service life – quality that pays for itself

Millions of Festo cylinders are used reliably every day, and they have been for more than 40 years. Whether it's a question of technology, quality or service, you can often only tell how good a cylinder really is when it's put to the test under harsh conditions.

Festo subjects every product series that leaves the factory to long-term functional and endurance tests, both during development and all other phases of the product life cycle. Festo aims to constantly optimize products for a long service life and increased cost effectiveness. The results from these tests, carried out under standard conditions, form the basis for preventative maintenance concepts – to ensure that your systems are always ready for use.

Example standard cylinder tests carried out to Festo standards:

B_{10} = 9,150 km
T = 12,766 km



Service life testing of a Festo actuator

ISO standard cylinders

Many Festo cylinders conform fully to ISO dimensional standards. With conformance to an international standard, global compatibility of the actuators is ensured. There are many benefits to standardizing on a single family of pneumatic cylinders – shorter engineering time, smaller inventory, less training, wider availability, and, in the case of Festo actuators, improved performance. While Standard, Festo cylinders are anything but ordinary.

Benefits to using ISO cylinders:

- Global standard ensures OEM partners can meet same requirements
- Future cylinder families are direct dimensional drop-ins. This ensures legacy products can easily be replaced with newer products
- Wide availability of actuators from many sources ensures access to replacements in short notice.

ISO Standard	Cylinder range
Compact Cylinders to ISO 21287	ADN 
Round Cylinders to ISO 6431	DSNU 
Profile Cylinders to ISO 15552	DSBC  DSBG 

Phase out of old ISO Standard cylinder ranges

Attention, from January 2016, DNC and DNG cylinder ranges are be phase-out. They are definitely replaced respectively by DSBC and DSBG ranges.

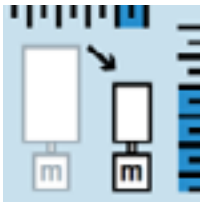
ISO Standard	Previous cylinder range	New cylinder range
Profile Cylinders to ISO 15552	DNC 	**100 % compatible** → DSBC 
	DNG 	**100 % compatible** → DSBG 

Summary of available features

Family	Product	PPS *1)	Q Square piston rod	C Clam-ping unit	E... End Position Locking	S2 Through Piston rod	R3 *2)	D3 *3)	V Swivel moun-ting position	S6 High temp
Compact to ISO 21287	ADN	•	•	•	•	•	•			•
	ADNGF					•	•			•
Round to ISO 6431	DSN(U)	•	•	•		•	•			•
Profile to ISO 15552	DSBC	•	•	•	•	•	•	•		•
	DNCKE									
	DSBG	•	•			•	•		•	•
Guided Actuators	DFM-B						•			•
	DGSL			•	•					
	DGC			•						
	DGC-K									

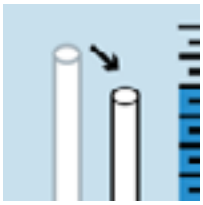
*1) Self-adjusting cushioning
*2) High corrosion resistant
*3) Cylinder profile with sensor slots on threes sides

Energy saving tips with pneumatic actuators



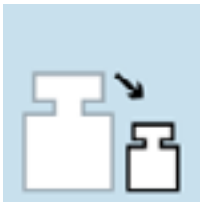
- Design safety coefficients correctly – accumulation of safety factors reduces the economic efficiency

- Check whether the pressure for the non-productive stroke of a drive can be lowered



- Lines of minimum length for current and compressed air – the longer lines are, the higher the loss of energy

- Use cylinders with round piston rods in preference to those with oval and rectangular piston shapes which always have relatively high leakage rates
- The combination of drive and guide guarantees deal operating characteristics, while being easy on the seals. This helps to prevent higher leakage rates
- Appropriate seals and scrapers on the piston rod reduce wear in environments

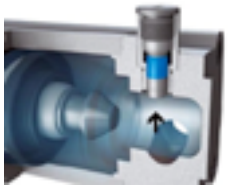


- Reduce moving masses as far as possible to reduce cylinder requirements

Safety with Pneumatic cylinders

Clamping Units
Clamping units can be integrated into a cylinder or be used separately. Clamping units lock onto the rod and prevent the rod from moving.
- The normally closed clamp locks onto the rod when compressed air is removed, preventing the actuator from moving
- Prevents unexpected movement (single-channel)

End-position locking
Cylinders with end-position locking feature an integrated end-position interlock. In the case of a pressure supply failure, the cylinder will not move out of the end-position.
- The interlock automatically releases when pressure is applied to move the actuator from the locked position
- Prevents unexpected movement (single-channel)



11.1 Compact cylinder to ISO 21287

Compact cylinder ADN

The compact cylinder series ADN/AEN complies with the standard ISO 21287
The ADN/AEN is distinguished by its compact design and broad area of application thanks to the large number of variants
The variants can be configured according to individual needs thanks to the modular product system :

- PPS cushioning for optimized performance
- Square piston rod to avoid rotation of the piston rod (Q)
- End position locking for one or both positions (ELV/ELH/ELB)
- Clamping unit in case of energy failure (KP)
- Heat resistant seals for operations up to 120°C (S6)

Name	Application	Remarks	Picture	Documentation
ADN compact cylinder to ISO 21287	• PPS Cushioning • Guided version available (ADNGF)	Diameter 12, 16, 20, 25, 32, 40, 50, 63, 80, 100, 125 mm Stroke length 1 ... 500 mm Double-acting Position sensing		ADN (en) ADN (fr) ADNGF (en)

11.2 Round Cylinders to ISO 6432

Round cylinder DSNU

The DSNU is produced in accordance to standard ISO 6432.
Equipped with a stainless steel piston rod, the DSNU offers excellent running performance. An extensive range of accessories makes it possible to install the cylinder virtually anywhere. A wide choice of variants allows the use of this cylinder in many different environments:

- P
- PPV
- PPS cushioning for cleaner profile and optimized performance
- Square piston rod to avoid rotation of the piston rod (Q)
- Heat resistant seals for operations up to 120°C (S6)
- Clamping unit in case of energy failure (KP)

Name	Application	Remarks	Picture	Documentation
DSNU cylinder to ISO 6432	• P – A • PPV- A • PPS Cushioning	Diameter 8 to 25 mm Stroke length 10 ... 500 mm Double-acting Position sensing		DSN(U) (en) DSN(U) (fr)
DSNU cylinder	• P – A • PPV- A • PPS Cushioning	Diameter 32, 40, 50, and 63 mm Stroke length 25 ... 500 mm Double-acting Position sensing		DSN(U) (en) DSN(U) (fr)

11.3 Profile and Tie-rod Cylinders to ISO 15552

Profile Cylinder DSBC

The dimensions of this reliable standard cylinder comply with ISO 15552, making it a drop-in replacement for ISO 15552 cylinders. The variants can be configured individually thanks to the modular product system :

- PPS cushioning for optimized performance
- Square piston rod to avoid rotation of the piston rod (Q)
- End position locking for one or both positions (E1/ E2/E3)
- Clamping unit in case of energy failure (C)
- Heat resistant seals for operations up to 120°C (T1)

Profile Cylinder DSBC with D3 (Renault recommended)

For all applications with the need of more nut slots, The DSBC is available with the D3 option: In addition to the upper slots already on the standard version, the DSBC-...-D3 offers two additional slots on each side of the cylinder. These slots are open on each end allowing the mounting of sensor through the end caps.

- End position locking for one or both positions (E1/ E2/E3)
- Clamping unit in case of energy failure (C)
- Heat resistant seals for operations up to 120°C (T1)

Tie Rod Cylinder DSBG

The DSBG is the new generation of tie rod cylinders at FESTO. The dimensions of this reliable standard cylinder comply with ISO 15552, making it a drop-in replacement for ISO 15552 cylinders.
A wide choice of variants allows the use of this cylinder in many different environments:

- PPS cushioning for optimized performance
- Heat resistant seals for operations up to 120°C (T1)
- Swivel mounting position (...V)

PPS Cushioning – Auto adjusting!

PPS ensure the best cushioning adapted to each load: The PPS will adapt automatically to the load and the speed. The benefits of PPS cushioning are extensive :

- PPS cylinder are less expensive
- Saving time to replace and work.
- Adapted to each motion
- Even with a variable load
- No risk of maladjustment

DSBC with PPS self-adjusting cushioning

DSBC with PPV cushioning (with adjustment screw)

Name	Application	Remarks	Picture	Documentation
DSBC profile cylinder to ISO 15552	• **PPS Cushioning** • PPV Cushioning	Diameter 32, 40, 50, 63, 80, 100,125 mm Stroke length 10 ... 2800 mm Double-acting Position sensing D3 variant for slot nuts on three sides		DSBC (en) DSBC (fr)
DSBG tie-rod cylinder to ISO 15552	• **PPS Cushioning** • PPV Cushioning	Diameter 32, 40, 50, 63, 80, 100, 125, 160, 200, 250, 320 mm Stroke length 10 ... 2800 mm Double-acting Position sensing		DSBG (en) DSBG (fr) DSBG-160 (en)

11.4 Cylinder with static clamping unit

Based upon a DSBC ISO1552 cylinder, with extended piston rod, and integrated clamping unit, with manual override.
The clamping unit locks the piston rod in case of air failure.
The lock is only static at the end of the cycle, with piston rod extended or retracted.
This unit is not a safety device.

Name	Application	Remarks	Picture	Documentation
DSBC - C	• Static clamping	Diameter 32, 40, 50, 63, 80, 100,125 mm Stroke length 10 ... 2000 mm Double-acting Position sensing		DSBC (en) DSBC (fr)

11.5 Cylinder with dynamic clamping unit

Based upon a DSBC ISO1552 cylinder, with extended piston rod, and integrated clamping unit, with manual override.
The clamping unit locks the piston rod in case of emergency stop
The lock can happen at any time of the cylinder motion.
This unit is not a safety device.

Name	Application	Remarks	Picture	Documentation
DNCKE	• Dynamic clamping	Diameter 40, 63, 100,mm Stroke length 10 ... 2000 mm Double-acting Position sensing		DNCKE (en) DNCKE (fr)
DFLC	• Dynamic clamping	Diameter 40, 63, 100,160 mm Stroke length 10 ... 2000 mm Double-acting Clamping sensing		DFLC (en)
Clamping unit DACS	• Dynamic clamping (standalone unit)	For cylinder diameter 40, 63, 100, 160 mm Clamping sensing		DACS (en)

11.6 Rotary actuators

Name	Application	Remarks	Picture	Documentation
Rotary vane drives DSM	• For simple rotation movements	Size 6 ... 63 mm Adjustable angle 0...270° Torque 0,15... 40 Nm Elastic or hydraulic cushioning Tandem version for double torque Ball bearing version for heavy loads		DSM (en) DSM (fr)
Twin piston semi rotary drives DRRD	• For high mass moments of inertia	Diameter 8...63 mm Adjustable angle 0...180° Torque 0,2... 112 Nm Elastic or hydraulic cushioning End position locking variant		DRRD (en) DRRD (fr)
Rotary vane drives DRVS	• For basic rotation movements	Size 6 ... 40 mm three fixed angles : 90°, 180°, 270° Torque 0,15... 20 Nm Elastic cushioning		DRVS (en) DRVS (fr)

11.7 Guided actuators

Name	Application	Remarks	Picture	Documentation
Guided drives DFM	Adapted to high radial forces	Diameter 12 ...100 mm Stroke length 10 ... 400 mm Position sensing Plain-bearing or recirculating ball bearing guide Metal scraping in option		DFM (en) DFM (fr)
Mini slides DGST	For high radial forces and precise movement	Diameter 6 ...25 mm Stroke length 10 ... 200 mm Compact design Position sensing Elastic or hydraulic cushioning		DGST (en) DGST (fr)
Mini slides DGSL	For high radial forces and very precise movement	Diameter 4 ...25 mm Stroke length 10 ... 200 mm Sturdy design Position sensing Elastic or hydraulic cushioning		DGSL (en) DGSL (fr)

11.8 Rodless actuators

Name	Application	Remarks	Picture	Documentation
Mechanically coupled rodless drives DGC	• With integrated guiding.	Diameter 8 ... 63 mm Stroke length 1 ... 8500 mm Position sensing Pneumatic or hydraulic cushioning plain-bearing or recirculating ball bearing guide DGC-HD with 2 parallel ball bearings guides for heavy loads		DSM (en) DGC (fr)
Mechanically coupled rodless drives DGC-K	• Without guiding	Diameter 8 ... 80 mm Stroke length 1 ... 8500 mm Position sensing Pneumatic cushioning 1:1 replaceable with linear drives DGP		DGC-K (en) DGC-K (fr)

11.9 Stopper cylinder

Name	Application	Remarks	Picture	Documentation
Stopper cylinder with roller DFSP	• Use to lock radial loads	Diameter 16 - 20 - 32 - 40 - 50 - 63 mm Stroke length 5 ... 30 mm Position sensing Single or double acting Variants with trunnion, threaded trunnion and roller		DFSP (en) DFSP (fr)
Stopper cylinder with toggle lever DFST-G2	• Use to lock radial loads • With adjustable shock absorber	Diameter 3 - 50 - 63 -80 mm Stroke length 30...40 mm Position sensing Pneumatic cushioning Single or double acting Variants with or without toggle lever lock		DFST-G2 (en)

11.10 Swivel Clamp cylinder

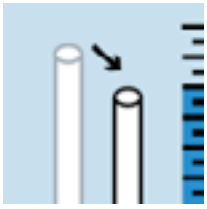
Name	Application	Remarks	Picture	Documentation
Linear / Swivel clamp cylinder CLR	• Use for clamping by combining linear and swivel motion of the piston rod	Diameter 12...63 mm Clamping stroke length 10 ... 50 mm Position sensing Swivel direction left or right Variants with dust and welding spatter protection		CLR (en) CLR (fr)

11.11 Feed separator cylinder

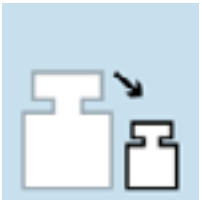
Name	Application	Remarks	Picture	Documentation
Feed separator cylinder HPV	• Immobilization of 1 piece on a conveying line	Diameter 10, 14, 22 mm Clamping stroke length 10 ... 60 mm Position sensing Alternate motions of the 2 piston rods Square piston rods		HPV (en) HPV (fr)

11.12 Pneumatic Grippers

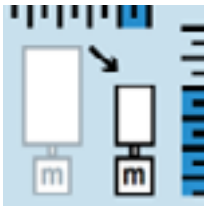
Saving energy with grippers



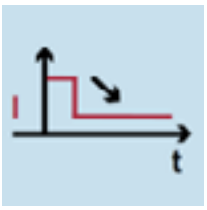
- Ensure tubing is as short as possible and position the valve as close as possible to the gripper



- Use pneumatic grippers in moving applications. They are lighter than electric grippers and therefore save weight and energy



- Reduce the air consumption and use single-acting grippers whenever possible
- Size grippers correctly - grippers which are too large consume an unnecessary amount of compressed air – while grippers which are too small must be operated with maximum permissible pressure



- Use pneumatic grippers for long holding times. With pneumatic grippers, the gripping force is available for as long as needed – without any additional energy consumption required. Electric grippers are controlled and require additional holding current

Name	Remarks	Picture	Documentation
Parrallel Gripper DHPS	• Stroke length 2 ... 12,5 mm per gripper jaw • Force 13...450 N per gripper jaw		DHPS (en) DHPS (fr)
Three Jaws Gripper DHDS	• Stroke length 2,5 ... 6 mm per gripper jaw • Force 29...250 N per gripper jaw		DHDS (en) DHDS (fr)
Standard Radial gripper DHRS	• Opening angle 180° • Total gripping torque 15 ... 725 Nm		DHRS (en) DHRS (fr)
Robust Parallel gripper HGPT	• Stroke length 3 ... 20 mm per gripper jaw • Force 53 ... 3150 N per gripper jaw • Sealing air connection for positive pressure		HGPT (en) HGPT (fr)
Parralel Gripper, sealed HGPD	• Stroke length 3 ... 20 mm per gripper jaw • Force 25...2170 N per gripper jaw • Sealed design		HGPD (en)
Three Jaws Gripper, sealed HGDD	• Stroke length 4 ... 12 mm per gripper jaw • Force 1221...943 N per gripper jaw • Sealed design		HGDD (en) HGDD (fr)

11.13 Piston rod attachments and mounting accessories

A wide variety of mounting accessories are available for every actuator. These accessories ensure easy mounting and consistent performance. Even electric actuators based on ISO 15552 such as the DNCE and ESBF are also capable of using these same components.

It is recommended to view the recommended accessories in the associated catalog for each actuator to verify compatibility.

