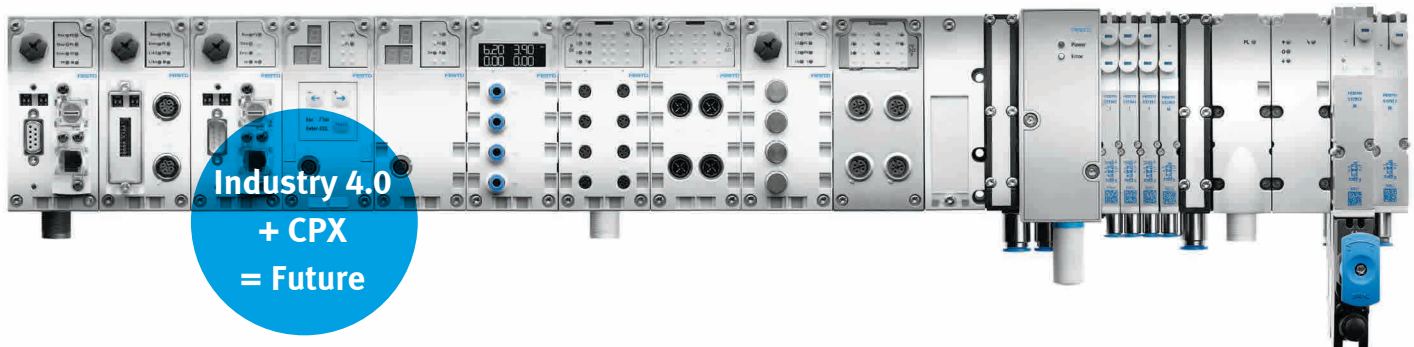


Maximum productivity right up to the cloud: terminal CPX.



Automation platform 4.0!

Highlights

- Modular and flexible remote I/O to IP65 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)
- Modular and flexible IP65 remote I/O
- Optimised version for IP20 and Ex environments
- Maximum function integration for complete applications
- Falling installation costs and rising productivity

CPX is ideal as an automation platform, valve terminal partner or remote I/O – it is electric, open and direct. It is also the perfect platform for electrical peripherals. With CPX, you can integrate pneumatic and electrical control chains easily, quickly, flexibly and seamlessly into all automation concepts and company-specific standards – and into Industry 4.0 as well!

CPX – the new benchmark for perfect networking thanks to:

- Universal communication via fieldbus/Ethernet
- A choice of pneumatic platforms (valve terminals)
- Subordinate, decentralised installation systems CPI, IO-Link or I-Port
- Unrivalled module and application variety

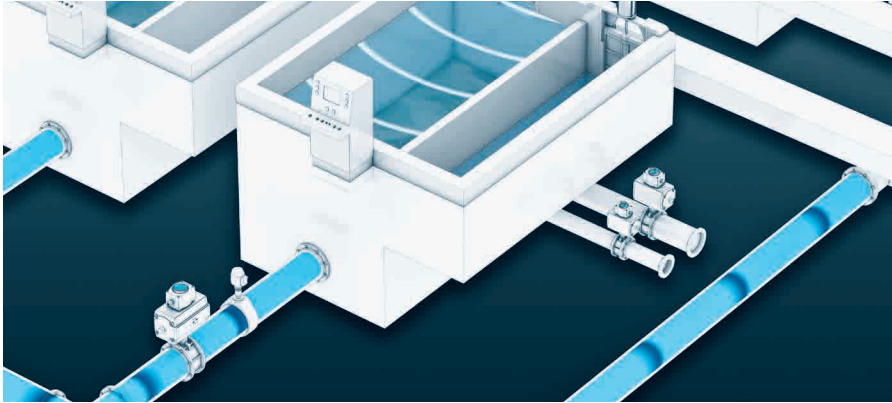
CPX – greater economy and operational reliability through function integration, such as:

- Front-end control
- A choice of scalable installation concepts
- Comprehensive diagnostics and condition monitoring
- Comprehensive diagnostics and condition monitoring, also via IoT gateway and Festo Cloud
- Motion control for
 - electric drives and
 - servo-pneumatic drives
- Measurement and control

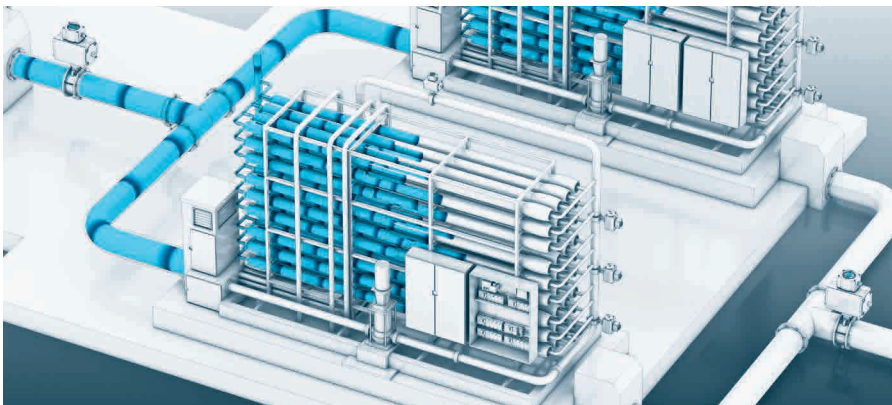
The terminal CPX contains everything that makes Festo stand out. Competency. Security. Efficiency. And simplicity. That is the basis on which we solve your automation tasks. And for working with you to achieve our shared goal: increasing your productivity.

Festo CPX. The first real platform for integrated automation. Highly competent in all standard functions.

Process automation



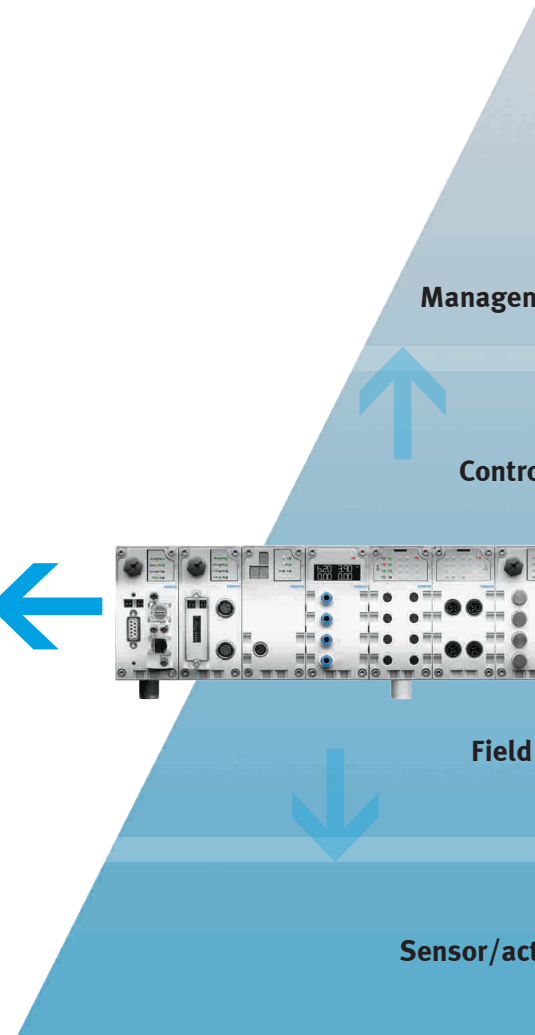
Sand filtration – CPX in a control cabinet for decentralised control of wastewater treatment processes.



Reverse osmosis – CPX as a proven, complete solution for municipal or industrial water treatment.



Control combined processes with fluid and motion control – CPX controls media valves for biotech or pharmaceutical production processes, or the cooling/lubrication/washing processes in machine tools, or simultaneous transferring and multi-stage packaging. All this as a complete solution from a single source.



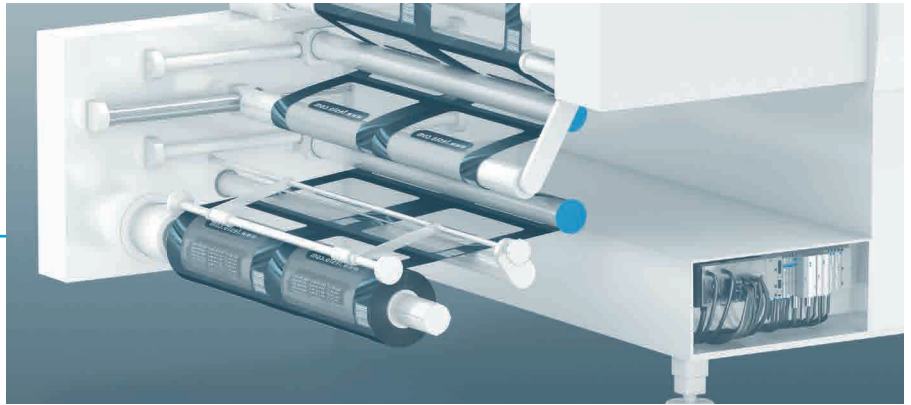
Festo CPX – the complete solution for groundbreaking automation.

CPX as universal standard

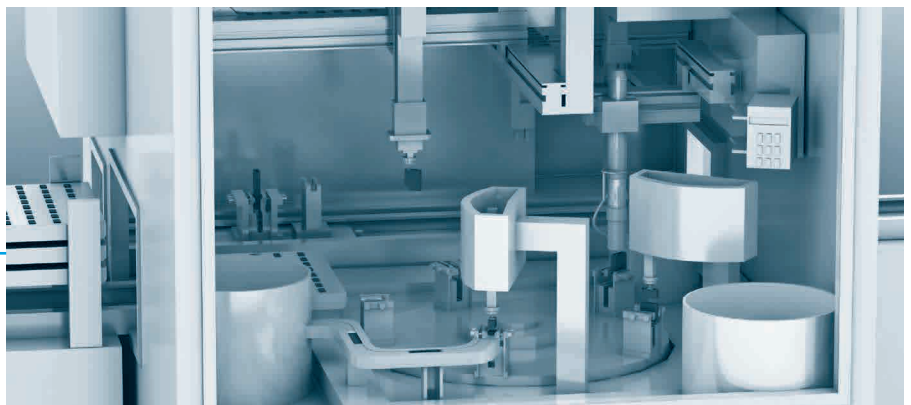
If you expect the best from your automation solutions, then CPX is exactly right for you. It covers all standard process and factory automation functions. This means CPX can be used as the standard for all process steps with fluid and motion control.

Core competency in automation 4.0

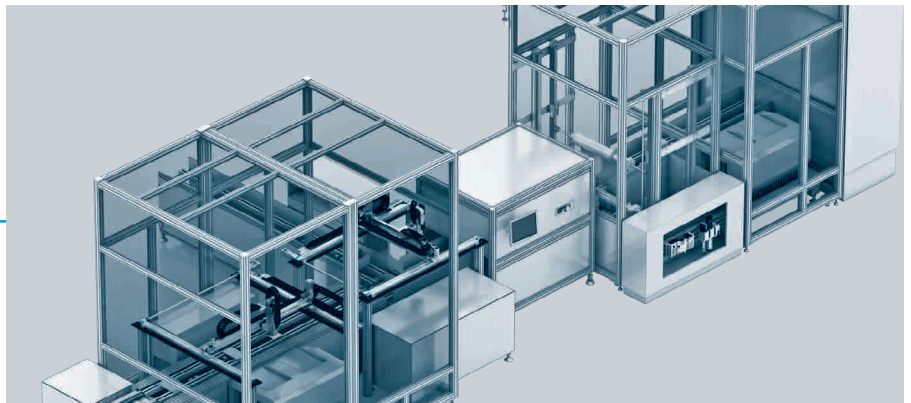
Factory automation



Dancer systems for packaging or printing processes – controlled by CPX with integrated proportional pneumatic systems or electric drives.



Small parts assembly – CPX controls a combination of electric and pneumatic drives and grippers, processes all sensor signals and provides comprehensive diagnostic services.



Battery production for electric vehicles – CPX controls independent, decentralised, interlinked machine modules.

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level

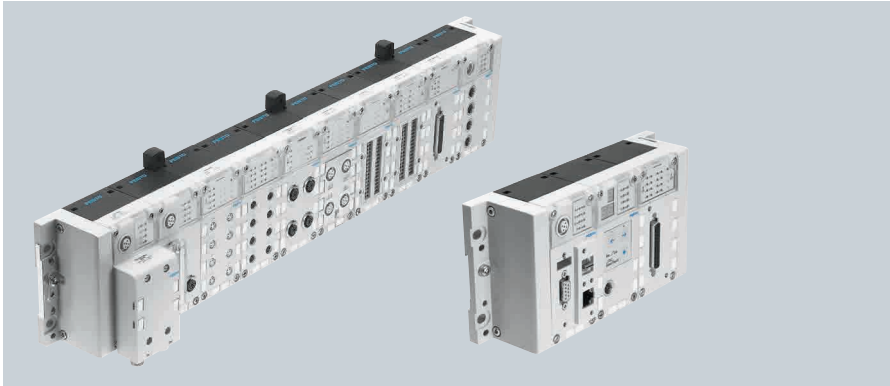
uator level

One platform across all levels in the control technology pyramid.

You can now get these automation solutions from a single source so you can benefit from reduced interfaces, considerably simplified engineering processes, convenient operation and reliability. A technology for the future: CPX can now be connected to host environments for Industry 4.0 – and also to the Festo Cloud (and others) via the IoT gateway.

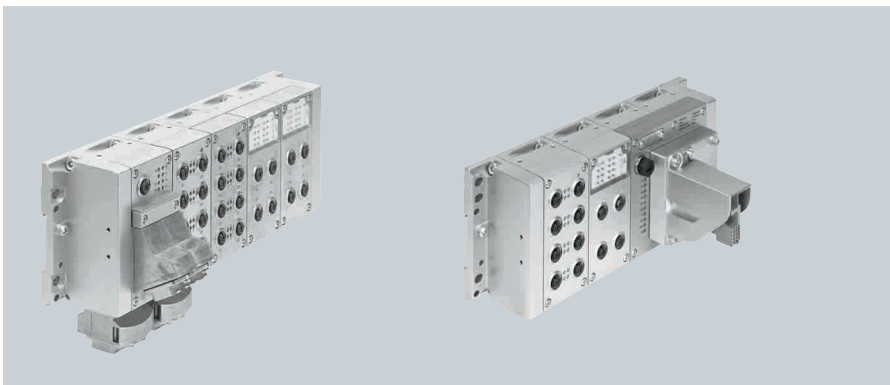
Festo CPX. One platform for many applications. Makes your automation easier.

Automation in the field

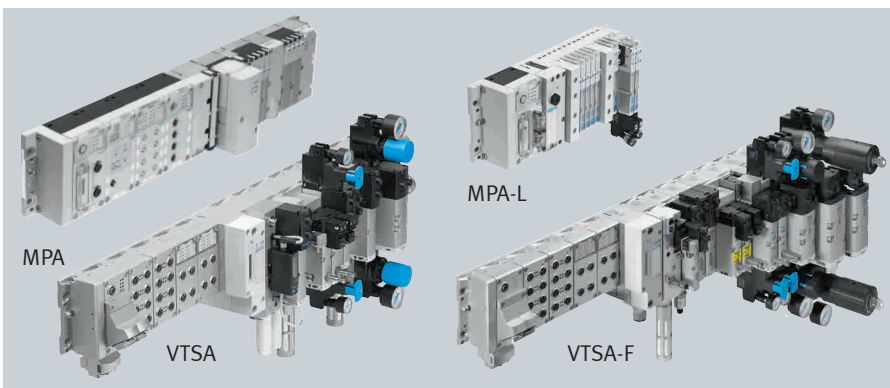


Universal and efficient for all applications – CPX as remote I/O with interlinking and connecting components in polymer. Perfect for centralised and decentralised installation concepts.

