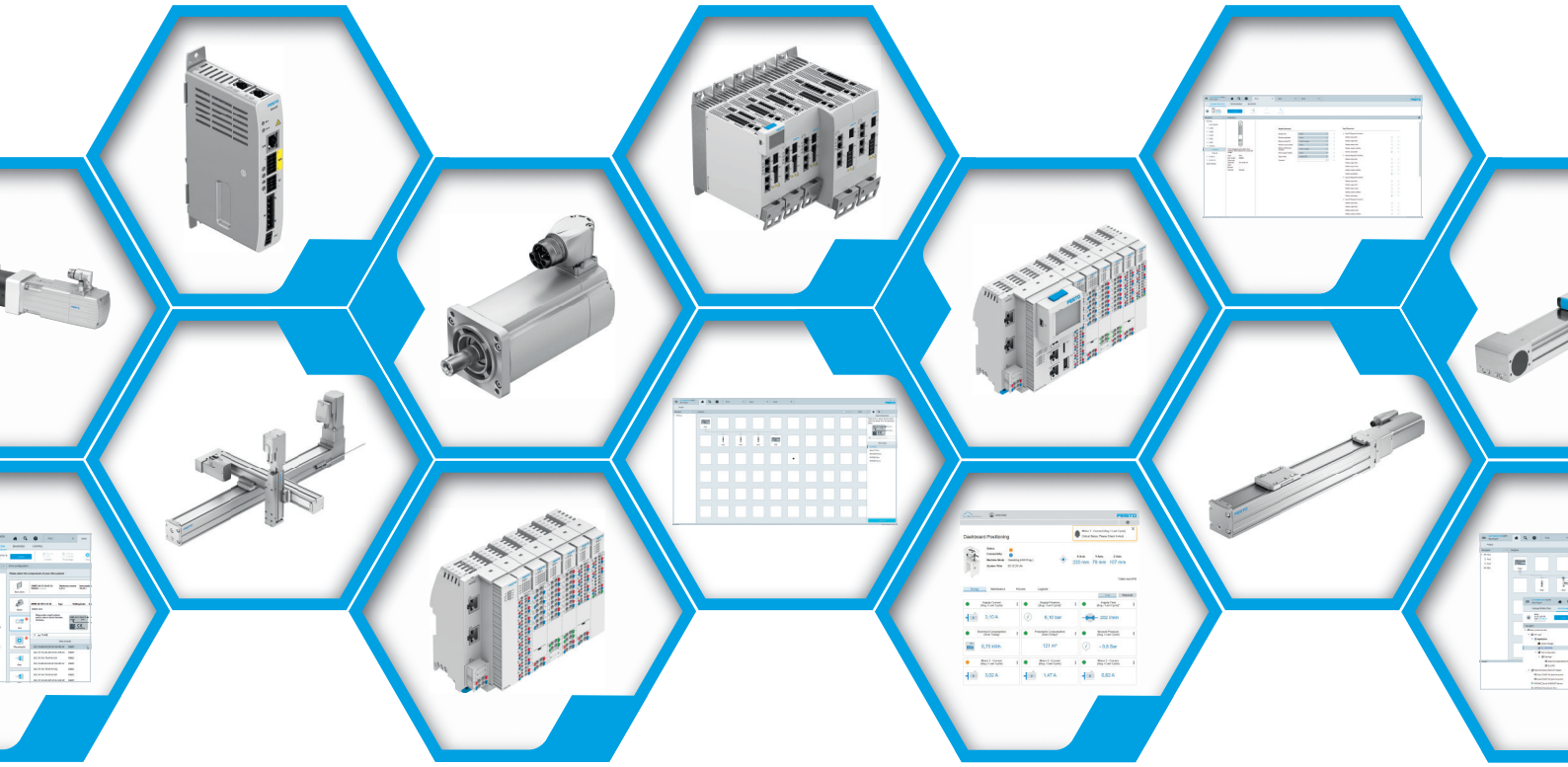
From mechanics to the cloud: decentralised control concepts

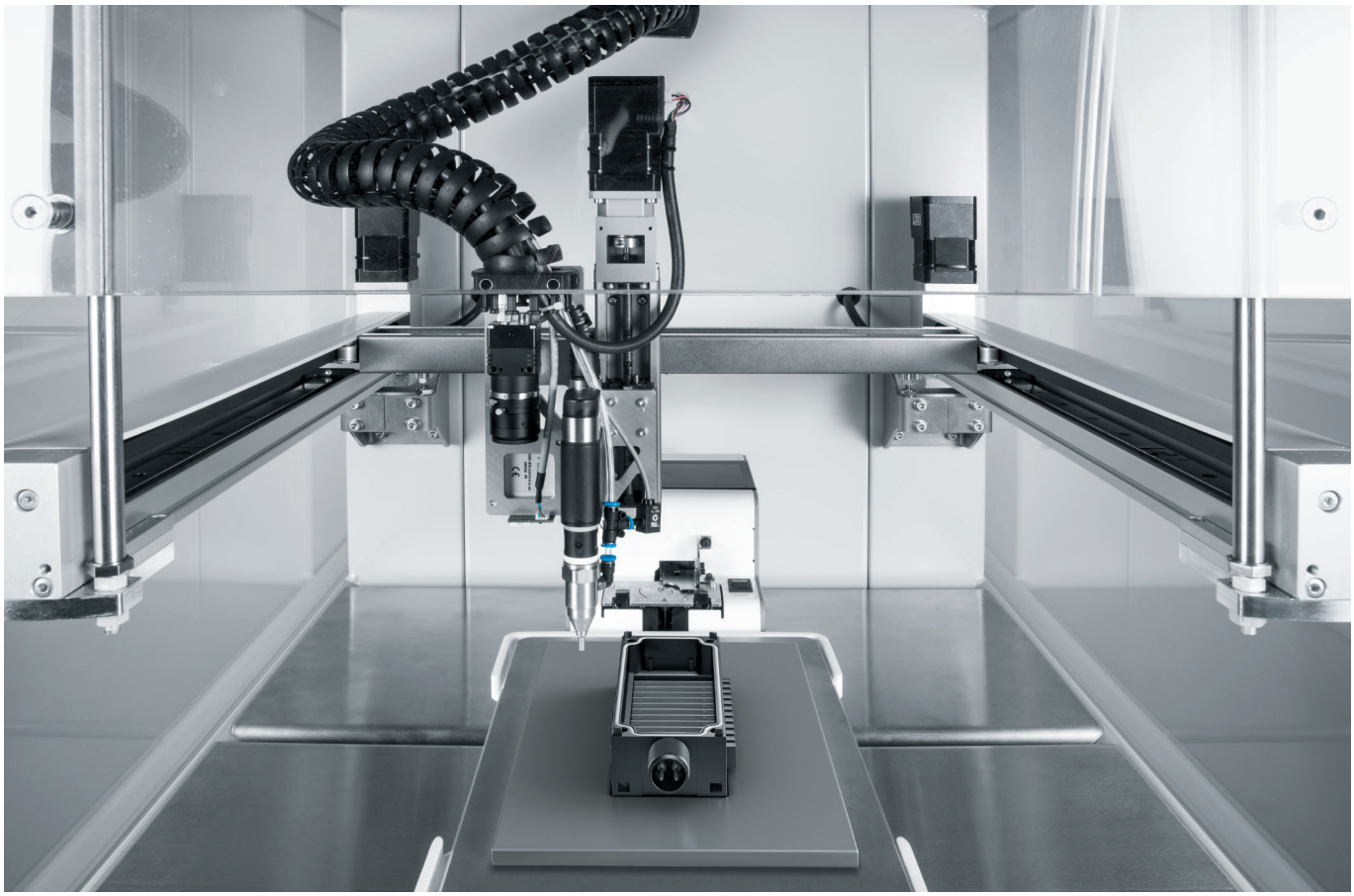
FESTO



The Festo automation platform

We drive automation for your success.
We are your partner to inspire you
We shape the future together

→ WE ARE THE ENGINEERS OF PRODUCTIVITY.



Page 4

The Festo Automation platform

4 Overview
6 Festo machine control
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Drive solutions

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34 Safety technology

Festo. At the forefront of automation.

Decentralised intelligence. Autonomous subsystems. Open platforms for Industry 4.0:
the control systems from Festo offer everything you need for today and tomorrow. They offer real benefits
- for more innovative machine builders
- for more productive end users
- in short, for professionals who can take a close look at the TCO and make the right calculations.

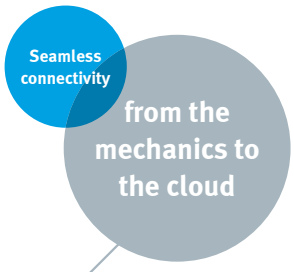
Hardware and software as a complete automation platform.
- Practical skills for real-life applications
- From mechanics to the cloud
- Always simple and intuitive

Intelligent networking of architectures for perfect connectivity.
Installation and control concepts are influencing each other more than ever before, especially as we move towards Industry 4.0 and the Internet of Things (IoT). Making these architectures work well together is fundamental for the success of these smart factories, because it leads to modular, flexible and adaptable production concepts with decentralised intelligence, pre-processing and cyber-physical systems.

Competency for new ideas – the connectivity of tomorrow.
Electric and pneumatic drive technology is home territory for Festo. You get perfect mechanical and kinematic systems and precisely matching motors and servo drives; you will also find control concepts in IP65 and IP20 with motion control for the large majority of industrial applications. Machine learning, artificial intelligence (AI) in devices and the Festo Cloud will round off the top end of the portfolio in the future – everything from a single source!

We want to make you as machine builders or end users even more successful. That's why Festo always wants to live up to its claim of being the driving force in automation. How do we do that? Just turn the page to find out.

Faster. Better. Connected.



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Smart cameras and sensors

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Digital products and services

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The Festo value chain

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46 The technology plant Scharnhausen
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Groundbreaking: the new automation platform from Festo.

Discover how easy and effortless state-of-the-art automation can be.
With the Festo automation platform, you can design your system architecture in the blink of an eye.

Plan machines and systems, size and select components using intuitive expert software; complete accessories using 3D graphics; manage complete machine projects in Festo Projects, and finalise engineering projects in the Festo Automation Suite. Everything in one tool including programming. It also allows you to seamlessly manage and use all the data right up to commissioning and operation.

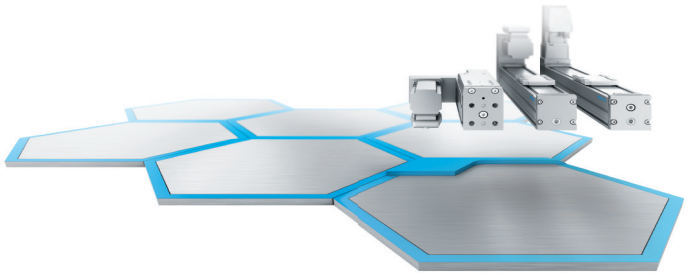
The new, open, expandable Festo Automation Platform makes it all incredibly easy. Thanks to the perfect connectivity of components and subsystems, the data from the systems you operate can be transferred to any commonly used control systems. If you wish, it can also be sent in parallel to the cloud.

With Festo solutions like Festo Dashboards transferring data is seamless and consistent. And the systems are immediately ready for use, without the need for any programming. All this makes it just as easy to optimise machine and operating processes as it is to set up mobile and preventive maintenance plans.

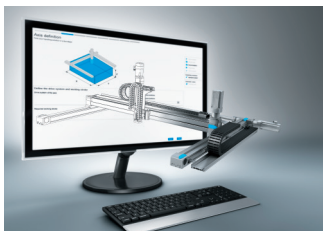
Selected AI algorithms in the devices themselves and in the Festo Cloud are also in the pipeline, giving you the data you need to make even better decisions to increase availability and productivity.

The seamlessly integrated automation solution

The performance and functionality of the scalable automation platform enable you to implement numerous applications, with the possibilities ranging from simple machine and system control concepts to preprocessing for complex mechatronic subsystems. The seamless and continuous data connection between the mechanical components and the cloud is what makes the automation platform unique.

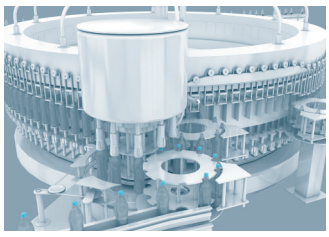


Added value with the automation platform from Festo:



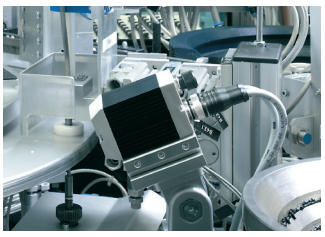
Smart engineering

- Size, select and integrate electric or pneumatic axis mechanics
- Select suitable accessories in 3D
- Simulate movements, use data consistently
- Festo: from the component to the cloud



Fluid and motion control

- Fluid and motion control from a single source
- Fast, synchronised movements up to 32 axes
- CODESYS standards with PLCopen Part 1, 2 and 4
- Robotic-Lib for specific Festo kinematics



Vision

- Measuring, tracking and synchronising all in one
- Pattern matching
- Tracking connected with motion control
- Sensors/cameras and software from Festo



Safety

- Solutions for pneumatic and electrical movements, including mechanics and sensors
- Reliable solution packages, certified by the German Technical Control Board (TÜV)
- Sample circuit diagrams and consultancy service

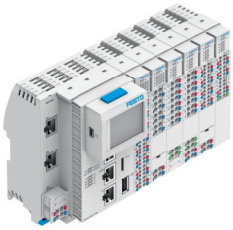
Options for tomorrow

The new and integrated automation solutions in the increasingly digital and networked world open up new opportunities for:

- Improving customer loyalty using seamless digital connections and information
- Providing more individual, market-specific products using flexible and adaptive production processes
- Optimising workflows and processes thanks to big data analytics and preventive maintenance
- Sustainable design, optimised operating phases and suitable disposal using simulation and online condition monitoring
- Global transparency using digital twins

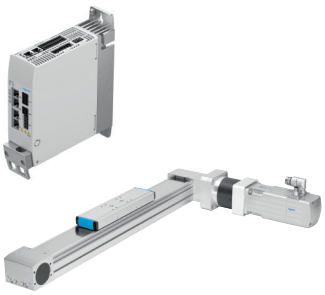
Automation platform

- Decentralised preprocessing or complete machine
- Connection to Industry 4.0/ the cloud via OPC UA
- A complete software platform for engineering

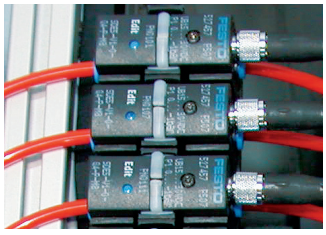


Drive solutions

- Versatile axis mechanics and kinematics in 1D, 2D and 3D
- Complete design using Festo tools for mechanics – motors – servo drives
- Consistent use of data (digital twin)

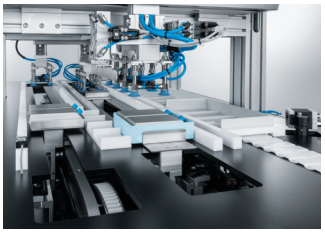


Seamless connectivity from the mechanics to the cloud



Sensors

- Improve manufacturing processes and quality
- Detect anomalies
- Reduce downtimes, increase OEE
- All common sensor technologies from Festo



Grippers

- Electric or pneumatic gripper technologies
- Mechanical and bionic gripping with vacuum
- Simulation and design tools
- From the component to the system solution



Collaboration (study)

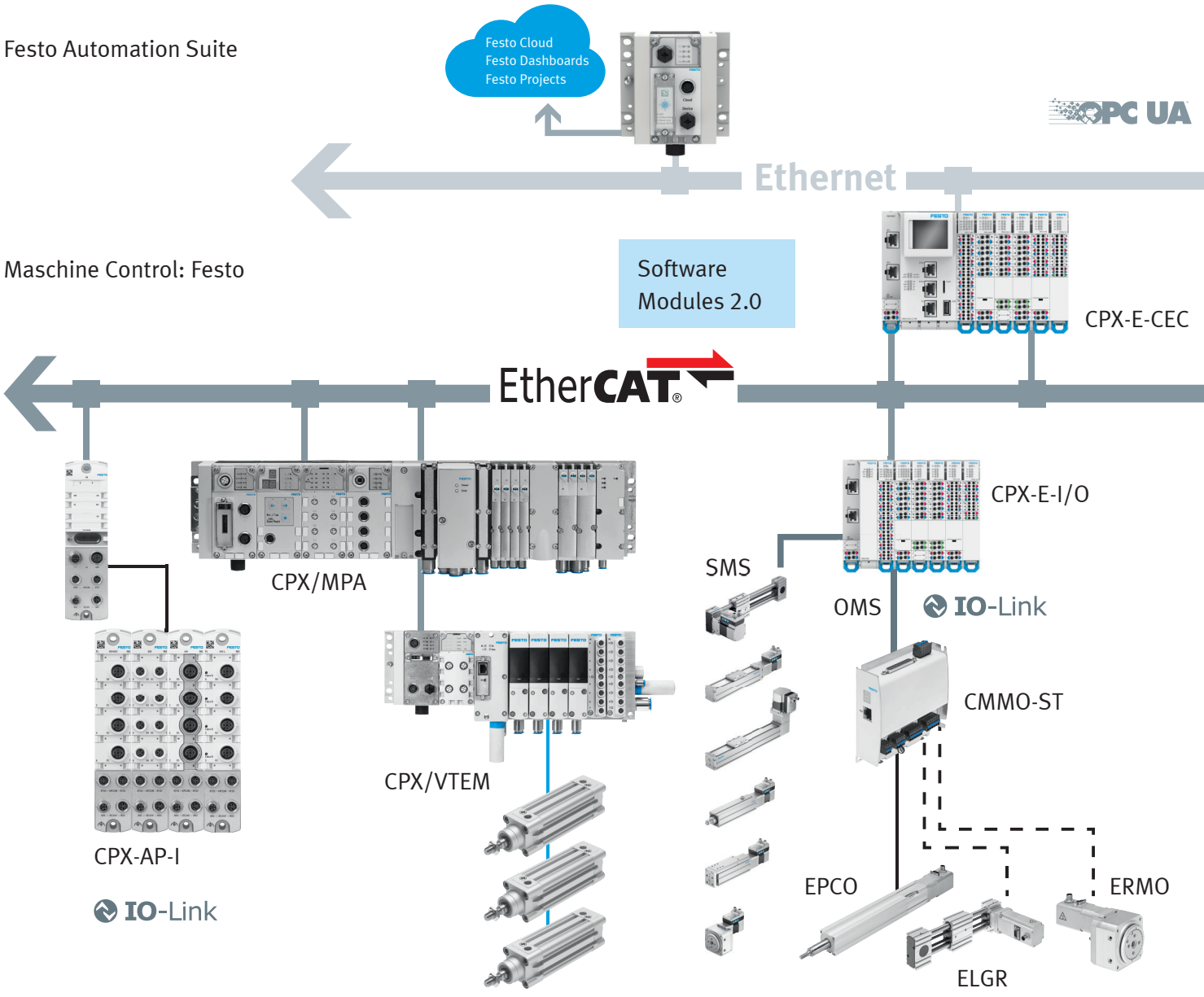
- Human–robot collaboration with artificial intelligence
- Robotic arm with human movement patterns
- Intuitive operating concepts for safe interaction
- Machine learning for optimised workflows

Quick design, complete control with the Festo Automation Platform and EtherCAT®.

With the EtherCAT master controller CPX-E, you can now plan integrated networking concepts and controllers on a completely new scale. By combining EtherCAT and CPX-E, motion control functionality becomes available for all machines and subsystems with real-time requirements, e.g. in compact or modular production facilities. This gives you complete control over small and medium-sized systems in factory and process automation.

The automation platform connects all mechanical data and 1D, 2D or 3D kinematics with the controlling field devices and servo drives. And you can combine stepper and servo motors as well as servo drives, helping you to deliver the optimum technical and economical solution for your application.