Example: DSBC mounting accessories

Piston rod attachments

Name	Remarks	Picture	Documentation
Rod clevis SG	• M4...M48 x 2		ADN (en) ADN (fr) DSBC (en) DSBC (fr)
Rod eye SGS	• M4...M48 x 2		DSBG (en) DSBG (fr) DSN(U) (en) DSN(U) (fr)
Self-aligning rod-coupler FK	• For actuators size 32...100		

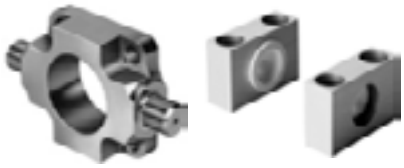
Flange and foot mounting attachments

Name	Remarks	Picture	Documentation
Foot mounting HNA	For ADN diameters 12...100		ADN (en) ADN (fr) DSBC (en) DSBC (fr)
Foot mounting HNC	For DSBC, DSBG, diameters 32...125		DSBG (en) DSBG (fr) DSN(U) (en) DSN(U) (fr)
Flange mounting FNC	For ADN diameters 12...125 For DSBC, DSBG, diameters 32...125		
FBN	Flange mounting for DSNU		
HBN	Foot mounting for DSNU		

Swivel mounting for ISO 6431 cylinders

Name	Remarks	Swivel	Documentation
Clevis foot LBN	LBN can be used as clevis foot for DSNU with swivel mounting		DSNU (en) DSNU (fr)
Swivel mount SBN	Swivel mounting for DSNU		

Swivel mounting for ISO 21287 and ISO 15552 cylinders

Name	Remarks	Picture	Documentation
Swivel flange SNCL and swivel mount LBN	• For ADN diameters 12...125		ADN (en) ADN (fr) DSBC (en) DSBC (fr)
Trunnion flange ZNG and trunnion mount LNZG	• For DSBC, DSBG diameters 32...125		DSBG (en) DSBG (fr) DSNU (en) DSNU (fr)
Swivel flange SNCB and swivel mount LNG			
Swivel flange SNCS and swivel mount LGB			

11.14 Proximity Sensors

SMx proximity sensors from Festo are designed for secure and reliable sensing. The SMT uses the magneto-resistive transistor technology, contactless. The SME uses the magnetic reed technology, with mechanical contact. Each technology is available for 2 slot nut shapes:
SMx-8M, for the mounting in T slots
SMx-10M, for the mounting in C slots

SMT-10M, for the mounting in C slot,
Grippers, small cylinders

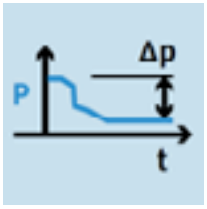
SMT-10M, for the mounting in T slot,
ISO cylinder, guiding cylinders

Name	Application	Remarks	Picture	Documentation
Proximity Sensor SMx-8M	• Use with DSBC, ADN, DSBG, DGC-K, DSNU, DFM-B-16...63 • SMT-8M-A for temperatures as low as -40°C	For T-slot IP65/IP68, 5...30 VDC, PNP, NPN or contacting Magneto-resistive or magnetic reed		SMX (en) SMX (fr)
Proximity Sensor SMx-10M	• Use with DGC, DFM-B-12	For C-slot IP65/IP67, 5...30 VDC PNP, NPN or contacting Magneto-resistive or magnetic reed		
Position transmitter SDAT	• Use with DSBC, ADN, DSBG, DGC-K, DSNU, DFM-B-16...63 • For analogue feedback of the piston position	For T-slot Stroke 50, 80, 100, 125, 160 mm Analog output 4...20 mA Digital output IO-Link compatible		SDAT (en) SDAT (fr)
Connecting cable NEBU	• A wide variety of cable, for the connection of inputs and outputs	M8, M12 with 3, 4 , 5 or 8 pin connectors Open end Suitable for energy chains or robotics ONLY MANUFACTURED CONNECTIONS Not by yourselves.		NEBU (en) NEBU (fr)

Cutting edge valve technology

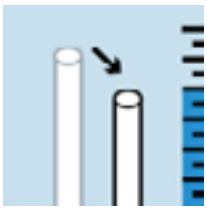
Valves from Festo enable flexibility, modularity, high performance, and industry leading diagnostics. From valve manifolds with integrated fieldbus systems with I/O modules to completely customizable valve configurations, the Festo valve family offers unprecedented options for control and communications. The long service life of Festo valves ensures the solution will be reliable and consistent.

Energy saving tips for valves



- Use reversible regulation – pressure regulators upstream of the valves enable the exhaust air of the cylinder to escape without resistance
- Create different pressure zones on valve terminals to only supply high pressure air to specific applications

- Use a lower pressure for the return stroke of a 5/2 or 5/3 valve by using a sandwich pressure regulator with A/B operation



- Favor a decentralized installation – lower compressed air consumption due to reduced tubing lengths

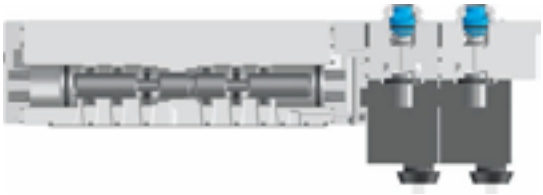
- Keep the number of connections/fittings to a minimum - using valves in valve terminals and vertical stacking options reduce potential leakages

Leading technology: The cartridge principale

The patented cartridge principle with its internal sealing structure, the contour of the seals and the special seal materials makes Festo valves absolute top performers, even on valve terminals. They are extremely durable, highly flexible and offer outstanding flow rates.

- Up to 100 % more flow compared to other technologies
- Smaller valves with higher flow rates for lower costs
- Higher pressure range of up to 10 bar
- Vacuum compatible
- Reversible – two pressures at a single valve at the same time
- Very high temperature ranges
- No overlap – totally reliable separation of the air ducts during dual pressure operation
- Minimal leakage

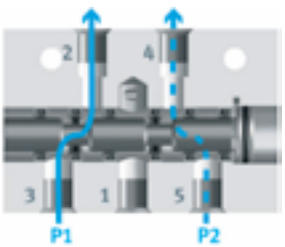
Non-overlapping: stable, resistant materials and positive-locking spool positions provide rugged reliability



Patented: the design, layout and materials of the cartridges ensure their exceptionally high performance

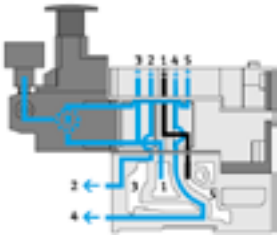
Reversible flow

- Reversible operation allows two pressures two be used for a single valve (ports 3 and 5), exhaust air flows through port 1
- This opens many possibilities such as operating vacuum and pressure in a single valve, using different pressures for each port, and many other specialized functions
- Neatly separated pressures means that overlapping between the air ducts during dual-pressure operation, common in other valves, doesn't happen with Festo valves
- Running a lower pressure in one port than the other provides an easy and cost-effective solution for reducing pressure on the return stroke of actuators



Reversible regulators

- Reversible regulators channel the compressed air so the compressed air is regulated prior to entering the valve
- Allows the pressure to be adjusted without switching on the valve
- Exhaust air is not channeled through the regulator, enabling the exhaust air from an actuator to escape without resistance. This alone could reduce the pressure or valve size required in time-sensitive applications, reducing total compressed air consumption

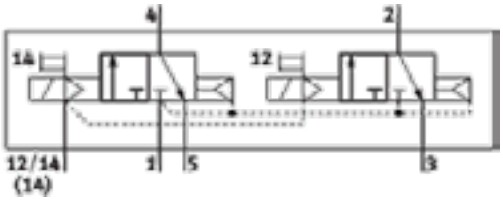


Wide variety of valve functions

Festo offers an industry-leading selection of valve functions which can be used in any combination. The wide variety enables you to choose the correct function from the start, eliminating unnecessary components or even opening up new solutions.

- 2x 2/2-way valve, single solenoid, pneumatic spring, normally closed
- 2x 2/2-way valve for vacuum and ejector pulse
- 5/2-way valve, single solenoid with mechanical or pneumatic spring return
- 5/2-way valve, double solenoid, bistable or dominant
- 2x 3/2-way valve, single solenoid (2x normally closed)
- 2x 3/2-way valve, single solenoid (2x normally closed, reversible)
- 2x 3/2-way valve, single solenoid (2x normally open)
- 2x 3/2-way valve, single solenoid (1x open, 1x closed)
- 2x 3/2-way valve, single solenoid (1x open, 1x closed, reversible)
- 5/3-way valve, double solenoid (center exhausted, pressurized)

5/2-way spring return valve



2x3/2-way normally closed valve

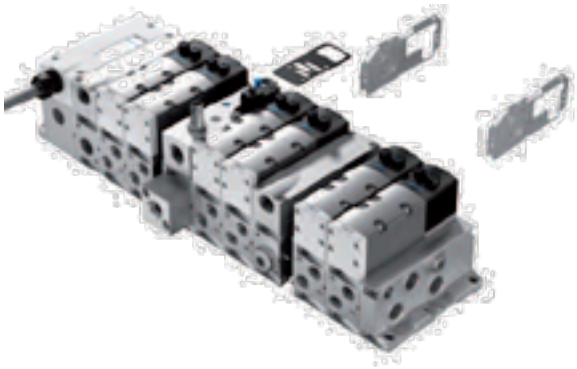
High valve density thanks to 2X 3/2 valves

In addition to offering individual valve functions with 5/2 or 5/3- way valves, it is also possible to combine two 3/2-way valves in a common valve slice. The two valves are independently actuated and controlled. Consider an application with 40 single-acting process valves. Rather than use 40 5/2 valves and plug one port, you can use 20 2X3/2 valves, saving space and cost!

Separate pressure zones

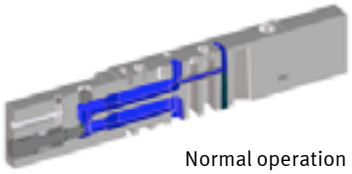
VTSA and MPA valve terminals are capable of having separate pressure zones

- No limit to number of pressure zones
- Isolate pressure or both pressure and exhaust
- Supply alternate pressures to different sections of the valve manifold
- Run lower pressure air to less-demanding section of the valve manifold to reduce compressed air consumption
- Pressure zones can even be supplied with vacuum when used with reversible valves – control vacuum at the valve terminal!
- Isolate separate pressure zones for maintenance without shutting down entire manifold

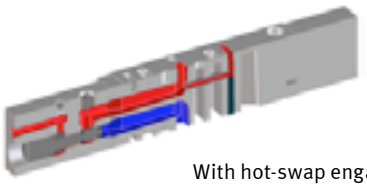


Hot-swap plates

- Hot-swap plates are available for VTSA, MPA-L, and MPA-S valve terminals
- The supply pressure for individual valves can be isolated from the rest of the manifold
- Allows removal and replacement of a valve while the operation is in progress, without shutting down the supply pressure or power
- Ideal for batch process applications where the failure of a single solenoid doesn't necessarily impact the entire system



Normal operation



With hot-swap engaged

12.1 ISO Single valves

Specifications :

- Subbase solenoid valve with internal or external pilot air, and pneumatic valves.
- Voltage ; 24 V CC.
- Footprint according to Standard :

ISO 5599-1

Footprint without electrical connection
Size 1 - 2 - 3

ISO 15407-1

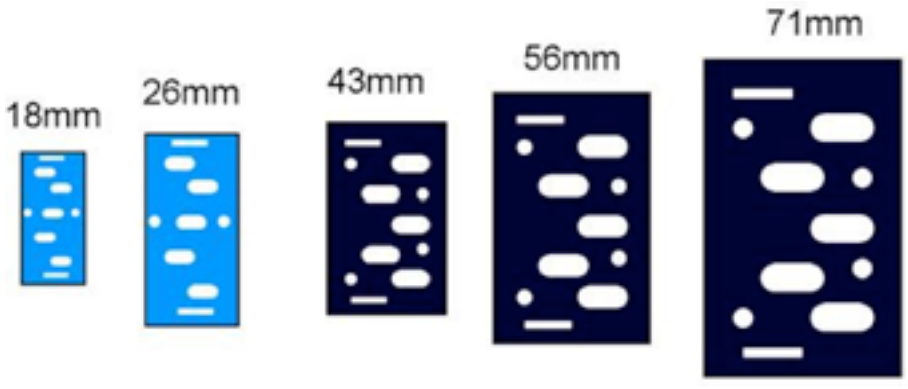
Footprint without electrical connection
Size 01 - 02

- Hot-swap plates are available for VTSA, MPA-L, and MPA-S valve terminals
- The supply pressure for individual valves can be isolated from the rest of the manifold
- Allows removal and replacement of a valve while the operation is in progress, without shutting down the supply pressure or power
- Ideal for batch process applications where the failure of a single solenoid doesn't necessarily impact the entire system

Use :

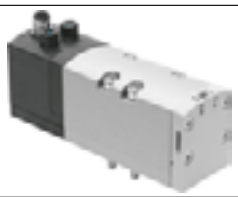
- Use with 7 bar , non-lubricated air
- With or without protected manual override.
- Possible Change between internal pilot air and external pilot air via selector
- Possible supply via exhaust channels (Channels 3 and 5)
- Sprig return and 5/3 valves with closed mid position forbidden
- Adapter plates between different manifold sizes forbidden

ISO Interface



Size **02** Size **01** Size **1** Size **2** Size **3**

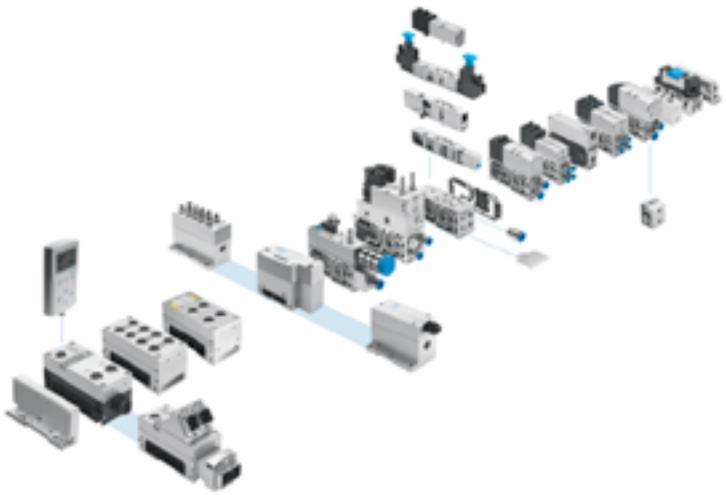
Valves and Valve manifolds

Name	Application	Remarks	Picture	Documentation
VSVA single solenoid valves	• Standard ISO valves	• Up to 1400 l/min • Individual connection via solenoid or central plug M12 • According to ISO15407-1		ISO-15407 valves (en) ISO-15407 valves (fr)
VSVA single solenoid valves	• Standard ISO valves	• Up to 4500 l/min • Individual connection via solenoid or central plug M12 • According to ISO5599-1		ISO-5599 valves (en) ISO-5599 valves (fr)
VSPA single pneumatic valves	• Standard ISO valves	• Up to 1400 l/min • Pneumatic actuation • According to ISO15407-1		ISO-15407 valves (en) ISO-15407 valves (fr)
VL single pneumatic valves	• Standard ISO valves	• Up to 4500 l/min • Pneumatic actuation • According to ISO5599-1		ISO-5599 valves (en) ISO-5599 valves (fr)
VABF Pressure regulators	• For pressure regulation	• **Vertical stacking components for mounting between the subbase and the valve** • **Regulation on channel 1, 2 , 4 or 2 and 4**		ISO-5599 valves (en) ISO-5599 valves (fr)
Subbases for ISO valves	• For the mounting of ISO valves	• **Subbase with footprint according to ISO 15407-1 and ISO 5599-1** • **Single subbase and subbase for terminal assemblies.**		ISO-5599 valves (en) ISO-5599 valves (fr)

12.2 VTSA valves and valve manifolds

VTSA – ideal for maximum pneumatic and electrical function integration

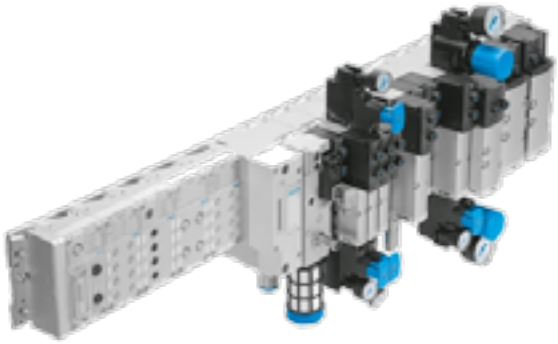
- Flexible control: individual connections, multi-pin, or CPX integration
- Unique worldwide: 5 different valve sizes (18, 26, 42 and 52, 65 mm) on one valve terminal, without adapter plates
- Integrated safety functions with Profisafe
- Pneumatic and electrical power supply for up to 32 valves
- Flexible and highly modular – valves and accessories can be organized as needed, down to the individual valve
- Standards-based valves and sub-bases to ISO 15407-2 and ISO 5599-2 with electrical contacting in the sub-base
- Low power consumption – as low as 1.3W coil activation at 24 VDC
- Energy monitoring with Profienergy
- OPC UA With Codesys



Flexible integration options

Individual VTSA valve

VTSA with multi-pin

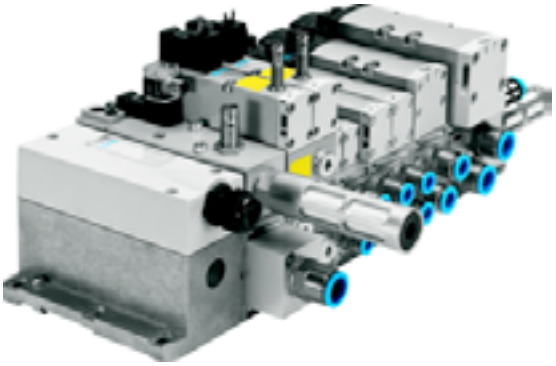


VTSA with CPX

VTSA and Safety Safety Integrated

An important application of VTSA is in safety pneumatics. Integrated safety functions in a working environment with lifting and rotary cylinders and manual clamping devices provide a maximum level of safety.