→ Pages 12/13

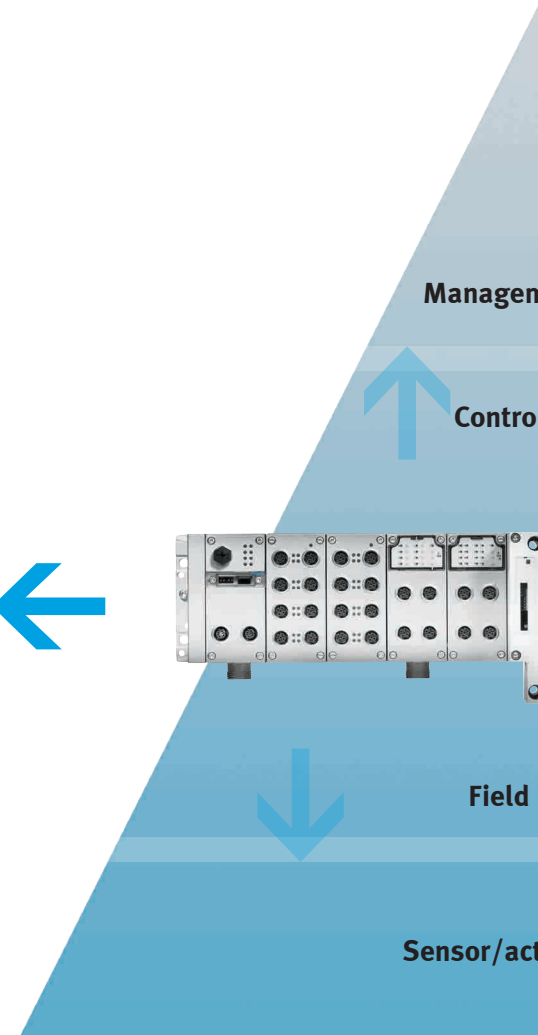


Especially robust, with individual linking – CPX as remote I/O with interlinking and connecting components in metal. AIDA connection technology available on request.



CPX combined with powerful valve terminal platforms

- MPA with serial interlinking and pressure control/proportional pneumatics
- MPA-L with individual expansion in affordable polymer
- VTSA – standard valves to ISO 15407 and 5599 in 5 sizes, with integrated safety functions
- VTSA-F – optimised for up to 30% more flow



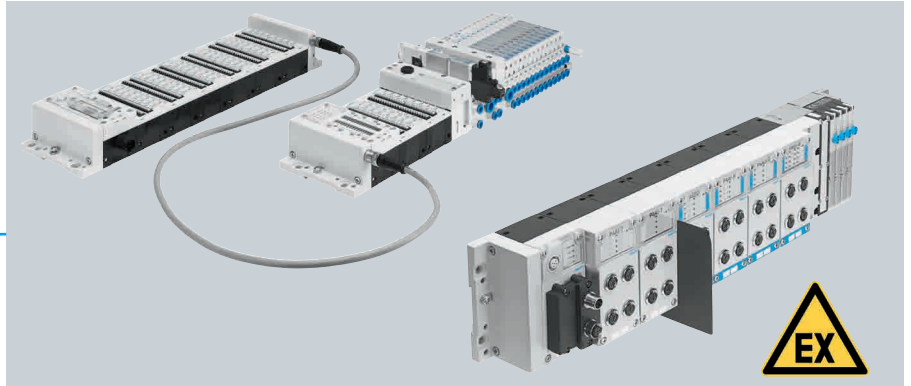
Festo CPX – the complete solution for groundbreaking automation. One platform

We want to make things easy for you.

The CPX portfolio provides you with one technology, one platform, one structure. And just one specification, one supplier, one responsibility. But in 4 specific variants so that CPX becomes the perfect fit for your application, sector, and environment.

Core competency in automation 4.0

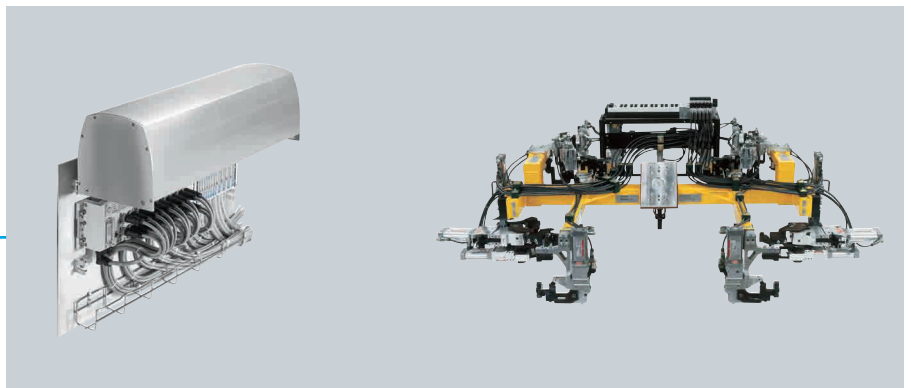
Automation in special environments



CPX-L as cost- and space-optimised IP20 solution for the control cabinet and with second-row expansion options. CPX-P with NAMUR inputs for sensors in Ex zones 0 or 1, can be combined with all CPX standard functions.



Control cabinet construction as a complete solution for fluid and motion control applications. A service from Festo.



CPX can also master special requirements, such as quick tool changeovers thanks to fast startup/quick connect functions. And it can be easily adapted to special environments or requirements.

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level

uator level

across all levels in the control technology pyramid.

But still have all your needs met.

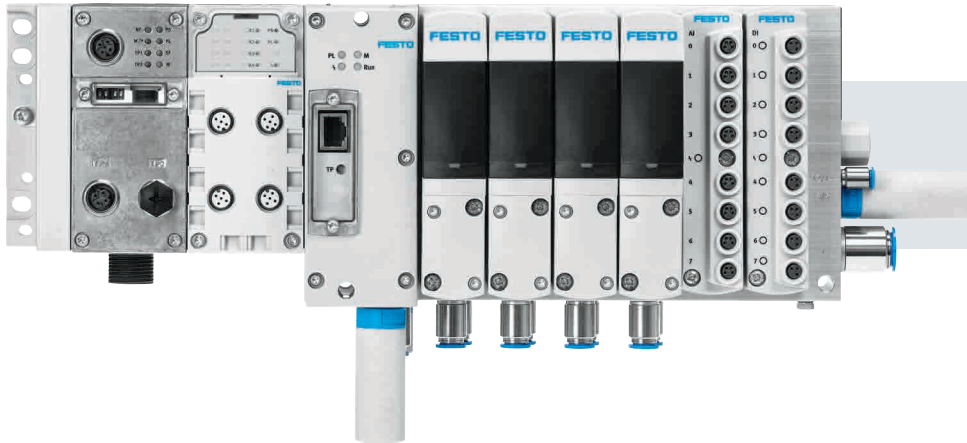
CPX can give you what you want: modifications, installation-specific adaptations and pre-assembled solutions are possible at all times and with little effort.

Just as easy to implement: decentralised CODESYS controllers with OPC UA and IoT gateway (OPC UA, AMQP/MQTT) for Industry 4.0.

Pneumatics 4.0 with CPX – the world's first Festo Motion Terminal VTEM

The Festo Motion Terminal VTEM is opening up radical new dimensions in the world of automation, as it is the world's first valve to be controlled by apps. It is the first product to truly earn the label “digital pneumatics”. It covers a multitude of functions which

currently require you to order and install more than 50 separate products/positions. CPX is a forerunner of this digitalisation – and now an integral part of digitised pneumatics.



Central component of the Festo Motion Terminal

- CPX terminal – electric system at its most flexible

With CPX, you have the option of using many different control systems and end user specifications, as well as all the usual digital and analogue I/O modules or decentralised “simple” valve terminals.

CPX is available on request with an integrated CODESYS controller and OPC UA for Industry 4.0.

Find out more at

→ www.festo.com/motionterminal

Controller with motion app – software at its most flexible

The core of your Motion Terminal.

It enables you to conveniently control numerous functions and to assign them to the individual valves via the Ethernet WebConfig interface.

With the Internet of Things, you can adjust parameters efficiently through the intuitive WebConfig user interface, which you access via a web browser on a computer – no additional configuration software is required. Or you can set parameters in the usual way, easily and directly via the PLC machine controller.

VTEM – pneumatics at its most flexible

The individual control and freely programmable functions of the individual VTEM valves offer a high degree of flexibility.

The integrated stroke and pressure sensors provide optimal control and transparent condition monitoring.

Each VTEM valve contains:

- Valve electronics with sensors
- 4 innovative piezo pilot valves for minimum energy consumption and maximum service life
- 4 diaphragm poppet valves for reliable functional diversity

Highlights

- Many functions in a single component – thanks to apps
- Combines the advantages of electric and pneumatic technologies
- Very high level of standardisation and reduced complexity
- Reduced time to market
- Greater profitability
- Reduced installation effort
- Increased energy efficiency

App-controlled flexibility: digital pneumatics for Industry 4.0

Intelligent apps and appropriate software are a central component of Industry 4.0. They allow the “things” in the Internet of Things to communicate with one another and to initiate or execute processes autonomously. At the same time, software modules, analysis and combinational logic are making functional integration possible as never before. With the app-based Motion Terminal, Festo has catapulted pneumatics into the age of Industry 4.0.

The access to new information and being able to process it boosts knowledge, adds value and puts you a step ahead technologically. It also provides you with huge benefits in engineering, design and programming, and ultimately increases your competitiveness and productivity. With 4.0 products such as the Festo Motion Terminal, you are buying much more than a mere product – you are buying a comprehensive added-value package.



The future of pneumatics – functions assigned at the press of a button

Digitisation will profoundly alter the world of production as digital simplicity is moving into the world of pneumatics.

With the Festo Motion Terminal, we are offering our first standardised solution that intelligently combines mechanics, electronics and software in the form of a “cyber-physical system”. It will enable you to build intelligent machines now for the world of tomorrow, and ensure your systems are truly ready for Industry 4.0, even in terms of pneumatics.

Disconnected: functions and hardware

With the Festo Motion Terminal pneumatic functions are, for the first time, no longer automatically connected to the mechanical hardware, but can be assigned simply using apps. You now require just a single valve type for an extremely wide range of pneumatic movements and functions. The Festo Motion Terminal makes it possible for the first time ever to have the same hardware for a multitude of functions. No modification, no additional parts, no arduous installation: none of that is needed any more. With the matching motion app, you can change functions at the press of a button, whether for a simple change in the directional control valve functions, Soft Stop, energy saving mode (gentle travel in the end positions, energy-efficient movements), proportional characteristics or a format change. The Festo Motion Terminal thus combines the advantages of electric and pneumatic systems.

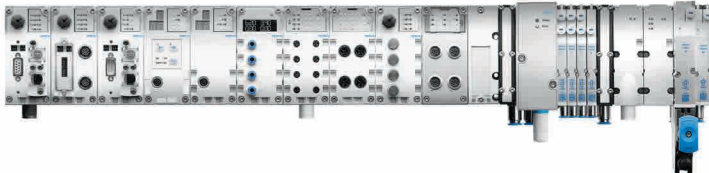
Motion apps – the first examples

- Directional control valve functions: over 10 valve functions can be reassigned cyclically
- Proportional directional control valve: two proportional flow control systems in one valve
- Soft Stop: self-adapting algorithm for time-optimised positioning without vibration (on request)
- Proportional pressure regulation: for both valve outputs
- Model-based proportional pressure control of the complete application, e.g. cylinder and tubing
- Model-based proportional pressure regulation including tubing and reservoir (available Q2/2018)
- Selectable pressure level (ECO): for high loads – reduced, self-adapting pressure level
- Leakage diagnostics: measuring leakage in the application
- Supply and exhaust air flow control for adjusting the supply and exhaust air between 0% and 100%
- Presetting of travel time: self-learning and adapting system for constant, monitored advancing and retracting

Further apps for even more functions are already being planned.

Festo CPX: a bridge to Industry 4.0

Technology and competency



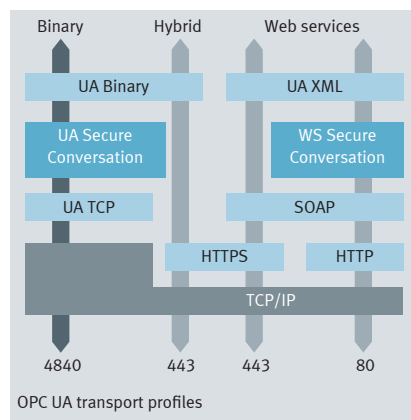
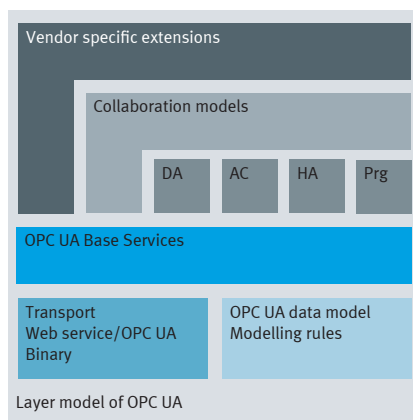
Embedded control from Festo is modular, adaptable and equipped with decentralised intelligence, and has been for more than 20 years. CODESYS V3 and OPC UA are building the bridge to Industry 4.0, also known as the Internet of Things.



Scan, look and discover with the product key

All the information for a modular CPX is contained in the data matrix code: the technical data, CAD, spare parts ordering by mobile phone and access to the cloud – putting Festo unmistakably on the road to Industry 4.0.

OPC UA as communication interface and information protocol

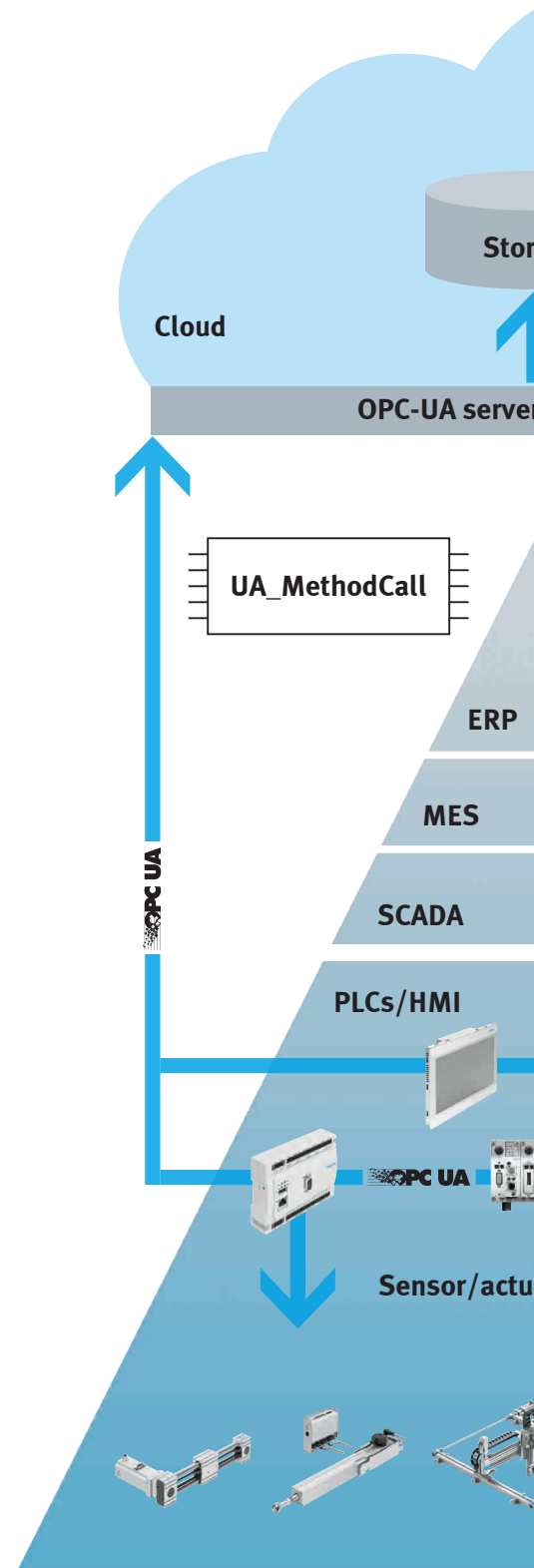


OPC UA opens up the way to an architecture which is platform-neutral, manufacturer-neutral, and service-oriented. Ideal for Industry 4.0. Source: OPC Foundation

Real solution package for Industry 4.0: tripod with robot control without control cabinet



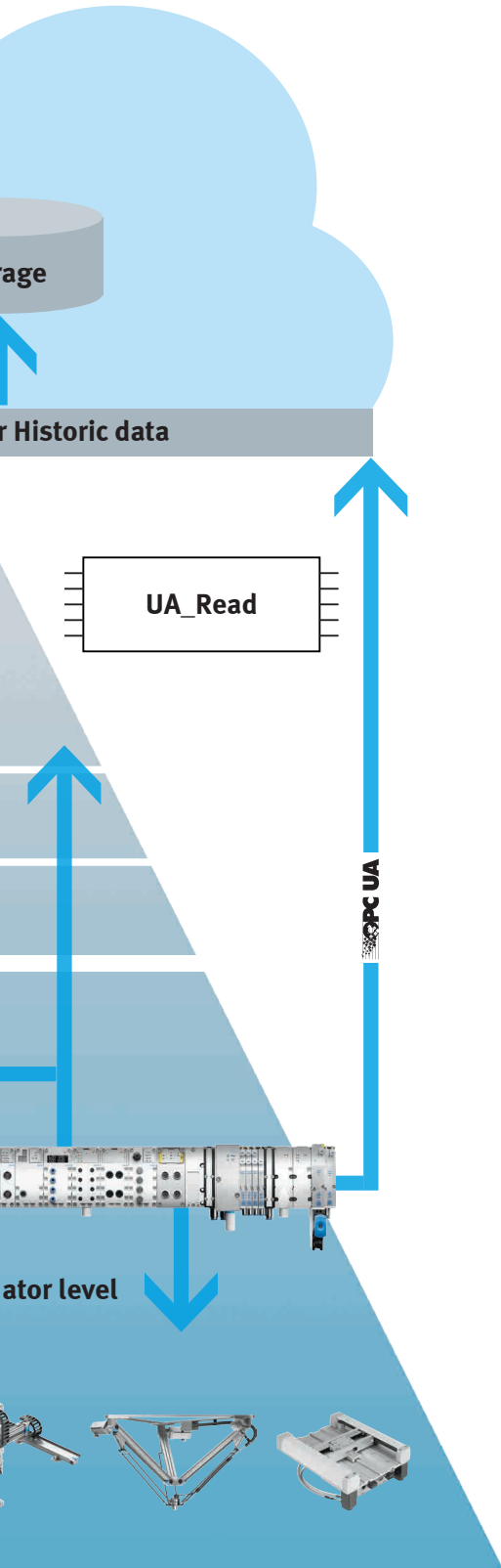
Made possible by new, intelligent electric drives EMCA with integrated servo controllers and CPX from Festo. A new addition is the networking of the real world with the virtual one via CIROS from Festo Didactic, and in the long term via Automation ML (AML).