Festo Automation Platform

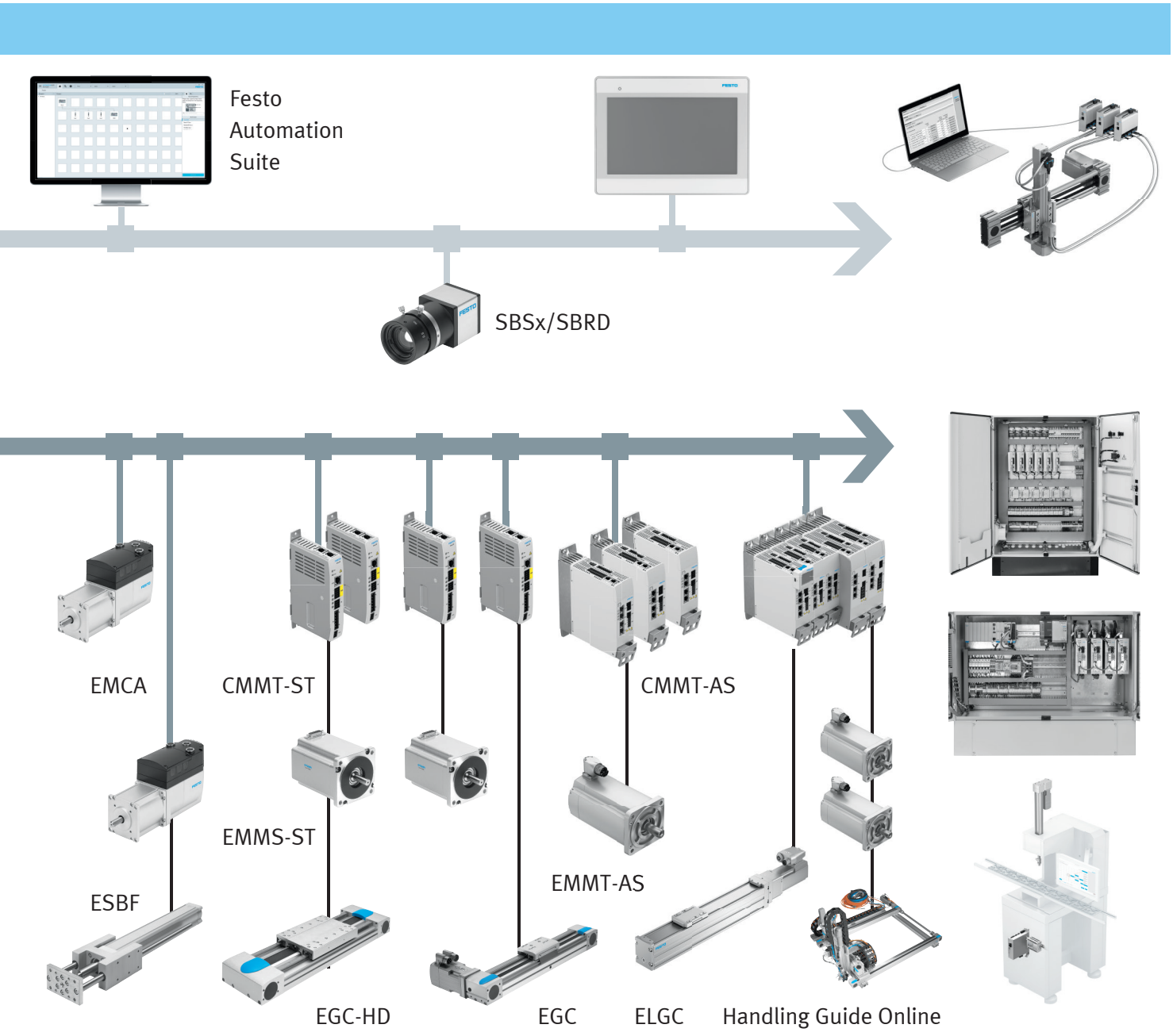


Pneumatic Motion Solutions + RIO

Optimised and Simplified Motion Series

The Festo automation platform offers a unique way of integrating electric and pneumatic automation technology, and together with Festo Projects and the Festo Automation Suite forms a complete engineering package. Where else can you fully integrate a servo drive into your configuration with just 2 clicks, as opposed to the 100 that were previously required? And where else do you need fewer than 5 steps to create a drive system that is ready for operation, including servo drive?

This package significantly accelerates your engineering process. The complete solutions from Festo can also be easily embedded in Industry 4.0 host environments and cloud concepts via Ethernet-based protocols such as Modbus and OPC UA.

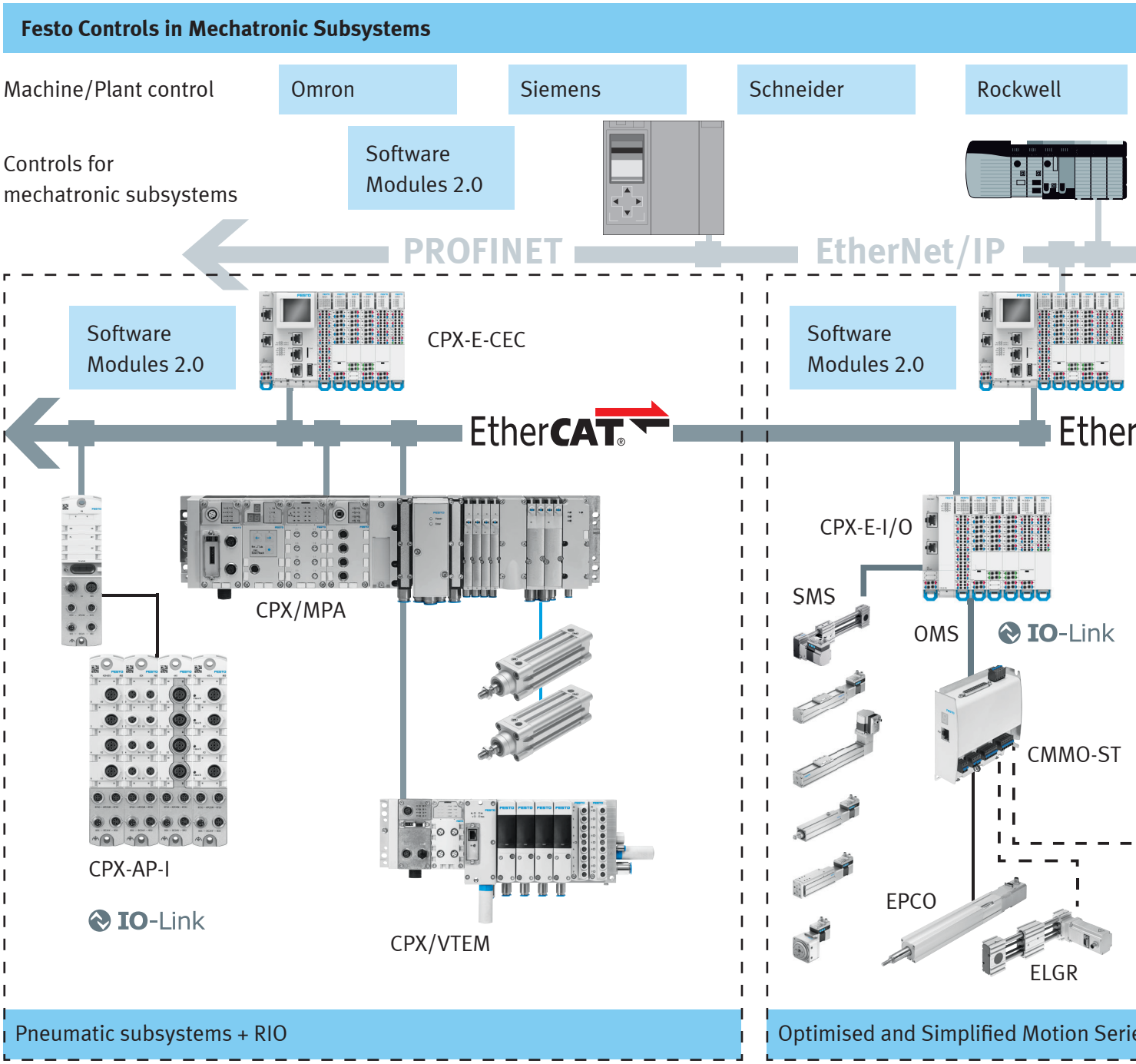


(OMS/SMS) | Advanced Performance: Electric Actuators/Servos/Handling Systems | Compl. solutions

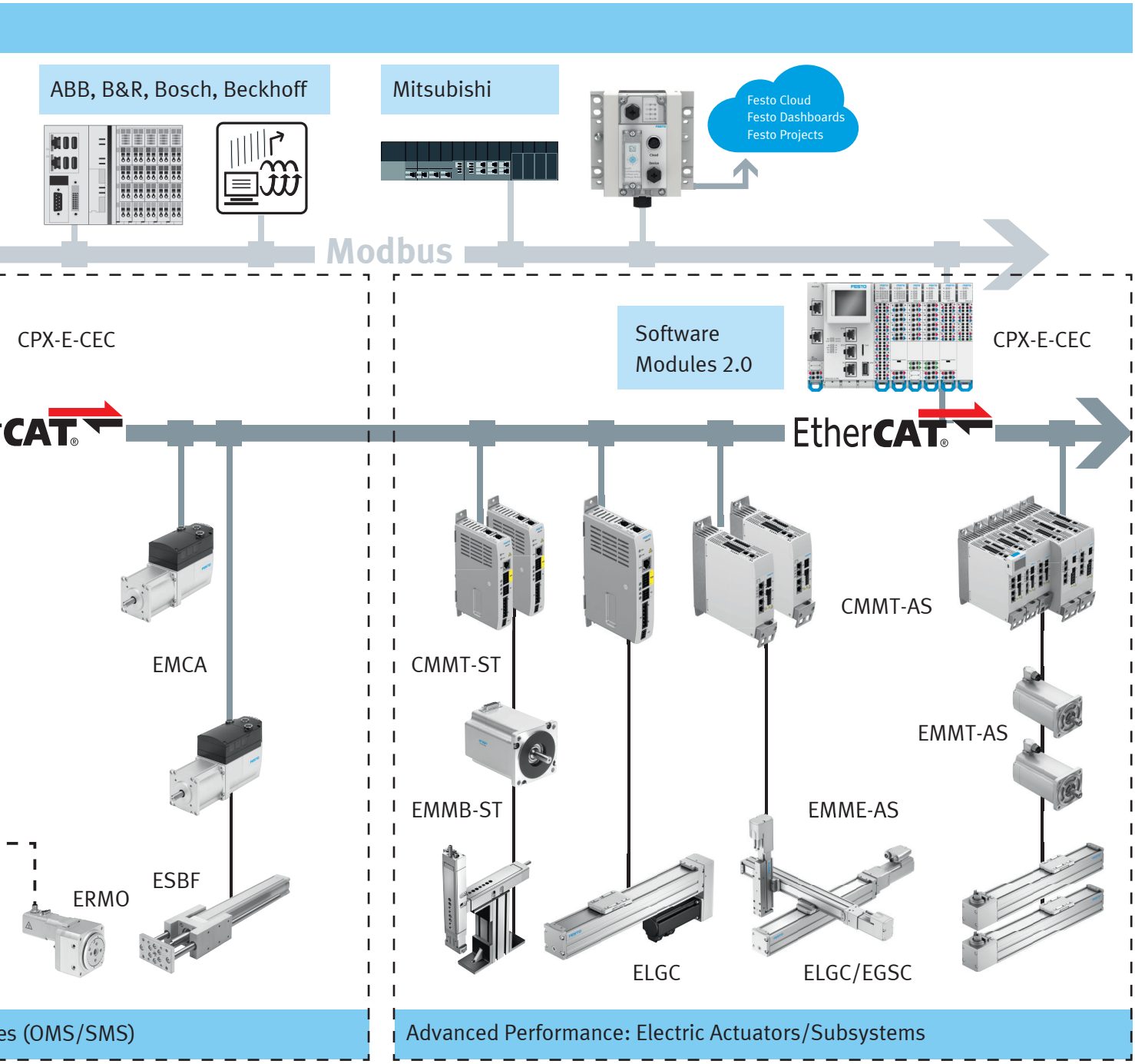
Perfectly integrated mechatronic subsystems with PROFINET and EtherNet/IP.

If you are looking for solutions for autonomous cells or subsystems, for example, or if you require powerful preprocessing, the new Festo EtherCAT® master controller CPX-E-CEC is perfect. You can integrate these as subsystems into large-scale or diverse automation environments by using Ethernet-based protocols such as Modbus®, PROFINET and EtherNet/IP.

Thanks to the OPC UA interface, you can integrate CPX-E-CEC-xx into Industry 4.0 host environments and cloud concepts. By using dashboards from Festo, you can also integrate the data from Festo components into Siemens MindSphere or Factory Talk of the IoT environment from Rockwell. With this approach, you can realise autonomous cells and subsystems and subsequently network them; or you can fully automate the powerful preprocessing of a mechatronic solution from Festo and integrate it into the host system.



In an EtherNet/IP environment, e.g. from Rockwell, all drives can be interpolated!
And all the engineering advantages are at your disposal in subsystems, including fast mechatronic design as well as easy and clear programming within the Festo automation platform.

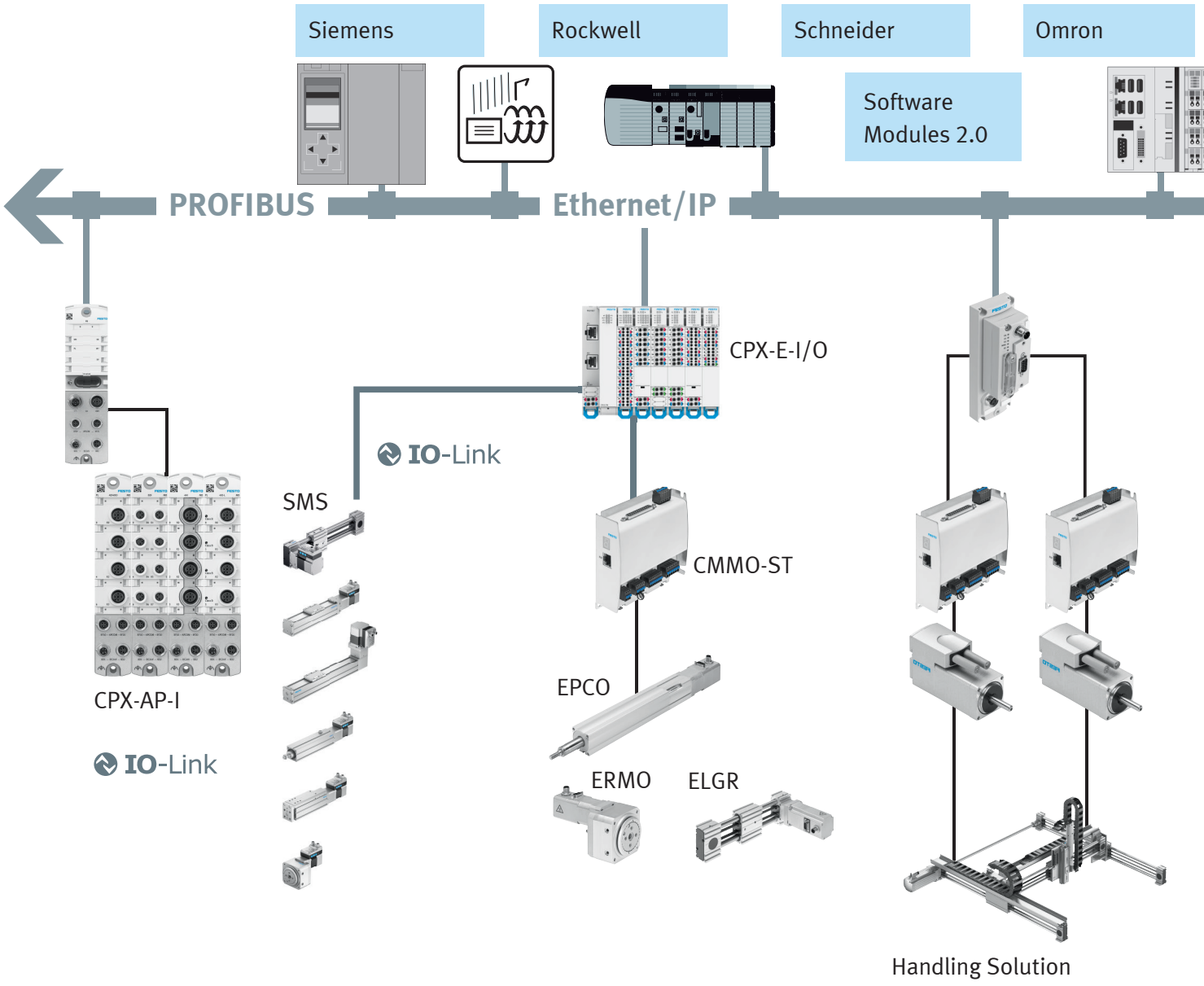


End-to-end connectivity in focus – drive solutions for third-party systems

Festo drive solutions have a modular design:
you select the mechanical system, motor and servo drives to suit you. We then seamlessly integrate our components into your system environment. This includes the mechanical components, gears/adapter kits, motors and their servo drives, providing optimum technical support for your mechatronic 1D, 2D or 3D kinematics solution. And they are extremely efficient too.

You can embed these solutions in larger or diverse automation environments using Ethernet-based protocols such as PROFINET, EtherNet/IP, EtherCAT, Modbus, etc. Festo also provides you with the functional building blocks you need to integrate the parameters into automation solutions from Siemens, Rockwell, Omron, Beckhoff and others. In addition, we support you by providing additional software tools and our in-depth application expertise across a range of industries.