- The VTSA series offers safety solutsions for protection against unexpexted start-up, safe exhausting and pressurizing, and reversal of a movement in an emergency situation
- In all cases, Festo delivers a standard component. It is up to the customer to realize a safety rating
- In all cases, a pressure sensor must be used to monitor P1 and a dual channel safe output must be utilized

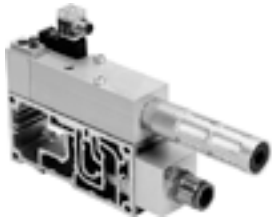


VTSA vacuum block integrated into VTSA valve terminal

The vacuum block can be integrated into the existing valve terminal VTSA. To do this, the vacuum block is screwed to a manifold sub-base for 2 valve positions, width 26 mm. The vacuum block is used in conjunction with a suction gripper to pick up, hold and place components. Picking up and holding is carried out by means of a vacuum by a suction gripper. Once the component has been positioned, it is released by an ejector pulse. This ejector pulse is created by pressurizing the vacuum system so that the vacuum briefly breaks down. The ejector pulse can be set.

Exhausting/pressurising and prevention of unexpected start – VABF soft-start valve

- The soft-start prevents unrestricted movement of components without back pressure by slowly increasing pressure during start-up
- Soft-start valve can be arranged as desired and supplies in both directions
- Up to 5 soft-starts can be used in 5 different pressure zones
- In combination with a reliable electric shut-down of load voltage, it is possible to realize two-channel systems
- Exhaust P1
- Without manual override (PR)



Vertical stacking – sturdy and modular

Complete vertical stacking for all 5 sizes. Additional modules can be inserted at each valve position between the manifold subbase and the valve. This configuration of modules – known as vertical stacking – provides special functions at the individual valve position

Pressure regulator plates
- Standard regulators for adjusting supply pressure or each working port independently
- Reversible A/B regulator on the pressure regulator plate for fine adjustment and up to 50% more venting, as venting not done via pressure regulator
- By reducing the pressure of the “retract” side of an actuator, total energy consumption can be reduced

Uninterrupted production with hot-swap plates
- Vertical pressure shut-off plate for “hot-swap”: maintenance or repair of a valve in operation, without shutting off the pressure or power to the rest of the valve manifold

Flow control plate
- For adjustment of speed of drive

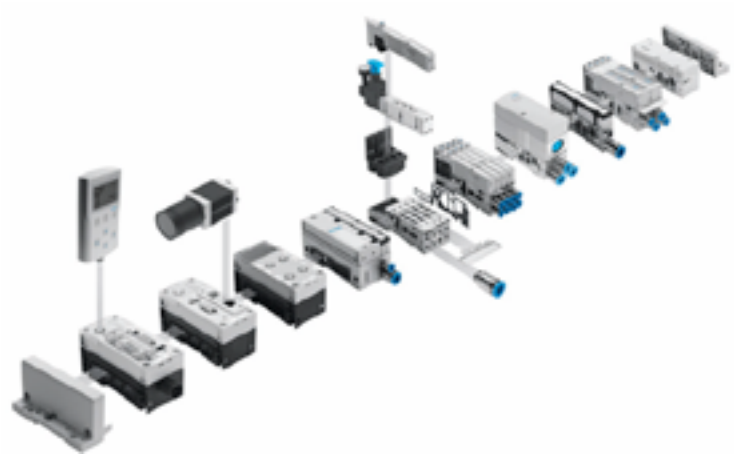
Technical data - VTSA	ISO 15407-2		ISO 5599-2	
Size	ISO-02 18mm	ISO-01 26mm	ISO-1 42mm	ISO-2 52mm
Number of valve positions	Max 32			
Flow rate up to VTSA [l/min] VTSA-F [l/min]	 500 700	 1100 1800	 1400 1800	 3000 3000
Working lines	G1/8, 1/8 NPT	G1/4, 1/4 NPT	G3/8, 3/8 NPT	G1/2, 1/2 NPT
Supply ports	G 1/2, 1/2 NPT or G3/4, 3/4 NPT			
Protection class	Complete manifold up to IP65			
Operating pressure	3 ... 10 bar/ (internal pilot air) -0.9 ... 10 bar (external pilot air)			
Temperature range	-5°C ... 50 °C (23°F ... 122°F)			

Name	Application	Remarks	Picture	Documentation
Valves with CPX or multi-pin connections	• Large actuators, medium to high flow rates	• Up to 4500 l/min • Controlled via fieldbus or control block • Maximum 32 solenoid coils		VTSA (en) VTSA (fr)
Electrical terminal CPX	• Stand-alone or with VTSA or MPA valve terminals • Input/output modules	• Use FB33 ProfiNet/ Profisafe • Use FB6 Interbus-S • Use FB36 Ethernet IP • OPC UA Server winth Codesys		Jump to CPX

12.3 MPA valves and valve manifolds in some specific application (after getting an agreement from Renault)

MPA valves series

Provides more valve functions than any other valve terminal while its compact design sets it apart.
- Modular design for easy conversion and expansion.
- Electrical I/O and fieldbus connections by CPX or CTEU
- MPA-S for advanced diagnostics, up to 128 coils, proportional valve control, up to 700 l/min
- MPA-L with polymer sub-base for light weight installations and up to 32 coils
- Up to 8 voltage zones on one valve terminal for greater safety, reliability and efficiency



Optional pressure sensor inside manifold to measure actual supply or exhaust pressure

Vertical-stacking pressure regulator plates for adjusting pressure of individual valves

Hot-swap plates for replacing valve without shutting down manifold – ideal for batch process systems!

MPA with individual connection

Valves with individual sub-bases can be used for actuators which are further away from the valve terminal. A 4-pin, threaded M8 electrical connection is required in this case

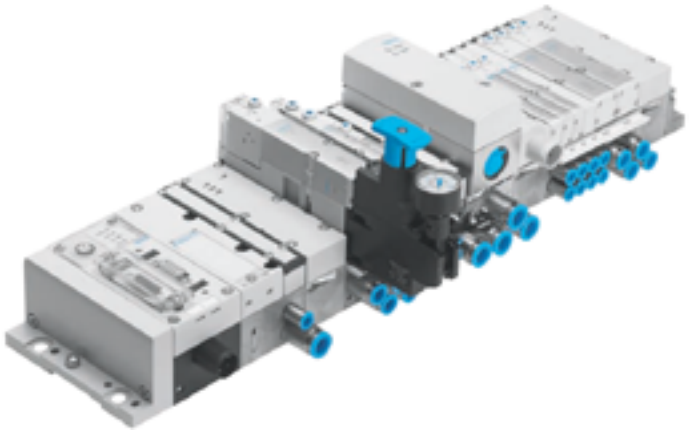
MPA with multi-pin plug connection

The valve terminal can be equipped with up to 24 solenoid coils, which corresponds to 4 to 24 MPA1 or 2 to 24 MPA2 valves, or a combination of both. The MPA-L can take up to 32 valves.
- Actuation via 24 V outputs
- Simple installation of the multi-pin cable in the machine
- Any desired compressed air supply and creation of pressure zones

MPA with CPX terminal

As an integrated fieldbus node ensures transmission to the master PLC, both small and large solutions can be implemented for pneumatics and electronics.

- Internal serial communication and linking of fieldbus interfaces with up to 16 sub-bases (128 valves, up to 512 I/O)
- Any desired compressed air supply and creation of pressure zones is possible
- Fieldbus and Ethernet protocols
- Digital and analog I/O
- Control of electric and pneumatic drives
- Diagnostics and condition monitoring



Technical Data		MPA-S	MPA-L
Electrical Connections	Multi-pin	Sub-D 25-pin	Sub-D 9-pin, 25-pin, 44-pin, 34-pin ribbon
	CPX	CPX	
Maximum flow		700 l/min	
Solenoid coils/valve positions (max.)	CPX	128/64	32/32
	Electrical multi-pin	24/24	32/32
Sub-base material		Metal	Plastic
Pressure range		-1 ... 10 bar (depending on configuration)	
Operating voltage		24V ± 25%	

Name	Application	Remarks	Picture	Documentation
Valve terminals MPA-S/MPA-L for CPX	• Piloting process valves, low to medium flow applications • Use MPA-S for more than 32 coils, for more diagnostics, or for use with VPPM	• Up to 700 l/min • Controlled via fieldbus or control block • Up to 128 valves/coils (MPA-S) • Multi-pin or fieldbus connection • Max. 10 I/O modules • Integrated diagnostics		MPA-S (en) MPA-S (fr)
Electrical terminal CPX	• Stand-alone or with VTSA or MPA valve terminals • Input/output modules	• Use FB33 ProfiNet/ Profisafe • Use FB6 Interbus-S		Jump to CPX

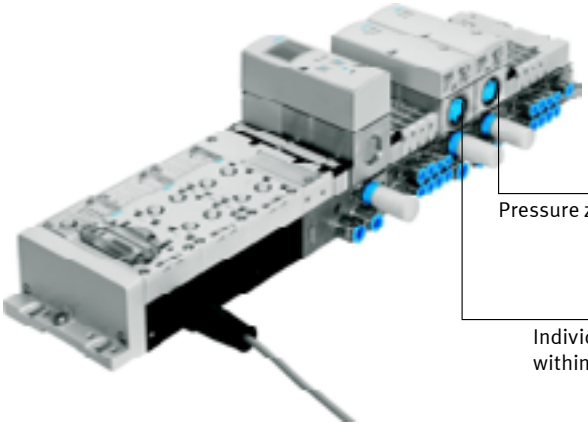
12.4 VPPM Proportional Valve

Proportional Pressure Regulators VPPM

- Proportional-pressure regulators are used to electronically control output pressure
- Pressure ranges 0-2, 0-6 and 0-10 bar
- Overall accuracy up to 1% of full scale
- Cascade control (2 sensors) for accurate and stable control structure
- Individual connection, sub-base mounting, or control via field-bus through CPX
- Monitor actual output pressure
- Switching outputs (NPN or PNP)
- Diagnostic LED

Only from Festo: Accurate Regulation via Fieldbus/Ethernet

Proportional technology is now integrated with the unique capability of the embedded bus technology of CPX/MPA. This allows for the combination of directional (MPA) and proportional valves (VPPM) on the same pneumatic manifold. This is truly a new generation of function and system integration.



Totally Flexible

A system can be configured with up to 16 VPPM pressure regulators

Variable MPA Pressure Zones

One VPPM can be configured to provide variable pressure for an MPA pressure zone. Multiple zones can be configured this way on one system.

Individual Pressure

Convenient control for variable force applications, or for other individual proportional processes, can be achieved with individual VPPMs.

Name	Application	Remarks	Picture	Documentation
Proportional-pressure regulators VPPM	• Change pressure of system through analog or fieldbus control. • **Pressure regulation, with integrated electronics 0-10V or 4-20 mA**	• Port G1/8 / G1/4 • Flow rate 380 ... 2750 l/min • Pressure regulating valves • 3 controller positions selectable (rapid, universal, precise) • Display optionally available		VPPM (en) VPPM/MPA (en) VPPM (fr) VPPM/MPA (fr)
Proportionnal-pressure regulators VPPE	• Change pressure of system through analog control. • **Pressure regulation, with integrated electronics 0-10V or 4-20 mA**	• Port G1/8 • Flow rate 300 ... 1000 l/min • Pressure regulating valve • 7-segment display integrated		VPPE (en) VPPE (fr)

12.5 Pneumatic valves

Name	Application	Remarks	Picture	Documentation
Manually actuated valve	• **For Head button ø 22mm (movements) or ø 30 mm (security / emergency)**	• Pneumatic connection M5 • 3/2 and 5/2 way valve functions		SV (en) SV (fr)
Mechanically actuated valve	• With roller actuation	• Available as NO and NC variants • Barbed fitting inner ø 3mm,G1/8		RS (en) RS (fr)

12.6 Pneumatic Logic

Name	Application	Remarks	Picture	Documentation
Pneumatic logic components	• **Use with a minimum pressure of 4 bars**	• Lots of function available : Stepper module, AND, OR, YES, NO, Amplifier module, pressure indicator, timing relay • Pneumatic connection M5 or Barbed fitting inner ø 3mm		M5 Compact (en) M5 Compact (fr)

12.7 Two hand control block

Name	Application	Remarks	Picture	Documentation
Two hand Control Valve ZSB	• **Use with 2 separates push buttons** • **For welding pneumatic assemblies, and every pneumatic logic installations.**	• Port G1/8 • Category 1, PL c according to EN ISO 13849-1 • 500 ms maximum between 2 signals		ZSB (en)

The variety of vacuum technology

Festo's complete system for vacuum technology gives you everything from a single source and enables a whole range of applications:
- Vacuum generators using the Venturi principle
- Suction grippers in more than 5000 combinations
- Wide variety of accessories for the ideal vacuum

OVEM vacuum generators

Innovative Vacuum Generation
Smart integration of functions and features results in economic efficiency! The new modular vacuum generator series OVEM offers a wide selection of useful functions. This new product series initially features three performance classes (nozzle diameters of 0.5/0.7/1.0) with a built-in air saving function. Achievable vacuum level up to 93%.

Process Reliability
- With vacuum sensor, including LCD display and with bar graph for easy reading during operation
- With switching output, signals when the vacuum level has been reached
- Optional safety function for dead vacuum generation
- Prevents loss of pressure thanks to integrated one-way flow control valve
- Air saving function – once vacuum is achieved, the vacuum is turned off

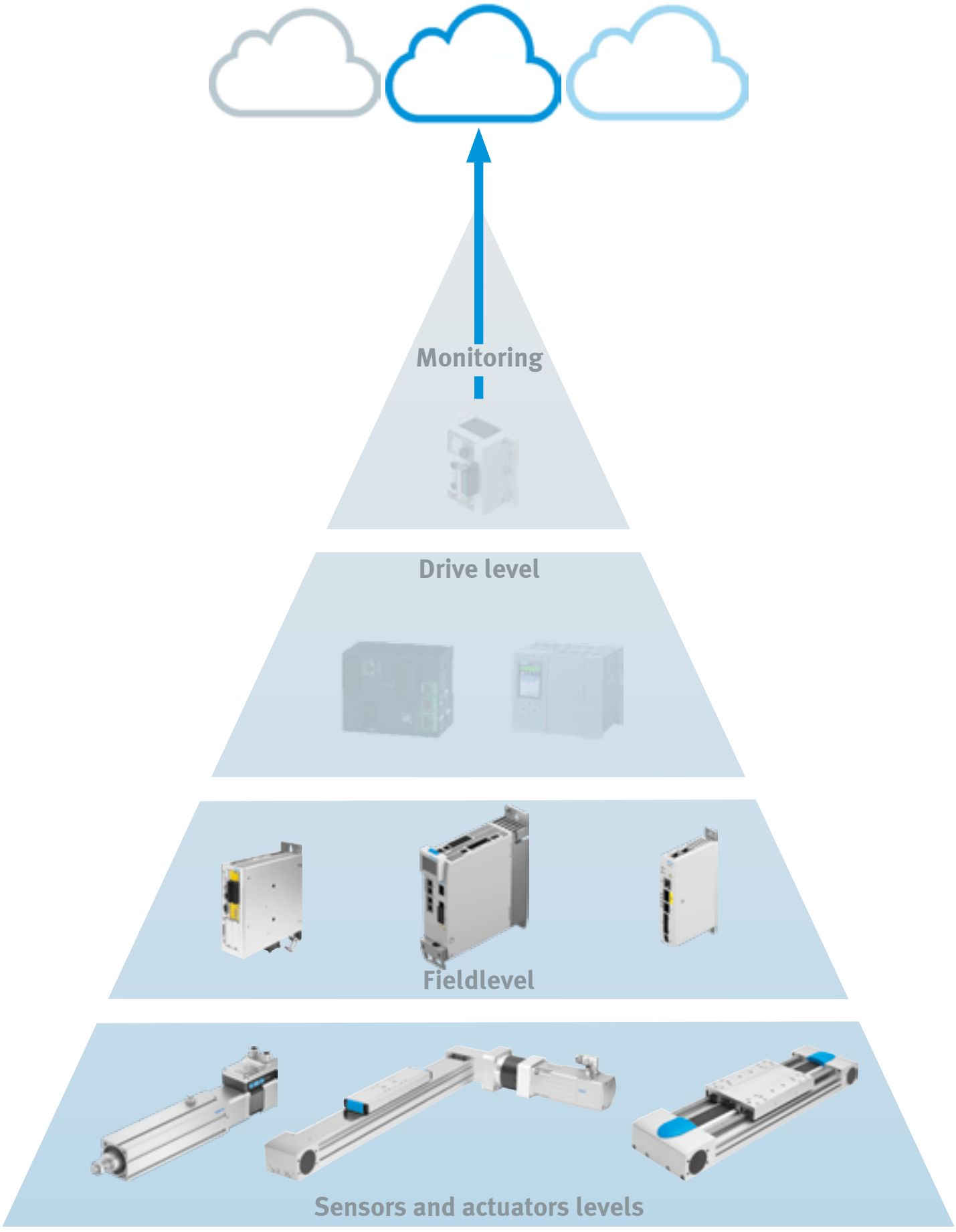
VN vacuum generators

Decentralized vacuum + mechanical ejector pulse + electrical actuation. Reduced cycle times and reliable set down: The new VN vacuum generators, with integrated mechanical ejector pulse, electrical control for decentralized vacuum production ON/OFF or both in combination. The ejector pulse and the solenoid valve are fully integrated. A consistent strategy of integrated functions reduces costs and installation space.