Industry 4.0: things communicate with one another

More master-master communication and both horizontal and vertical networking with a single, uniform information model: these are the hallmarks of a fourth industrial revolution – Industry 4.0 or the Internet of

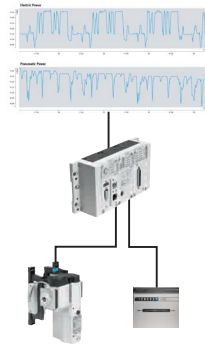
Turning vision into reality



Things. The traditional, inflexible automation pyramid will cease to exist in the foreseeable future.

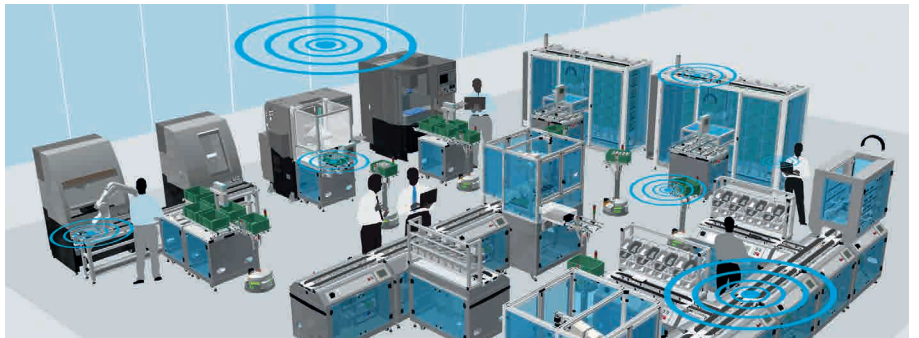
Festo CPX is making an important contribution to this transformation – see next page.

Highly flexible: Festo's Scharnhausen Technology Plant



Our adaptable Technology Plant is an example of where Industry 4.0 can lead. OPC UA and CPX are used intensively in production, for example in energy monitoring with the energy efficiency module E2M, a world first from Festo.

Teaching Industry 4.0: Festo Didactic



With subjects like simple and flexible networking in production, communication between components in industrial systems, interaction between people and technology, and the production environments of the future, Festo Didactic offers technical basic and further training for the practical implementation of Industry 4.0.

Bionics as an inspiration for Industry 4.0

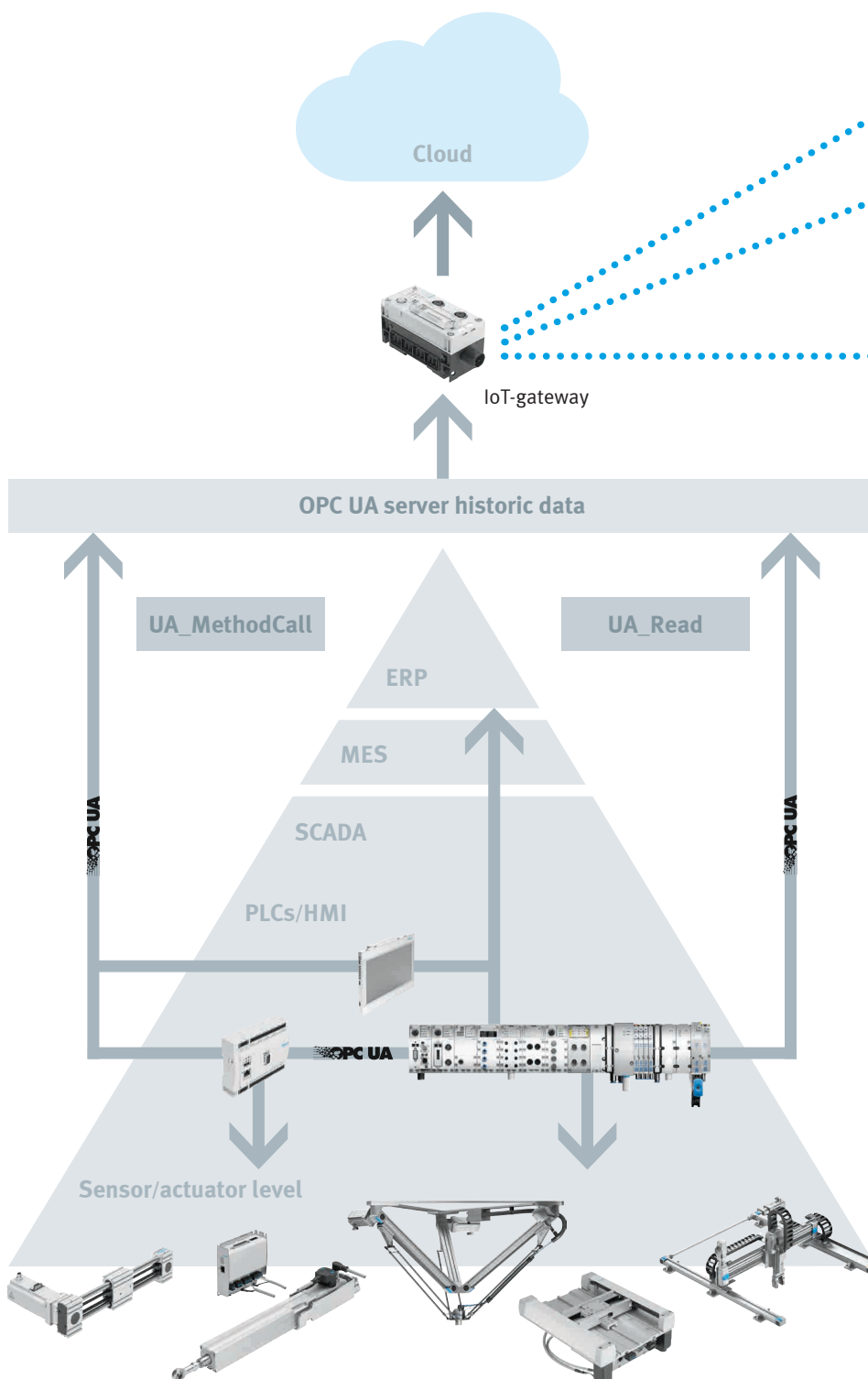


Bionics as an inspiration for Industry 4.0: the collaborative behaviour of ants, collective flight behaviour of butterflies, or an extremely versatile gripper modelled on the tongue of a chameleon are revealing new pathways for visionary automation technology, exclusively at Festo.

Industrie 4.0 – always a finger on the pulse thanks to complete networking

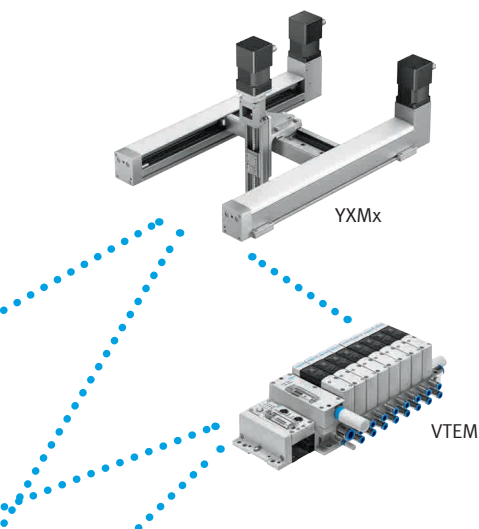
Many concepts from the past have been overtaken by the fourth industrial revolution: business models, partnerships, customer interfaces, value chains, and even the traditional pyramid structure of the automation environment – all are undergoing huge change. As an innovator and trendsetter in fieldbus technology, Festo will

make a major contribution to reshaping the future with new concepts for Industry 4.0. This includes new products, cloud services, apps, as well as a new online shop with comprehensive, integrated engineering concepts. This will ensure that, in the medium term, data will be available seamlessly and globally on all user devices.



Industry 4.0: things communicate with one another

More communication from controller to controller or subsystem to subsystem, and horizontal as well as vertical connectivity with a single, uniform information model, including the cloud: these are the hallmarks of a fourth industrial revolution – Industry 4.0. The traditional, inflexible automation pyramid will cease to exist in the foreseeable future. Festo CPX and the Motion Terminal VTEM are making an important contribution to this transformation.



Hardware for unlimited communication: Festo's IoT gateway CPX-IOT

The industrial Internet of Things gateway is based on the CPX module format. CPX-IOT collects information about Festo devices and their statuses via an Ethernet connection and a standardised communication protocol such as OPC UA, for example. It sends that information via a second Ethernet connection using IoT protocols such as AMQP or MQTT. Suitable IT security mechanisms ensure data security.

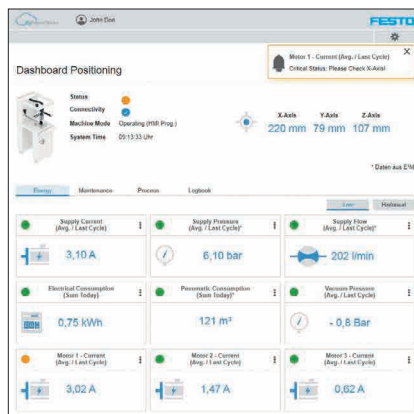
Integration as a subsystem or as a non-hierarchical system

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 if needed, e.g. via decentralised controllers such as CPX or CECC.

Or alternatively they can be integrated directly, with no hierarchy. For example:

- The handling system YXMx*
- The energy efficiency module MSE6*
- Or the Festo Motion Terminal VTEM*

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



Cloud services: increased productivity for machine builders and end users

Future cloud concepts and services will initially be very heavily dependent on the particular approach, partner or provider selected. Data will undergo further processing and long-term analysis in the cloud, with a dashboard visually presenting the information acquired. Festo supports machine builders and end users on the road to increased productivity. This includes:

- Simple visual presentation of complex interrelationships in the Festo cloud – worldwide
- Analysis function for rapid data processing
- Greater transparency, e.g. by condition monitoring online
- Optimisation of the applications, preventive maintenance, etc.

The result: increased productivity through improved utilisation and less downtime.

Software functions

- Festo CM-Lib for condition monitoring with the energy efficiency module MSE6...
- Motion apps for automated motion sequences in our electric drives/handling systems YXMx

Please contact your Festo sales engineer about possible implementations. The dashboard shown should be viewed as a pilot model for joint customisation projects together with customers/users.



Festo Software Market: implementing functions digitally

Apps greatly simplify the engineering and use of products and services. Festo will offer apps for numerous technical applications, target systems and working environments.

- Cloud-based apps
- Desktop-based apps
- Apps for mobile devices
- Product/hardware-specific apps

Product-specific apps

- Motion apps for the Festo Motion Terminal VTEM simplify the programming of automated movements, even without advanced knowledge of pneumatics
- Motion apps for YXMx handling systems with electric drives
- Further products are in development

Software/service apps

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

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

Make the most of maximum modularity and flexibility

Unique on the market thanks to its flexibility as remote I/O: what was once complex has now become simple.

Global trend of function integration:

Excellent flexibility and modularity make the CPX unique in several ways:

- It can be easily adapted to all applications, environments and company standards
- It enables huge savings to be made on engineering and installation thanks to function integration (→ pages 14/15)

Incredible variety of I/O modules

- Limitless adaptability
- Use as remote I/O
- Expandable up to 17 I/O modules
- Up to 256 local and 512 decentralised inputs
- System expansion to several thousand I/Os via CANopen
- Flexible adaptation with software parameterisation reduces inventory requirements

Maximum modularity and flexibility

- 15 connections 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 connecting cables
- Either plastic or metal threads
- Perfect for direct machine mounting and adaptation to machine concepts

Modular cable system

- Choice of any cable lengths between 0.1 ... 25 m
- Adapted to all devices with M8 and M12 plugs or solenoid coils
- Cable types: standard cable, robotics cable, cable suitable for use with energy chains
- Installation accessories

A choice of scalable pneumatic installation concepts

- Centralised installation
 - Decentralised installation with CPI or CTCL (I-Port; IO-Link)
 - Hybrid installation
- Pages 16/17



Versatility through competency: CPX communicates in multiple languages and is suitable for numerous control concepts

Perfect networking for universal communication

Focal point of CPX: maximum openness for all installation, communication and control concepts.

- Standardised communication with a single platform, from the management and operational level to the actuator/sensor or field level.
- Integration of pneumatic and electrical control chains into all automation concepts – even company-specific ones.
- Open to all fieldbus protocols as well as Ethernet



Front-end control:

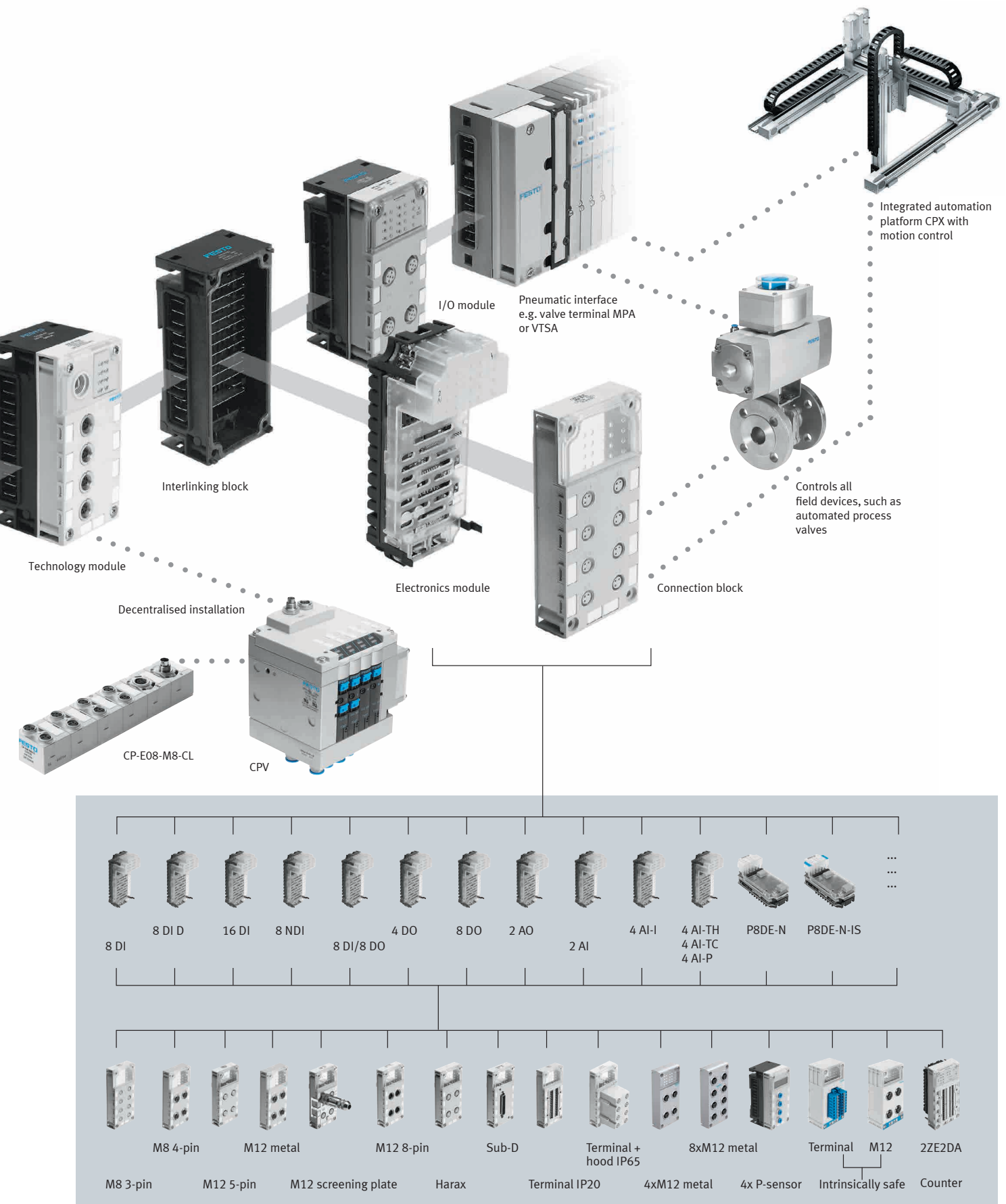
possible electrical control concepts

- Remote I/O on fieldbus/Ethernet
- Stand-alone operation (IP65/67 stand-alone control)
- Fieldbus remote controller
- Ethernet remote controller including use of IT technology
- Preprocessing
- Motion control for electric and servo-pneumatic drives

Rapid data transmission and real-time capability thanks to built-in preprocessing.