Directly integrated Festo drive solutions



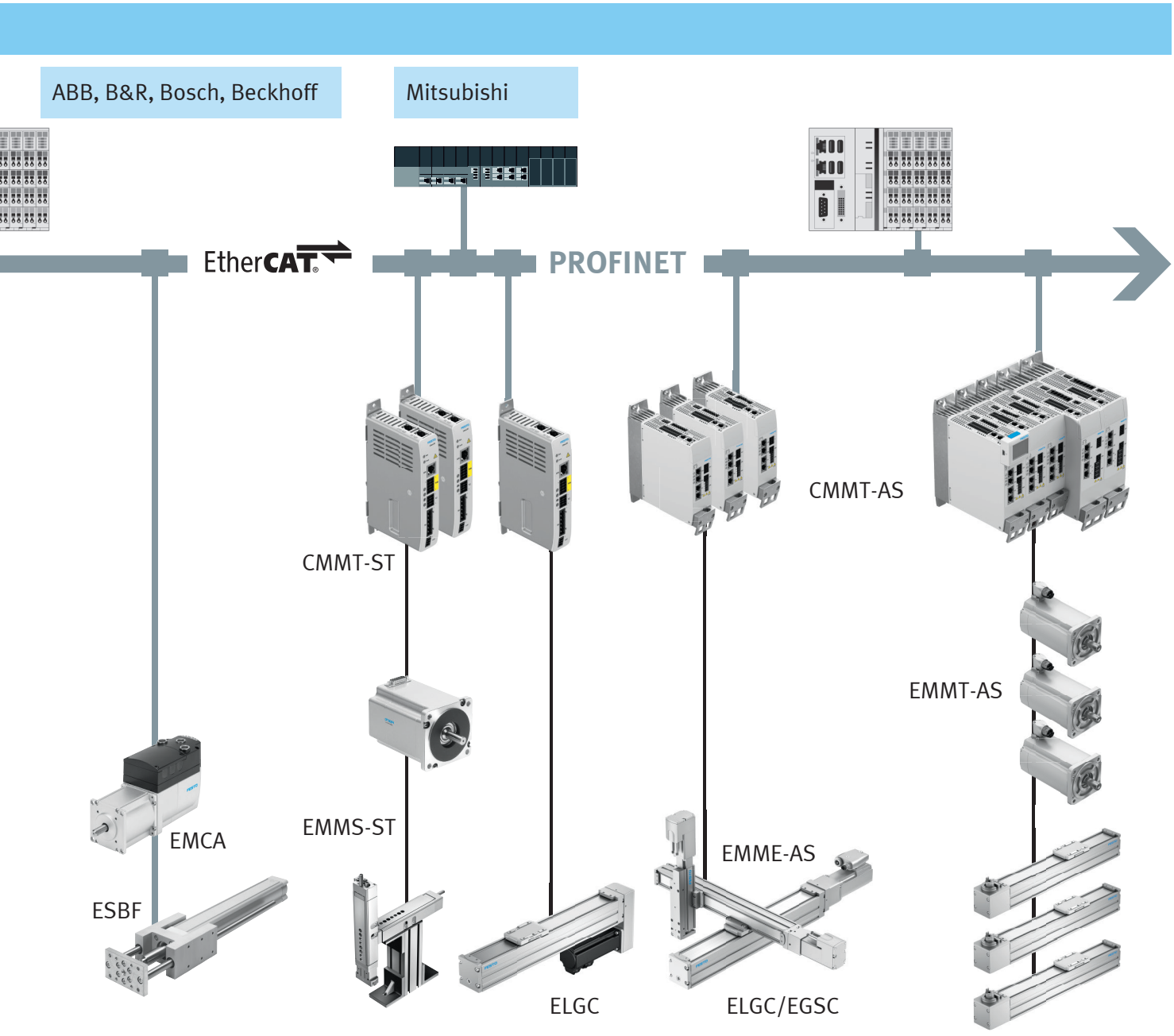
Pneumatic Motion + RIO

Optimised and Simplified Motion Series (OMS/SMS)

Optimally coordinated mechatronic solutions for real benefits on the factory floor

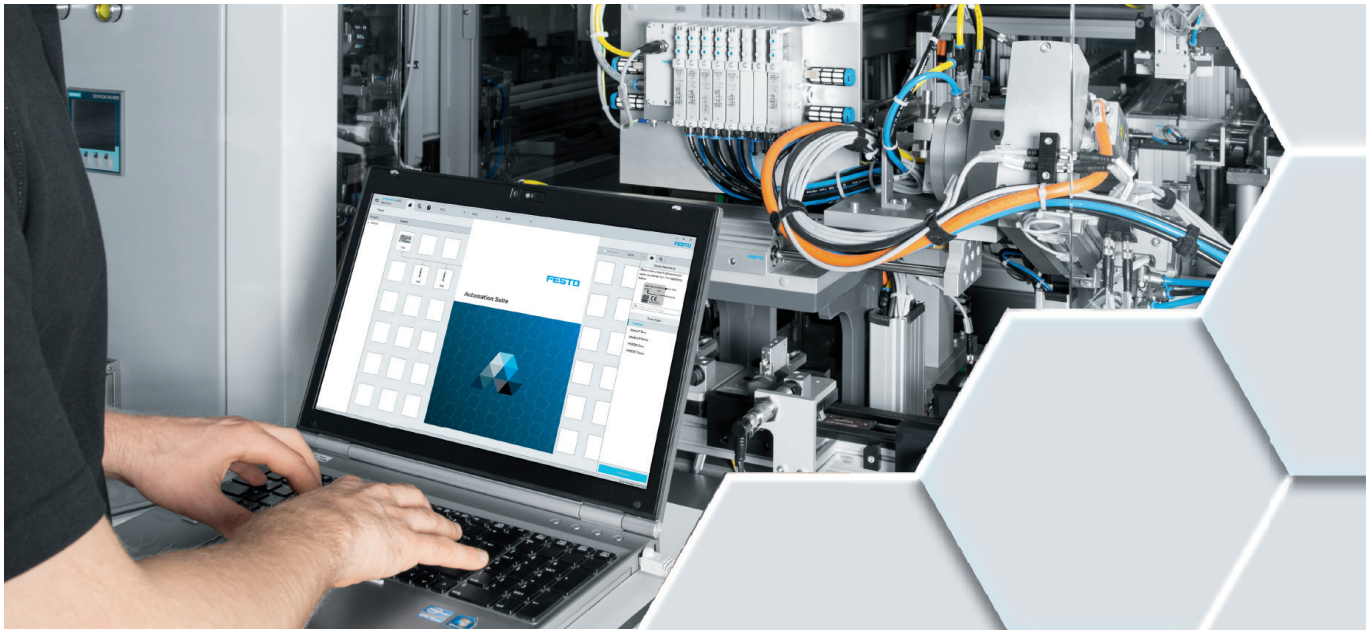
Festo supports you in all three control scenarios (pages 6/7, 8/9 and 10/11) on the factory floor with comprehensive mechatronic solution packages:

- Versatile electric axes and comprehensive gantry solutions, plus all gripper systems
- Controlled via EtherCAT®, using either servo or stepper motors and suitable servo drives such as the new CMMT/EMMT or EMCA.
- Servo motors and servo drives for all demanding, fast movements
- Stepper motors and servo drives for routine, controlled motion
- Integrated compact drives for extremely cost-effective on-site installation (IP54/65)



For high speed engineering: the Festo Automation Suite

This new software package from Festo is revolutionising engineering. Where in the past up to 100 clicks and movements were required, it now takes just 2! Commissioning, including optimised design of a servo drive on EtherCAT, only takes a few minutes.



Selection of drives

- The quick and easy way to your electric drive solution – and it's free!
- Intuitive engineering and selection software
- Delivers the right mechatronic drive solution, without design errors and with improved system energy efficiency.
- Data export from Positioning-Drives (see screen) to the Automation Suite

Parameterisation of a servo drive

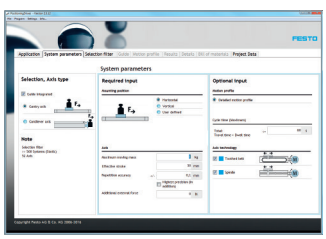
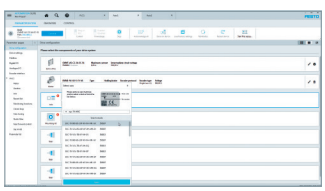
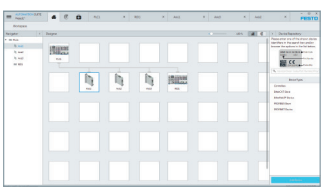
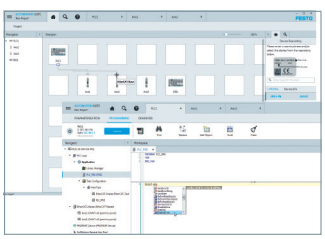
- In the Festo Automation Suite, you can integrate servo drives via a plug-in, e.g. via the CMMT plug-in
- Clear, simple management within a project, comprehensive parameterisation (formerly FCT)
- All basic data of the design (e.g. from PositioningDives) is transferred

Festo Projects

- System project management
- Virtual image of all Festo components in a machine system
- Link to all Festo software tools
- Accurate information on all products over their entire life cycle
- Life cycle management (updates etc.)
- For details, see page 16/17

Fieldbus commissioning

- Commissioning via EtherCAT (formerly FFT) is also included into the Festo Automation Suite
- Just 1 click – and the connection loads all data in the background
- Secure firmware updates
- Add new features at no additional cost

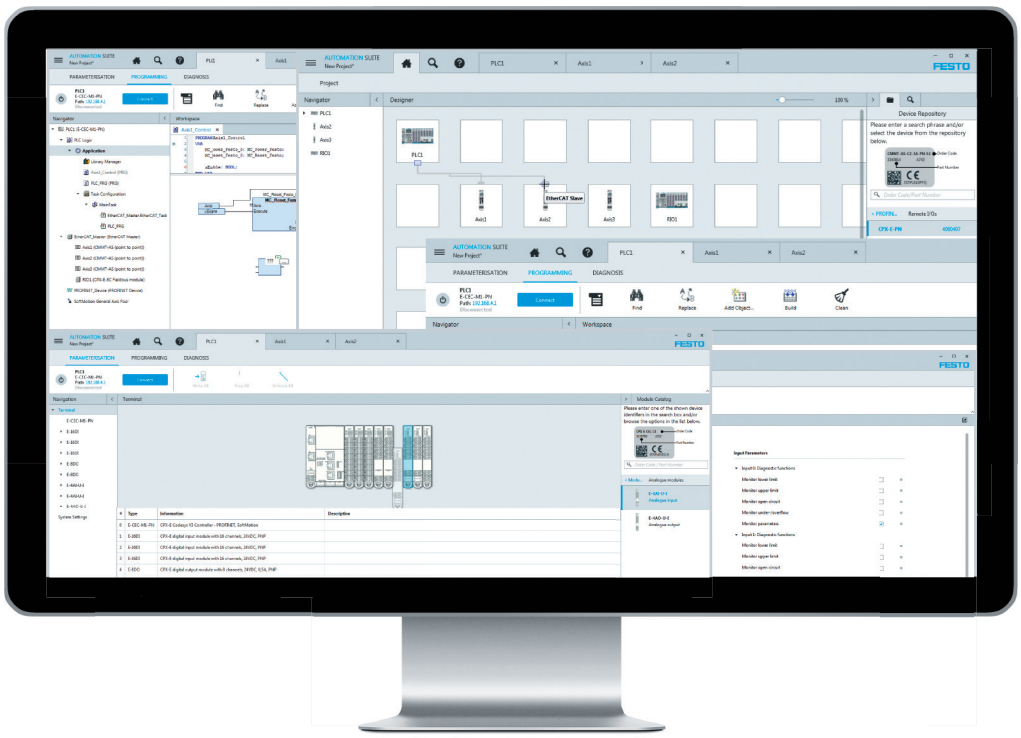
Festo Automation Suite

One automation solution – powered by one piece of software: the Festo Automation Suite

The new software package from Festo revolutionises engineering, since commissioning, including the optimised design of a servo drive via EtherCAT, only takes a few minutes.

The Automation Suite is an open engineering platform that can be adapted to future tasks using plug-ins and added functionality.

Device information and instructions can be accessed directly from the software.



CODESYS programming

- CODESYS provided by Festo is integrated into the Festo Automation Suite as an extension
- Universal language to IEC 61131-3, widely accepted in the control systems market.
- Comprehensive CODESYS V3 function library and many Festo function blocks (Robotics lib)

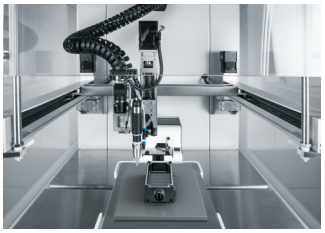
Motion control/robotics

- CODESYS SoftMotion is a powerful software library for simple and complex motion control applications. It includes:
  - PLCopen part 1 and part 2, robotics (PLCopen part 4), Camshaft editor, CNC Editor (.dxf file import)
  - Robotics lib extends SoftMotion to include Festo kinematic systems such as EXCT and EXCH

Specific maintenance

- Maintenance and servicing functions are integrated into the Festo Automation Suite
- Module can be easily scanned for connected, modular devices
- EDS/GSD export, display of configuration and diagnostic data or service functionality (formerly FMT)

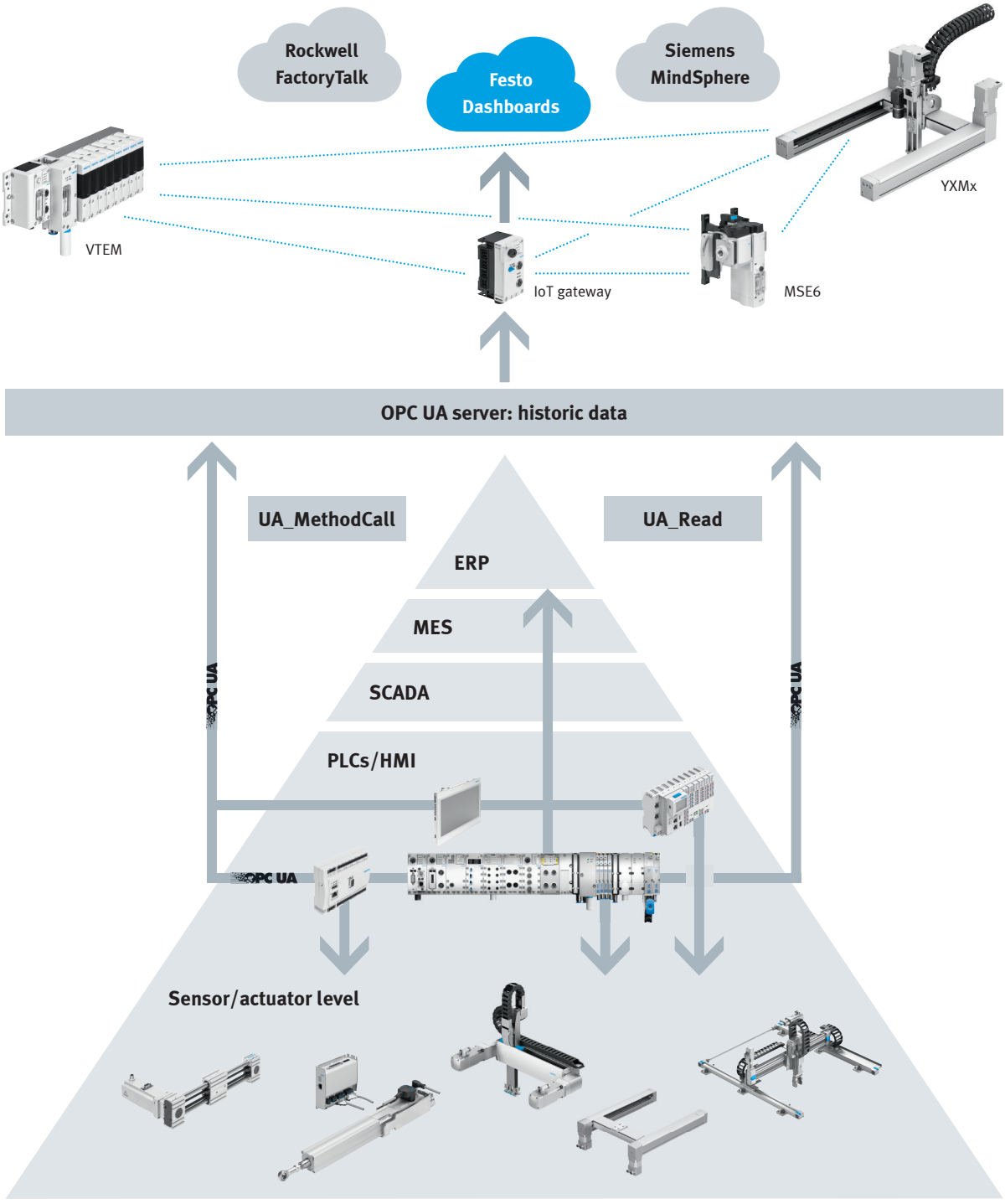






Completely networked and always well informed!

As a **driving force**, Festo also wants to inspire other companies to think and shape the future when it comes to Industry 4.0. Join us on this new journey! Because one thing is clear: business models, partnerships, customer interfaces, value chains, and even the automation landscape with its traditional automation pyramid are all undergoing huge change. Many of yesterday's concepts will be consigned to history by the 4th industrial revolution.



As a trendsetter in fieldbus technology, Festo will also play a major role in shaping Industry 4.0 and the future of industry. With our new concepts, we are creating new products with added value for you, from cloud services such as Festo Projects and Festo Dashboards and Apps, to a new WebShop that offers a range of comprehensive, integrated engineering concepts. In the medium term, data will be made available seamlessly and globally for you on all user devices. This is what the new automation platform from Festo is all about – continuous, seamless connections from the mechanics to the cloud.

Industry 4.0: When objects communicate with each other
More communication from controller to controller or subsystem to subsystem, and horizontal as well as vertical networking with a uniform information model, including the cloud: these are the hallmarks of a fourth industrial revolution – Industry 4.0. The traditional, rigid automation pyramid will cease to exist in the foreseeable future.

The Festo Automation Platform, with the modular control system CPX-E, servo drives CMMT, the CPX terminal or our motion terminal VTEM, is making an important contribution to this change.

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

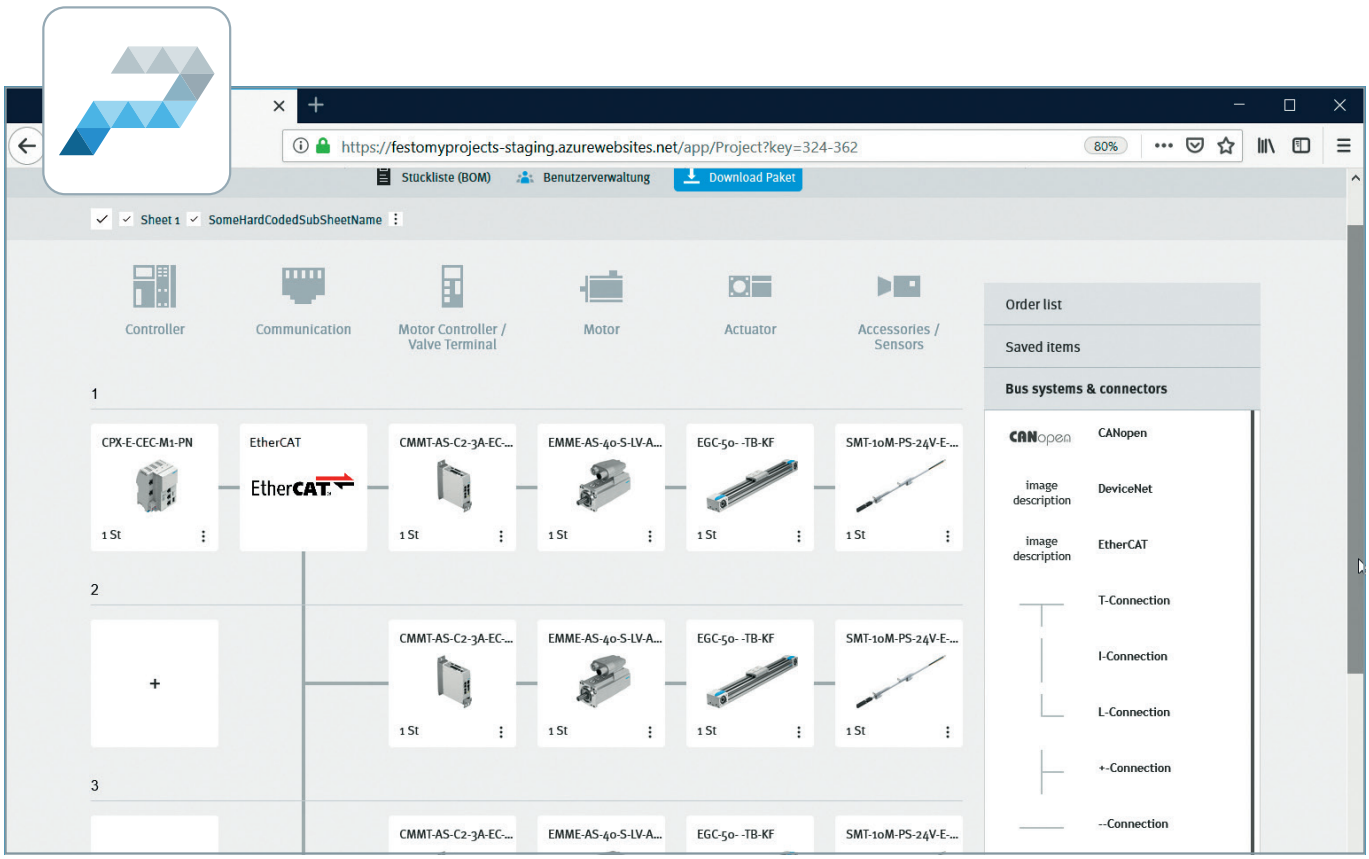
Integration as a subsystem or as a non-hierarchical system
Festo products, such as electric and pneumatic drives, valves/ valve terminals, I/O terminals, compressed air supply or sensors, can thus be integrated as subsystems from the traditional pyramid hierarchy, e.g. via decentralised control systems such as CPX or CECC, or directly, without a hierarchy.
These products include, for example:

- The compact handling system YXMx*
- The energy efficiency module MSE6*
- The Festo Motion Terminal VTEM*
- Or the modular electrical terminal CPX and, by extension, valve terminals MPA or VTSA*

* These products from Festo are therefore cyber-physical systems within the context of Industry 4.0. They record data from the application and the device itself, precompress it by processing the data in diagnostic modules in CODESYS V3 according to VDMA 24582, and then forward this information to the cloud, as shown by Festo Dashboards. (see also page 18/19)

Festo Projects: the lifecycle management platform in the Festo Cloud.