Shorter cycle times = higher productivity
Extremely fast evacuation thanks to direct attachment to the suction gripper. Combined with the integrated ejector pulse, the depositing of the workpiece is accelerated with maximum safety.

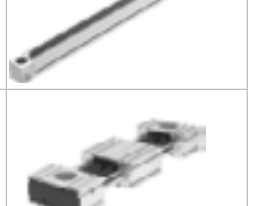
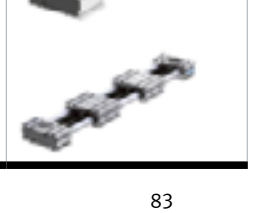
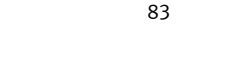
Name	Remarks	Picture	Documentation
Vacuum generator OVEM	• Nominal size 0.45 ... 0.95 mm • Push-in connector QS6 or QS8 connection • Solenoid valve for both vacuum and ejector pulse • Vacuum switch, integrated		OVEM (en) OVEM (fr)
Vacuum generator VN	• Nominal size 0.45 to 3 mm • 4mm to 12mm connection or M5, G1/8, G1/4, G3/8 threaded connection • Vacuum port 90° to supply port or inline • Optional ejector pulse, solenoid valve, and/or vacuum switch		VN (en) VN (fr)
Vacuum generator OVEL	• Nominal size 0.45 ... 0.95 mm • Push-in connector QS4 or QS6 connection • Solenoid valve for both vacuum and ejector pulse • Vacuum switch, integrated		OVEL (en) OVEL (fr)

Name	Remarks	Picture	Documentation
Bernoulli Gripper OGGB	**• Gripping of planar surfaces thanks to Bernoulli effect Diameter 60 ,100 , 140 mm • G1/8 connection • Nominal pressure P=1 bar**		OGGB (en) OGGB (fr)
Suction Cup VAS, VASB	• Round Shape • Flat or bellow 1,5 convolutions • Diameters : 2...125 mm • Male Thread : M5, G1/8, G1/4, G3/8 • Material : NBR, PUR, SI		VAS (en) VAS (fr)
Vacuum efficiency valve ISV	• For parallel arrangement of several suction cups : To prevent dissipation of the vacuum if one or several suction cups do not make full contact • Saves compressed air and energy : Retention is only successful if 100% contact is achieved • 3 sizes : M5, G1/8, G1/4 G3/8 • Direct mounting on suction cup		ISV (en) ISV (fr)


Monitoring
Drive level
Fieldlevel
Sensors and actuators levels

14.1 Linear actuators

Linear actuators

Product	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (m/S)	Max. Acceleration (m/s^2)	Repeatability (+/- mm)	Max feed force (N)	Picture
ELGA-TB-KF	Toothed belt	Recirculating ball bearing guide	8500	5	50	0,08	2000	
ELGA-TB-RF	Toothed belt	Roller bearing guide	7400	10	50	0,08	1300	
ELGA-TB-G	Toothed belt	Plain-bearing guide	8500	5	50	0,08	1300	
ELGA-BS-KF	Ball screw	Recirculating ball bearing guide	3000	2	15	0,02	3000	
ELGC-TB	Toothed belt	Recirculating ball bearing guide	2000	1,5	15	0,1	250	
ELGC-BS	Ball screw	Recirculating ball bearing guide	1000	1	15	0,015	350	
EGC-TB-KF	Toothed belt	Recirculating ball bearing guide	8500	5	50	0,08	2500	
EGC-HD-TB-KF	Toothed belt	Recirculating ball bearing guide	5000	5	50	0,08	1800	
EGC-BS-KF	Ball screw	Recirculating ball bearing guide	3000	2	15	0,02	3000	
EGC-HD-BS-KF	Ball screw	Recirculating ball bearing guide	2400	1,5	15	0,02	1300	
ELGW	Electromecha-nical axis with belt drive	Recirculating ball bearing guide	5700		6		2500	
ELGR/ELGG	Toothed belt	Plain-bearing guide	1500	1 3	50	0.1		

14.2 Linear cylinder actuators

Electric actuators

Product	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (m/S)	Max. Acceleration (m/s²)	Repeatability (+/- mm)	Max feed force (N)	Picture
EPCO	Ball screw	External	400	0,5	10	0,02	650	
ESBF	Ball screw	External	1500	1,35	25	0,01	17000	
EPCC	Ball screw	External	250	0,6	15	0,02	1000	

14.3 Linear guided cylinder actuators

Product	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (m/S)	Max. Acceleration (m/s²)	Repeatability (+/- mm)	Max feed force (N)	Picture
EGSL	Ball screw	Recirculating ball bearing guide	300	1,3	25	0,015	450	
EGSC	Ball screw	Recirculating ball bearing guide	200	0,6	15	0,015	250	

14.4 Cantilever linear actuators

Product	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (m/S)	Max. Acceleration (m/s²)	Repeatability (+/- mm)	Max feed force (N)	Picture
ELCC	Toothed belt	Recirculating ball bearing guide	2000	5	50	0,05	2500	
EHMH	Rack and pinion	Recirculating ball bearing guide	2500	1,5	6	0,1	4900	

14.5 Rotary actuators

Product	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (m/S)	Max. Acceleration (m/s²)	Repeatability (+/- mm)	Max feed force (N)	Picture
ERMO	Direct drive	Recirculating ball bearing guide		Infinite	100	0,05	5	
ERMB	Toothed belt	Recirculating ball bearing guide		Infinite	300	0,03	26	

14.6 Linear rotary combined actuators

Product	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (m/S)	Max. Acceleration (m/s²)	Repeatability (+/- mm)	Max feed force (N)	Picture
EHMB	Toothed belt Ball screw	Recirculating ball bearing guide	200	Infinite	300	0,03	20	
EHMD	Direct drive	Recirculating ball bearing guide		Infinite		0,72	0,3	

14.7 Actuators with integrated drive and motor (Simplified Motion Serie)

Product	Drive type	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (m/s)	Max. Acceleration (m/s²)	Repeatability (+/- mm)	Max feed force (N)	Picture
ELGS-TB	Stepper motor with integrated drive	Toothed belt	Recirculating ball bearing guide	2000	1,3	6	0,1	75	
ELGS-BS	Stepper motor with integrated drive	Ball screw	Recirculating ball bearing guide	800	0,25	5	0,015	200	
ELGE-TB	Stepper motor with integrated drive	Toothed belt	Recirculating ball bearing guide	800	1,2	8,5	0,1	50	
EPCS	Stepper motor with integrated drive	Ball screw	NA	500	0,23	5	0,02	900	
EGSS	Stepper motor with integrated drive	Ball screw	Recirculating ball bearing guide	200	0,25	5	0,015	250	
EPCE	Stepper motor with integrated drive	Toothed belt	Plain-bearing guide	80	600	9	0,15	150	

Product	Drive technology	Driving technology	Guiding	Max. stroke (mm)	Max. Speed (tr/mn)	Rotary stroke (°)	Repeatability (+/- °)	Max peak torque (Nm)	Picture
ERMS	Stepper motor with integrated drive	Direct drive	Recirculating ball bearing guide	NA	150	90, 180	0,05	5,6	

14.8 Motors

Type	Technology	Options	Nominal voltage	Nominal current	Nominal torque	Nominal rotational speed	Max. rotational speed	Picture
EMCA	Brushless	Length S ou M Absolute encoder, single ou multitour With or without parking brake Digital I/O - CANOpen - Profinet - Ethernet/IP - EtherCAT Standard protection or IP65	24 V DC	6,9 A to 7,2 A	0,37 ou 0,45 Nm	3100 or 3150 rpm		
EMMS-ST	Stepper	Size 28 42 57 or 87 Length S M or L With or without encoder	48 V DC	1,4 A to 9,5 A			430 rpm to 6000 rpm	
EMMT-AS	Brushless	Size 60 80 100 Length S M L H Option splined shaft Option shaft with tightening gasket Voltage LS or HS Single or multi turn encoder Option parking brake	325 V DC à 565 V DC	1,4 A to 5,5 A	0,6 Nm to 7,2 Nm	2700 rpm to 3000 rpm		
EMMS-AS	Brushless	EMMS-AS Brushless Size 140 et 190 Length S M L Option splined shaft Voltage and winding LS LV HS HV Connector A R S T Single or multi turn encoder, or resolver Option parking brake Option IP65 565 V DC 4,40 A à 14,43 A 20,05 Nm 2000 rpm	565 V DC	4,40 A to 14,43 A	20,05 Nm	2000 rpm		

To choose and dimension your motors and axes, see the Positioning Drives software.

Download Positioning Drives

14.9 Controllers

Priority products

Type	Technology	Options	Nominal drive power	Nominal current	Nominal service voltage CA	Picture
CMMT-ST	Stepper	Profinet Ethercat Ethernet/IP Modbus Safety : STO SS1	300 W	8,0 A	24 or 48 V DC	
CMMO-ST	Stepper	IOLink TOR PNP ou NPN Safety : STO		6,0 A	24 V DC	
CMMT-AS	Brushless	Ethercat Ethernet/IP Profinet Modbus Safety : STO SS1 SBC	350 W to 4000 W	2 A to 15 A	400 V tri	
CMMP-AS ... M3	Brushless	Extension cards for fieldsbuses and safety Safety : STO SS1 SSR SBT SBC SOS SS2 SLS SSM	500 VA to 9000 VA	2 A to 13 A	400 V tri	

Controllers catalog

14.10 Operator unit CDSB

Characteristics

The operator unit CDSB from Festo is a plug-in display and control unit for the servo drive CMMT and the automation system CPX-E.

The integrated colour TFT display with touch screen can be used both for operation and for simple diagnostics of the connected basic unit. Ease of use is increased thanks to error diagnostics with clear-text error messaging.

When plugged in, the resistive touch screen can be used to set a range of parameters (depending on the basic unit). Diagnostic messages can be read and updates can be performed. In the unplugged state, the CDSB can be connected to a PC using a mini USB connection. The device is detected by the PC as a mass storage device, and firmware files can then be written to it.

Functionality

- Universal operation on a range of basic units (CMMT or CPX-E)
- Compact size
- Colour touch screen
- Diagnostic function
- Update function for basic unit (inplugged-in state)
- Power supply comes from the basic unit
- Mini USB interface
- Interface for basic unit (covered in plugged-in state)

Further information

Firmmware update

A firmware update can be downloaded from the Festo Support Portal as required. After connecting the operator unit CDSB to a PC, the downloaded update must be saved in the «/Update» folder.
The update is started automatically after restarting the operator unit (Power off/on). The update can take up to 2 minutes. The operator unit will then automatically restart.

Operation of basic unit

If the operator unit CDSB is plugged into the basic unit, the display will be activated:
- If there is no connection to the basic unit (yet), «Loading data» appears
- Following successful connection, the user interface of the basic unit or the first menu item of the basic unit will be displayed immediately
- A function can be selected within amenu level using the arrow keys (e.g. diagnostics)
- The arrow keys can be used to move from one menu level to another
- Fields that can be amended or that perform an action are highlighted in blue

14.11 Sizing software : Positioning Drives

Combines mechanical and electrical systems PositioningDrives provides you with support for finding the right combination of electromechanical components, an electric motor and a suitable motor controller.

Documentation positionning Drives

Software

14.12 Setting up TIA Portal

Installing the SIMATIC library to TIA portal
Download the latest version of the SIMATIC Drivelib from the Siemens website here.
SIMATIC Blocks DriveLib for the control in the TIA Portal
Make sure TIA portal is closed and execute the downloaded .MSI.

SIMATIC Drivelib

CMMT-AS-PN controlled by technology objects with SIMATIC S7-1500 in the TIA Portal

Link

Other interesting links :

CMMT-AS controlled by SINAPOS functions block with SIEMENS

CMMT-AS-PN controlled by technology objectswith SIMATIC S7-1500in the TIA Portal

Synchronous Motion with using the technology objects in TIA V16

How to setup „Travel to fixed stop“ with CMMT-AS-PN by using the SINA_POS / telegram 111

CMMT-AS-PN controlled by Siemens Simotion P320-4 in Siemens Scout 5.3

CMMT-AS-PN controlled by SINAPOS functions block with Siemens S7 1500 controller

14.13 Commissioning software : Festo Automation Suite

Quickly and reliably to a ready-to-use drive system – the Festo Automation Suite combines the parameterisation, programming and maintenance of Festo components in one program and enables the entire drive package, from the mechanical system to the controller, to be commissioned. Perfect for making industrial automation simple, efficient and seamless.

Individual, intuitive – and user-friendly as never before

Uniform user interface
Basic functionalities of all Festo components are already integrated
Customisable through device plug-ins and add-ons
Practical: device information and instruction manuals can be accessed directly via the software
Available free of charge on the Festo Support Portal

Documentation Festo Automation Suite

Software

Tutorial

14.14 Sizing and parameterizing with positioning drives and Festo Automation Suite

How to start

Best result can be achieve while sizing linear drives

System parameters

Select at least following:

- Axis type and with or whithout guide
- Mounting position
- Maximum moving mass
- Stroke
- Maximum cycle time (movement in both directions and dwell time in between)

Selection filter - axis, motors, gearbox, controller

- To be able to narrow calculated solution, small knowledge of Festo Portfolio is good to have.
- In Selection filter pages, you can filter axis, motor, gearbox and controller families to narrow the amount of calculated variants.
- Minimum filtering would be selecting the core product range.

Guide dimensioning

Column in the middle shows suitable systems based on static dimensioning when you apply mass center point values to the right column.

• If you want to make sizing with additional slide, rough rule is, that use values in Zand X-direction that are half of the real values.

• If the load is to Y-direction, add a tick to Heavy Duty axis in selection filter page

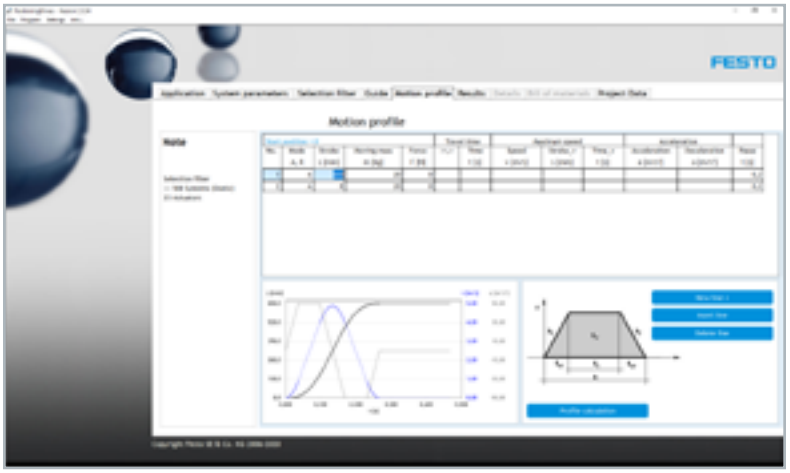
Motion profile

• Default motion profile is always back and forth with default dwell times

• With default profile PD optimizes max.torques to max.torque curve and RMS torque close to constant torque (S1) curve.

• You can effect to these points by applying either speed or ACC/DCC values.

• You can also add more lines, with different masses,etc
Pls. Remember that the whole motion must be fitted to the time you gave in system parameters



Results

• When looking results, the number tells you the costs, No.1 is always the most cost-effective model.
• You can sort and filter the results based on every column and from result filter tab you can exclude sizes etc.
• If there is value 99% in some bars, it does not mean that you have 1% of performance left. It means that the product is optimized and works as a limit for that combination

Details

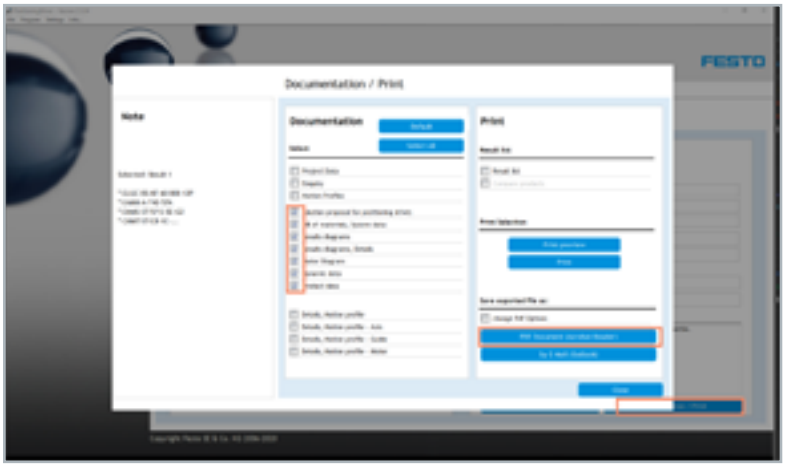
• In details page you dig deeper to the results and check the inertia ratio, required power, check the motor diagram etc.

Bill of Materials

• All part numbers marked with three dots, must be selected.
• In example you have to choose fieldbus interface:
PN = ProfiNet
EC = EtherCat
EP = EthernetIP and Modbus
• When BoM is ready, you can either copy it to the clipboard and paste it to Quicksearch, make an excel file of export it to Online Shop.