→ Pages 18/19

Core competency in automation 4.0



Maximum efficiency through function integration

Lowers costs, saves time, provides limitless possibilities and reduces TCO: the modular electrical terminal CPX.

Thanks to maximum modularity and functionality, multiple functions can now be integrated into valve terminals and the CPX as remote I/O, providing virtually limitless possibilities.

As a stand-alone system, Festo CPX can completely control compact machines and systems such as testing stations, making higher-level controllers obsolete.

→ Pages 18/19

These single-source solutions drastically reduce your installation costs and minimise total costs.

Single-platform solutions

- Digital and analogue standard tasks
- Demanding I/O tasks with single-channel diagnostics and parameterisation
- Temperature, displacement and pressure measurement
- Rapid pulse counting and measuring in single, periodic and constant modes
 - Measuring frequency, duty cycle, and rotational speed
 - Position detection by measuring travel length, travel direction, speed, and angle
 - Fast pulse output for pulse train, pulse-width modulation, switch-on delay, switch-off delay, and frequency output variants
 - 24 V DC motor control
 - 5 V and 24 V encoder supply
- Electrical and pneumatic safety functions
- Integrated, comprehensive diagnostics and condition monitoring
- Subordinate, decentralised installation system

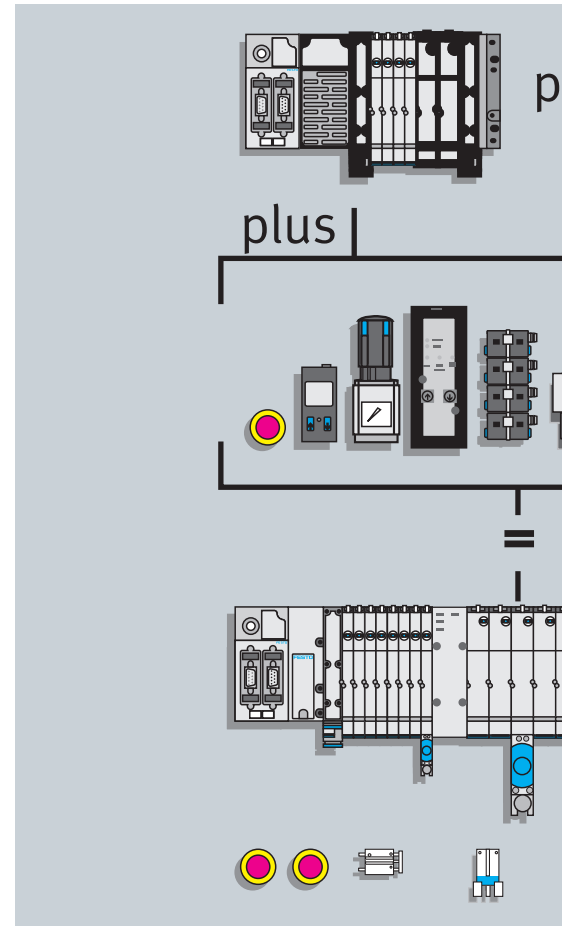
Combine this information

directly with the operating elements

- Pilot or process valves
- Control valves for cylinders, grippers, vacuum
- Pressure regulators for proportional control systems
- Servo-pneumatic positioning systems
- Electric drives and axes

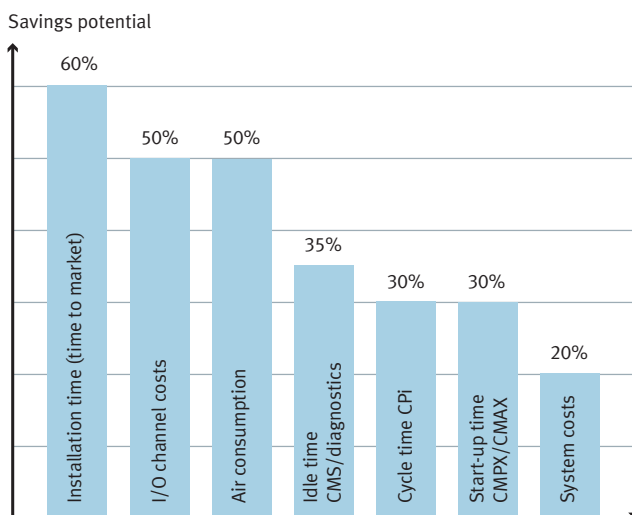
Choice of control via fieldbus/Ethernet as remote I/O or with front-end controllers

- CPX-CEC-S1-V3
- CPX-CEC-C1-V3
- CPX-CEC-M1-V3
(CODESYS V3 controller with 32 bit processor, 800 MHz, CANopen master (-C1, -M1) or serial interface (-S1). M1 with motion control package).



Resource-saving function integration with CPX: multiple valve terminals, voltage zones and many other single components can be combined without any problem.

Reduce TCO – your savings potential with CPX

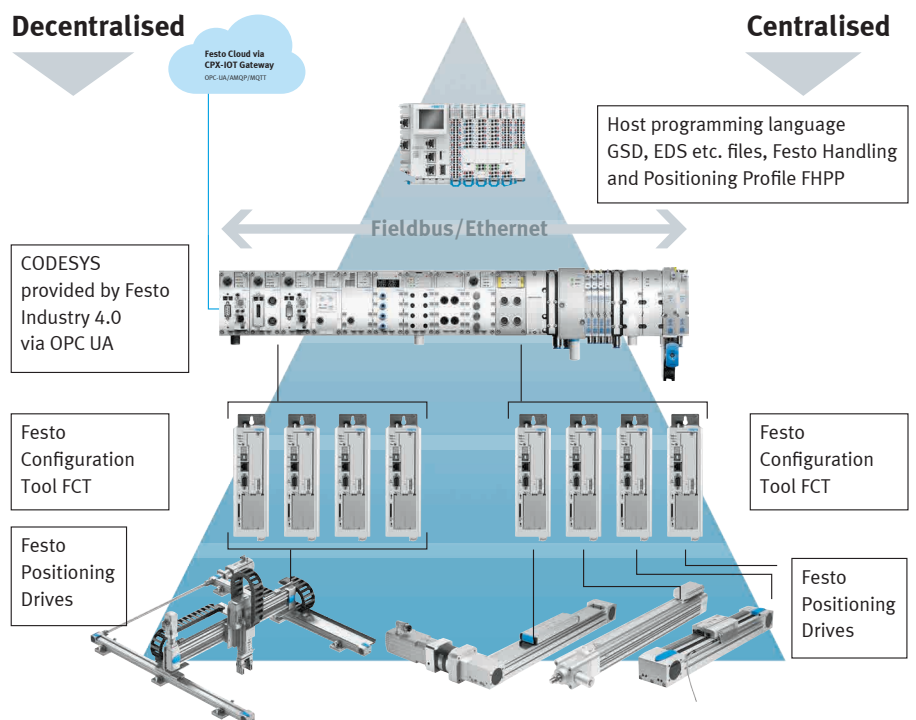


Core competency in automation 4.0

We make function integration on the CPX easy – whether integrated decentrally or centrally into your control architecture (host environment) and cloud concepts

Universal selection, configuration, optimisation of control chains, and the smooth integration of all data with engineering tools from Festo all make an important contribution to your success. Your automation solution becomes easy, complete and decentralised.

If you decide on a centralised automation architecture, you can seamlessly integrate a CPX – also available as a complete unit – into your control architecture and control system.



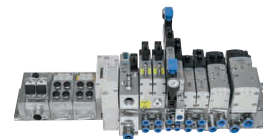
Learn from the best – customer examples of function integration and reduced TCO



Car assembly – saves 762 minutes



Label production – saves 1060 minutes



Thin film processing – saves 849 minutes

More online at

<http://www.festo.com/funktionsintegration>
Here you can find 12 real customer examples of function integration on our CPX platform. Discover how to optimise pneumatic and electric systems and integrate safety. Your Festo sales engineer will be happy to discuss

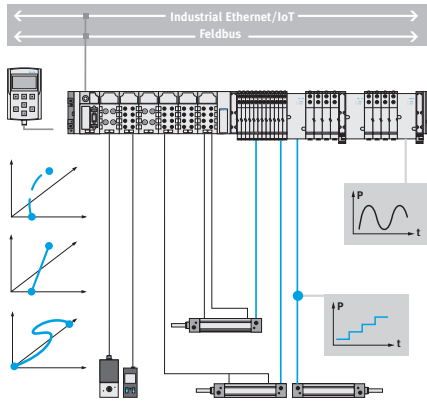
the details with you and provide an estimate of the potential savings for you.

Function integration is the guiding principle; on the next few pages you will find an overview of all available options.

- 1 Installation concepts
- 2 Control concepts
- 3 Motion control
- 4 Technology modules for measurement and proportional control systems
- 5 Measurement and control
- 6 Safety engineering, diagnostic systems
- 7 ...

Always the ideal installation concept = maximum efficiency

Centralised or decentralised: CPX can be optimally adapted to your machine/system concept

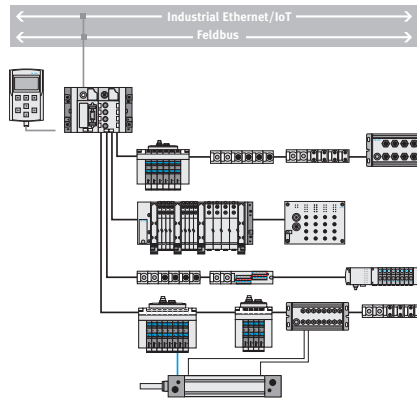


Centralised installation

- Control of several drives and functions via one valve terminal
- Short control loop system, only a few metres long
- Typical number of I/Os between 16 and 128

Benefits

- Up to 60% more efficient thanks to function integration
- Channel costs reduced by up to 50%
- Up to 40% better performance



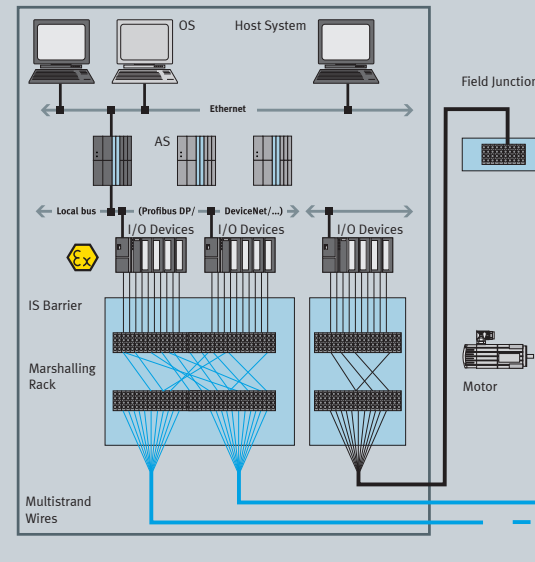
Decentralised installation system

- Subordinate, Festo-specific, self-configuring bus system
- Individual functions on a small valve terminal
- Installation-saving hybrid cable for data and power for connecting up to 16 modules via fieldbus nodes
- Typical number of I/Os between 16 and 512

Benefits

- Cycle times shortened by up to 30% thanks to very short tubing lengths
- Space reduced by up to 70%
- Air consumption reduced by up to 50%

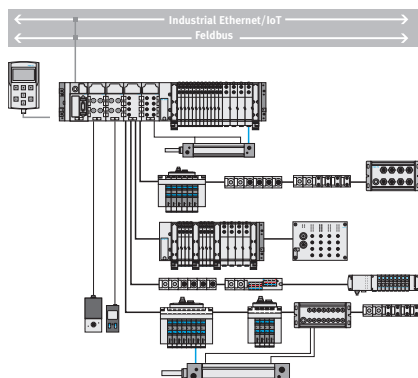
Installation environment with control room



Easier than ever: installation concepts in Ex zones with CPX-P and NAMUR sensors in Ex zones 0 and 1

- CPX-P modules are optimised for the process industry
- They can be combined with CPX standard modules, all CPX versions certified for zone 2/22

Only from Festo: the combination of centralised and decentralised machine/system concepts



Hybrid installation system (centralised/ decentralised)

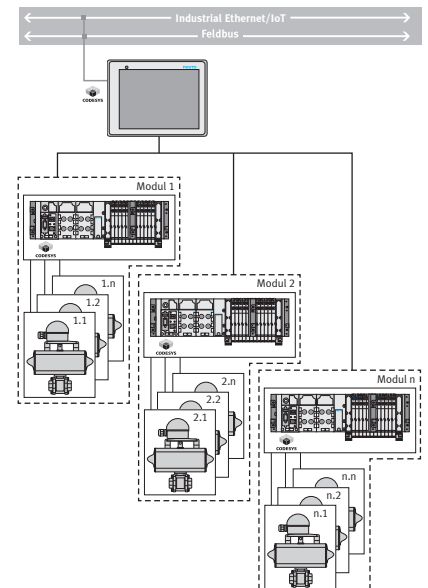
Only available from Festo!

- Individual systems can be combined and expanded as needed
- Also ideal in a control cabinet or on a control cabinet wall.

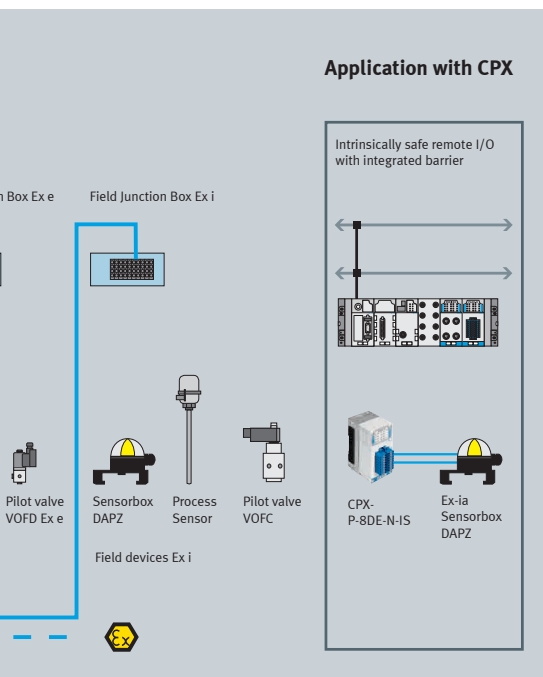
Benefits

- Excellent combination
- Short cycle times and high machine performance
- Greatly reduced system costs in terms of TCO

Trends and requirements in the process industry

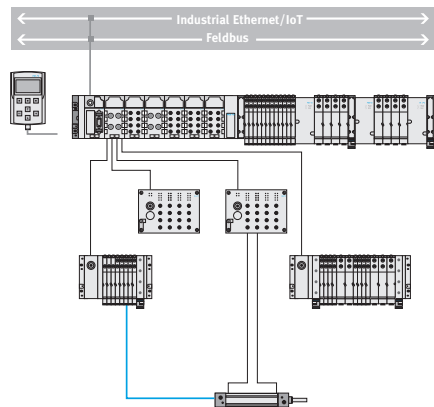


Core competency in automation 4.0



- Certified for use in a control cabinet in Ex zone 2
- NAMUR sensors in Ex zone 1 or 0 can be connected to the blue, intrinsically safe CPX-P modules
- Online product configurator – for error-free configuration!