Festo Projects is the first life cycle management platform from a component supplier! Thanks to this platform, you have a simple and permanent way of organising all your projects with and at Festo in your personal cloud container. And you are always up to date, safe in the knowledge that you will always have the right documents and data to hand for any Festo component, throughout the engineering processes and later on during the machine's lifecycle. For maximum transparency, you can specify the relationships between the control system/ fieldbus/components.



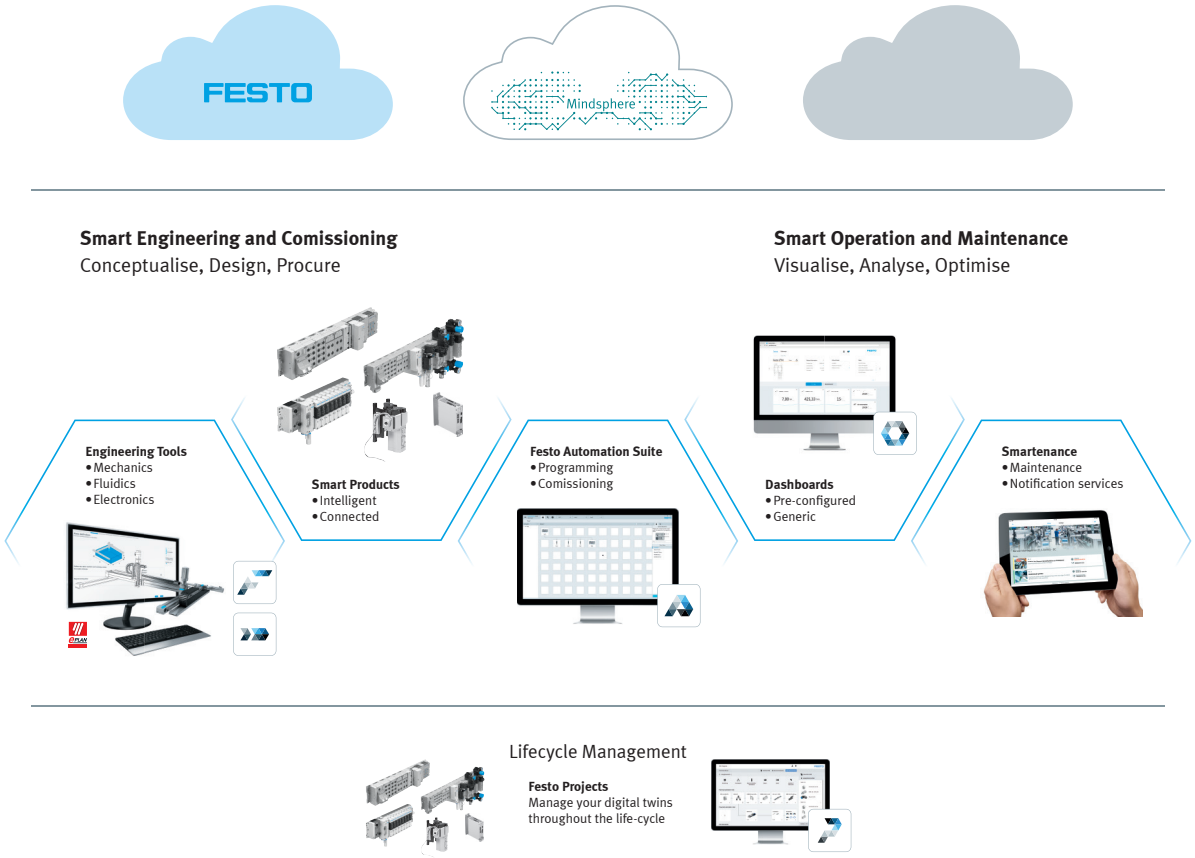
Quick and accurate information for you!
Festo Projects provides you with high-quality, configuration-specific documents and data that are always accurate. With Up2date, firmware or product changes, for example, can be updated. This ensures that life-cycle-specific information about your components and systems is always correct.

Work even better together!
Festo Projects also supports and simplifies collaboration across departments and companies.
It makes exchanging projects via e-mail invitations, either with individual departments or with Festo and you as a customer very simple:

- Festo sales – customer
- Mechanical department – electrical department – programming – commissioning
- Maintenance on the end user's premises

All in all, Festo Projects gets your projects done faster, and with more transparency.

Digital customer journey:



Key features

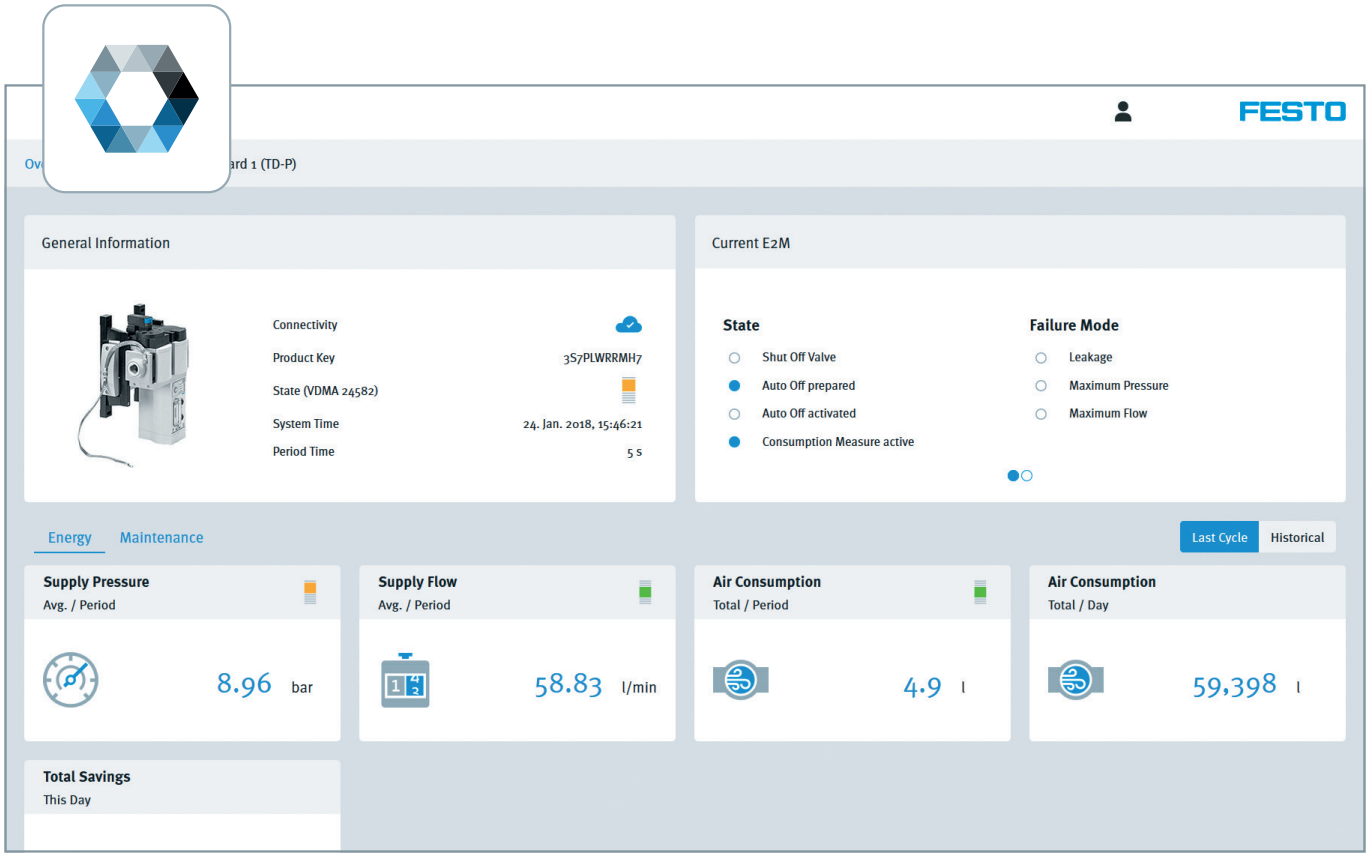
- A life cycle management system, including a constantly updated digital representation of the machine or station, gives you an objective basis on which to make decisions on upgrades, updates and maintenance.
- The collaboration platform provides you with a centralised project storage location allowing you to upload and share projects not just across departments and companies, but between components too.
- You save time because you can reuse and configure specific engineering data. You have access to all the customer tools from Festo, including design and engineering tools, the Festo Automation Suite, the website with AppWorld, the online shop and integrated, convenient configuration tools.
- The digital twin, or the digital representation of every Festo product used, forms the basis for the introduction of Industry 4.0.
- Product-related recommendations from Festo give you valuable tips and suggestions, which you can also pass on to your customers to provide added value.

How to find Festo Projects:

- Go to the Festo App World at www.festo.com/appworld
- Just register for access to completely new solutions!

Festo Dashboards: use your data whenever you want, anywhere in the world.

With Festo Dashboards you can read, view and analyse your data anytime, anywhere in the world, whether for condition monitoring or other applications, and use it to make further decisions. Festo offers preconfigured, turnkey and ready-to-install solutions for the three most common applications. Simply plug them in and you'll be ready to start production in as little as five minutes.



- Specific widgets** and diagrams for the top 3 applications:
  - Energy monitoring
  - (Preventive) maintenance
  - Process KPIs and OEE
- Access to historical data (up to 1 year)
- Objective: preconfigured dashboards for each relevant Festo device
- Existing products: valve terminal CPX/MPA, motion terminal VTEM, energy efficiency module MSE6-E2M, compact handling system YXMX
- Coming soon: valve terminal CPX/VTSA, servo drive CMMT, controller CPX-E, remote I/O system CPX-AP-I
- Others are available on request, including adaptations for third parties

** Widgets are active elements of a window system. They are used to interact with users and display data, but can also perform operations.

Digitalisation in just 5 minutes? Here's how:
Visit our App World: www.festo.com/appworld. There you can purchase licences for Festo Dashboards and assign them to the appropriate product using the Product Key. Digitalise your components and systems in just 5 minutes!

Festo Dashboards offers you more possibilities

For monitoring energy consumption, other long-term measured values, comparing process performance and much more:
Data analysis using MyDashboards presents you with completely new options to make your production processes more productive. This is now possible thanks to the new cloud technology with a web interface. You don't need any additional software and there is no need for programming!

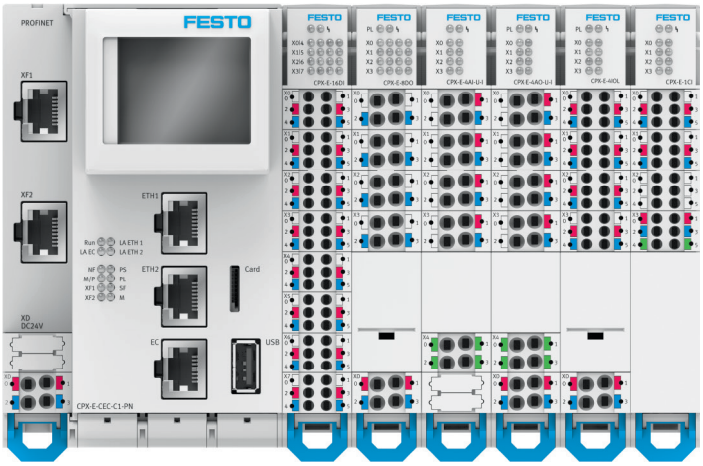
So, for example, you can:

- Implement preventive maintenance, allowing you to plan downtime in advance and increase productivity, for example by scheduling service and maintenance work outside of production time.
- Monitor system status so that all spare parts and kits are available at the right time. Spot any changes in your system very early on, giving you more time to take action. Reduce unplanned downtime and unproductive periods
- Gain clarity on certification issues affecting your company thanks to e.g. information on the products' CO2 footprint or sustainability. All production data is available digitally:
  - This makes certification easier for you
  - You always have an overview of the total cost of ownership (TCO)
  - You know the CO2 footprint
  - And it makes audits easier for you
- Compare the process performance of machines across factories and production facilities:
  - Identify bottlenecks
  - Make unstable processes visible
  - Gain insight into machines and compare them with the performance of other equipment.
- Get a quick fault diagnostics, even from home
  - It reduces your travel time
  - It ensures you are prepared and informed.
- Monitor energy consumption for one year and identify energy savings.
  The cloud-based database for fast and efficient analysis of long-term measured values provides you with clear information.
- See the energy and CO2 savings generated by using the energy efficiency module from Festo
- and increase your productivity, e.g. through efficient engineering and all types of value-added services

Start digitising your production now!
Festo Dashboards for Festo devices can be your first step towards digitising your production. Modern, web-based data analysis using dashboard and cloud solutions supports the entire life cycle of your system and provides you with the greatest possible transparency.

Maximum performance with the modular control system CPX-E-CEC

The automation system for factory and process automation. Designed as an EtherCAT master controller and motion controller in IP20, CPX-E serves as the central control system for numerous applications.
With CPX-E-CEC as a fully-fledged motion controller, you can control up to 32 axes synchronously, or use the system to control our handling systems and smaller machines/systems.



CODESYS

OPC UA

Modbus

EtherNet/IP

PROFIBUS

PROFINET

EtherCAT

Technical highlights

- Fast EtherCAT master interface
- Slave interfaces
  - PROFINET I/O
  - EtherNet/IP
- USB interface
- Optional SD card
- Display CDSB optional
- CODESYS V3
- Motion based on CODESYS SoftMotion
- Web visualisation based on CODESYS
- UL/CSA, C-Tick and IEC Ex certifications

Powerful
CPX-E not only offers you comprehensive PLC functions through to multi-axis applications with interpolation, you can also easily integrate the controller into existing host systems using the integrated PROFINET device or the EtherNet/IP slave interface.
OPC UA features are available for easy integration and interoperability in Industry 4.0 host environments with cloud and digitalisation concepts.

One solution for a host of applications
CPX-E features specific software functions to establish a close connection with products and solution packages from Festo, e.g. in handling technology for
- Parts handling
- Assembly systems
- Palletising
- Gluing, dispensing

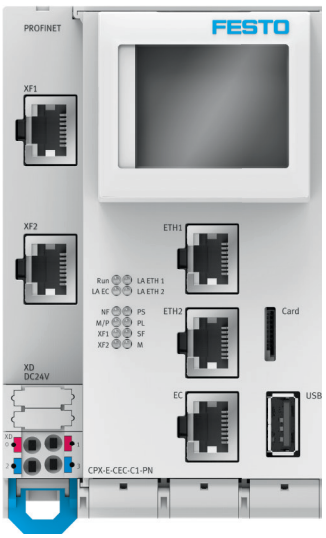
Total automation with CPX-E
- Packaging machines (flow wrappers)
- Palletising systems
- Selective soldering systems
- Wafer handling

The automation system for factory and process automation – system benefits

Key features:
- Modular and flexible IP65 remote I/O for I4.0
- IoT gateway and Festo Cloud
- Decentralised and networked intelligence with embedded CODESYS controller
- Industry 4.0 thanks to OPC UA and CODESYS control V3 (SP10)
- Optimised versions for IP20 and explosive environments
- Maximum function integration for complete applications
- Reduced installation costs and increased productivity

- Uniform programming interface: CODESYS is used for control tasks and motion control applications.
- Significant reduction in engineering effort: integrated data management when combined with the Festo Automation Suite.
- Advanced software features ensure seamless integration. And the electric drives from Festo are perfectly easy to control.

- The uniform platform allows you to seamlessly combine servo technology and stepper motor technology, so you can run mixed operations smoothly.
  Your system behaviour is uniform, and the customer interface will always have exactly the same look.
- All motion control functions are embedded in this controller world, ensuring functional integration is exceptional.
- High I/O component density
- Easy to wire up and assemble on an H-ail.



CODESYS
Programming in a universal language to IEC 61131-3! CODESYS is widely accepted throughout the control systems market, thus providing OEMs with an additional sales opportunity, and end users with simplification. CODESYS and the Festo Automation Suite interact perfectly as one engineering platform. Information can be easily transferred without needing any editing, e.g. data on axis mechanisms, servo drives and applications. Once set, it can be used again and again.

System overview: CPX-E modules and components in detail

PLC controller
- CPX-E-CEC-**C1**
- CPX-E-CEC-**C1**-PN
- CPX-E-CEC-**C1**-EP

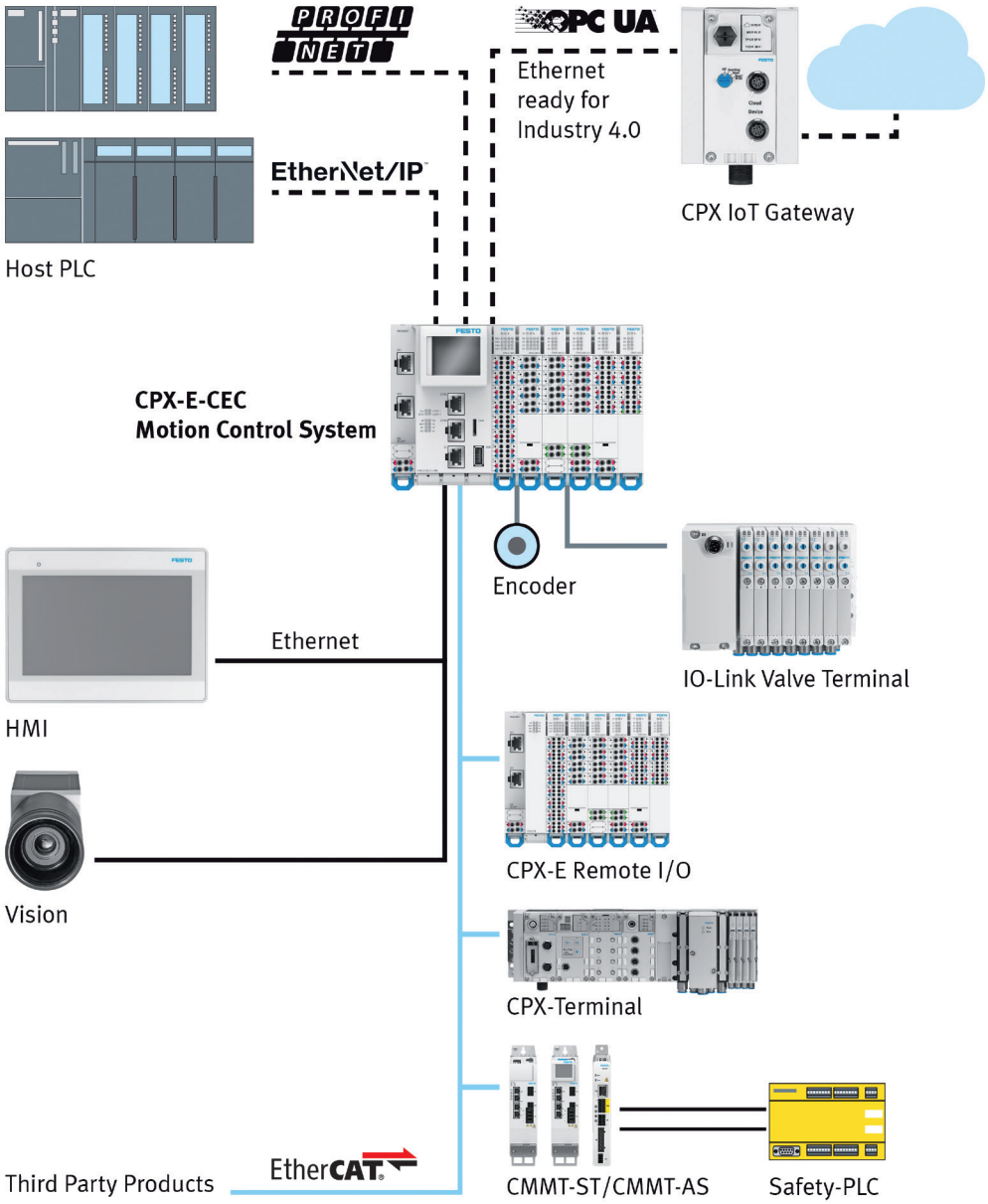
The C1 version is a powerful CODESYS V3 control unit with extensive PLC functions.