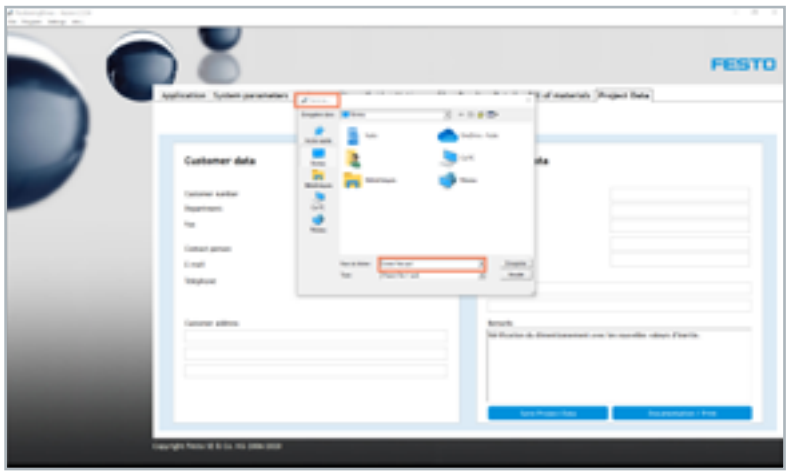
Project Data

• In Project Data page you can create pdf summary of the sizing, which can be added to quotation or to project documentation.



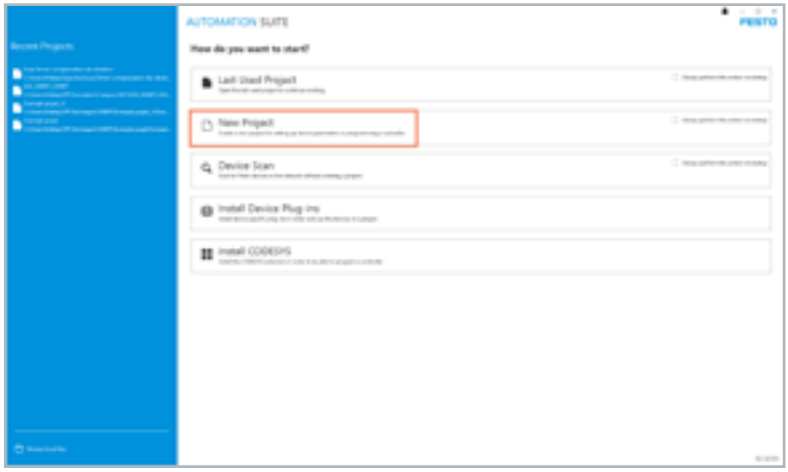
Saving data and preparing Automation Suite import

• When saving the Positioning Drives sizing project (.xpd), add the file name so, that it corresponds your companys specfication of naming electrical devices or fieldbus station.
• If these are not known, don't worry, the name can be changed afterwards in Festo Automation Suite

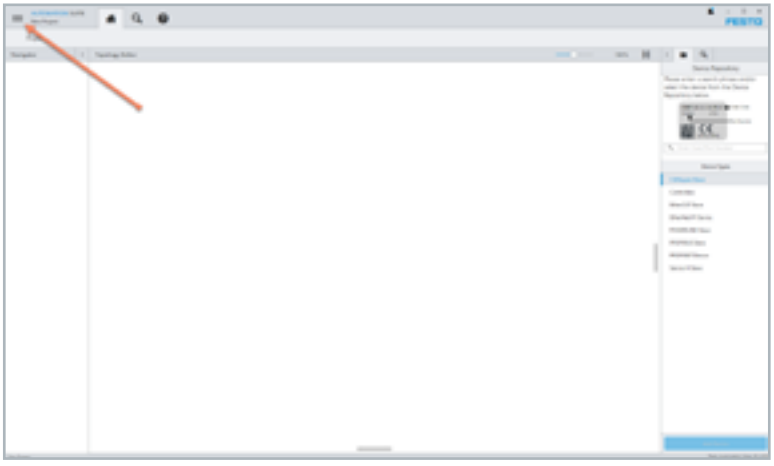


Second step: How to use sizing file for parametrizing actual components with **Festo Automation Suite** import

Start a new project in Festo Automation Suite

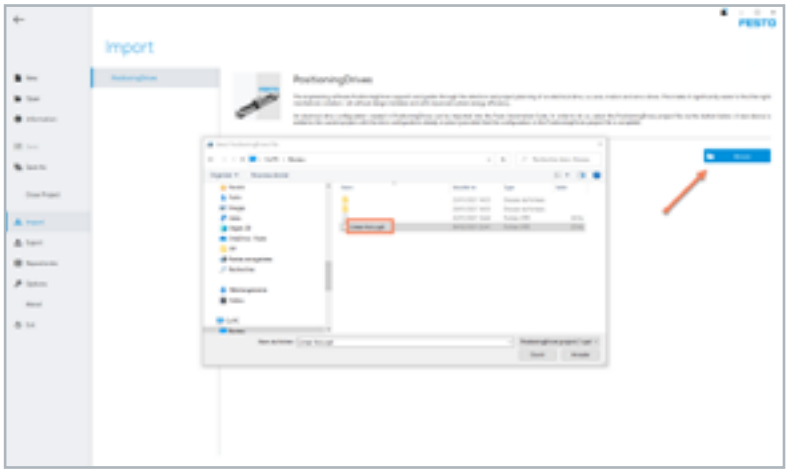


Go to files via three lines that are located up left

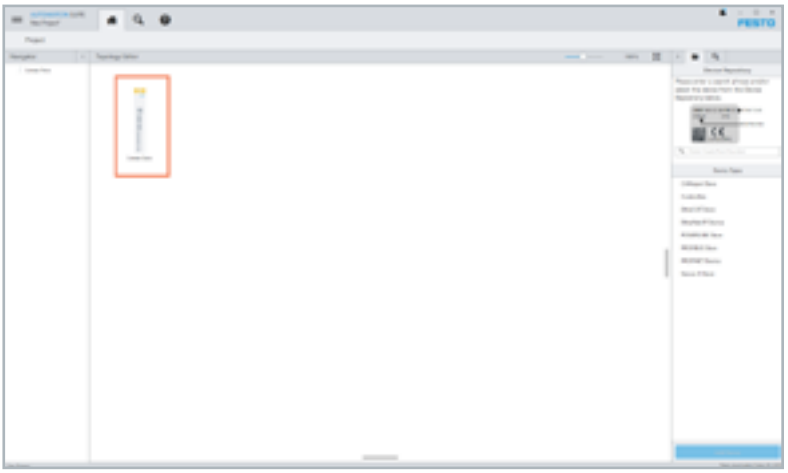


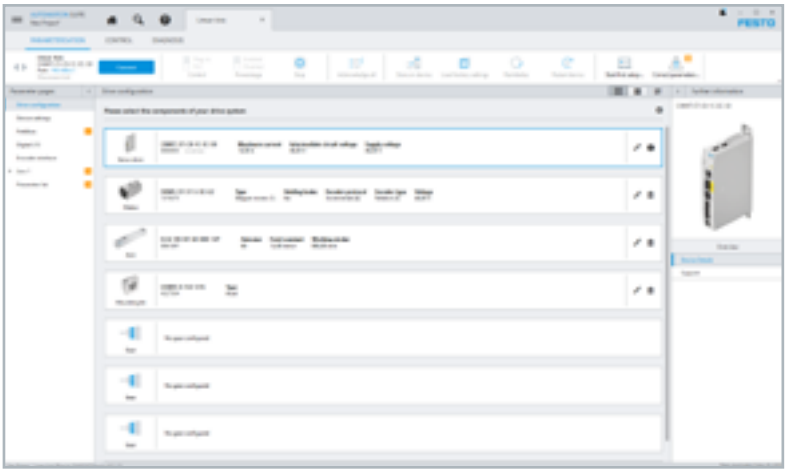
Select import

Import the file you generated with Positioning Drives

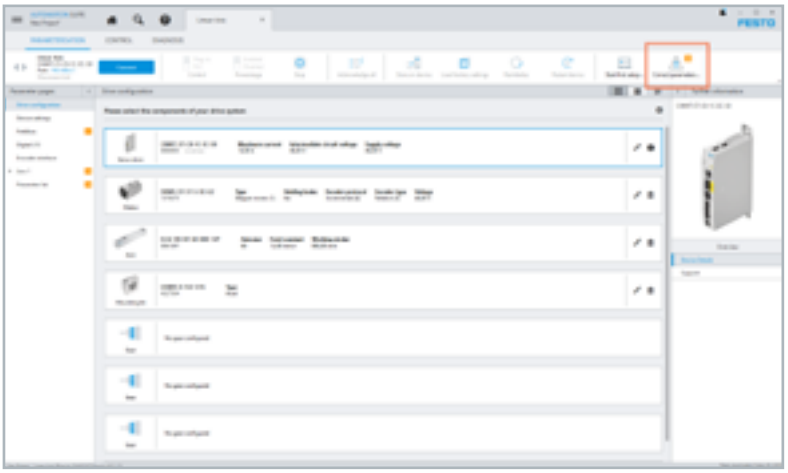


Double click the picture

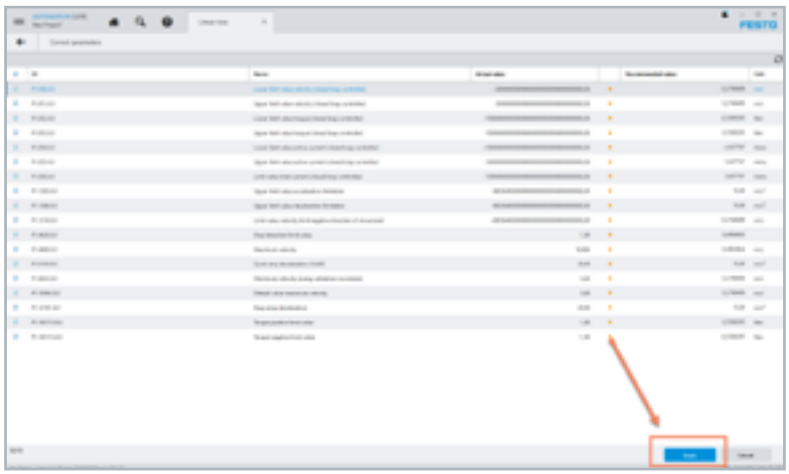




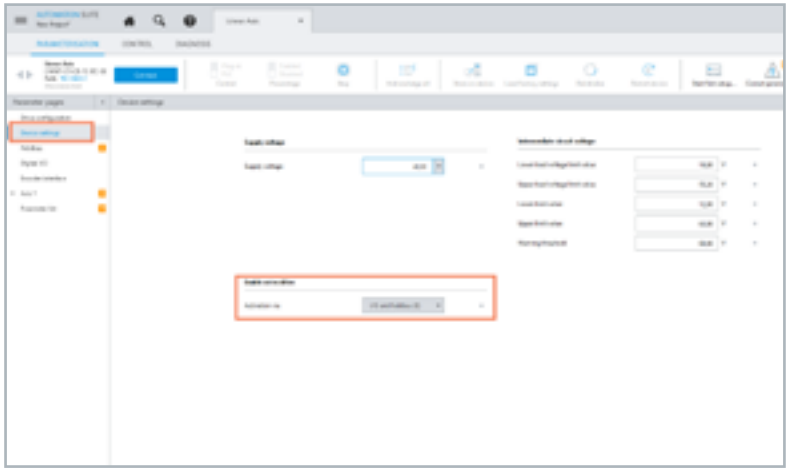
Press the warning sign



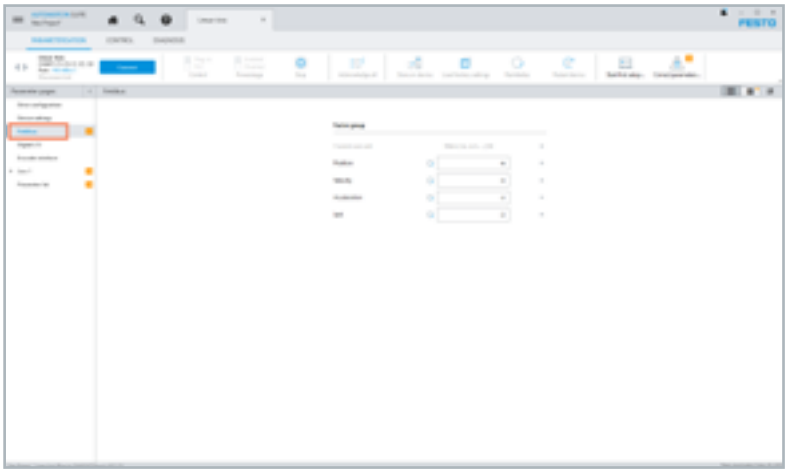
Press apply to parametrize the drive according the Positionning Drives sizing



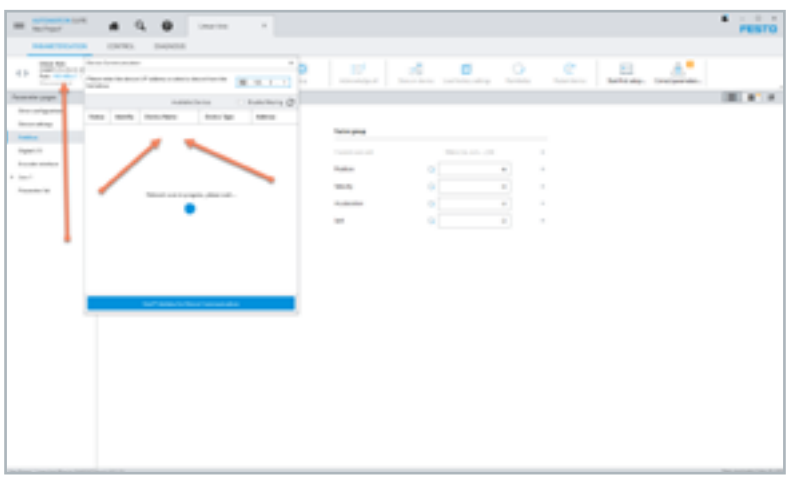
Go to device settings and select the most suitable enable logic to your application



Correct fieldbus settings can be found from dedicated application notes from Festo Support Portal

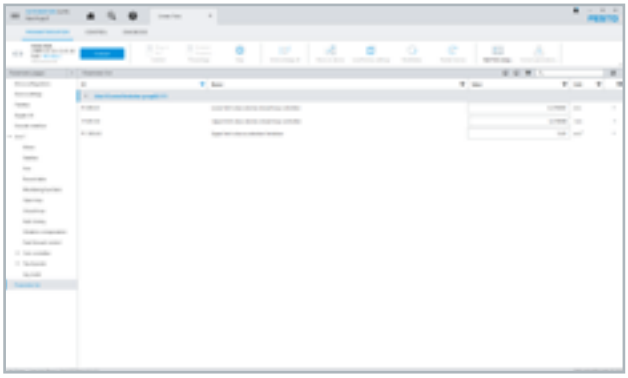


Scan the drive via TCP/IP (port X18 in CMMT), connect and download the parameters



Reminder : Dynamic driving values in Positonning Drives and Festo Automation Suite

After import you might still notice a difference in dynamic values.
- FAS values are maximum values, that the system can provide with current application mass, use these only in situations like e-stop, fast stop, etc..
- In normal application movements, program the PLC/MC software according the Positioning Drives values to be on a safe side.