System expansions made cost-effective

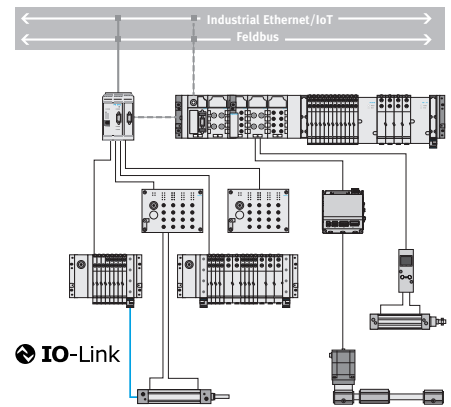


System expansion Festo I-Port/CTEL

- CPX-CTEL master with 4 I-Port interfaces
- I-Port: Festo-specific, uniform M12 interface for connecting to subordinate input modules and valve terminals
- Point-to-point connection for up to 20 m
- Self-configuring system
- Basic diagnostics: undervoltage, short circuit

Benefits

- Self-configuring
- Inexpensive basic functions
- Everything from a single source



Festo IO-Link master

- Controller CECC with Ethernet, 4 IO-Link master ports or 1 CANopen master.
- IO-Link interface CPX-CTEL-...-LK with 2 IO-Link ports (PROFINET, SERCOS)
- IO-Link: universal, standardised M12 interface for connecting to subordinate devices from various manufacturers
- Point-to-point connection for up to 10 m
- Configuration via device descriptions (IODD) and PC/laptop.

Benefits

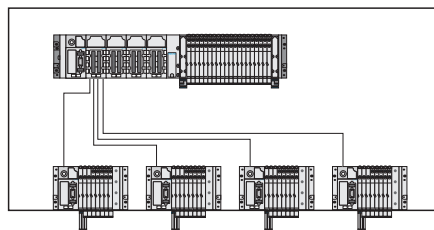
- Open, standardised system
- External functions can be integrated

Series: modular automation

Modular automation concepts with CPX

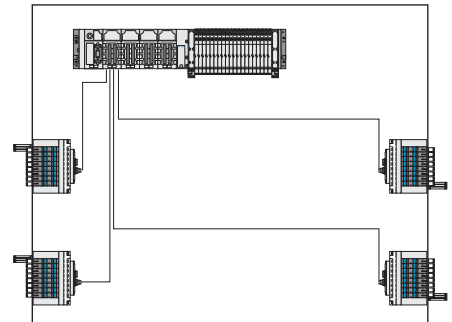
- Faster time to market for products
- Reduced planning and setup costs due to the standardisation of subassemblies (modules)
- Savings in investment and operating costs over the product lifecycle
- Process intensification for improved energy efficiency
- Reduced number of process steps, conversion of batch process sections into continuous process sections

I-Port or IO-Link – fast, easy, economical for your control cabinet



In combination with the I-Port extensions, innovative control cabinet installation concepts that are both space- and cost-optimised can be realised as follows:

- Simple control cabinet execution
- Fast electrical and pneumatic installation
- Easily adaptable to cleaning, installation



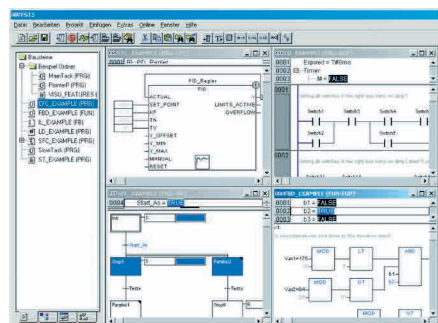
space and Ex protection concepts

- Technically and economically optimal system design
- Construction of the entire control cabinet by Festo on request.

Competency built-in: stand-alone control with CPX as front-end controller

Stand-alone automation platform: CPX-CEC with CODESYS as embedded controller

With CPX-CEC, the remote I/O can be expanded into a modular PLC in IP65/67. Direct machine mounting enables preprocessing or completely autonomous control, while reducing installation costs – in every sector and application. It all makes CPX into an unprecedented, stand-alone automation platform. It can be used to control manual workstations, relatively small machines or interlinked subsystems.



Programming in a global language to IEC 61131-3. CODESYS enjoys widespread acceptance on the control system market. Optional OPC UA package for Industry 4.0 HOST environments.

Festo CPX offers three control variants, all with Ethernet connection

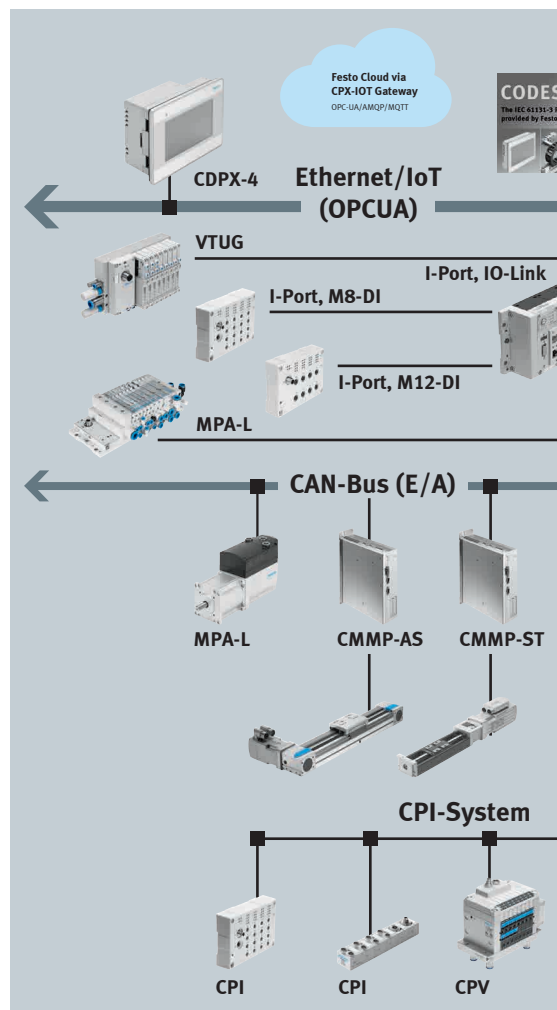
- CPX-CEC-S1-V3 and serial interface module
- CPX-CEC-C1-V3 with CANopen master
- CPX-CEC-M1-V3 plus Softmotion library for MC applications in up to 3D

CODESYS

The CANopen master integrated in the control system can actuate pneumatic and electric axes intelligently via fieldbus. The extensive CODESYS V3 function library provides diagnostics and condition monitoring options. CODESYS V3 simplifies your life with standardised controller programming to IEC 61131-3: you benefit from simple commissioning, and fast programming and parameterisation. This also includes the new Softmotion library for motion control and interpolation in up to 3D with the controller CPX-CEC-M1-V3.

Summary of benefits:

- Increased performance
- Reduced costs (central control and separate engineering process steps can be eliminated)
- Improved cycle times
- More actuators can be connected
 - 127 axes on CPX-CEC-C1-V3
 - 31 axes with interpolation (3D) on CPX-CEC-M1-V3



CPX-CEC with CANopen and CODESYS make CPX fully autonomous. The top part of the illustration shows which additional

Simple system design and many expansion options

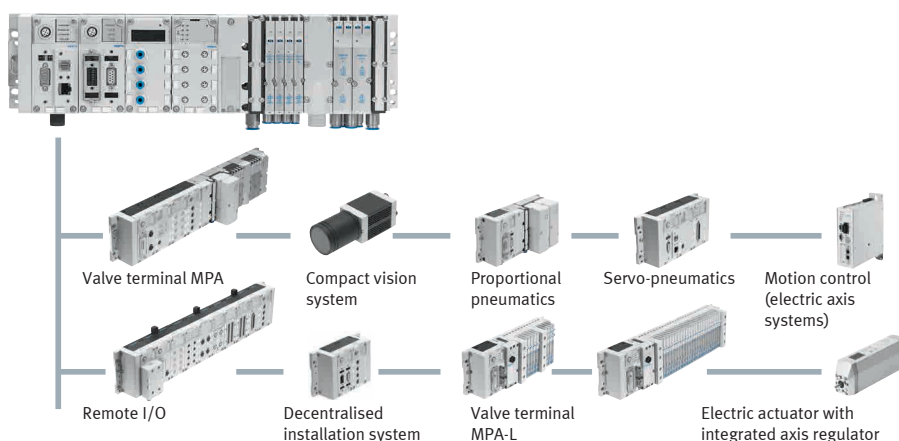
System design and expansion

- 9 CPX modules with 4 ... 16 DI/O or 2 ... 4 AI/O each
- Second-row CPX extension: up to 17 CPX modules on one fieldbus node, up to 11 on one CPX-CEC
- Up to 127 CANopen slaves in CPX-CEC-C1, fewer depending on the required system performance.

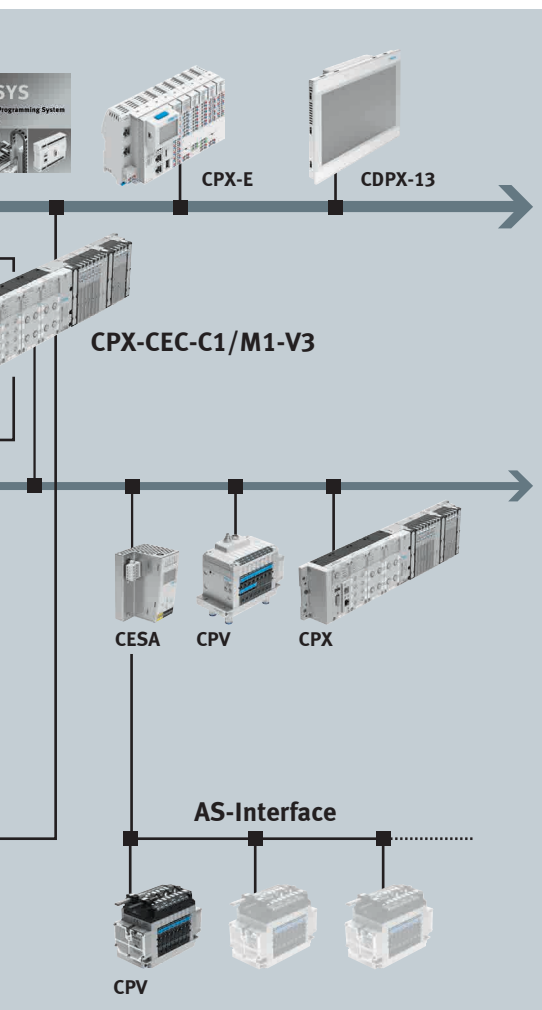
System expansion with CPX extension



System expansion with CANopen



Core competency in automation 4.0



components can be docked on and controlled by CPX-CEC; the lower part of the illustration shows which work options this gives you.

Excellent solution package for diagnostics and condition monitoring in pneumatic (sub)systems

Fast and simple implementation of diagnostic functions, enhanced energy efficiency, process optimisation for customer projects, or support with air consumption measurement and system analysis. It is all possible with the software library for all Festo CODESYS controllers. Ready-made software components support the monitoring of pressure, flow rates and air consumption. Other diagnostic functions include:

- Standard functions (mean/maximum values, etc.)
- Counting functions
- Time functions, such as travel times
- Pressure build-up times for actuators
- Detailed diagnostics, such as wear or leak detection

CODESYS can also be used to interpret the information acquired. Detailed diagnostics and plausibility checks

(if-then analyses) are also possible, as is integration into SCADA systems via an OPC server/OPC UA

Integrated IT service

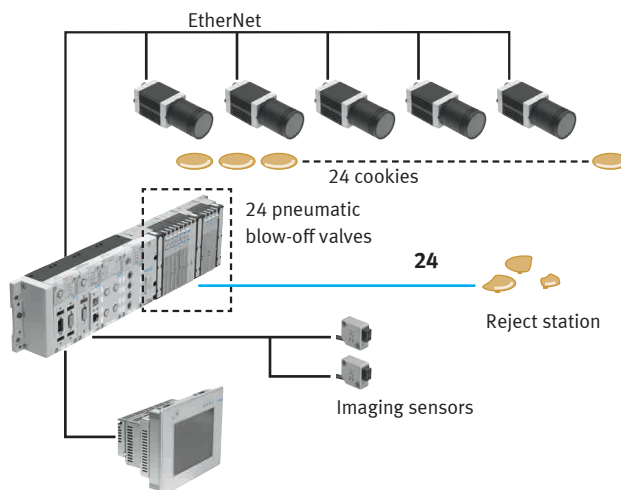
The CPX-CEC provides among others:

- TCP/IP
- Data transfer
- Remote service, remote diagnostics
- FDT/DTM
- Web server, OPC server
- Web monitor as integrated homepage
- Text message and e-mail alert
- Maintenance tool with USB adapter for PCs

This opens up opportunities for integrated diagnostic concepts, reduces unscheduled downtime of your system by up to 35%, saves costs and can be seamlessly integrated into host systems.

→ Pages 28/29

IP65 control concept with compact vision system as a customer application for reliable rejection of damaged goods



Integrated automation with networked CODESYS control systems from Festo: terminal CPX and compact vision system SBox-Q. Communication between the two systems is via

- EtherNet
- CANopen
- or simple I/O interface

The compact vision system SBox-Q provides constant monitoring when combined with an optoelectronic distance sensor SOEG-RTD. It detects defective cookies at a production speed of 200 cookies per minute and sends the pulse to separate out the defective ones.

The experts at Festo will be happy to help you.

Easy with integrated motion control

Control electric drives easily: individual modules

Motion control with CPX-CEC-C1-V3

Benefit from automation programming based on IEC 61131-3.

Directly mounted on the machine as an intelligent remote I/O terminal in IP65/IP67, CPX-CEC is perfectly adapted to the CPX terminal and decentralised control tasks in the machine.

- Extensive CODESYS function library
- Integrated CANopen master for several thousand I/Os
- Motion control with up to 127 asynchronous electric drives

Benefits

- Reduced installation costs
- Improved cycle times
- Significantly more functionality



CPX-CEC-C1 V3 CODESYS controller with CANopen master for multiple asynchronous axes – controlled decentrally in the field.



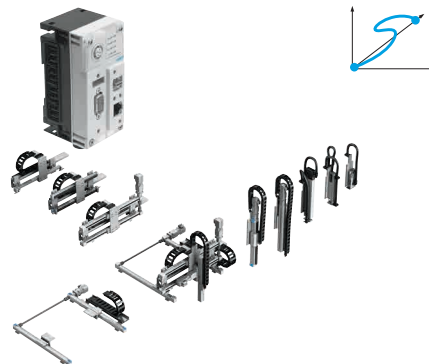
Motion control with CPX-CEC-M1-V3

As the CPX-CEC-C1, with additional CODESYS Softmotion library. This allows the controller to perform a 3-dimensional interpolation for up to 31 synchronous, electric axes. With flexible electronic camming functions and CNC editor included.

New: predefined profiles are available in the library as function blocks and visualisation components for highly dynamic applications such as T- and H-gantries ("Festo Robot Lib").

Benefits

- Efficient open- and closed-loop control
- The world's only fully integrated IP65 automation platform for standard, proportional and closed-loop pneumatics, electric drives and sensors.



CPX-CEC-M1 V3 with additional CODESYS Softmotion library for 3-dimensional interpolation in the field.

Core competency in automation 4.0



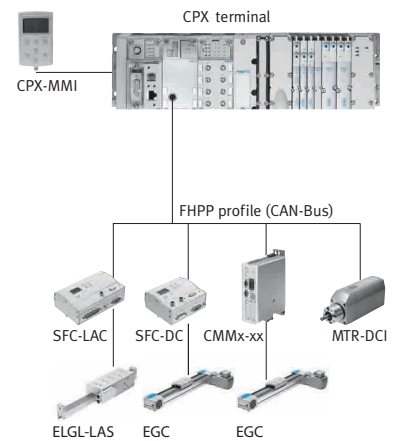
Easy positioning with servo-pneumatics or electric drives

Fieldbus gateway CPX-CM-HPP

With Festo Handling and Positioning Profile HPP for efficient control of up to 4 electric drives per module, with up to 8 in the CPX system.

Benefits

- High flexibility: all electric drive units from Festo are integrated in fieldbus/Ethernet
- Simplified engineering
- Reduced complexity
- Faster commissioning

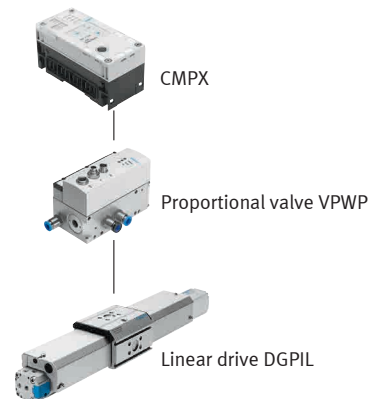


Soft Stop electric end-position controller CPX-CMPX

The CPX-CMPX is based on the SPC11. The CPX-CMPX speeds up cycles times by up to 30% for up to 8 drives and reduces air consumption by 30% compared to standard pneumatic systems, by providing cushioning for strokes up to 2 metres, depending on the drive.