Motion controller
- CPX-E-CEC-**M1**
- CPX-E-CEC-**M1**-PN
- CPX-E-CEC-**M1**-EP

The M1 variant is a motion controller that supports motion functions based on CODESYS SoftMotion. SoftMotion is a powerful software library for simple and complex motion control applications and includes:
- PLCopen Parts 1 and 2
- Robotics (PLCopen Part 4)
- Cam disc editor
- CNC editor (.dxf file import)

Remote I/O with CPX-E:
By using this model type as a pure remote I/O, you receive input and output modules as well as bus modules. All variants of the I/O modules are identical – see page 26.

System structure and system integration

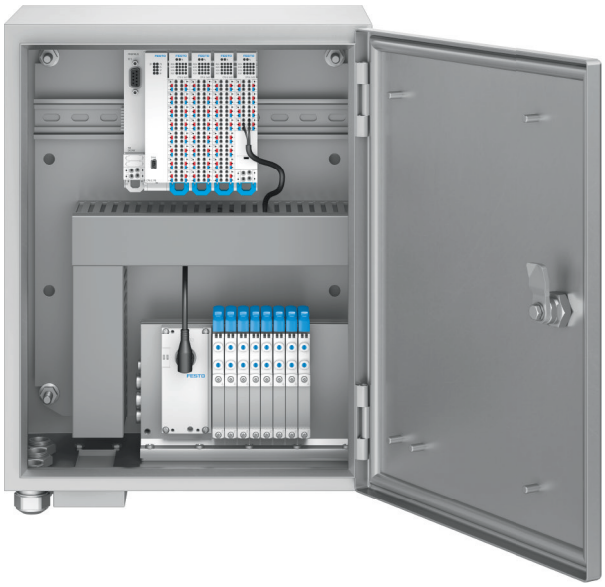


From parameterisation to control cabinet design: anything is possible.

Even when you usually have to adapt your system to the application during commissioning, you can modify the functions extremely easily with the CPX-E using configuration software, because the CPX-E modules can be parameterised. For example, you can reduce the input debounce time of an input module from a standard 3 ms to a speedy 0.1 ms for faster processes.

You can influence the following settings via parameterisation:

- System behaviour in the event of communication errors
- System behaviour during a restart
- Debounce times and signal extension
- Force settings (setting the signal status)
- Operating mode of the diagnostic memory
- The analogue modules can be configured via software for voltage or current measurement



An ideal combination, now even more compact: automation system CPX-E and valve terminal VTUG together in a control cabinet. This is a complete solution that is easy to install and minimises the amount of tubing required.

Optimised for control cabinet installation
The automation system CPX-E, with its especially narrow remote I/O modules, is extremely compact and easy to install. The valve terminal VTUG, with new manifold rails, check valves with high flow rates and fixed flow restrictors, is a real all-rounder. The LED display and label holder are clearly visible and all manual overrides are easily accessible.

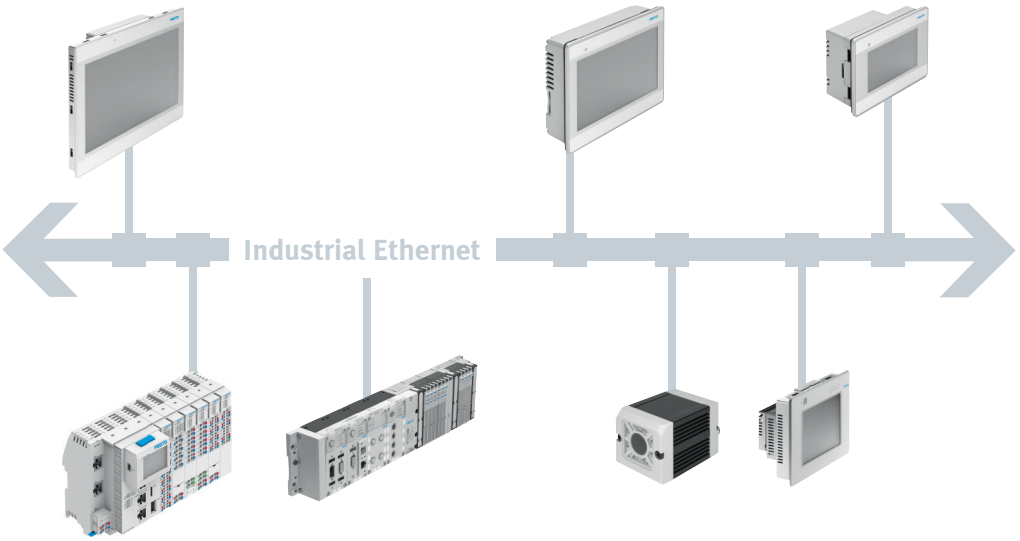
Easy installation
Installed directly in the control cabinet wall, the valve terminal does away with the need to install tubing in the control cabinet. This saves time, money and engineering effort.

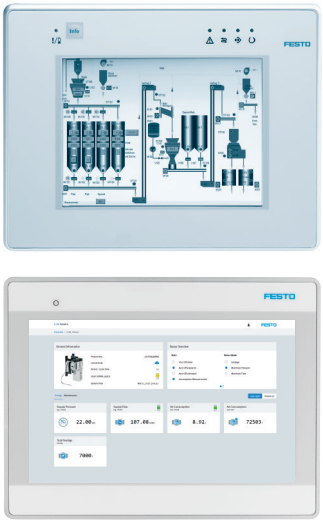
For use in the process industry
The CPX-E modules meet the requirements for process automation applications in accordance with NE21 interference immunity requirements for process and laboratory control equipment. The hot-swap function of the VTUG also enables it to be used in the process industry as individual valve slices can be replaced during operation without the valve terminal having to be depressurised.

CDPX – front end display, touchscreen, controller and server in one

State-of-the-art technology and performance combined with outstanding design make CDPX the ideal choice for factory and process automation applications.

CDPX: modules and components in detail





Visualisierungsbeispiele auf CDPX – gestaltet mit dem Festo Designer Studio.

Panels CDPX visualise data and simultaneously function as servers for external clients, locally and worldwide. They are networked via the Ethernet interface using an integrated switch. You receive graphic representations for clear analysis at high resolution. Simple, intuitive project planning and programming in Designer Studio make operation easy and intuitive. Ideally matched to CODESYS controllers from Festo or Modbus/TCP networks, CDPX outputs data and parameters in simple graphical form. Choose whichever of the various display types works best for you.

Thanks to modern touch technology, planned dialogue with machines and systems is child's play.

And with the optional integrated controller CODESYS V3.5 provided by Festo, you can expand the panel CDPX to a space-saving control system.

Powerful and intuitive

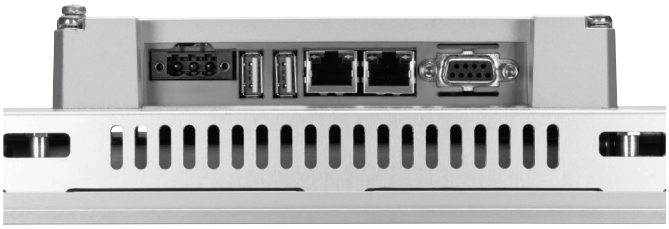
- Powerful processors are combined with widescreen technology for greater functionality, higher resolution and versatile access options.
- Perfect graphical representations help you to produce neat documentation and a clear analysis.
- With Designer studio, extremely simple, intuitive instructions will make planning and programming easier for you.
- You can visualise data and access it remotely from anywhere in the world.
- Proven and widespread: CODESYS V3 (>SP7) is a widely accepted, manufacturer-independent control software in accordance with the IEC 61131-3 standard.
- The OPC UA client allows you to integrate it quickly into Industry 4.0 concepts.
- Multiple languages, including Far Eastern languages, make you fit for the world market in this segment. Additional software also reduces your translation costs.
- You have a range of functions at your fingertips, including data acquisition, alarm management, time planner and time actions (daily and weekly time planning, time exceptions), formulas, user management, RSS feed, rotating menu, and many more.

Designer Studio Software
Designer Studio lets you easily design and implement complex display representations in HMI by using drag-and-drop. That's no surprise. You'll be familiar with many Designer Studio features from Windows environments.

Designer package
The following features are part of the installation:

- Designer Studio Designer Studio – You can design customer projects with human-machine interface functionality in a simple and user-friendly way, including using the various functions such as the Widget** gallery, which is part of the library.
- Windows client Designer Client for Windows allows you to view and operate applications running on HMI.
- HMI Application Runtime is a single function that runs on CPDX HMI. Runtime allows you to adjust or change the runtime on the target systems.

** Widgets are active elements of a window system. They are used to interact with users and display data, but can also perform operations.



Connectivity options:
USB interface
Ethernet interface RJ45 10/100 MBd
PLC interface ModbusRTU and RS485







Display	CDPX-X-A-W-4	CDPX-X-A-W-7	CDPX-X-A-S-10	CDPX-X-A-W-13
TFT colour display	•	•	•	•
Touchscreen capability	•	•	•	•
Display size	4,3"	7"	10,4"	13,3"
Display resolution	WQVGA 480x272 Pixel	WVGA, 800x480 Pixel	SVGA, 800x600 Pixel	WXGA, 1280x800 Pixel

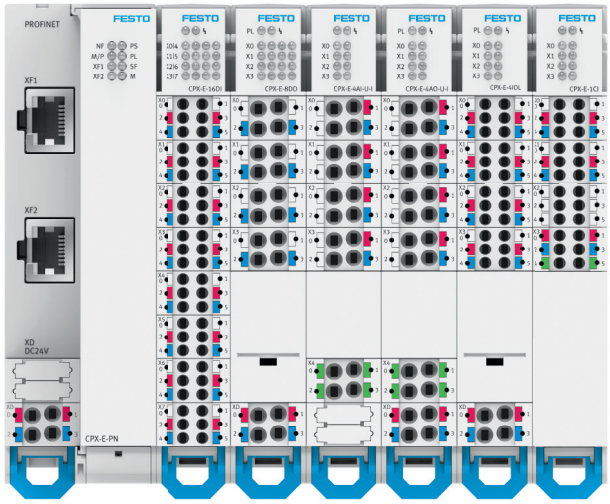
CDPX offers many more features and functions. You can find out more about CDPX at www.festo.com/CDPX

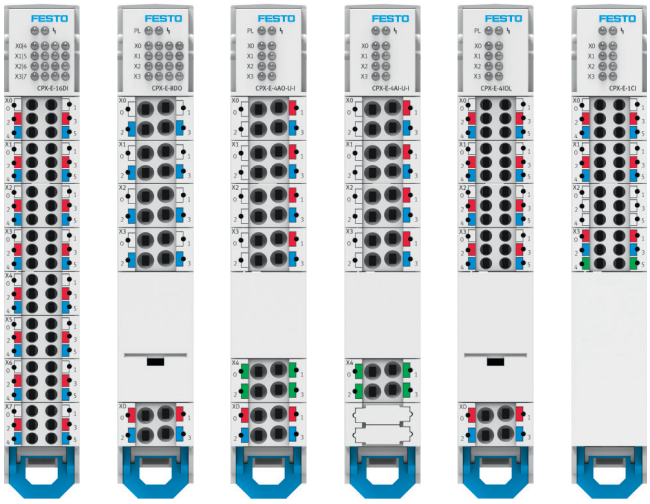
Compact and cost-effective: CPX-E as a modular remote I/O

CPX-E as a remote I/O in IP20 for factory and process automation offers you a cost-effective and compact alternative for a range of universal applications. Modules with specific approvals (NE21 and IECEx) are available for applications in process automation. There are several bus modules, allowing you to easily integrate CPX-E into existing host systems.

By using CPX-E as the control system and remote I/O, you have an integrated approach for your tasks, regardless of whether you use CPX-E universally as an individual component or as a system solution from Festo, pre-assembled and wired in the control cabinet. When combined with the Festo Automation Suite software, you have uniform data management, considerably reducing your engineering effort.

CPX-E: Modules and components in detail





1 2 3 4 5 6

Input and output modules

1 Digital input modules (16 DI)*
2 Digital output modules (8 DO/0.5 A)*
3 Analogue input module (4 AI current/voltage)
4 Analogue output module (4 AO current/voltage)
5 IO-Link master modules (4 channels)*
6 Counter module (single-channel)

* These modules meet the requirements for process automation applications in accordance with NE21 (interference immunity requirements for process and laboratory control equipment).

Bus modules

- PROFINET
- EtherNet/IP
- EtherCAT
- PROFIBUS

The EtherNet/IP CPX-E-E-EP module also supports the Modbus/TCP protocol.

Depending on the module combination, you can configure and use the system as a purely remote I/O system (with bus module) or as a control system (with control unit) (see page 20/21).

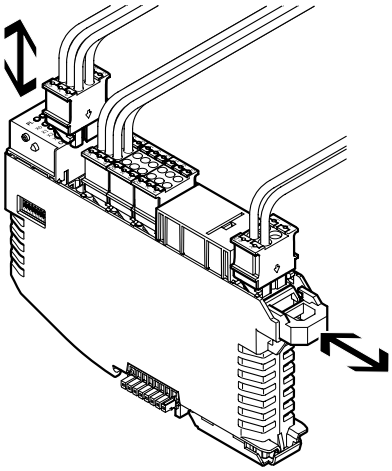
The Festo Field Device Tool (FFT) supports Ethernet-based products from Festo during commissioning and maintenance, e.g. secure firmware updates, updating new features without additional costs, secure updates with FFT checking for compatibility between installed and selected hardware.

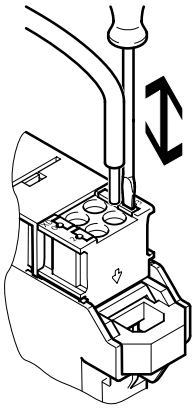
Electrical connections
All the electrical connections of the automation system CPX-E are designed as terminal strips with spring-loaded terminals. You can easily add, remove or replace modules at a later date, using 'stationary wiring'.

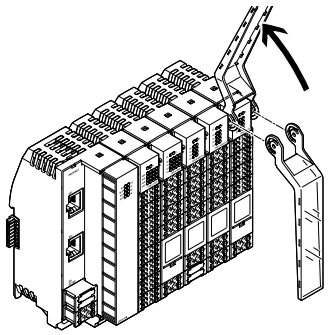
- Changing the entire CPX-E module is easy. The wiring remains unchanged.
- The terminal strips have a partially coded plug pattern:
  - Terminal strips with the same number of pins are interchangeable.
  - Terminal strips for power supply connections can only be used for power supply connections.

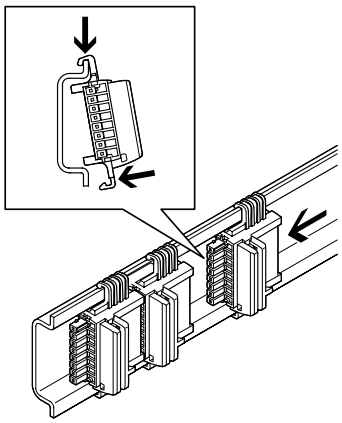
It couldn't be easier:

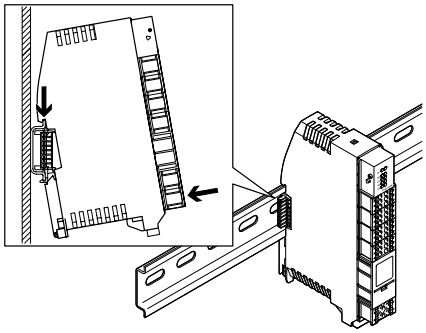
1 Attach the interlinking connector to the H-rail
2 Latch the CPX-E modules to the interlinking connector
3 To remove it, push a screwdriver into the latch and lift the modules out of the linkage.











Uniquely modular and flexible: CPX

The modular electric automation platform CPX opens up completely new options for increased productivity. Its extreme flexibility makes CPX an exceptional remote I/O on the market.

At the same time, CPX also simplifies complex production processes, since you can easily adapt CPX to all applications, environments and company standards. And the almost limitless function integration options save you significant engineering and installation costs.

Perfect networking – universal communication
With CPX, you can rely on maximum openness for all installation, communication and control concepts.

Highly flexible and powerful: decentralised high-performance remote I/O system CPX-AP-I
- Bus coupling modules on PROFINET, EtherCAT, EtherNet/IP and others
- Compact modules in IP65/67 with 4/8/16-way digital and analogue inputs/outputs, IO-Link master, etc.
- Variety of parameterisable functions for flexible machine concepts and manufacturing processes
- Data consistency all the way to the cloud, dashboard in preparation
- Synchronised with the host system, cycle times from 15 µs, up to 500 consumers
- 100% deterministic

All this makes CPX unique. Discover the technical strengths of CPX, including as a remote I/O!