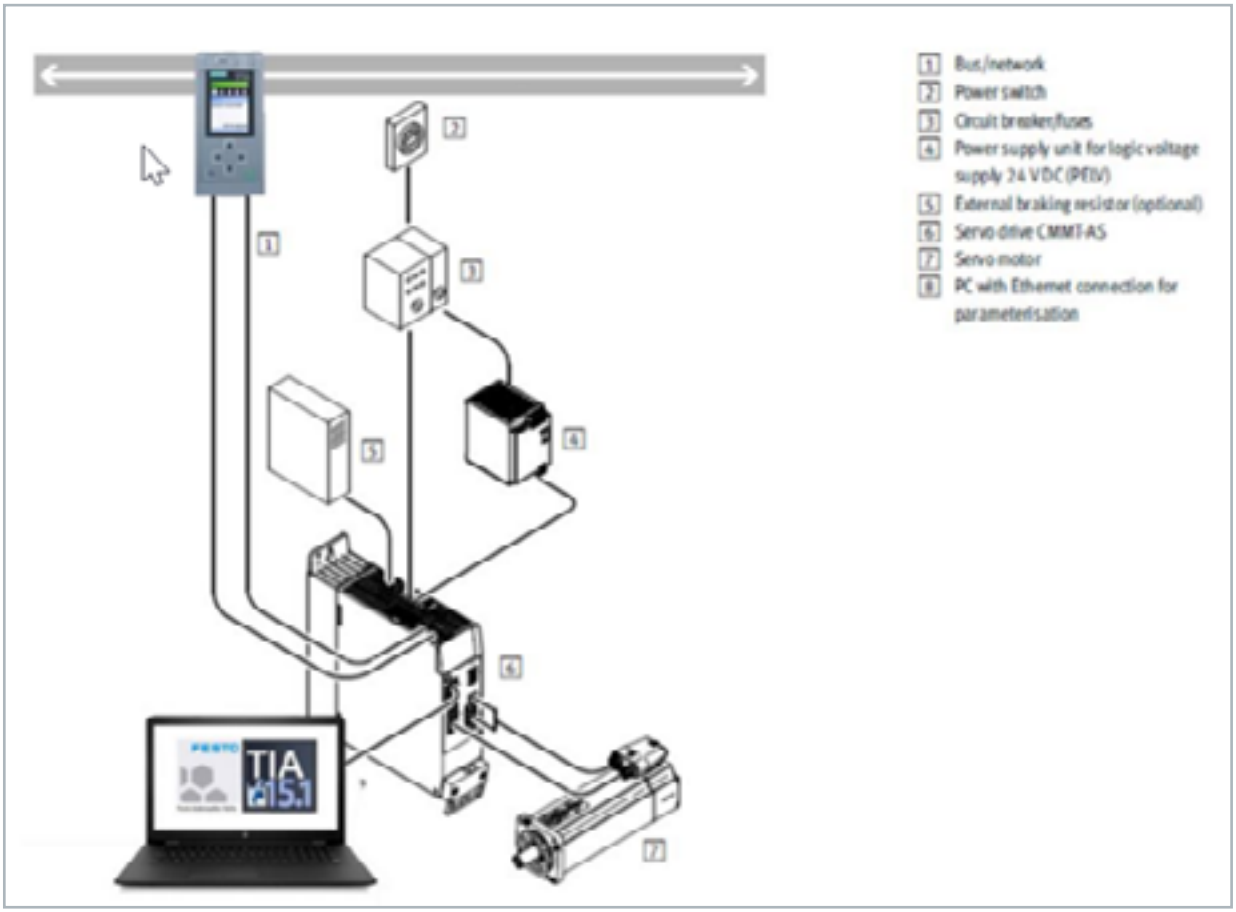
For more information on this or other technologies visit the official Festo Service YouTube channel where you will find a compilation of video tutorials that will assist you in the commissioning, maintenance and repair of Festo products.

https://bit.ly/3rAs8vk

https://bit.ly/3qHhwtr

14.15 Control via ProfiNet sur S7-1200 ou S7-1500

14.15.1 TIA PORTAL



CMMT-AS-PN controlled by technology objects with SIMATIC S7-1500 in the TIA Portal

This document describes which control figures are implemented in CMMT-AS-PN drives and how to use it in programming environment of Siemens in TIA portal. Specifically focus on how to use Technology Objects (Interpolated motion) with PLC Open Function blocks.

Application Note manual

Tutorial

14.15.2 Recommended manuals / GSDML / Plug-in

CMMT-AS Manual

Manual CMMT-AS-SW-EN

Servoantriebsregler - CIA 402 - Function - Software

Associated products

- servo drive CMMT-AS-C2-3A-EC-S1 (5340819)
- servo drive CMMT-AS-C4-3A-EC-S1 (5340820)

Manual CMMT-AS-SW

Festo Automation Suite Plug-in

Festo Automation Suite

Parameterisation, programming and maintenance of electronic devices by Festo

Features

- PositionningDrives data import

Download Festo Automation Suite Plug-in

CMMT-AS Firmware package

Firmware Package

Firmware CMMT-AS-...-PN (PROFINET) & GSDML

Firmware and PROFINET GSDML data for the servo drive CMMT-AS...-PN (PROFINET)

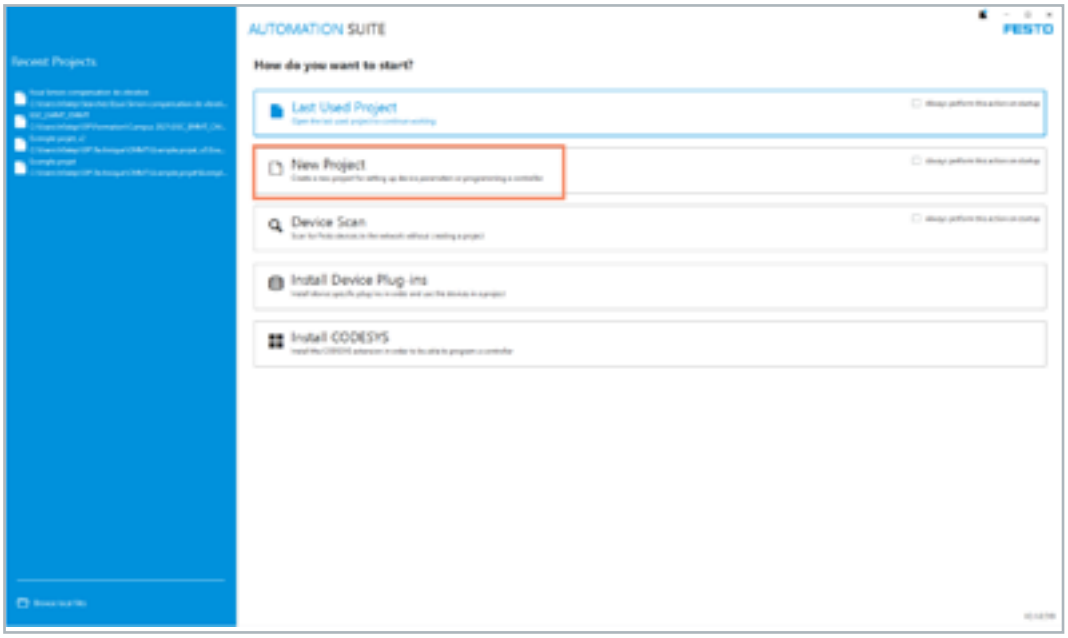
PROFINET GSDML File for the Servo Drive CMMT-AS-...-PN

Firmware and PROFINET GSDML data for the servo drive CMMT-AS-...-PN (PROFINET)

14.16 The first steps in Festo Automation Suite

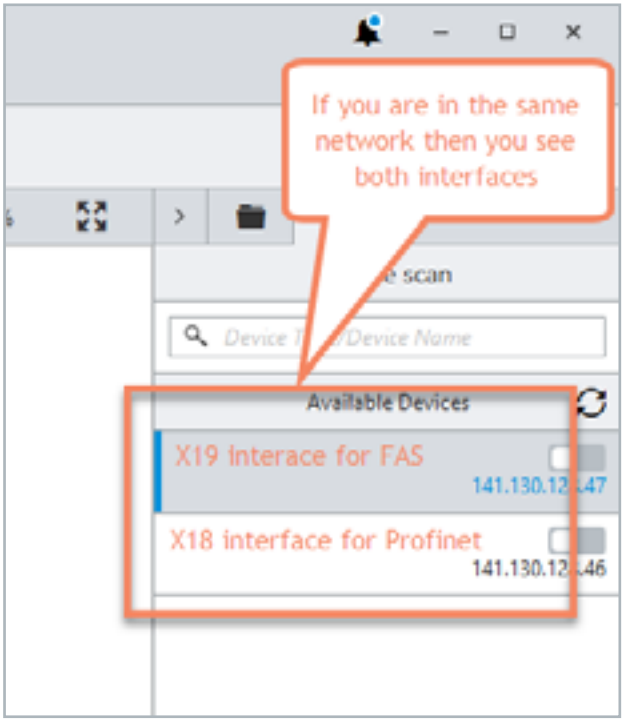
14.16.1 Creating a new project

Step 1: After starting Automation Suite you have the possibility to open your recent projects or to create a new

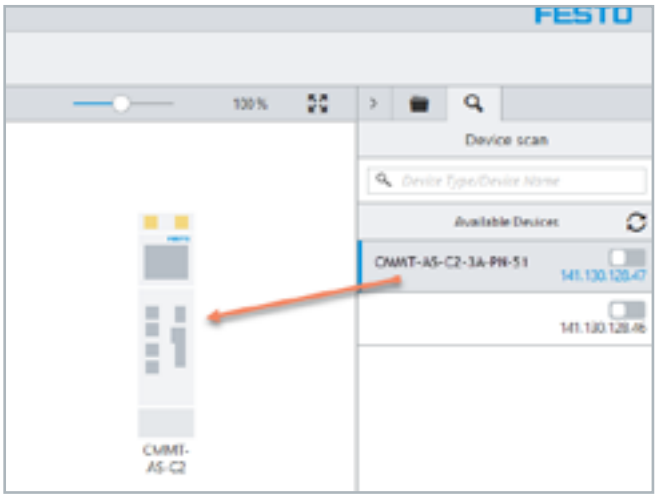


14.1.2 Step by step commissioning of CMMT-AS

Step 2: Searching for the connected CMMT-AS via the smaller loupe, because then you can drag and drop the connected devices to your project directly

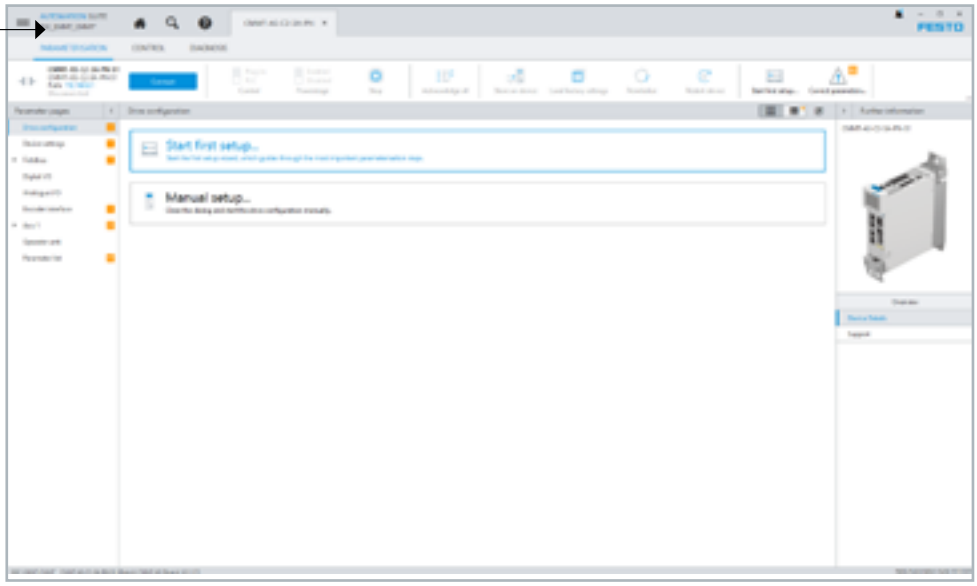


Step 3: Drag and Drop the CMMT-AS to your new project

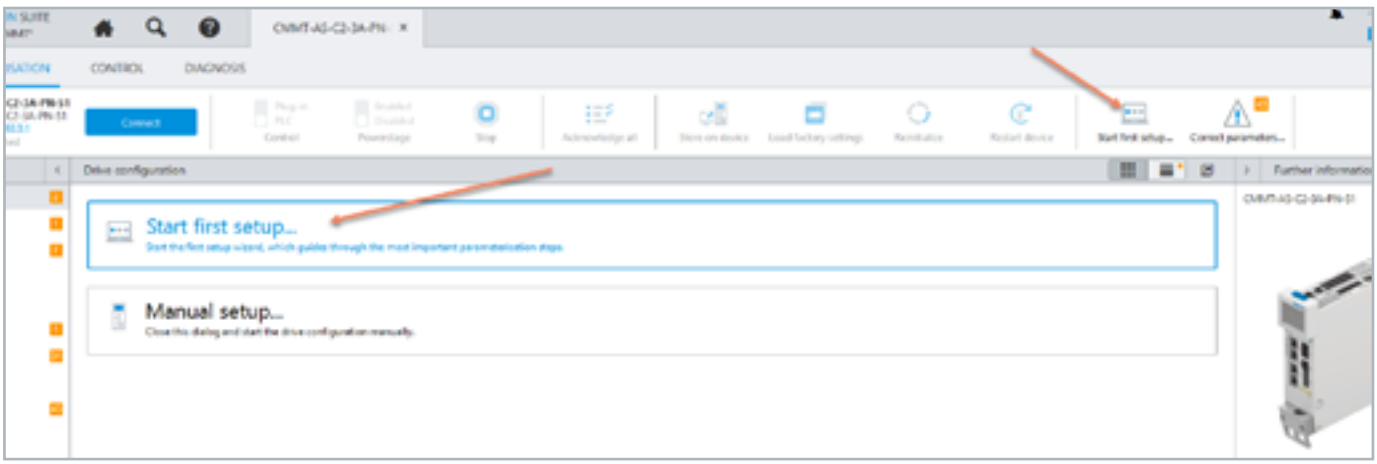


Step 4: Open the CMMT-AS configuration view via double click on Axis1

CMMT-AS-C4

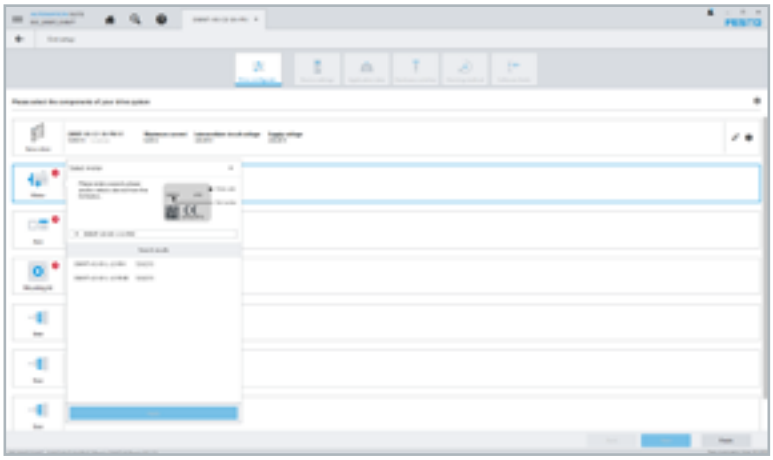


Step 5: Use the Wizard for an easy and fast configuration

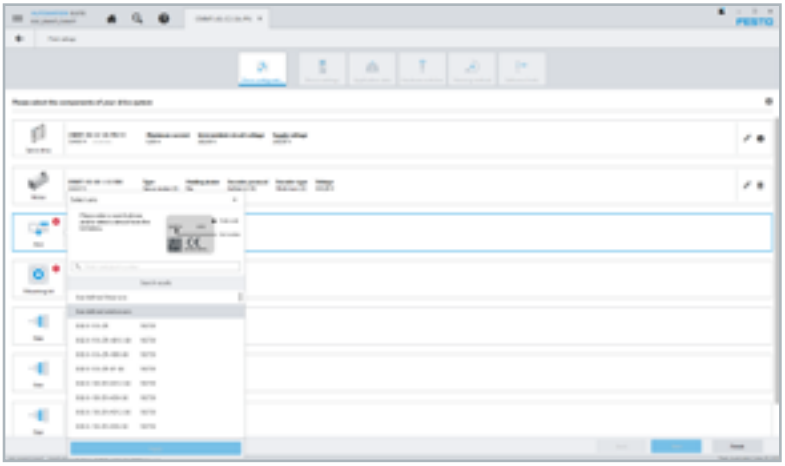


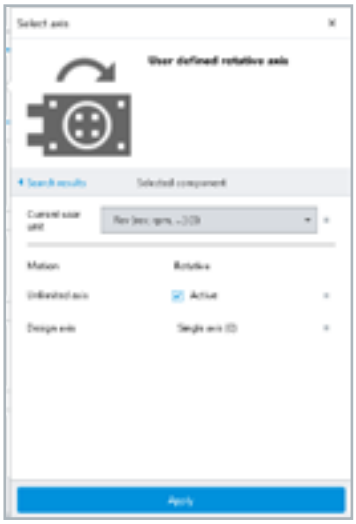
Step 6: Start the configuration step by step

Choose the connected motor

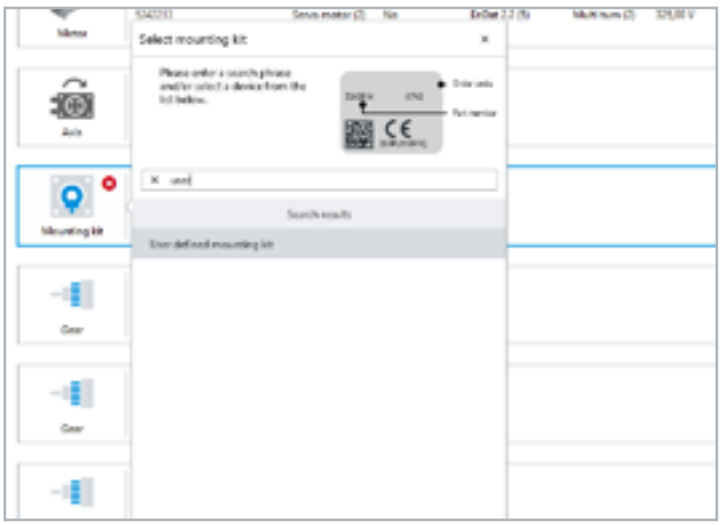


Define the axis **(In this application we are working with an unlimited user defined rotative axis)**