Benefits

- “Auto-teach” function thanks to the pressure sensors in the proportional valve VPWP
- Fast, vibration-free travel between two fixed stops
- Highly dynamic movement of loads up to 300 kg
- Increased cylinder service life

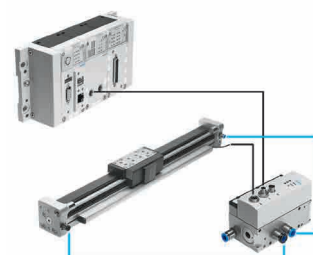


The world's only servo-pneumatic position controller CPX-CMAX for pneumatic drives

Whether for linear or rotary motion, IP65-rated CPX-CMAX controls the positioning of several pneumatic drives on up to 8 axes per CPX terminal. And it allows switching from positioning to force control. This eliminates an entire work step and makes your application considerably simpler.

Benefits

- Travel speeds of up to 3 m/s
- Acceleration of up to 30 m/s² with accuracies $\geq \pm 0.2$ mm
- For loads of 1 kg to 300 kg
- 64 configurable positioning records available via fieldbus
- Force control

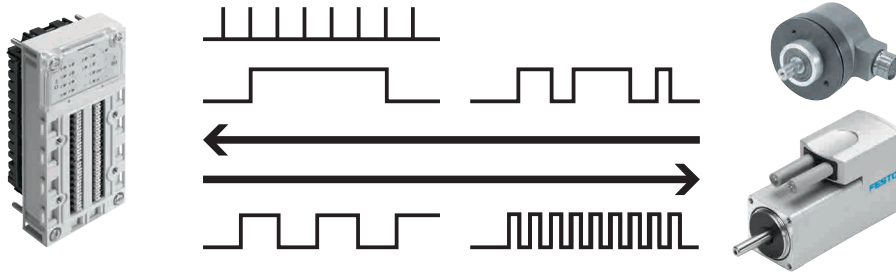


Robust and cost-effective positioning within a range of up to ± 0.2 mm with simultaneous force control in the current position for gluing, welding, etc.

Competency at work: modules for measurement and proportional technology

Far more than just counting! Many new options with counting and measuring modules for CPX.

Counter and measuring module (fast counter) CPX-2ZE2DA



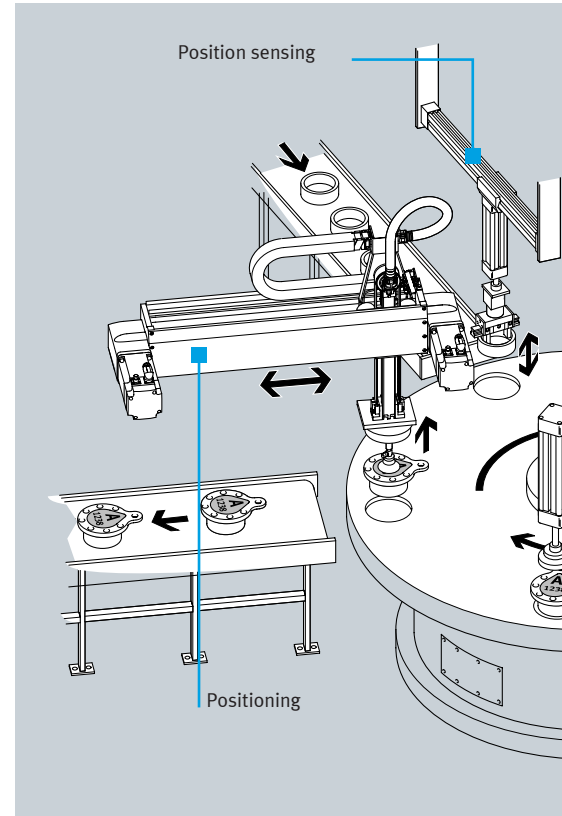
The dual-channel counter module substantially expands CPX as an automation platform, providing highly efficient operation. The signals, the counting and measuring modes, and the output functions are extraordinarily flexible and each channel has the following functions:

- Rapid counting of pulses in single, periodic and constant modes
- Measuring frequency, duty cycle, and rotational speed
- Position detection by measuring travel lengths, travel direction, speed, and angle
- Fast pulse output, pulse train, pulse-width modulation, switch-on delay, switch-off delay, and frequency output variants
- 24 V DC motor control
- 5 V and 24 V encoder supply

The functions shown here are supplemented by additional features, such as a latch function, synchronisation, counter limits, limit monitoring with diagnostics, comparator unit, load value, hysteresis, and polarity. The range of functions and associated settings are determined through parameters and process data. This means each channel can be used as a counter/pulse input or an encoder/SSI input, depending on parameterisation.

Benefits

- Economical thanks to high function integration in one module
- An extensive range of functions provides flexibility for the application
- Open- and closed-loop control of fully-fledged applications with motion control via CPX



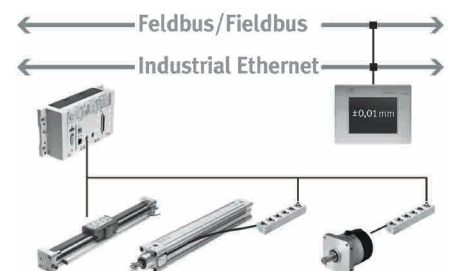
The rotary indexing table shows just some of the many possibilities offered by the rapid counter CPX-2ZE2DA.

Measuring module CPX-CMIX-M1-1

Turns pneumatic cylinders into sensors. And is the only one of its kind in the world thanks to fully digital data acquisition* and data transmission. Repetition accuracy of ± 0.01 mm, and with integration of both analogue and digital transducers.

Benefits

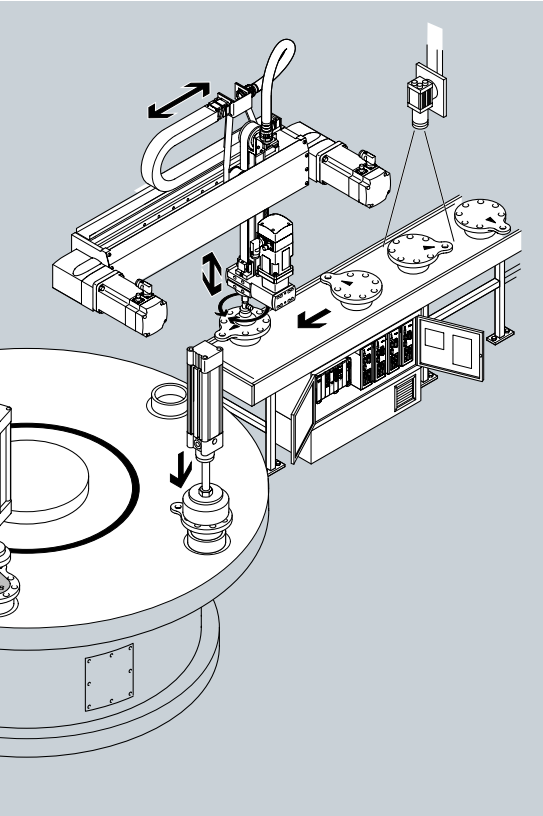
- Space and time-saving: retracting/advancing and measuring in one step
- Reduced cycle time: subsequent process steps can be triggered based on the stroke
- Improved quality: process steps are measured and documented
- Faster and more reliable commissioning thanks to a co-ordinated system



Better communication and productivity through optimised cycle times, since subsequent processing steps can be optimally triggered based on the stroke.

*Depending on the measuring system

Core competency in automation 4.0



Extremely simple and time-saving: integrated pressure sensor modules for CPX

Analogue input module with 4 pressure sensors CPX-4AE-P

The new pressure sensor modules offer extreme function integration in a tiny space, and with IP65 protection. They greatly simplify installation in the field, and make engineering far easier.



Pressure sensor module CPX-4AE-P

Benefits

- Parameterisation, commissioning, evaluation as an absolute value in mbar, psi, kPa without conversion – extremely efficient!
- Parameterisable pressure sensor for 4 relative pressure measurements or 2 differential pressure measurements. Versions for 1 ... 10 bar or a vacuum of -1 ... +1 bar.

- No external sensors – greatly reduced installation costs and space requirements
- Pre-assembled and tested unit
- Channel-oriented diagnostics for reduced downtime

Proportional pressure regulator VPPM on CPX/MPA

The proportional pressure regulator VPPM for reliable and precise closed-loop control. It has preselectable presets plus multi-sensor control. Integrated into the electrical terminal CPX-MPA, VPPM enables many additional diagnostic functions and variable pressure zones.

Benefits

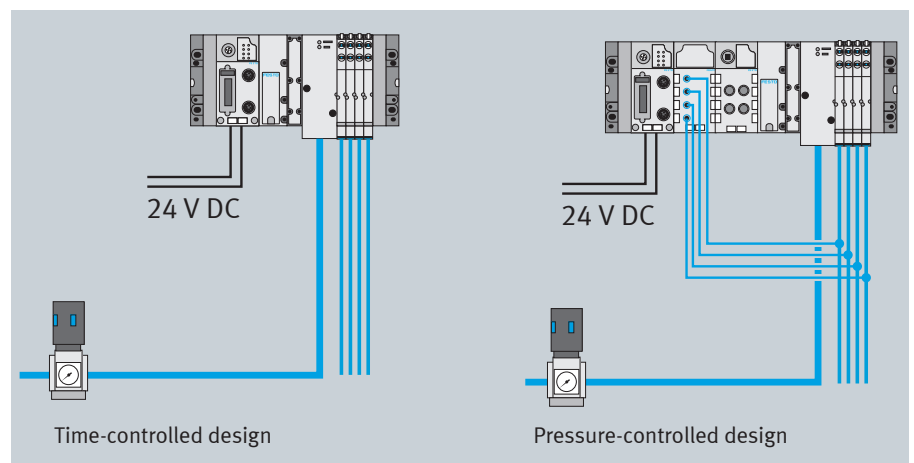
- Reliable and trouble-free pressure regulation and diagnostics via fieldbus/Ethernet
- Efficient: up to 8 VPPM per CPX/MPA valve terminal, can be subsequently expanded
- Reliable: pressure is maintained if the supply voltage or bus communication fails
- Economical: long service life, 100% tested and pre-assembled units
- Energy-efficient: on-site control



Proportional pressure regulator VPPM on CPX/MPA

Multiplexing – full functionality with fewer proportional valves

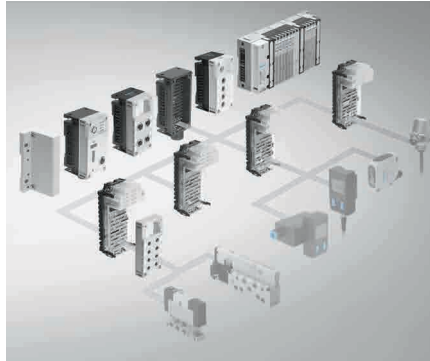
Multiplexing saves up to 8 proportional valves per pressure zone on a valve terminal. Multiple pressures can be sequentially transferred to various actuators through downstream directional valves. This allows 8 downstream directional valves on the valve terminal MPA to be controlled by one proportional valve, providing significant savings compared to a more conventional design. Multiplexing can be either pressure-controlled or time-controlled.



Consistently simple: measurement and control

Competency creates simplicity and flexibility in measurement and control

Up until now, measurement and control were separate subsections of automation, which could only be implemented with complex and mostly external solutions. The incredible variety of I/O modules, together with technology modules for measuring and controlling pressures and pneumatic or electric drives, dramatically simplifies measurement and control – which also makes the electrical peripheral CPX truly universal and unique.

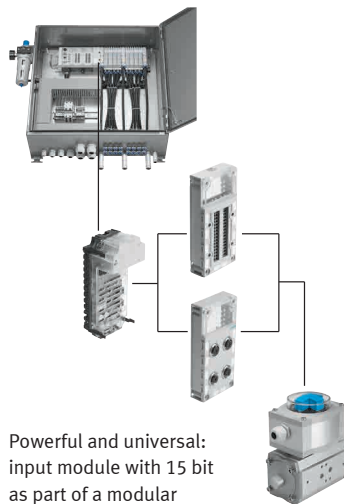


High-resolution analogue input module with four 15-bit inputs CPX-4AE-U-I

Very flexible for complicated tasks in factory and process automation, such as level measuring, pressure measuring and distance measuring. Many technical functions, limit monitoring, diagnostics, and the following measurement ranges can be programmed per channel:

- Bipolar

0 ... 20 mA	0 ... 10 V
-20 ... +20 mA	4 ... 20 mA
-10 ... +10 V	1 ... 5 V
-5 ... +5 V	
- Unipolar



Powerful and universal: input module with 15 bit as part of a modular system.

Benefits

- Economical: numerous signal types integrated into a single module
- Reliable thanks to overload protection included as standard
- Reduced downtime thanks to comprehensive, channel-oriented diagnostics
- Powerful and can be used universally
- Analogue module with a high degree of protection integrated in the field

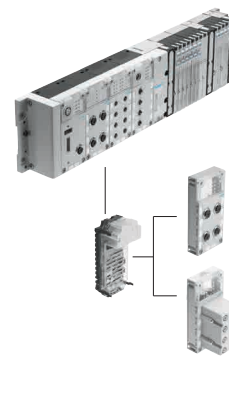
Example: analogue input modules for 4 thermocouples or temperature sensors CPX-4AETC/CPX-4AE-TH

Whether in process automation or in manufacturing processes, the new temperature sensor modules are designed for:

- Thermocouple types B, E, J, K, N, R, S and T (-270 ... 1820° C)
- Temperature sensors PT 100, PT 200, PT 500, PT 1000, Ni 100, Ni 120, Ni 500, Ni 1000 (-200 ... 850° C)

Benefits

- Reduced channel costs due to 4 channels per module
- No need for expensive sensors with integrated signal converters
- Reduced downtime thanks to channel-oriented diagnostics
- Reduced system costs thanks to simple function integration in fieldbus/Ethernet networks



Core competency in automation 4.0



Simpler: CPX as platform for Ex and non-Ex zones

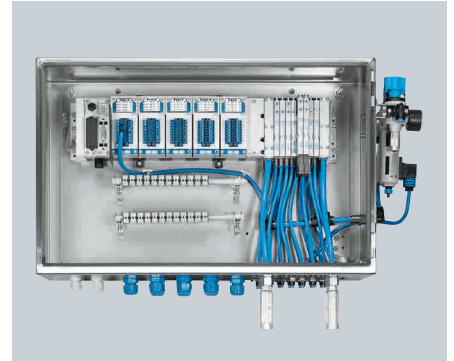
CPX-P-AB-...-8DE-N-IS/ CPX-P-AB-...-8DE-N

NAMUR sensors can be directly connected to a CPX. These NAMUR modules are available in 4 versions:

- IP20 with terminal connection, intrinsically safe feature optional (-IS)
- IP65 with M12, intrinsically safe feature optional (-IS)

Benefits:

- No separate isolating amplifier or special barriers for connecting intrinsically safe devices when mixing signals.
- Control cabinet installations in Ex 2 zones in the process industry for controlling valves and connecting to NAMUR sensors in hazardous Ex zones 0 and 1
- Direct machine mounting in safe zones and connection of sensors in Ex zones 0 and 1
- In combination with valve terminal MPA for electrical and pneumatic control of applications in the process industry and in hybrid sectors



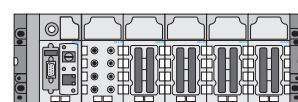
CPX-P with NAMUR I/O modules – safety made easy



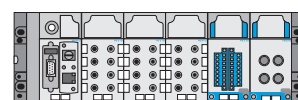
IP20 peripheral I/O system for use in explosive areas



IP20 I/O peripheral system



IP65/67 or IP20 CPX with CEC and CPX-P-8DE-N



IP65/67 or IP20 CPX with CEC and CPX-P-8DE-N-IS

Festo sensor box DAPZ

Isolation amplifier

Isolation amplifier

CPX with CEC and CPX-P-8DE-N-IS makes your safety concept extremely simple. You only need one module – that's just how Safety@Festo works.