The unbelievable variety of I/O modules
- Limitless adaptability
- Can be used as a remote I/O
- Expandable up to 17 I/O modules
- Up to 256 local and 512 decentralised inputs
- System expansion up to several thousand I/O via CANopen or lower-level installation concepts such as Festo CPI or CTEL (I-Port, IO-Link) or HART
- Flexible adaptation with software parameterisation reduces inventory requirements

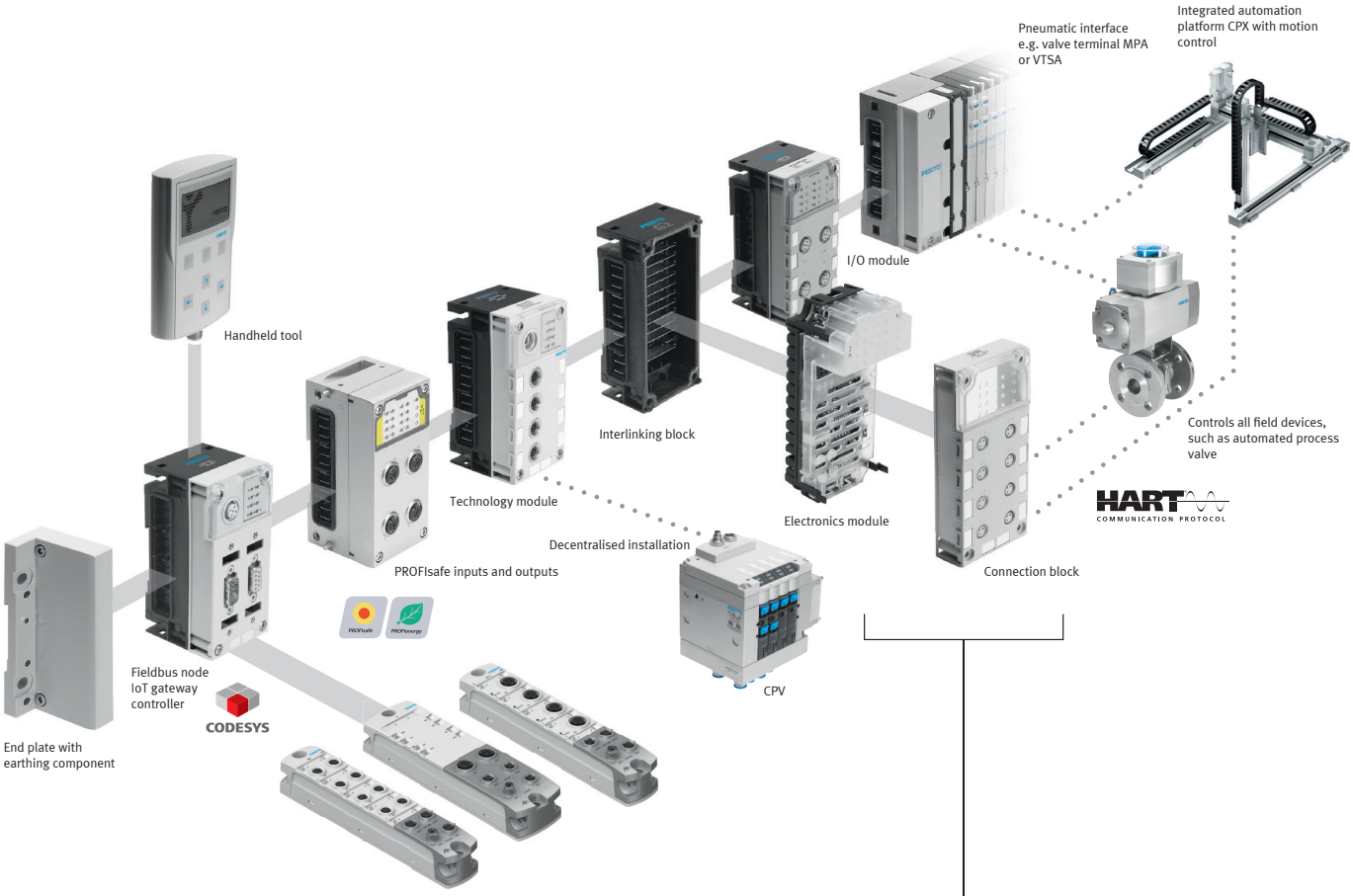
Very economical thanks to maximum modularity and flexibility
- 15 connection variants in IP20/IP65/IP67 – for faster installation and compatibility with company standards
- Connection accessories M8/M12/Sub-D/quick connector
- Modular system for M8/M12/ cage clamp connection cables
- Plastic or metal thread
- Direct machine mounting, perfectly adapted to the machine concept

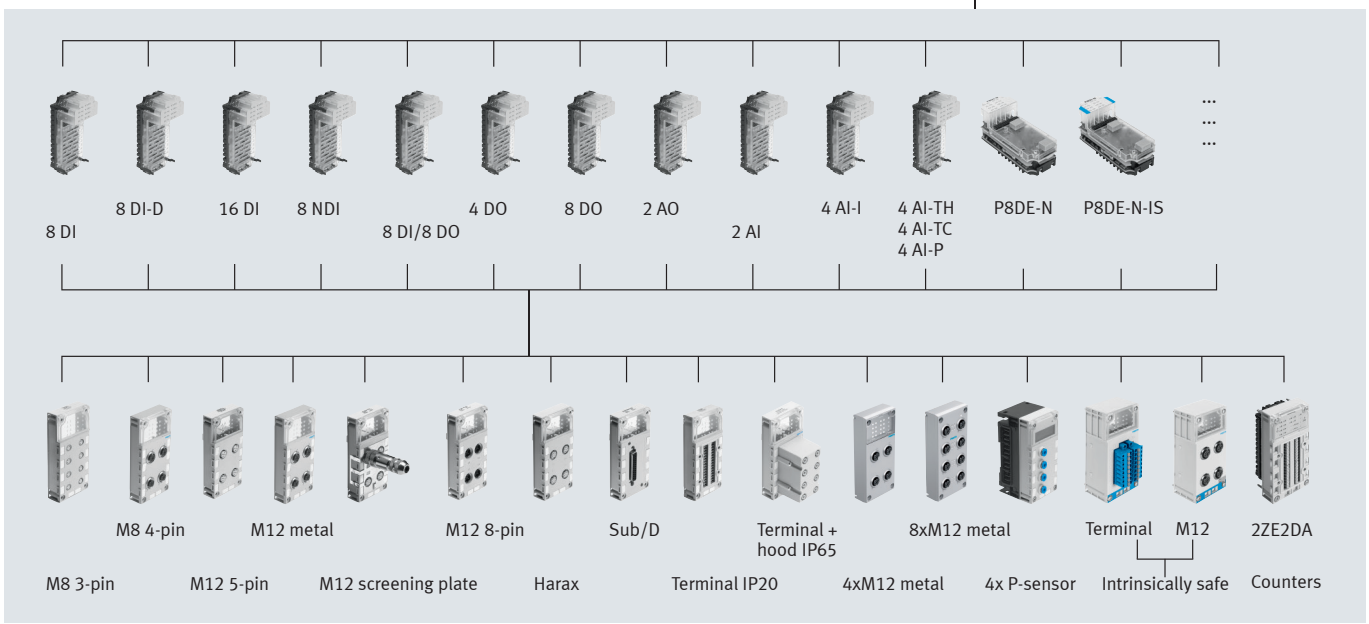
Extremely capable: multiple languages and numerous control concepts
- Standardised communication with a single platform, from the management and control level to the actuator/sensor or field level.
- Integration of pneumatic and electrical control chains into all automation concepts, even company-specific ones.
- Open for all fieldbuses and Ethernet

Variety built in: possible electrical control concepts as front-end control
- Remote I/O on fieldbus/ Ethernet
- Stand-alone operation (stand-alone control IP65/67)
- Remote controller fieldbus**
- Remote controller Ethernet** including use of IT technology
- Preprocessing
- Motion control for electric and servo-pneumatic drives
- Fast data transfer and real-time capability thanks to preprocessing included.

** These decentralised controllers have a CANopen master interface.




Pneumatic interface
e.g. valve terminal MPA
or VTSA
Integrated automation
platform CPX with motion
control
I/O module
Handheld tool
Interlinking block
Technology module
Electronics module
Controls all field devices,
such as automated process
valve
HART
COMMUNICATION PROTOCOL
Decentralised installation
PROFIsafe inputs and outputs
Connection block
CPV
Fieldbus node
IoT gateway
controller
CODESYS
End plate with
earthing component


8 DI
8 DI-D
16 DI
8 NDI
8 DI/8 DO
4 DO
8 DO
2 AO
2 AI
4 AI-I
4 AI-TH
4 AI-TC
4 AI-P
P8DE-N
P8DE-N-IS
M8 4-pin
M12 metal
M12 8-pin
Sub/D
Terminal +
hood IP65
8xM12 metal
Terminal
M12
2ZE2DA
M8 3-pin
M12 5-pin
M12 screening plate
Harax
Terminal IP20
4xM12 metal
4x P-sensor
Intrinsically safe
Counters

Precise and fast: servo drives for demanding assignments

By combining the latest motor and control technology, Festo has developed a perfectly matching motor and servo drive package for you that will provide the best support, even for complex tasks: CMMT-AS and EMMT-AS. Either as a stand-alone unit for purely rotary applications, but also for linear movements. Together with the mechatronic axis modules from Festo, the package of CMMT and EMMT always provides a perfect solution.

Compact dimensions but providing great performance: servo drive CMMT-AS
Its great flexibility, the connectivity with direct fieldbus integration to all major control manufacturers and the small amount of space required in the control cabinet make the CMMT-AS almost a must for special machine builders as well as medium and large series machine builders.

The Festo Automation Suite will help you with fast parameterisation and programming, while the initial commissioning assistant will make the entire drive system ready for operation in just five steps.

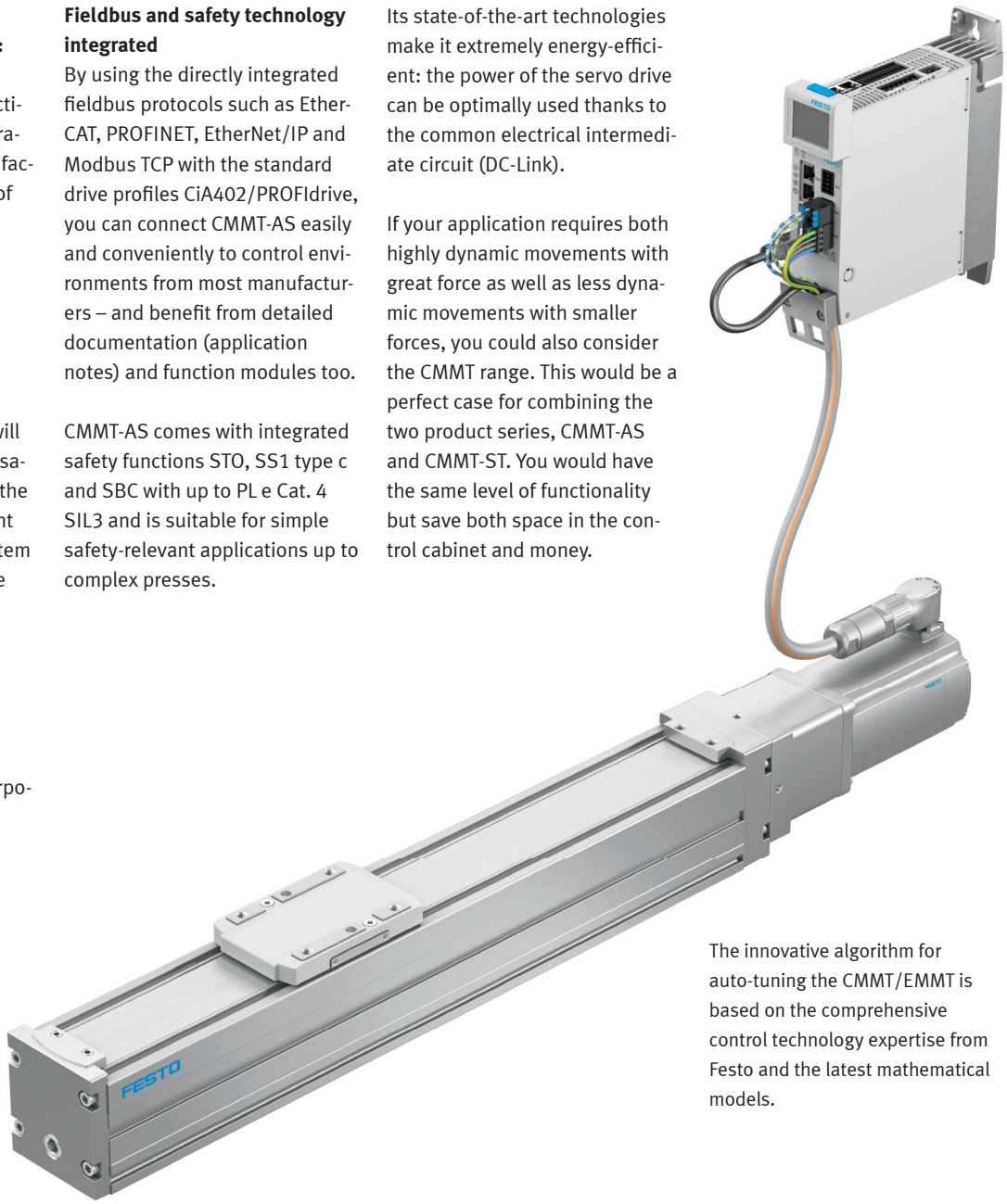
The scope of motions that you can implement with CMMT-AS ranges from simple point-to-point and multi-axis motion to high-precision interpolated motion.

Fieldbus and safety technology integrated
By using the directly integrated fieldbus protocols such as EtherCAT, PROFINET, EtherNet/IP and Modbus TCP with the standard drive profiles CiA402/PROFIdrive, you can connect CMMT-AS easily and conveniently to control environments from most manufacturers – and benefit from detailed documentation (application notes) and function modules too.

CMMT-AS comes with integrated safety functions STO, SS1 type c and SBC with up to PL e Cat. 4 SIL3 and is suitable for simple safety-relevant applications up to complex presses.

Its state-of-the-art technologies make it extremely energy-efficient: the power of the servo drive can be optimally used thanks to the common electrical intermediate circuit (DC-Link).

If your application requires both highly dynamic movements with great force as well as less dynamic movements with smaller forces, you could also consider the CMMT range. This would be a perfect case for combining the two product series, CMMT-AS and CMMT-ST. You would have the same level of functionality but save both space in the control cabinet and money.



The innovative algorithm for auto-tuning the CMMT/EMMT is based on the comprehensive control technology expertise from Festo and the latest mathematical models.

The new servo drive CMMT-AS with servo motor EMMT-AS

Seamless connectivity with the new servo drive CMMT-AS

- Easy implementation in well-known PLCs brands with extensive documentation and function blocks
- With optional operator panel CDSB (full-text diagnostics and operation)
- Compact design: all plugs on top and at the front are easily accessible
- Multi-encoder connection for a flexible motor selection and high precision/safety

PROFINET

EtherNet/IP

EtherCAT

Modbus



Ready for any task: new motors EMMT-AS from Festo

With the new product range EMMT-AS, you are well equipped for all the requirements of traditional handling and automation technology. The motors are based on permanently excited, electrodynamic, brushless servo motors.





Key technical data EMMT-AS:

- Digital rating plate: all important motor data is stored on the motor and can be read from the servo drive during commissioning to make the process faster, easier and safer.
- As standard, digital single-turn absolute encoder (EnDat 2.2®) or optionally as digital multi-turn absolute encoder (EnDat 2.2®) with digital rating plate.
- Temperature measurement integrated in motor with interference-proof digital transmission
- Low detent torque for the best running characteristics.
- One cable plug: only one motor cable for power, signal and holding brake (optional)
- Degree of protection IP67: complete housing with connection technology
- Degree of protection IP40: on the shaft, optionally with PTFE sealing ring IP65

Commissioning and programming:
→ **www.festo.com/AutomationSuite**

Close to perfect: a winning combination

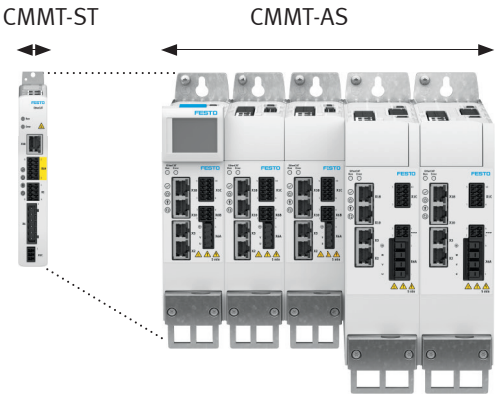
Mechanical/motor/power electronics from Festo – you can combine the best of all worlds.
It will provide you with considerable benefits, not only in terms of connectivity, but also in terms of functionality and process safety.

Just try it out and see how quickly and easily you can obtain drive solutions by using only components from Festo. Convenient design, sizing, commissioning and parameterisation –- the overall design will be more suitable than ever before!

Small and cost-effective: servo drives for tasks requiring smaller forces

If you want to realise ordinary and simple motion processes of up to 300 W at a reasonable price, then the new series of stepper motors and servo drives from Festo is ideal for you. Whether it is the price-, size- and function-optimised CMMT-ST/EMMT-ST, or the CMMO, EMCA or Optimised Motion Series OMS and Simplified Motion Series SMS, they will considerably reduce your installation costs as a completely integrated solution package. And you will be able to solve concepts with servo and baseline tasks extremely cost-effectively and save space too – even with interpolation!





PROFINET

EtherNet/IP

EtherCAT

Modbus

Perfect for up to 300W/48V: servo drive CMMT-ST
Control your stepper motors like a servo motor. The price and size-optimised CMMT-ST is the best solution for you when small loads need to be moved. It can be integrated seamlessly into the Festo automation platform; and, like the CMMT-AS range, it can be parameterised extremely quickly and easily in the Festo Automation Suite. Its size?
A small 144 x 88 x 27 mm. The CMMT-ST of course behaves like the CMMT-AS range and can execute both point-to-point and interpolated motion.

The CMMT-ST also has PROFINET, EtherNet/IP, EtherCAT and Modbus/TCP directly integrated so it can communicate with controllers of other manufacturers without any problem. Comprehensive documentation and a large number of function blocks make integration simpler. In particular for applications that require both large and small amounts of electrical power, the combination of CMMT-AS and CMMT-ST is ideal. The common safety concept means the safety of the machine with the AS and the ST is always guaranteed.

Time saving with the Multiturn Encoder
The Multiturn Encoder, which can optionally be provided with a battery, makes homing after the machine has been restarted unnecessary and therefore saves time and increases process safety. Safety has also been integrated: STO and SS1 (type c) PLe/Cat3/SIL2.

Highlights

- Max. continuous output: 300 W
- Primary voltage: 24... 48 V DC
- Motor current: 8 A/peak 10 A
- Point-to-point and interpolating motion as well as precise positioning
- 50% more compact than the smallest CMMT-AS
- Direct fieldbus integration for the main controller manufacturers
- Standard safety functions without software configuration: STO, SS1
- Auto-tuning supports easy commissioning and automatically optimises the control behaviour of rotary and linear motion, with mechanical systems from Festo and third-parties.
- Optimally with proven stepper motor EMMS-ST
- Thanks to an identical platform as the CMMT-AS, it has the same connection and communication concept, functional modules and standard safety features

EMCA – the integrated servo drive for on-site installation in IP54/65

Your perfect complete solution for the positioning of drives.
The EMCA consists of a maintenance-free and wear-resistant EC motor and drive system (motor controller). This drive system also includes integrated power electronics. Integrated monitoring functions ensure safety and system availability.

EMCA capture the absolute position via a single-turn encoder as standard, or optionally with a multi-turn encoder. The Festo Configuration Tool (FCT) software makes parameterisation and commissioning quick and easy. A plug-in for the Automation Suite is currently being planned.

- 64 freely programmable positioning sets
- Multi-turn encoder with buffering (resolution up to 32 bit or › 4 billion revolutions)
- IP54, optional IP65 for direct installation in the system
- Activation via CANopen, Ethernet/IP and I/O interface, PROFINET and Modbus/TCP



Simply achieving performance: Optimised Motion Series

Optimised Motion Series:
to work cost-effectively and with optimised performance you should use this system. This package will make moving and positioning easier than ever before. And it is significantly cheaper than conventional electric solutions. It comprises a mechanical system with permanently mounted motor and drive system (motor controller) with integrated web browser technology and matching connecting cables.

CMMO-ST: the servo controller for stepper motors is a fully fledged closed-loop servo system and uses the best possible motor characteristic curve so you will have the highest degree of operational safety and high dynamic response. This includes broad connectivity such as IO-Link, Modbus TCP or I/O interface!



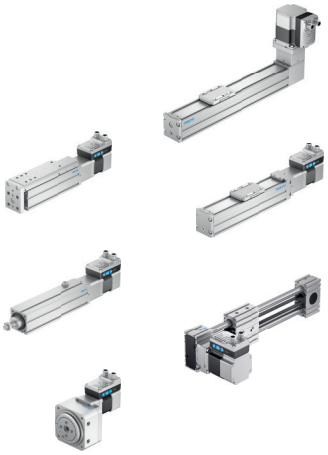
You will be working with just 1 type code for configuration, ordering and commissioning.

Simply combining benefits: Simplified Motion Series (SMS)

The Simplified Motion Series combines the simplicity of pneumatics with the benefits of electric automation. The integrated drive solutions are perfect if you are looking for an electrical alternative, but you want to avoid the often complex commissioning processes of traditional electric drive systems.