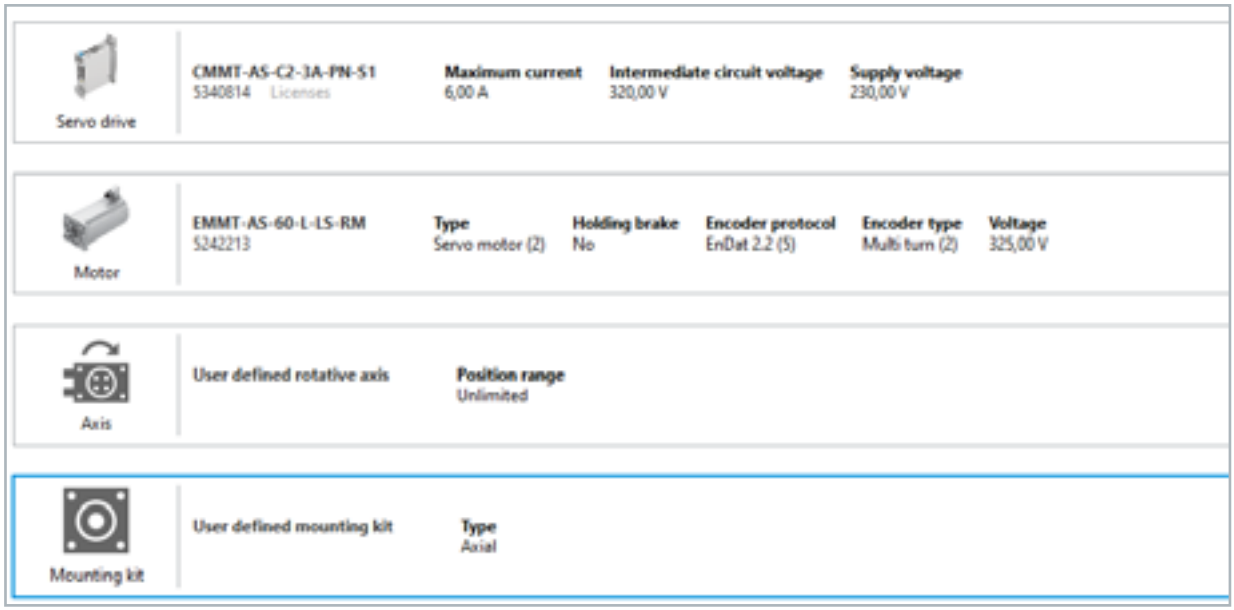




Define the mounting kit **(in this application we are using no mounting kit)**



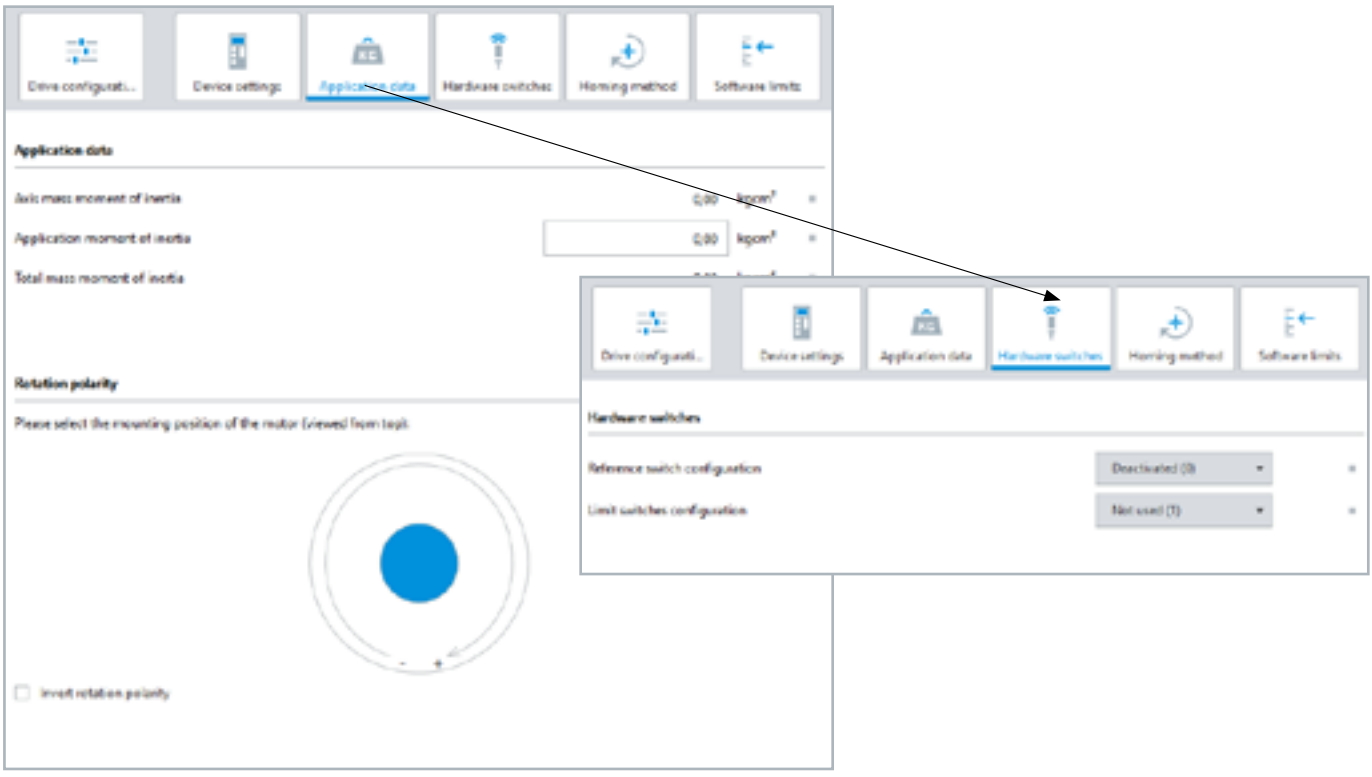
Step 7: After the basic configuration is finished the options for Application data, Hardware switches, Homing method and Software limits are available

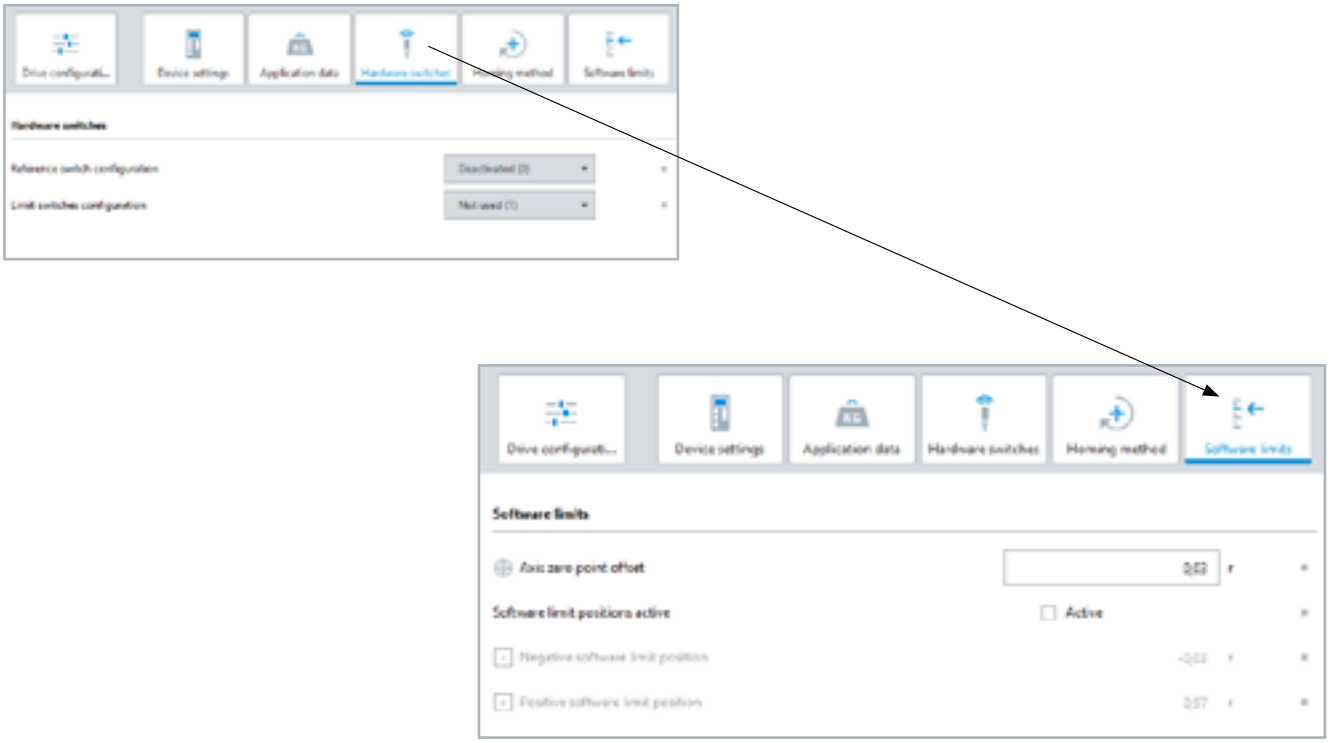


You have access to this parameters via the “Next” button which appears on the lower right corner

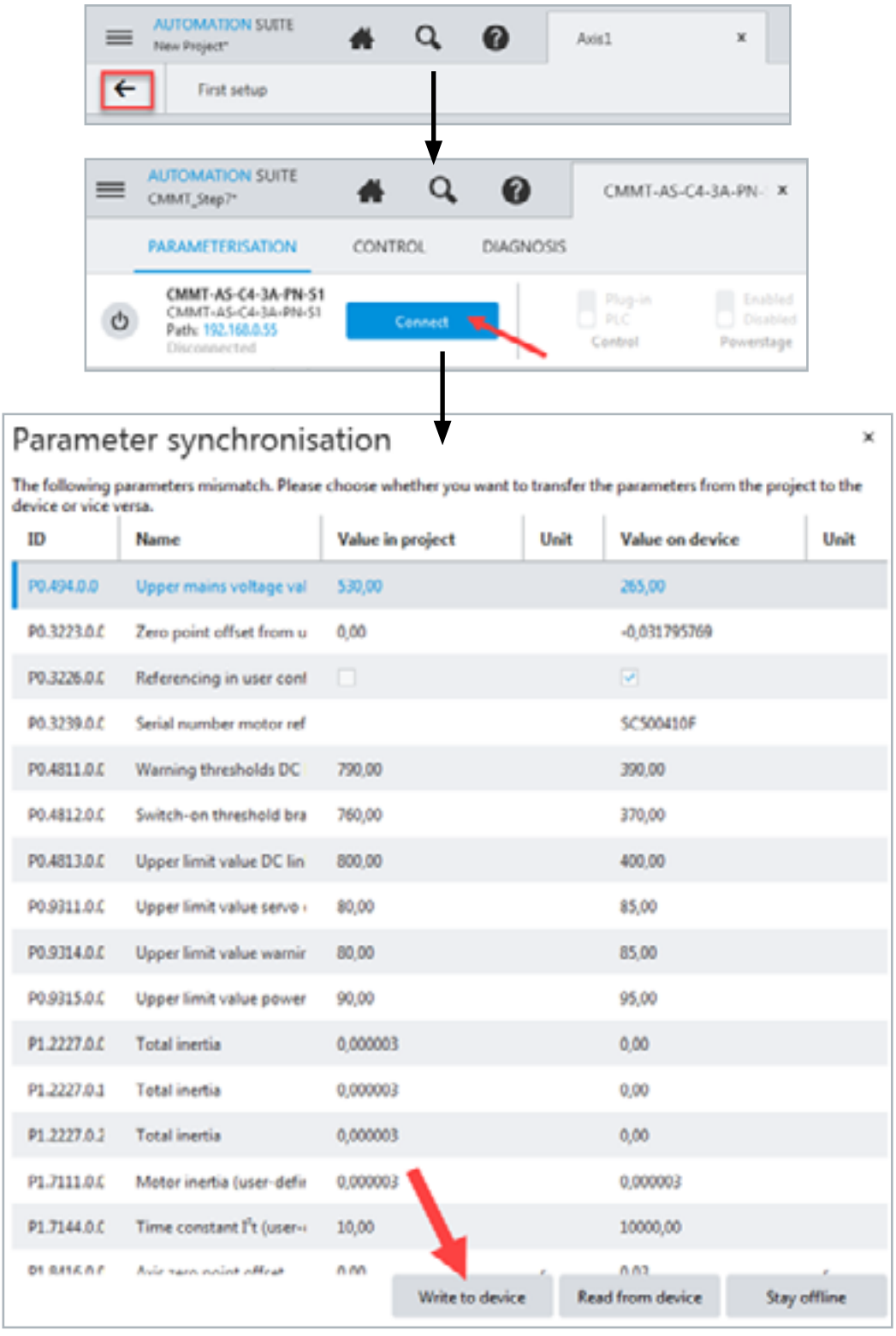
Or per direct click in the upper menu

Note: In this application we have used following settings:



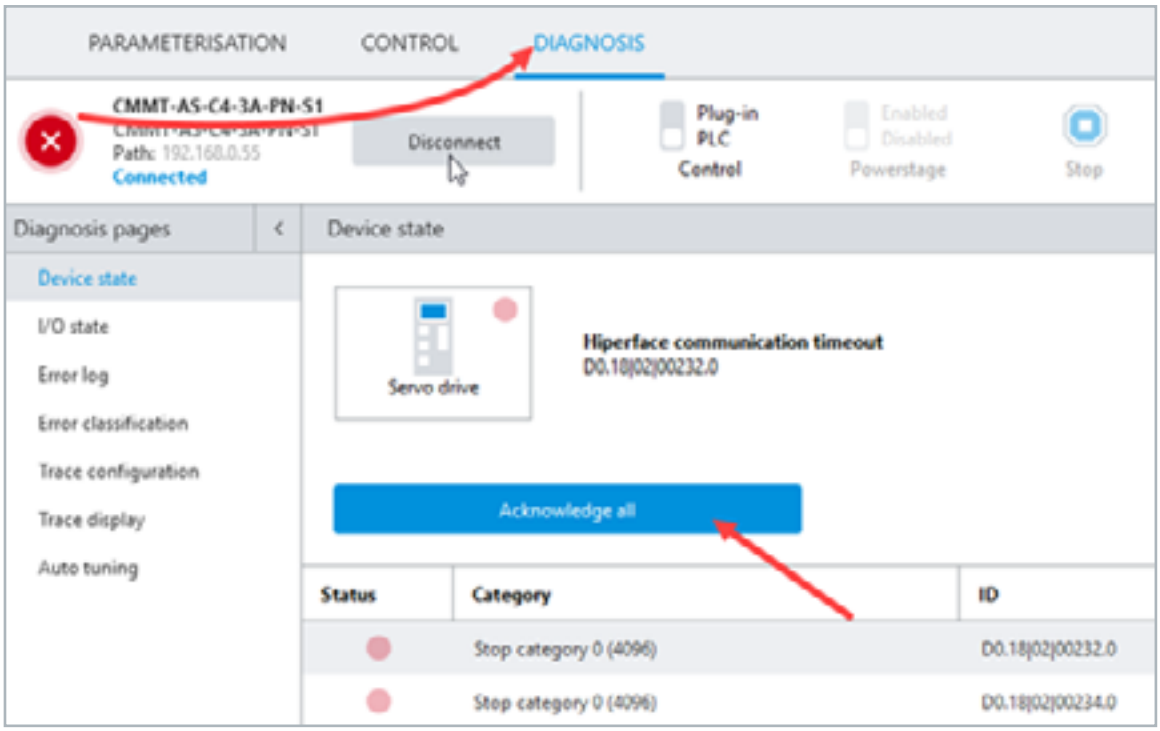

Drive configurati...
Device settings
Application data
Hardware switches
Homing method
Software limits
Hardware switches
Reference switch configuration
Deactivated (0)
Limit switches configuration
Not used (1)
Drive configurati...
Device settings
Application data
Hardware switches
Homing method
Software limits
Software limits
Axis zero point offset
0,00
r
Software limit positions active
Active
Negative software limit position
-0,01
r
Positive software limit position
0,57
r

Step 8: Close the Wizard and download everything to the motor controller

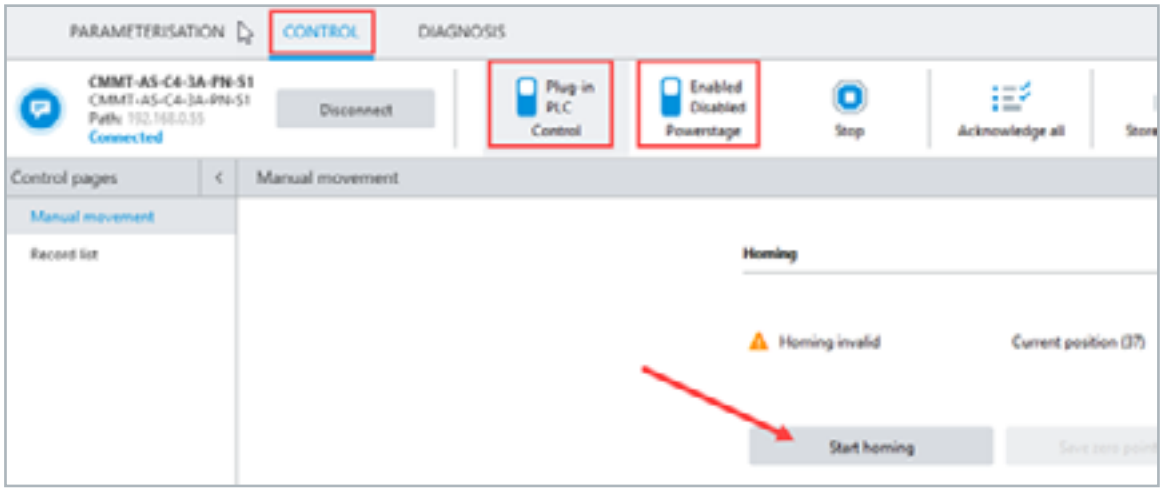


Step 9: If the CMMT-AS was in use already then, because of the changes some diagnosis messages can occur.