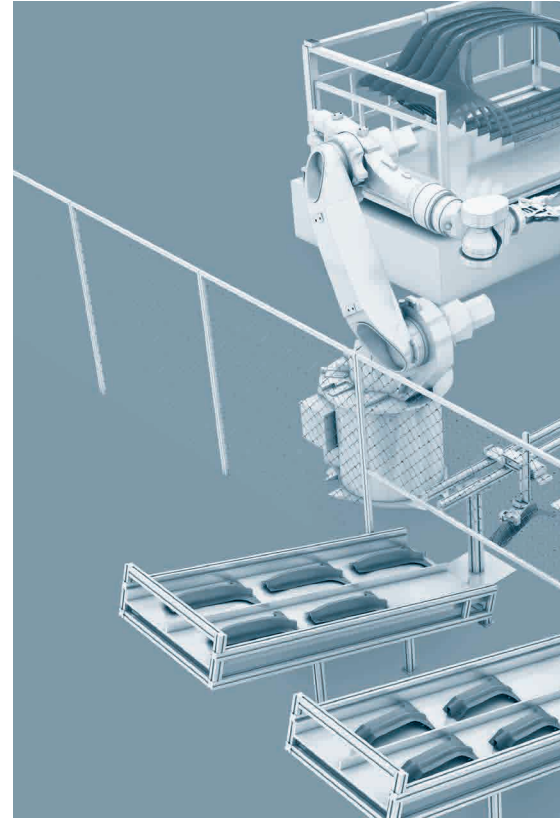
Integrated safety: diagnostics management and safety engineering

Safety engineering to EN ISO 13849-1 and IEC 61508/61511/62061

Safety@Festo

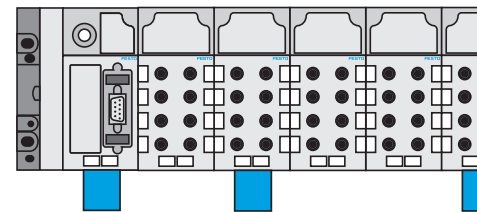
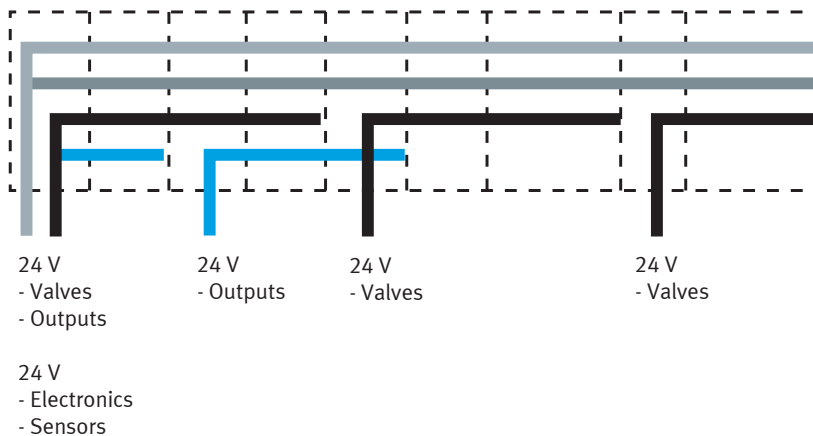
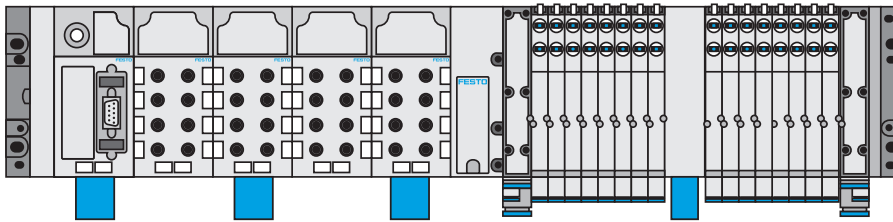
Quality has many aspects at Festo, one of which is working safely with machines. This has led to our safety-oriented automation technology. These components ensure that optimum safety is achieved in the workplace.

→ See “Safety engineering guidelines”



Voltage zones

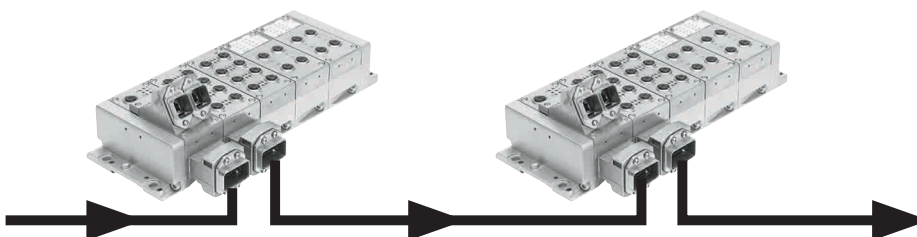
Basic CPX power supply: 24 V DC, max. 16 A each for electronics/ sensors and outputs/valves



PROFIsafe input module CPX-F8DE-P

On-site sensing for the entire safety chain

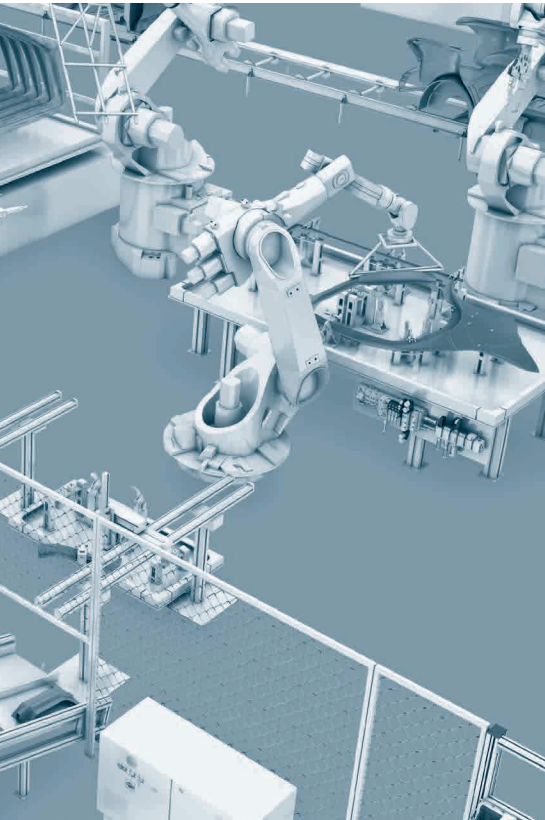
- Simple and clear installation: inputs – logic via PROFIsafe – outputs
- Simple connection of safety-oriented switching devices, such as emergency stop, through-beam sensors or roller levers (OSSD/contacting sensors)
- Compact, sturdy, 8-channel PROFIsafe input module
- High level of safety
- Simple: preprocessing on the module and secure parameter data thanks to process image



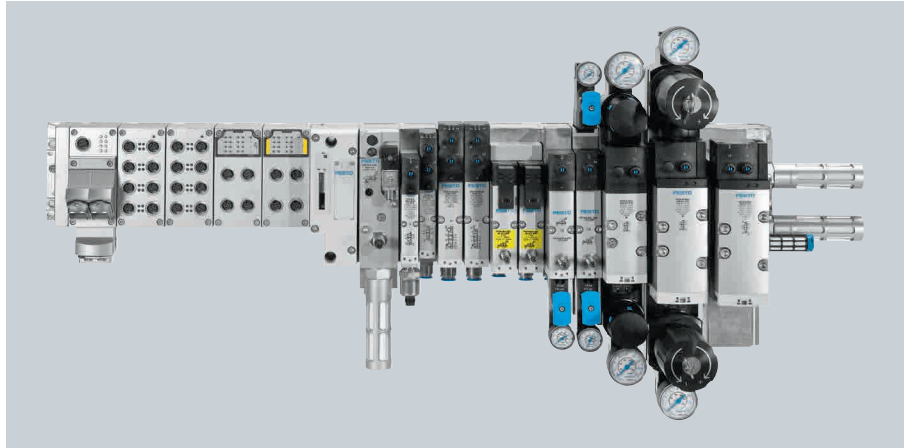
AIDA connection technology

For voltage supply looping

Core competency in automation 4.0



Valves: Safety@Festo with VTSA

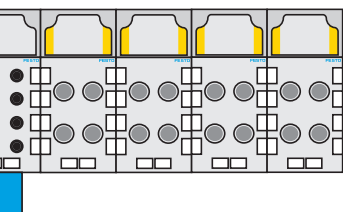


Unique: VTSA offers the most comprehensive safety functions worldwide.

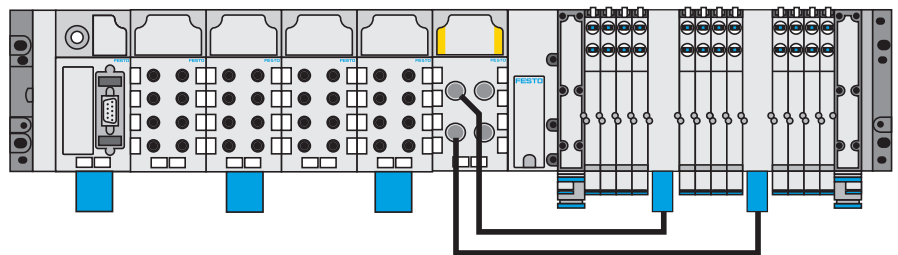
- More built-in safety for systems and machines with VTSA.
- Ready-to-install solution on a valve terminal

Functions:

- On/off and soft-start valves for greater process reliability during switch-on
- Multiple voltage zones on one valve terminal
- Switching position sensing for greater safety, such as for press actuation (single-/dual-channel)
- Special valves for pneumatic manual clamps, lifting cylinders and rotary cylinders
- Switchable pilot air supply: protects against unexpected system restarts up to max. PL d in accordance with EN 13849-1
- Optional check valves for dual-channel pneumatic stopping. These are also controlled by the pilot air supply valve.



- Channel-granular passivation
- Multiple PROFIsafe input modules possible per CPX
- Smart and intuitive design engineering:
 - Predefined operating modes for the input functions
 - No selection of parameters necessary
 - No additional software tools required
 - All configuration carried out in STEP7 or TIA
 - Quick and simple validation



AIDA connection technology

For voltage supply looping

PROFIsafe output module CPX-FVDA-P2

The internal valve supply is shut-off, and two independent and safe external outputs are additionally supplied. This allows other voltage zones or valve functions to be supplied externally.

Pressure zones

To provide for different safety concepts, valve terminal platforms MPA and VTSA offer multiple pressure zones and valves with separate pressure supply for each valve. MPA also permits regulated pressure zones that are monitored by integrated sensors for process documentation purposes.

Integrated safety: diagnostics management and safety engineering

Diagnostic options in the valve terminal range from Festo

Three error modes for simple detection

Current errors – LED-supported diagnostics provide rapid, immediate assistance. A CPX-MMI reports locally in plain text. Fieldbus or Ethernet transmits details at channel level for process visualisation.



Future errors – hopefully these will not even occur thanks to automatic condition monitoring for preventive maintenance. Numerical data and warning messages – at channel level, e.g. for up to 128 solenoid coils.

Random errors/history – analysed and detected faster thanks to a diagnostic trace that automatically stores the 40 most recent errors. No need for time-consuming investigations, even for intermittent errors!

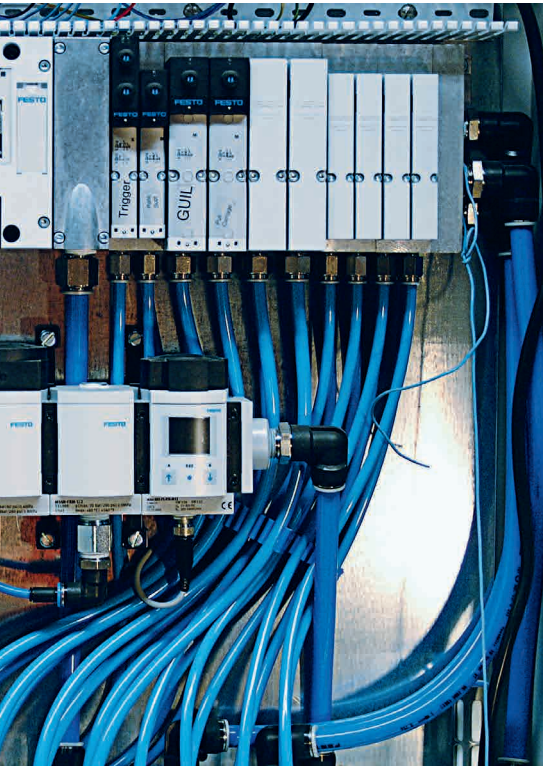
V = Voltage
I = Current input
T = Temperature
DI = Digital input
DO = Digital output
AI = Analogue input
AO = Analogue output



	CPX-4DE	CPX-8DE	CPX-P-8DE-N(-IS)	CPX-16DE	CPX-L-16DE	CPX-8DE-D	CPX-16DE-D	CPX-4DA	CPX-8DA/8DA-H	CPX-8DE-8DA	CPX-L-8DE-8DA	CPX-2AE-U-I	CPX-4AE-U-I	CPX-4AE-I	CPX-4AE-P	CPX-4AE-TC/TH	CPX-2AA-U-I	VTSA	MPA-L	MPA-S	MPA diagnostics	MPA pressure sensor
	Digital I/O											Analogue I/O					Pneumatics					
Undervoltage																						
Short circuit – signal																	U					
Short circuit – supply																						
Wire break												I	I	I								
Lower limit value																						
Upper limit value																						
Parameterisation error																						
Condition monitoring																						
Sensor overload																						
Measuring range exceeded																						

□ No diagnostics ■ Module-oriented diagnostics ■ Module-/channel-oriented diagnostics

Core competency in automation 4.0



Perfect process reliability – the diagnostics and condition monitoring package with CPX

Integrated diagnostic concept – for up to 35% less downtime for your system.

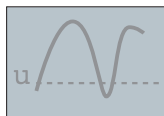
CPX integrates internal diagnostics and condition monitoring functions. Each channel in the corresponding valve terminals such as MPA or VTSA can be tracked down to the last detail thanks to the integrated serial interface or a fieldbus module from the CPX series. In-process diagnostics, e.g. with CPX-CEC or with compact vision systems, are also integrated.

→ Pages 12/13

Convenient: save diagnostic data in your host environments

This option integrates IT services into CPX. Depending on the fieldbus system and the control/visualisation system, the diagnostic data from your CPX can be seamlessly transferred and integrated. Specific diagnostic components make engineering easy. You can also find expert information on device files, drivers, PCS7, firmware questions, etc. on our Support Portal: → www.festo.com

Our manuals provide more information on all of our fieldbus systems.



Undervoltage per module

- Electronics -25%
- Load -10%/valves -25%
- Emergency off $\leq 10V$



Error memory

- Last 40 messages
- With timestamp
- Detects sporadic errors



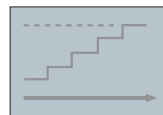
Wire break can be selected

- Per channel
- Per module
- Per valve



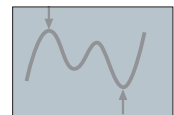
Short circuit can be selected

- Per channel
- Per module
- Per valve



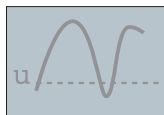
Condition monitoring

- Setpoint specification for each valve
- Monitoring of downstream mechanical systems/ processes
- Preventive diagnostics/ maintenance



Upper/lower limit value

- For each analogue channel
- Voltage
- Current
- Temperature
- Pressure
- Counting



Undervoltage per valve block

- Auxiliary power supply to valves monitored separately
- Load/valves -25%

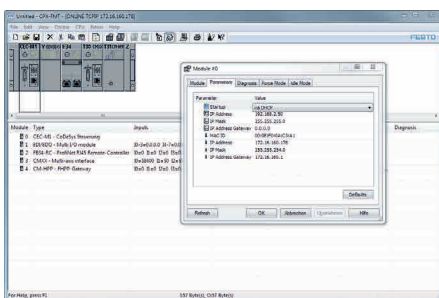
Other specific diagnostic options for measuring pressure and distance, for counter and measuring modules, all electric and servo-pneumatic axes, our proportional pneumatic systems or motion control can be found on the relevant pages and manuals in our electronic catalogue.

Easy to implement. With Festo.

On request, we can carry out complete projects for diagnostics/condition monitoring in pneumatic (sub)systems. These are based on CPX-CEC.