You can use the SMS using the “plug & work” principle – without the need for any software!
You can thus implement simple motions between two mechanical end positions with a reduced selection of parameters. You can set these parameters either directly at the drives, or remotely via IO-Link.

The simple control via digital IO considerably simplifies commissioning, for example for manufacturers of series machines. You can also use the IO-Link functionality that is available as standard for extended diagnostics.



Your partner for safety: Safety@Festo

Reduce risk – think preventively!
Machines have to be designed in a way that protects people, animals, property and the environment from harm. The objective is to prevent all kinds of physical damage. Festo provides you with many safety solutions for the complete pneumatic and electrical control chain, for input, logic and output. Depending on your requirements, this can be individual products, customer-specific solutions, proposals for circuit diagrams and training courses. In practical terms, there are solutions such as displacement encoders and clamping units for the mechanics of the pneumatic and electric axes and common safety functions such as STO0 and STO1 for the servo drives of the CMMT and CMMP series.

Training courses and consultancy services are provided by Festo Didactic. From standards and guidelines for risk assessment to the evaluation of technical protective measures, the training offer will meet all your needs.

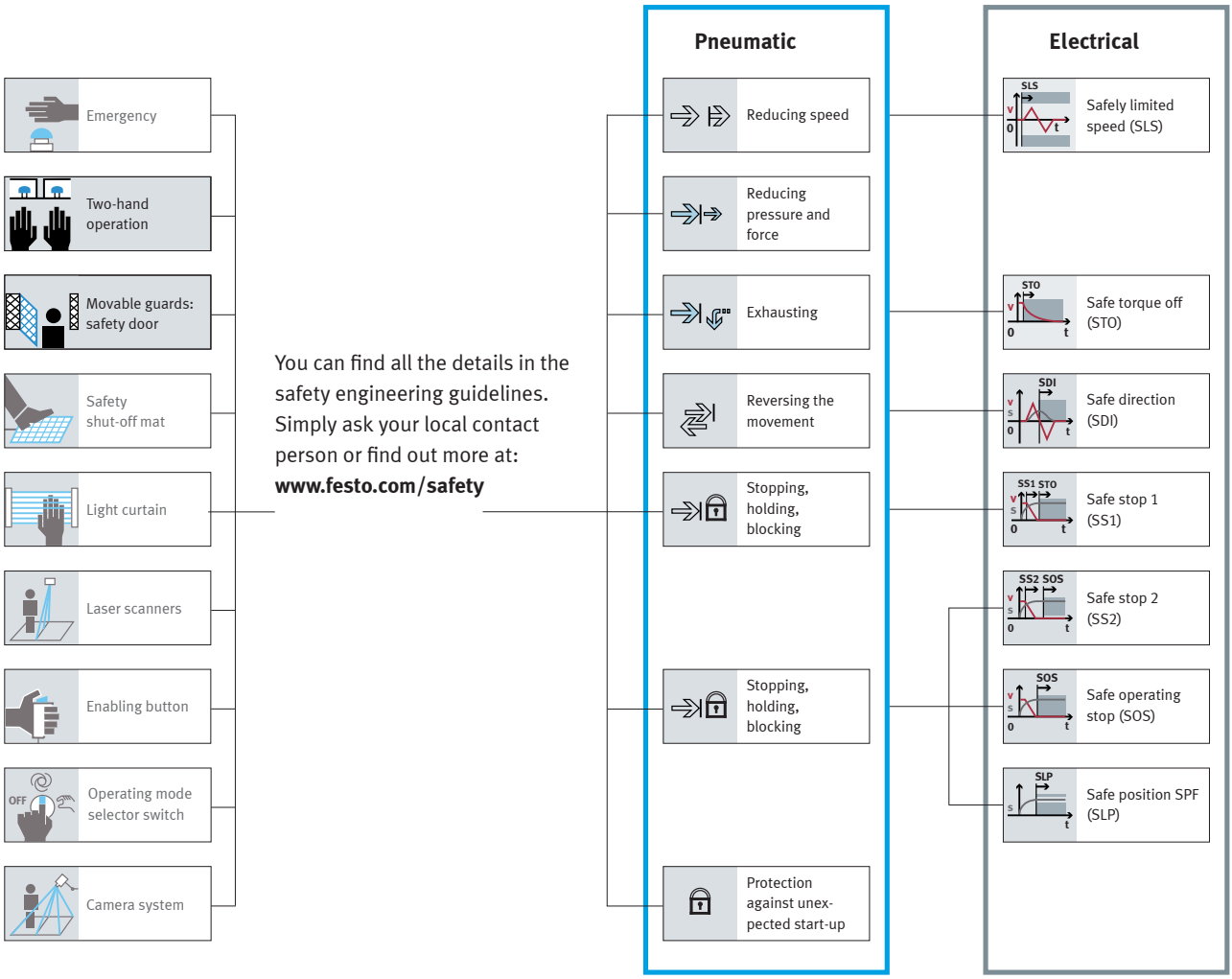
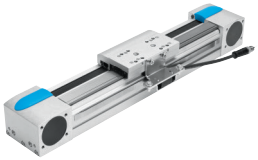


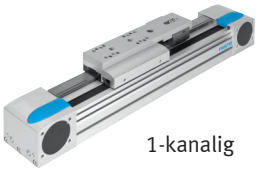
Figure 1: technical protective measures considered as a whole.
The safety chain goes from the sensor via the safe evaluation to the drive.

Examples of mechanical safety solutions from Festo

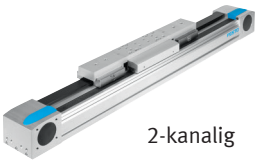
EGC – linear measuring system
The linear measuring system is not a complete safety solution but it can be used as part of a solution. A monitoring system is always required in this case. A 2-channel solution is possible together with a motor encoder and a suitable safety switching device.



EGC – clamping unit
- 1- or 2-channel design, for holding loads
- Reliable holding is guaranteed since the forces act directly on the slides



1-kanalig



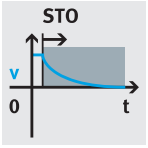
2-kanalig

	Only linear measuring system	With 2nd measuring system (encoder) in the servo motor
Kat	2	4
PL	d	e
dC	Medium	High
CCF	>65%	>65%
Channels	1	2
Safety component to MD 2006/42/EC	no	no

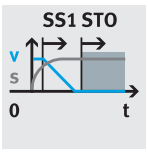
Kat	Can be used in higher category systems with additional measures	Can be used in higher category systems with additional measures
PL		
dC		
CCF		
Channels	1	2
Safety component to MD 2006/42/EC	no	no

All specified values are maximum values, which can be achieved via correct operation and interconnection of the SRP/CS.

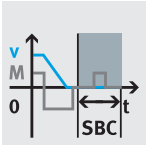
Examples of electrical safety solutions from Festo with CMMT-AS



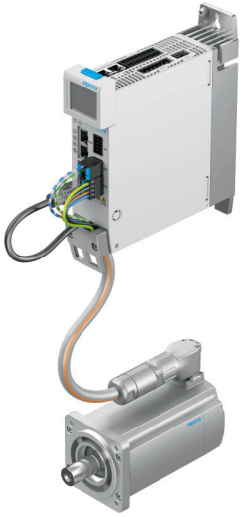
STO
Safe torque off



SS1
Safe Stop 1



SBC
Safe Brake Control

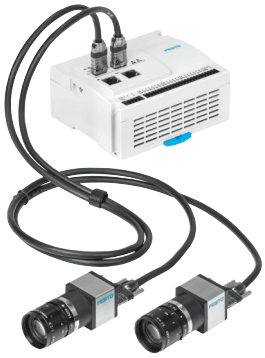


Making sure that input and output agree: the smart camera from Festo

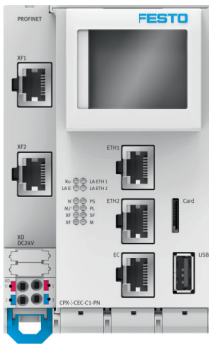
Simply cost-effective: innovative and intelligent camera systems and sensors. These systems are very versatile and, thanks to the compact, industrial design and clear interface definition, can also be easily integrated into existing installations.

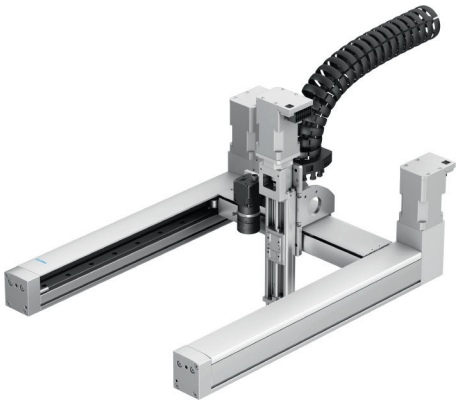
The smart camera SBRD is suitable for beginners as well as for professionals. Its high-resolution cameras, the specially designed machine vision controller and powerful image processing software open up new opportunities for automation and robotics. All with tried-and-tested performance from Festo.

Festo vision and motion control solution:



Position found:
x, y, α





Vision supports motion – characteristics

- The high-performance machine vision controller SBRD-Q
- Connection of up to two Festo mini camera heads, especially for multi-camera assignments with up to 5-megapixel resolution in monochrome or in colour
- Optimised for robotics/motion applications:
  - Workpiece position sensing
  - Calibrated coordinate system
  - Simple transmission of the workpiece position to robot/motion controller
- Intuitive Camera Configuration Studio (CCS)

You can take advantage of:

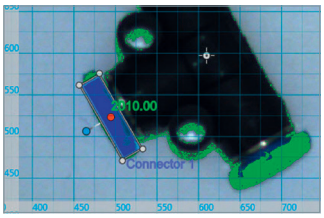
- New, flexible solutions and applications via vision + motion, for example with dynamic gripping from any position instead of static gripping positions
- Flexible and scalable components
- Standard configuration software
- Fast commissioning
- Solution components and expertise from a single source

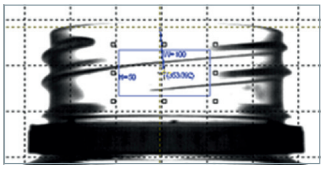
Eyes on the arms: machine vision in flexible robotic solutions

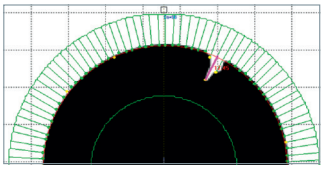
The handling unit should grip a workpiece from a random position x/y/α and move it to a defined end position. This requires machine vision with a controller that controls the gripping and motion using the data recorded.

Main functions: calibration, conversion, object recording and controller interface
The machine vision solution first calibrates the data and uses it to correct the imprecision of the lens. It then converts the data into common international units, for example, millimetres.
At the same time, the solution can recognise a predefined object and can convert its position into the dimension used by the robot.

Simultaneously, it can prevent collisions between the object and the gripper, or can provide additional information, e.g. if the object is undamaged and is of the right quality. At the same time, it functions as a control interface for the robot/motion controller and transmits the data of the workpiece inspection.





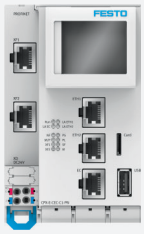
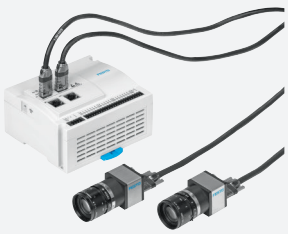
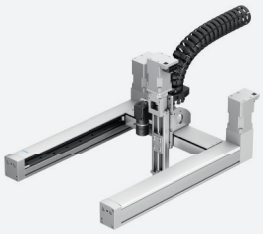




Intuitive, simple, fast

The intuitive operation and configuration with the Festo Camera Configuration Studio software and the easy installation makes working with the smart camera much easier. You can integrate these machine vision systems seamlessly into your robotics environment.

Furthermore, numerous function blocks for the most frequently used functions for robotics and motion are available for you to use, in CODESYS as well, to speed up the process. A plug-in for the Festo Automation Suite is currently being planned.

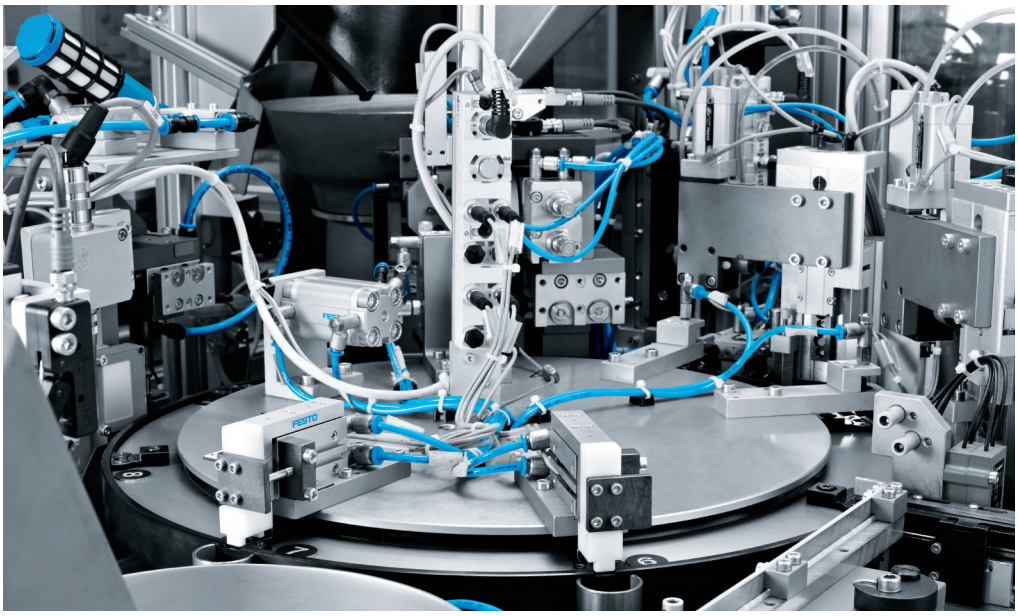
Robot/Motion Controller		Smart Camera SBRD		Robot/Handling
				
1. Request picture	→	Picture is taken Position of the workpiece is determined		
2. Request position of workpiece	→	Transmit position data x, y, α		
3. Travel commands for gripping and positioning	→		→	Grip the workpiece, travel and set down

Festo sensors – for successful automation from a single source

Increased cycle times, better process control, shorter downtimes: these days system and machine management that ensures the optimal use of resources is a critical factor in the economic success of your company. Sensor technology, too, is an indispensable part of this success in the world of automation.

Optimum performance and maximum reliability: our comprehensive portfolio of sensors combines these important core qualities and ensures smooth and efficient production sequences.

The starting point for the sensor portfolio from Festo:
For an automation expert such as Festo it is only logical that it includes proximity sensors for pneumatic drives and limit switches for electric axes. These optimally coordinated sensors have formed a stable and successful platform for new variants with some completely new functionalities.





Position transmitter
These provide an analogue, displacement-proportional output signal in the sensing range. The contactless measuring principle ensures wear-resistant sensing, which is a particular advantage in harsh environments.
** With IO-Link



Pressure and vacuum sensors
Pressure and vacuum sensors expand the application range of systems, provide greater process reliability and offer the option of remote maintenance and monitoring. They are also quick and easy to use thanks to the standardised control and display concept shared by all Festo pressure sensors.
** With IO-Link



Flow sensors
By monitoring the flow, a simplified diagnostic and condition monitoring process can be implemented. A change in the flow rate is often an indication that problems are likely to occur.
** With IO-Link



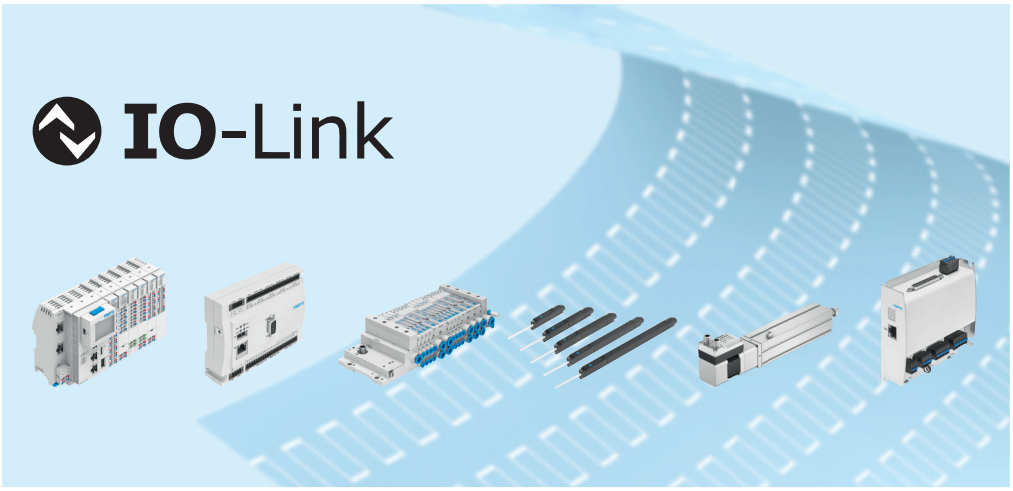
Optical sensors
With their optical measuring techniques, the sensors in the SOE... series cover a wide variety of tasks, from recognising colours and tiny parts through to distance sensors using laser light.

IO-Link – the portfolio from Festo at a glance

The standardised IO-Link technology

Highlights

- Safe installation
- User-friendly data handling
- Easy to replace devices
- Quick restart
- Large portfolio thanks to data storage for IO-Link and automation from Festo
- Description files can be found quickly and easily with the IODD Finder



Examples from the IO-Link product portfolio from Festo:

- Compact controller as IO-Link master: CPX-E, CECC, CPX-AP-I
- Valve terminal MPA-L, VTUG, CPV, VTOC
- Input module CTSL
- Proportional pressure regulators VPPM
- Position transmitter SDAT
- Signal converter SCDN
- Pressure transmitter SPAE, pressure sensors SPAU and SPAN
- Flow sensors SFAW and SFAH
- Vacuum generators OVEM and OVEL
- Electric drives from the Simplified Motion Series (SMS)
- Motor controllers CMMO-ST (closed-loop servo controller as position controller for stepper motors on IO-Link)


SPAN


SPAU


SPAE


SFAH


OVEM


OVEL


SFAW

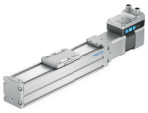

VPPM

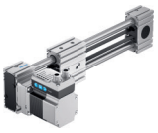

SDAT


CTSL

SMS













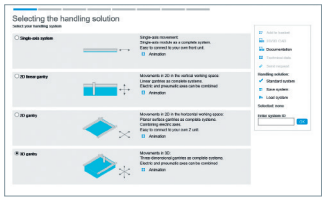
Select, design and assemble – it's never been so easy

When you offer complex solutions from mechanics to the cloud, you also have to think about how multiple components and subsystems are selected, designed and assembled.

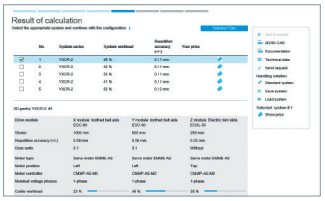
This is exactly where Festo provides you with support. From the configuration of individual axes with PositioningDrives to designing a 3D gantry in three steps using the Handling Guide Online: only Festo can make it so quick and easy. Not only that, but you also get a digital twin whose data you can use all the way up to the cloud. If you would like to purchase a control cabinet from Festo, whether for motion control in factory automation or process control in flow processes, our online configuration tool Cabinet Guide Online also makes life extremely easy for you.

Example Handling Guide Online: efficient, fast, intuitive, reliable! It gets you to your handling system in just three steps:
We are constantly improving the Handling Guide Online to ensure that you always keep your automation technology up to date. In preparation:

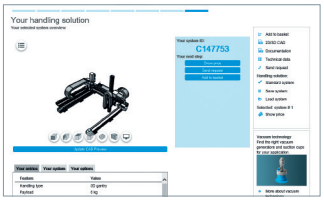
- eplan Makros
- Kinematic systems EXCT and EXCM
- Prompt integration of the new motors and servo drives of the EMMT/CMMT series with a direct interface to the Automation Suite.