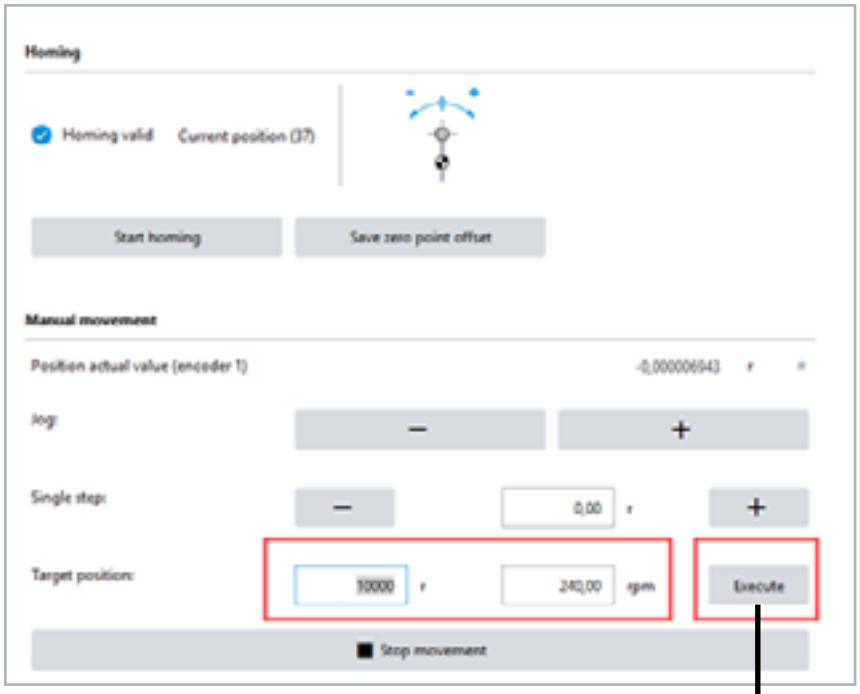
You can delete them here:

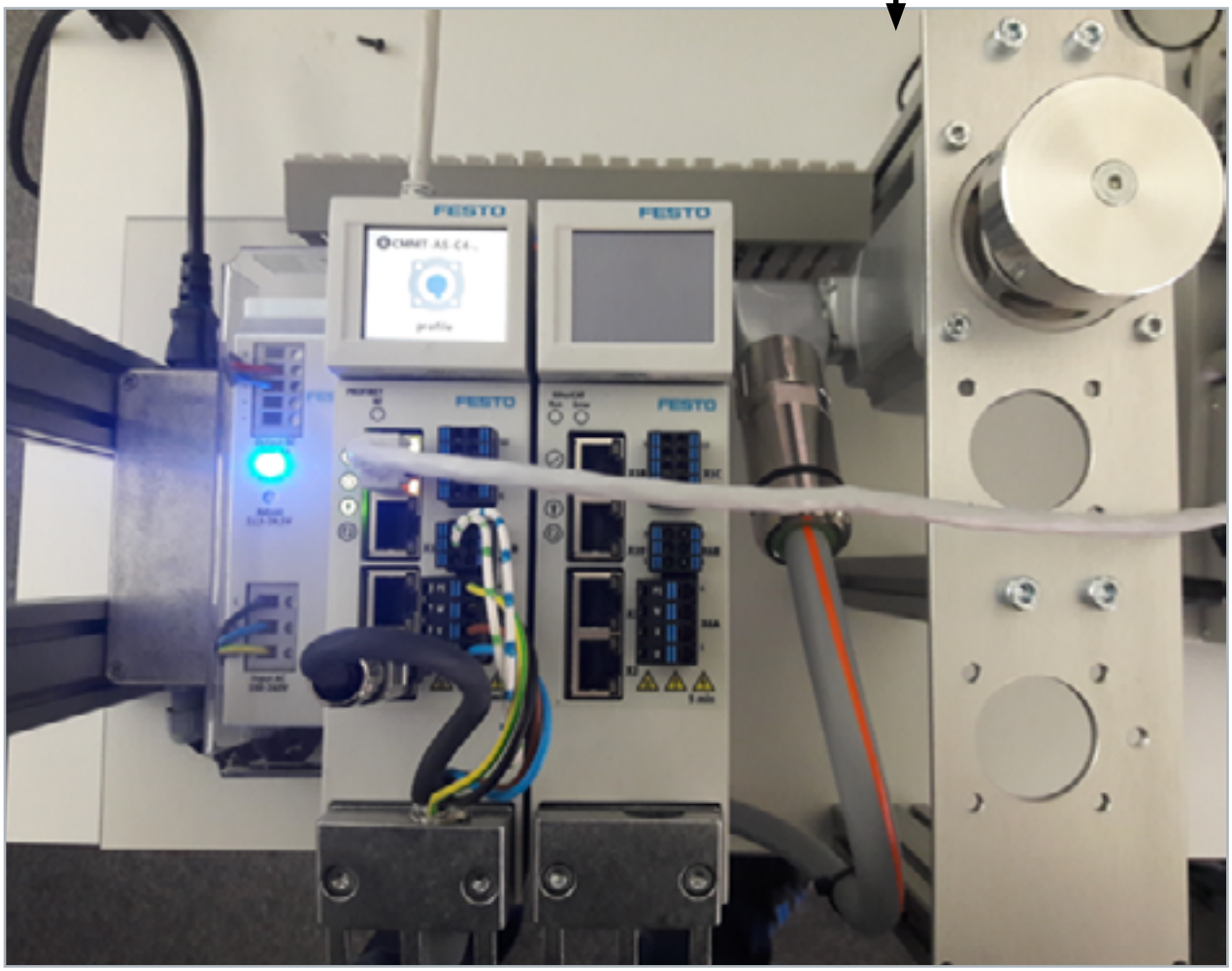


After that you can do for testing purpose a Homing and some movements

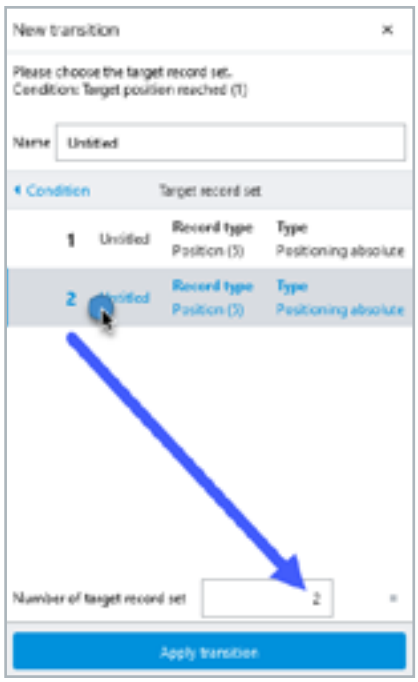


Start e.g. a manual movement of the rotative “unlimited” axis
➔If you have a linear axis take care about the mechanical limits!



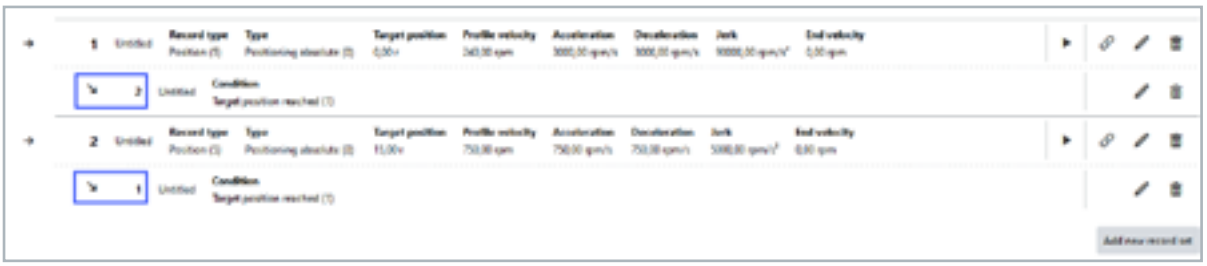


Click on the Second record, the number 2 should be copied to the Number of target record set field as shown in the screenshot below. Click the Apply transition button.



Repeat this procedure for the second record but now select record 1 instead of record 2.

The final record list should look like this:



When you click on a play button, the record will start, and after reaching the requested position, the other record will automatically be started.
You can interrupt this sequence by clicking the stop button on top of the screen:

You have now taken the first steps in working with Festo CMMT servo drives. Of course, this system has much more features than the basic functions we have shown here.
More detailed information can be found via the links below:

CMMT-ST Hardware

CMMT-ST software

Safety: SS1-t, STO

Safety: STO

14.17 Function developed with Festo's Edrives: Servo-press kit

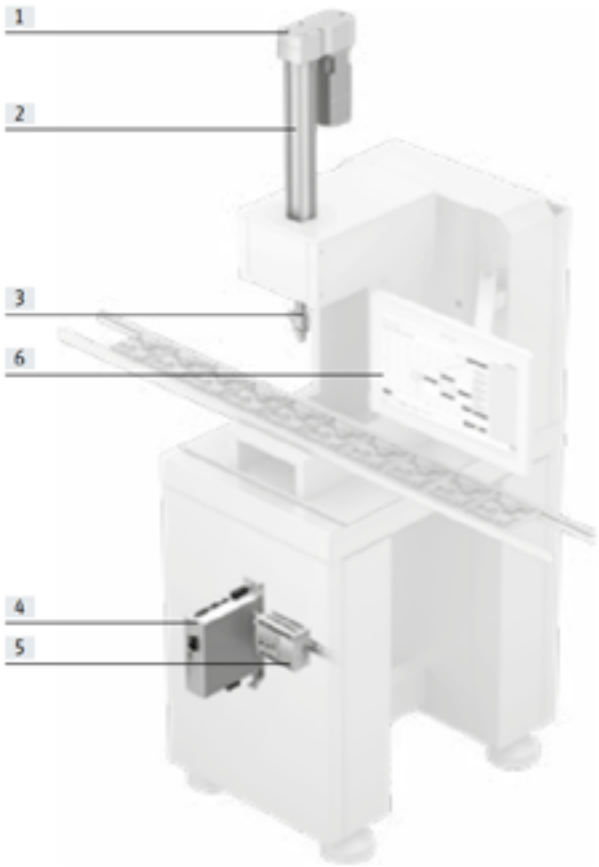
Characteristics

At a glance

The servo press kit and its associated application software can be used to respond quickly and flexibly to a range of press processes. It is a great alternative to complex and often oversized presses.
The software can be used for continuously monitoring parameters such as moments of force and displacement during joining and press-fitting processes.

Advantages:
- Pressing forces up to 17 kN (higher force ranges on request)
- Very high positioning and repetition accuracy
- Ideal price/performance ratio
- Easy integration into any application

Sample pressing device



Individual components:
[1] Servo motor
[2] Electric cylinder
[3] Force sensor (incl. inspection record)
[4] Software package
[5] Motor controller
[6] Controller (incl. micro SD memory card)
Motor/encoder cables are included in the scope of delivery.

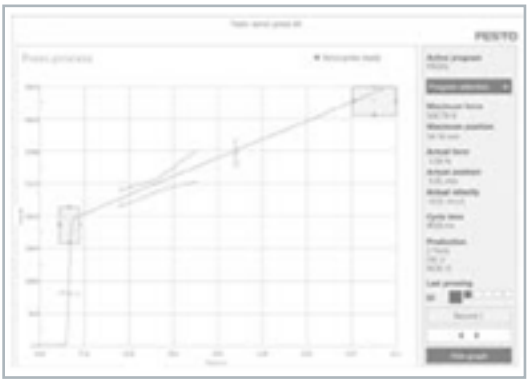
Documentation

Servo Press Kit YJKP - Description of host function blocks in Siemens SIMATIC S7 (TIA Portal V14)

Characteristics

Modular application software for configuration, operation and visualisation

- The application is controlled via a web interface, which is also used for configuring the application-specific functions
- No programming skills are required to use the pre-installed, ready-to-use software
- A non-platform-specific software display allows visualisation on all kinds of human-machine interfaces (HMIs) with a web browser, such as touchscreens, PCs, iPads, mobile phones, etc.
- The program sequence itself is controlled by variables and digital control inputs, e.g. by the higher-order controller
- All recorded process data can be interchanged individually with the HOST system



The following software functions are available

Comissioning

- Configuring the hardware
- Carrying out homing
- Taring and adjusting the force sensor
- Moving the press manually in “jog” mode
- Configuring logging
- Making fundamental system settings

Writing program

- Managing programs
- Defining press processes and parameterising and configuring them using the sequencer
- Recording/loading reference curves
- Configuring the threshold values/envelopes/windowing evaluation methods
- Managing individual variables

Operation

- Selecting saved press programs
- Recording and displaying reference curves
- Allowing OK/NOK evaluation of pressed parts
- Logging

The interfaces enable the GUI (graphical user interface), the PLC and the host to be selected and defined.

Diagnostics

- Process diagnostics
- Sensing of various system parameters, system status and statistical values
- Enabling the display of current data/statuses for the various interfaces, such as digital I/Os or data transferred by a host PLC.

Festo Didactic – Your partner for successful training solutions

A didactic method

(Greek: didáskein, to teach; lore of teaching) is a teaching method that follows a consistent scientific approach or educational style to engage the student's mind.

Manufacturing know-how

Festo is both a global engineering and manufacturing company and training and consulting organization with experienced instructors and consultants. This gives us insight into the challenges and opportunities not normally available to training providers. We practice what we teach. And we can use this experience to help you optimize the two parts of the productivity equation – people and technology.

Globally qualified trainers

Our networks of qualified trainers in the areas of Technology, Organization and People share resources and best practices and contribute to continuous improvement and development of new products to address customer needs.

15.1 Overview of recommended face-to-face courses for Renault:

Course	Outcomes
P111 - Modern industrial pneumatics – Fundamentals Target groups: Operators, maintenance, design/ engineering, trainer 3 days	The participant: • Can design, assemble and test basic pneumatic circuits • Can maintain and troubleshoot pneumatic components and basic control systems • Can identify and describe the design, feature and operation of pneumatic components • Can identify and explain symbols for pneumatic components • Can interpret technical specifications and data relating to pneumatic components • Knows the fundamentals of compressed air generation Pre-requisites: Basic technical understanding
P121 - Troubleshooting of electropneumatic systems using PLC controls Target groups: Maintenance, trainers 3 days	The participant: • Can describe the functional relationship between mechanical, pneumatic, electronic and PLC components • Master troubleshooting techniques and strategies • Is familiar with safety aspects of pneumatic systems • Can effectively use PLCs to identify and locate failures in an electro pneumatic system Pre-requisites: P111 Modern industrial pneumatics – Fundamentals training, Basic PLC training
P351 - Systematic safety improvement in pneumatic systems Target groups: Operators, maintenance, engineering, designers, trainers 2 days	The participant: • Recognizes the hazards in pneumatic processes • Analyzes the risk factors of simple pneumatic designs • Applies safety measures and safety circuits • Understands the principles of emergency and safety solutions • Raises the safety reliability of simple pneumatic designs Pre-requisites: P111 "Modern industrial pneumatics – Fundamentals" or equivalent knowledge
P361 - Energy saving in pneumatic systems Target groups: Operators, maintenance, engineering, designers, trainers 2 days	The participant: • Understands the relation between the consumption and the cost of energy sources • Applies efficiency measures in the preparation, distribution and consumption of air • Corrects the failures that cause efficiency waste • Applies efficiency measures in pneumatic circuits • Selects efficient components for various applications • Measures the air consumption of various pneumatic applications • Improves the lifetime of various pneumatic components Pre-requisites: P111 "Modern industrial pneumatics – Fundamentals" or equivalent knowledge
VTSA specific training for Renault maintenance people Available in all countries Please ask to your local Festo contact 1,5 day, for 6 participants	The participant: • Can make the configuration of valves terminal • Know features of VTSA valves terminal • Can understand several shut off and safety functions • Can understand how to diagnostic the failures • Can modify and add part of the VTSA configuration • Can lead the list of spare parts in Mabec code

Name	Remarks	Picture	Documentation
ATEX	• Today, you will be able to choose from 7,700 Festo products which are certified for the various explo-sion-protection categories. More will follow. We are working on this with maximum effort		ATEX additional Information
Cleanroom Products	• Reliability for the most stringent requirements		Cleanroom Product Range
RoHS	• Festo, too, is changing selected products over to RoHS-compliant materials • Around 2,000 Festo products are already made from RoHS-compliant materials today. On request, the electronics production depart-ment can produce RoHS-compliant printed circuit boards in lead-free soldering plants		RoHS information
UL / CSA	• UL standards for the certification of Festo products • Electrical and mechanical hazards in the case of electrical products • Housing materials and insulation materials in the case of fire-protec-tion tests • Valves: bursting pressure test at 5x the rated pressure • Inspection of production facilities by UL		Online Certifications Dictory
TÜV certification	• ! ! !!TÜV are German organizations working on the validation / certification of products of all types to protect the environment and human health.		TÜV information
Support	• User's manuals and declarations of conformity		Support Portal Functions
Engineering tools	• Find suitable products for your application with Festo engineering tools • Avoid complex reality tests and use our engineering tools to simulate your application