Step 1:
Choose the type of handling system and enter your application data in the Handling Guide Online. The tool calculates appropriate handling systems, including the price.



Step 2:
Select the most suitable handling system from the list of suggestions. The correctly configured CAD model and the data sheet with all the relevant figures are immediately available for download.

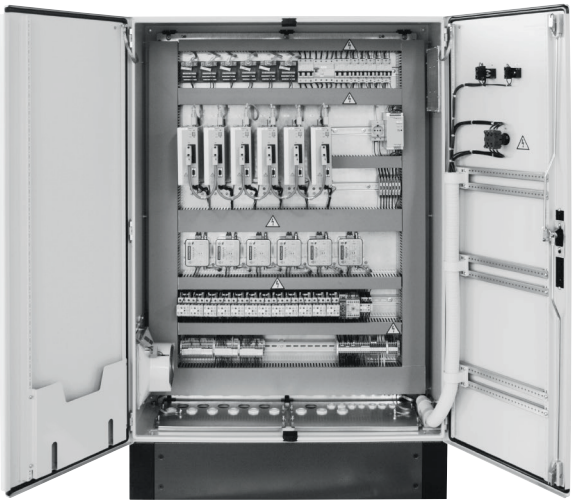


Step 3:
You can use additional options to configure your selected system in accordance with your requirements. Then add the preferred handling system to your shopping basket and confirm your order.

Ready-to-install solutions – control cabinets

- Made-to-measure control cabinets
- Individually configured in the Cabinet Guide Online
- Adapted to requirements in industrial automation
- Design and sizing included

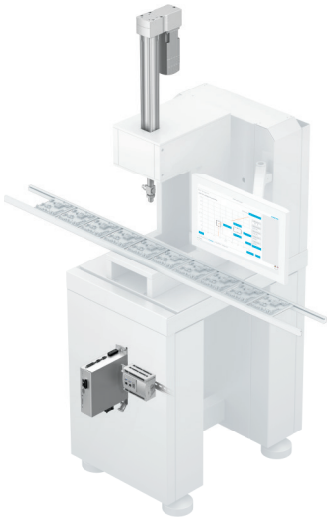
Festo tailor-made control cabinets ensure that all your pneumatic, electric and electronic system components are housed in a protected environment. The control cabinets are designed and built on a made-to-measure basis for the specific application. At your request, Festo can also deliver directly to the installation site.



To ensure that you, our customer, are provided with maximum convenience and added value, our system concept goes even further. It allows you to plan and include predefined solution kits for special applications from Festo right from the start and commission them based on the plug-and-produce principle! You thus gain significantly more time for your core competencies.

Example: servo press kit YJKP for electrical press-fitting applications with CODESYS SoftMotion
Festo added value: the modular servo press kit YJKP gives you just the software functions you need for your application. You get an extremely precise press-fitting system with a high level of repetition accuracy and an excellent price/performance ratio. Simple, cost-effective and quick to install.

Pre-installed software
The pre-installed operating software is ready to use straight away and you don't need to be a programming expert to parameterise it, it's that easy and intuitive! The modular software in CODESYS, featuring application-specific functions, can be used on a PC, iPad or other types of human-machine interface and is compatible with all kinds of platforms. The controller CECC-X with OPC UA interface makes the system ready for Industry 4.0.



Example: Compact handling system YXMx for desktop applications
Screwing in, dispensing, testing, soldering, gripping, opening and closing containers and much more: the compact handling system YXMx forms the basis for a wide variety of desktop applications.

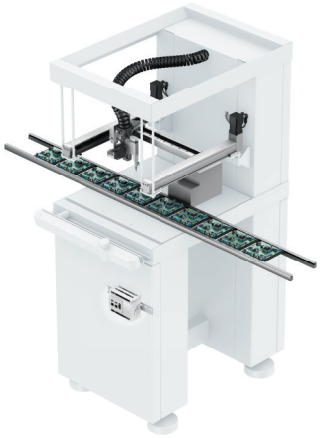
The system kit comprising kinematics, controller and software saves you money and reduces your time to market – from development to programming and commissioning. There is also an optional software module for condition monitoring.

1. Control technology
- Compact and powerful
- SoftMotion for 3D path applications
- Image processing function
- High connectivity thanks to numerous interfaces
- Industry 4.0 via OPC UA interface

2. Scalable hardware
- Planar surface gantry based on EXCM-30
- Flat, compact
- Scalable stroke lengths
  - X: 90...700 mm
  - Y: 110...510 mm
- Motors with integrated controller and frequency converter
- Clean look

3. Software
Festo Positioning Desktop library Motion controller for the kinematics

Festo Condition Monitoring Library
- Monitoring operating parameters
- Maintenance information
- Process monitoring
- Energy monitoring



Double the benefit with digital added value

Our Support Portal is the central platform for all information. Here you will find everything relating to products along with device description files, relevant function blocks and firmware.
The Online Shop is the central tool for all physical products and their accessories. And in the App World, all digital products are made available for you: dashboards, Motion Apps, Eplan Services, Smartenance and much more. The App World manages licences, safety certificates, checks compatibility with your hardware, etc., and offers all the Festo digital services that are available for purchase. You can access all these services with the Festo Product Key.



Reliable, secure, efficient: Product Key to access the digital twin

Find information quickly and without lengthy searches – that is the aim of the Support Portal and Product Key.

Enter it manually or scan it – and the Product Key gives you access to all available information for the product.

If the product consists of many individual parts/modules, you will even find everything at a glance!

This enables you to order the spare part immediately. And to register (board) a cloud-enabled product directly in the cloud.

This not only makes all your processes more reliable and secure, it also boosts the efficiency, speed and profitability of your production.

The Festo App World – for more flexibility and productivity
The App World is the online portal from Festo where you can purchase all smart services (apps, software libraries, cloud products, etc.). You can use your existing account for the Online Shop to access the App World. Select the products you want to buy. For some products, you may need to enter the Product Key or Identcode of the corresponding hardware product.

App World

→ **www.festo.com/appworld**

Schematic Solutions for EPLAN projects

This circuit diagram service for complete EPLAN projects is unique to Festo. Schematic Solution for EPLAN projects documents your configured solutions in next to no time!

Simply enter the order code in App World and receive the complete plan in just a few minutes – error-free and trouble-free. Tedious searching, downloading and assembling of individual parts is a thing of the past.

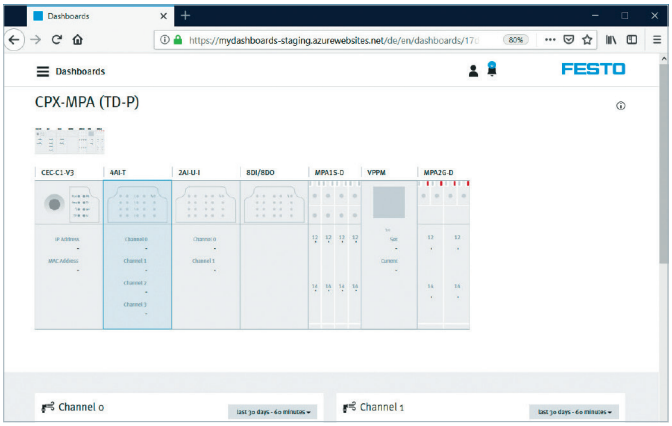
Your engineering process will be much more efficient since you only need 4 minutes instead of 2 to 8 hours to design your system. This Eplan Schematic Solution Service is already available for complete, individually configured valve terminals and for customer-specific handling systems and control cabinets from Festo.

This also applies to the configurable products from the new CMMT range and the range of controllers CPX-E.

Dashboards and Festo Cloud Dashboards

Through the Festo Cloud, Festo products can then also be connected to the Internet of Things (IoT). Whether you're a machine builder or operator, you'll benefit from the easy plug-and-play approach, as there is no longer any need for extensive configuration. This dramatically improves the transparency and availability of your automation solutions.

The IoT gateway CPX-IOT enables you to consolidate, analyse and provide important additional data via standardised interfaces. It can detect Festo components and integrate them into the cloud.



→ **www.festo.com/appworld**
→ **www.festo.com/getdigitalnow**

Smartenance – Mobile digital maintenance management

The digital maintenance manager for production managers and system operators is being launched. Festo Smartenance is one of the first exclusively digital products from Festo. It enables our end customers to schedule, monitor and evaluate system maintenance independently of our components. Smartenance is easy to install, self-explanatory and provides a simple, low-cost introduction to the world of digitalisation.

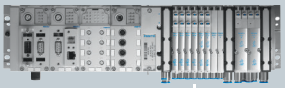
- Mobile, digital maintenance instructions – for system operators
- Maintenance task reminders and feedback – for system operators
- Central evaluation of maintenance tasks – for production managers





A quick overview of the motion control portfolio at Festo

Overview of multi-axis controllers

Module	Compact controller	Integrated controller	CPX terminal		CPX-E automation system in the control cabinet	
	 Controller CECC-DCECC-LK	 Controller CODESYS V3 CDPX	 Controller CODESYS V3 CPX-CEC-C1-V3	Motion controller CPX-CEC-M1-V3	 Modular controller CPX-E-CEC-C1-PN	Modular motion Controller CPX-E-CEC-M1-PN
Functionality	Single axis (PTP asynchronous)	Single axis (PTP asynchronous)	C1: Single axis	M1: Interpolation (3D)	C1: Single axis	Robotics (3D)
Maximum permitted axes	4 axes on CANopen	8 axes on CANopen	Open as per CANopen specifications	31 axes on CANopen	Open as per EtherCAT specification	16 axis interpolated for EtherCAT (32 in cam disc mode)
Motion	• PTP asynchronous	• PTP asynchronous • Each axis moves with its own predefined parameter • The axes do not reach their end positions at the same time, and the path is not defined • M1 variants: 3D interpolation with M1 variants for up to 31 axes			• C1 versions: PTP asynchronous • M1 versions: 3D path interpolation	
Special features	• Stand-alone controller • Integration of two fast inputs (200 kHz) • 4 IO-Link masters for CECC-LK • CODESYS V3 • OPC UA server	• Integrated controller in one display • CODESYS V3 • OPC UA client	• Function integration on the CPX terminal • CODESYS V3 • 32 bit/800 MHz processor • OPC UA server		• CODESYS V3-SPS SP10 • Encoder interface • Interrupt function • High-speed clock pulse inputs • Digital and analogue I/O modules • IO-Link master module • Two EtherCAT interfaces, one EtherCAT master • Integrated full CPU • Host integration via fieldbus interface as slave to: – PROFINET (version PN) – EtherNet/IP (version EP, on request) • USB interface • SD card interface	
				• SoftMotion: • PLC open • CNC editor • DXF import • Cam disc editor	• PLC open Part 1, 2, 4*** • CNC editor • DXF import *** • Cam disc editor *** Robotics library	
Application example	• 2D/3D handling systems • Pick and place • Palletising	• 2D/3D handling systems • Pick and place • Palletising		• Path control • Bonding • Cutting • Handling • Flying saw • Cam disc	• 2D/3D handling systems • Pick and place • Palletising	• 2D/3D handling systems • Palletising • Bonding • Dispensing • Painting • Cutting • Flying saw • Cam disc

The future: motion control in Bionics. Artificial Intelligence (AI)

Besides innovative automation technology, Festo is also forging ahead with major future topics, including human-machine collaboration, interactive and adaptive workplaces, new job profiles and the role of people, as well as artificial intelligence in devices, machine/systems or in the cloud.

Bionic Learning Network und Future Concepts

Festo received the German Innovation Award for the first time in 2018 for the "Robotic Suite" software – already a third successful award.

The jury explained that Robotic Suite, which can be used to control the lightweight robot BionicCobot, was chosen because "the BionicCobot is operated intuitively via a specially developed graphical user interface. Users can teach-in and parameterise the required actions very easily using a tablet."



"Work steps can be arranged in a timeline in any order by dragging and dropping. A complete motion sequence can be displayed virtually and simulated at the same time. Repetitions of specific motion sequences or more complex 'if-then' conditions are also possible."

Dr. Elias Knubben
Head of Corporate Research and Innovation

Artificial intelligence – Resolto and Festo create added value

By taking over the AI specialist Resolto, Festo is opening the door to AI in real industrial applications. Resolto has been working in the field of AI for 15 years, and the Festo Bionic Learning Network team has been using AI algorithms in grippers, robot arms and hands for seven years. Now, the first industrial products have been launched as proof of concept at the Hannover Messe. Whether on edge, on premise or in the cloud, Festo will support all the options for a practical application.

The servo drives CMMT-AS were part of these studies, which give rise to hopes for innovative concepts for process optimisation and improved maintenance in the near future. Resolto also independently handles individual customer projects for process optimisation in machines and systems – please ask your Festo sales partner.



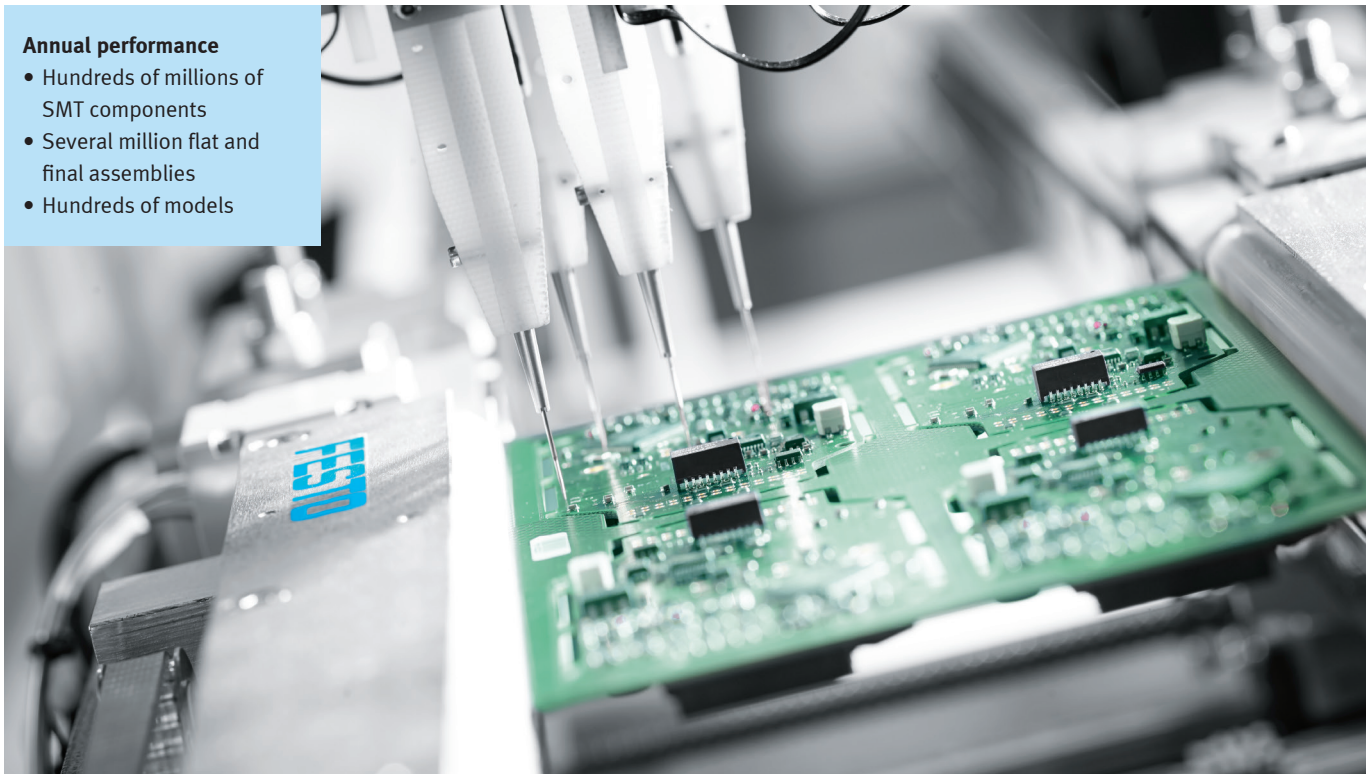
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Added value through electronics: Scharnhausen Technology Plant

Electronics form a fundamental part of automation components, and as such are often developed and manufactured by Festo at its Scharnhausen Technology Plant, whether for in-house applications or as products for customers. One thing is for sure: everything works.

Many products simply wouldn't exist without electronics. In the Technology Plant, 200 employees produce complex electronic assemblies and products in an area covering 6000 square metres. 2.5 million items alone are used by the company itself each year. The areas for further processing receive either complete assemblies in the housing or mounted circuit boards.

Annual performance
- Hundreds of millions of SMT components
- Several million flat and final assemblies
- Hundreds of models



Fully equipped
Festo uses state-of-the-art manufacturing and soldering processes to meet your requirements at all times. This includes the smallest electronic SMT components (surface-mounted technology) and powerful microprocessors with over 500 connection pins. These are processed on four fully automated production lines.

In order to ensure exceptional product quality every time, all modules pass through several stages of optical and electrical test procedures. Specialists in electronics manufacturing check and optimise the entire production process with the help of innovative methods. The process can be seamlessly tracked for every assembly.

As part of the ambitious expansion plans for electric automation technology, the electronics production department at the Scharnhausen Technology Plant now also manufactures motion control controllers such as the CPX-E, all components of the CPX terminal and servo drives of the CMMT range for stepper and servo motors.

Latest generation of sensors and motors: global production in Sofia

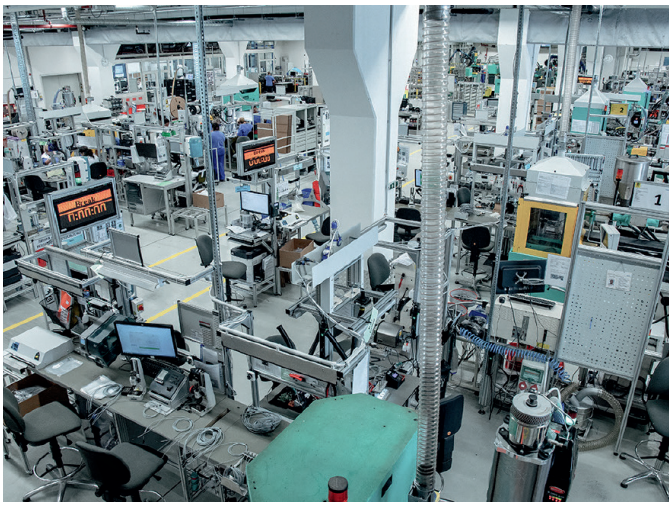
Festo has been represented in Bulgaria since 1986. The Global Production Centre (GPC) Sofia is the global leading plant for sensor and motor production at Festo. The new motor range EMMT is also manufactured here, to the highest Festo quality. As with all innovations at our Industry 4.0-oriented manufacturing sites, we control and streamline the entire manufacturing process using state-of-the-art methods.

Networked Kanban systems, the latest assembly machines and networked test stations are all part of these methods.

It is clear that in an ever more networked automation world state-of-the-art sensor technology is ever more important. Ultra-modern production facilities, such as those in Sofia, ensure that production and products are of top quality. On the occasion of a state visit by the Bulgarian President, representatives of well-known companies shared their positive experiences with the Bulgarian site – during a visit to the Scharnhausen Technology Plant.

After a welcoming address by the chairman of the Management Board, the president was able to gain an impression of the business and innovation strength of the world market leader in automation technology as well as its technical training programmes.









Productivity

Maximum productivity is a question of ambition
Do you share this attitude? We will be glad to help you achieve this goal – through our four outstanding qualities:
• Security • Efficiency • Simplicity • Competency

We are the engineers of productivity.

Discover new dimensions for your company:
→ **www.festo.com/whyfesto**

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