FMT – Festo Maintenance Tool for CPX

- Module scan
- EDS/GSD export
- Configuration
- Diagnostics
- Service functionalities

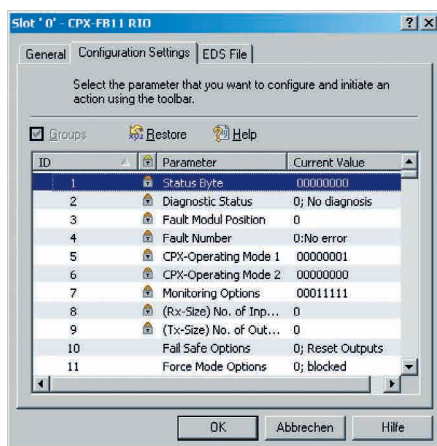


Easy and reliable: commissioning and software services

Uncomplicated commissioning with software from Festo

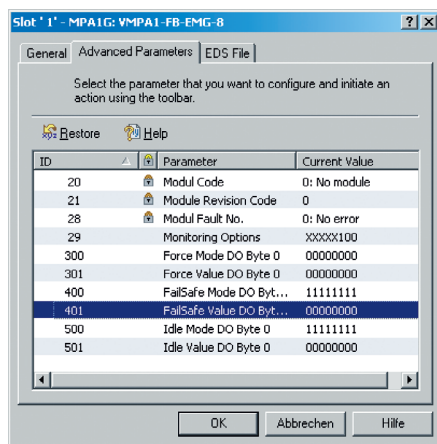
CPX not only handles special functions without any problem, it can also communicate independently and flexibly via fieldbus/Ethernet – anywhere in the world, and from the management level down to the field level. The modular electric terminal is quickly

setting the benchmark in industrial communication. These benefits are easy to implement in the versatile, modular world of CPX. Without them, features such as comprehensive diagnostics would not even be possible.



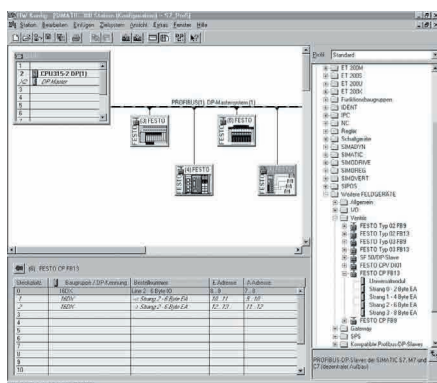
Status byte and diagnostic status interface

CPX provides comprehensive diagnostic information. If this information is not supported by the fieldbus or host system in use, some of the information can also be transferred through the process data. This allows at least some of the data to be evaluated.



Fail-safe/fault mode

Ideal for risk management: safety-critical processes can be planned precisely with fail-safe or fault mode, since output behaviour during a bus interruption can be defined in advance (e.g. OFF or Hold Last State). This function is available for PROFIBUS, DeviceNet, Ethernet/IP, PROFINET and EtherCAT.



Parameterisation via PLC/fieldbus

Depending on the fieldbus, startup configuration can be defined for each field device and loaded through the fieldbus after power-on.

Benefits

- Uniform user interface in the PLC
- In the event of a fault the field device can be easily replaced and parameterised with the old values

This function is available for PROFIBUS, DeviceNet, CANopen, Ethernet/IP and PROFINET.



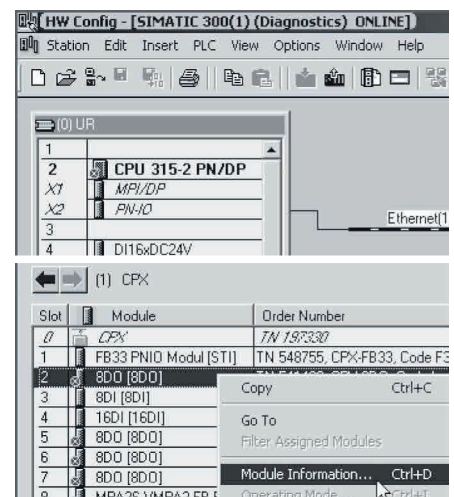
Modular device configuration

This function makes modular devices such as CPX and other subsystems easier to configure.

Benefits

- Clear configuration
- Differentiated planning, even with different data types
- Simple parameterisation

This function is available for Profibus, DeviceNet, CANopen and PROFINET.



Core competency in automation 4.0



The Festo Field Device Tool (FFT) – for a complete overview on Ethernet

The Festo Field Device Tool (FFT) supports Ethernet-based products from Festo during commissioning and maintenance, e.g. secure firmware updates, updating new features with no additional costs, safe updates (checks compatibility between installed hardware and selected firmware revision). It provides CPX with extremely convenient diagnostic details on every Festo network station, or offers an LED- or LCD-based identification function with a single click.

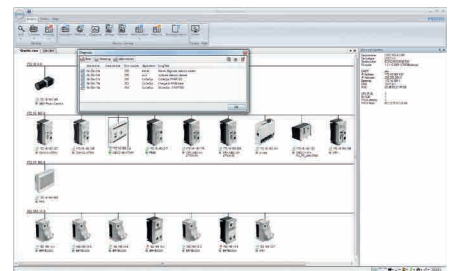
FFT – Festo Field Device Tool

- Firmware updates
- Network scan
- Diagnostics
- Network settings
- Backup and restore

More information on the Festo Field Device Tool can be found on the Support Portal: → www.festo.com

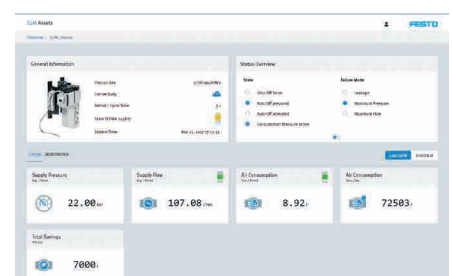
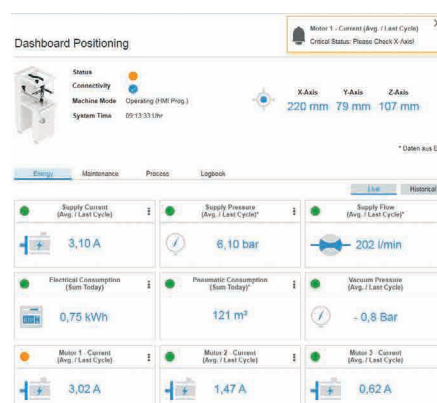
Summary

- For secure updates of firmware on various devices
- Clearly structured and extremely detailed graphical overview
- Preselection of scanning process
- Time-saving, particularly in large systems through parallel updates of multiple devices
- Update logs for system documentation
- Local firmware database for updates and downgrades without Internet connection
- Backup of remaining data before updating for immediate restart



CPX-IoT gateway and Festo Cloud

- Simple visualisation of the status of mechatronic sub-systems via Festo apps
- Component details via “drill down” – everything at a single click
- Further analyses and evaluations in the cloud via optional condition monitoring and predictive maintenance apps – on request
- Phased approach for seamless integration into your I4.0 strategy
- Add value according to your requirements via in-house programming or the Festo app/service



Possible pilot projects with the Festo Cloud could also include:

- VDMA traffic light for current status
- Transfer to other clouds
- Further options and project partners available from Festo on request

A wealth of variants for a multitude of applications

One terminal complete with remote I/O – many modules

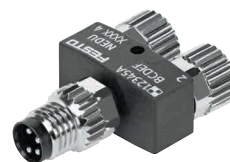
This is the only way to achieve maximum connectivity. The automation of the future, especially with Industry 4.0, will be fundamentally determined by this modularity, adaptability and communication ability.

That is the reason for the modular variety of the CPX electrical peripherals. Below you can see, module by module, all the possibilities offered by CPX for pneumatic and electric systems.

Technical data	
Electrical system	
Power supply	
- Electronics plus sensors	24 V, max. 16 A
- Actuators plus valves	24 V, max. 16 A
Power supply connection	M18: 4-pin, 7/8": 4- or 5-pin AIDA push-pull
Current consumption	Dependent on system configuration
Mechanical system	
Grid dimension	50 mm
Module dimensions (W x L x H)	50 x 107 x 50 mm incl. interlinking module
Connection technology	Choice of 10 connection technologies/IP20 and IP65/67
Environment	
Degree of protection to EN 60529	IP20/IP65/IP67 depending on connection technology used
PWIS classification	PWIS-free
Module types: bus node	
CPX-FB6	InterBus
CPX-FB11	DeviceNet
CPX-FB13	PROFIBUS DP
CPX-FB14	CANOpen
CPX-FB20/21	INTERBUS fibre optic cable (rugged line)
CPX-FB23	CC-Link version 1.0
CPX-FB24	CC-Link version 2.0
CPX-FB32	EtherNet/IP
CPX-FB33	PROFINET (2xM12)
CPX-M-FB34	PROFINET (2xRJ45, CU)
CPX-M-FB35/41	PROFINET (2xSCRJ, FO)/(1xSCRJ, FO)
CPX-M-FB36	Ethernet/IP (integr. switch), Modbus/TCP
CPX-FB37/38	EtherCat (2xM12)
CPX-FB39	SERCOS III
CPX-FB40	Powerlink
CPX-CEC-S1-V3	Front-end controller CODESYS with serial interface, Ethernet: Modbus TCP, EasyIP
CPX-CEC-C1-V3/CPX-CEC-M1-V3	Front-end controller CODESYS with CANopen master, Ethernet: Modbus TCP server, Easy IP. Optional OPC UA interface for Industry 4.0. M1: with CODESYS Softmotion library for motion control in up to 3D
CPX-IOT	Converts up to 31 OPC UA stations to AMQP/MQTT and establishes a secure cloud connection



Perfectly co-ordinated: CPX, specially designed cables and plug connectors, from Festo. For optimum installation, very simple ordering and just one delivery.

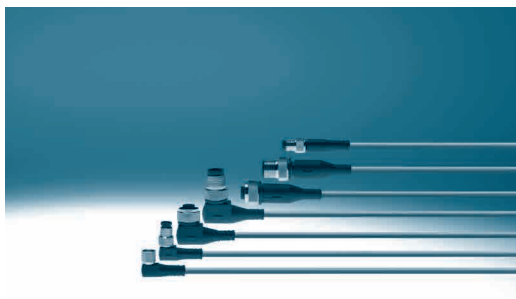


NEDY: T-distributor M12/M12, M8/M8, M12/M8



NEDY: Y-distributor for everything: all combinations M8, M12 from 0.30 to 30 m

Core competency in automation 4.0



Connecting cables as stock items or configured and assembled to your requirements



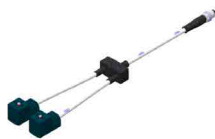
NEBV coil socket



NEBV M12/M8



NEDY: Y-distributor for M8/
M12-solenoid coils, up to 30 m



NEDY: Y-distributor for
Festo solenoid coils,
up to 30 m



NEDY: Y-distributor for solenoid
coils as per standard, up to 30 m

Pneumatic interface	
VMPA-FB-EPL-...	MPA with max. 128 solenoid coils
VMPAL-EPL-...	MPA-L with max. 32 solenoid coils
VABA-S6-1-X1 /-X2	VTSA with max. 32 solenoid coils
VTEM-xxxxx	VTEM Motion Terminal with 4 or 8 valves
Digital I/O modules	
CPX-16DE	16 inputs (PNP)
CPX-16DE-D	16 inputs (PNP) + channel diagnostics
CPX-L-16DE-16-KL-3POL	16 inputs (PNP), 16x terminal strips, 3-pin
CPX-8DE	8 inputs (PNP)
CPX-4DE	4 inputs (PNP)
CPX-4DA	4 outputs (PNP/1 A)
CPX-8DE-8DA	8 inputs (PNP) plus 8 outputs (PNP/0.5 A)
CPX-L-8DE-8DA-16-KL-3POL	8 inputs (PNP) plus 8 outputs (PNP/0.25A), 16x terminal strips, 3-pin
CPX-8DE-D	8 inputs (PNP) + diagnostics
CPX-8NDE	8 inputs (NPN)
CPX-8DA	8 outputs (PNP/0.5 A)
CPX-8DA-H	8 high-current outputs (PNP/2.0 A)
CPX-FVDA-P2	PROFIsafe output module: shut-off module for valve power and 2 additional independent outputs (PNP/1.5 A)
CPX-F8DE-P	PROFIsafe input module: 4/8 fail-safe, digital type 2 inputs PNP/ Cat.4/SIL3. Contacting sensors/OSSD can be connected. Optional: module variant for reliable identification of a CPX on request.
Analogue I/O modules	
CPX-2AE	2 inputs (0/4 ... 20 mA, 0 ... 10 V)
CPX-2AA	2 outputs (0/4 ... 20 mA, 0 ... 10 V)
CPX-4AE-I	4 inputs (12 bit, 0/4 ... 20 mA)
CPX-4AE-U-I	4 inputs, 15 bit (0/4 ... 20 mA, ±20 mA, 0 ... 10 V, ±10 V, ±5 V)
CPX-4AE-TC	4 inputs (12 bit/thermocouple temperature measurement, -270 °C to 1820 °C)
CPX-4AE-T	4 inputs (12 bit/temperature sensor temperature measurement, -200 °C to 850 °C)
CPX-4AE-P	4 inputs (10 bit) as integrated pressure sensor module, 4 absolute/ 2 differential pressures, versions for 1 ... 10 and -1 ... +1 bar
Technology modules	
CPX-2ZE2DA	2 fast inputs (counters), 2 fast outputs, inputs up to 100 kHz/1 MHz at 24 V/5 V, outputs up to 20 kHz (PWM), also as controller for 24 V DC motor
CPX-CM-HPP	Fieldbus gateway, up to 2x4 asynchronous axes
CPX-CMPX	Soft Stop electronic end-position controller, up to 8 pneumatic drives
CPX-CMAX	Servo-pneumatic position controller, up to 8 pneumatic drives
CPX-CMIX-M1-1	Measuring module for cylinders with displacement encoder
CPX-CP-4-FB	Interface for the decentralised installation system up to 512 (4x128) I/O
CPX-CTEL-4-M12-5pol	Master for 4 I-Port participants
CPX-CTEL-2-M12-5POL-LK	IO-Link® interface for two IO-Link® devices

Turning vision into reality with CPX

Bionics – a great source of inspiration

Bionics as an inspiration for Industry 4.0: the collaborative behaviour of ants, collective flight behaviour of butterflies, and the LearningGripper – a self-learning gripper with artificial intelligence – are revealing new ways forward for programming and visionary automation technology, exclusively at Festo.

The BionicCobot is breaking new ground in human-machine collaboration. This is closely connected to the innovation processes in our learning company, and is also part of our dedication to technical basic and further training. Festo is setting trends with its projects, from reliable automation to energy-efficient biomechatronic solutions and green production.

From nature to application: the biomechatronic footprint

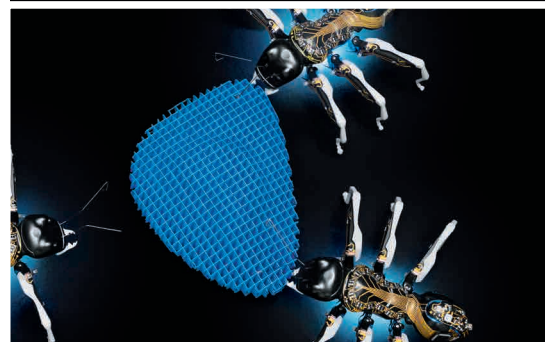
The biomechatronic footprint documents (r)evolutionary developments and improvements in mechatronic products and procedures through bionics. Its path can be traced from nature's examples and their basic technical principles to bionic adaptation and industrial application.

CPX as a link to the future

Festo is taking the lead in industrial automation concepts with the kind of integrated automation seen in CPX. This is no coincidence, but the result of a structured innovation process that generates products such as CPX. CPX's unique versatility, flexibility and numerous function integration options are building a bridge to the future.

BionicCobot

The way the joints of the BionicCobot are arranged resembles a human arm. With its seven-axis robotic kinematics and pneumatic rotary drives it grips and transports payloads of up to 2 kg quickly and easily, powerfully and precisely. Closed-loop control together with flexibility and adaptability recreate the stretching and bending abilities of human muscles. This inherently safe system that is used for human-robot collaboration doesn't require any holding forces. The modular design allows a variety of gripper systems to be fitted for transporting different loads. The BionicCobot is operated intuitively using a tablet, and can be precisely corrected and adjusted via an infrared tracking system. The application is controlled by CPX and the Festo Motion Terminal with 7x2 chambers and a CODESYS controller CPX-CEC with protection to IP65/67 for compact on-site installation – without a control cabinet. The available interfaces include all fieldbuses, Industrial Ethernet and Industry 4.0 standard OPC UA.



Core competency in automation 4.0



The virtually limitless capacities of the CPX for open- and closed-loop control, motion and front-end control and measuring are a real advantage. Its openness to numerous communication modes and concepts, too, has a role to play as it facilitates comprehensive diagnostics and condition monitoring. All this makes CPX an indispensable, integral part of Bionic Learning Network and Future Concepts projects.

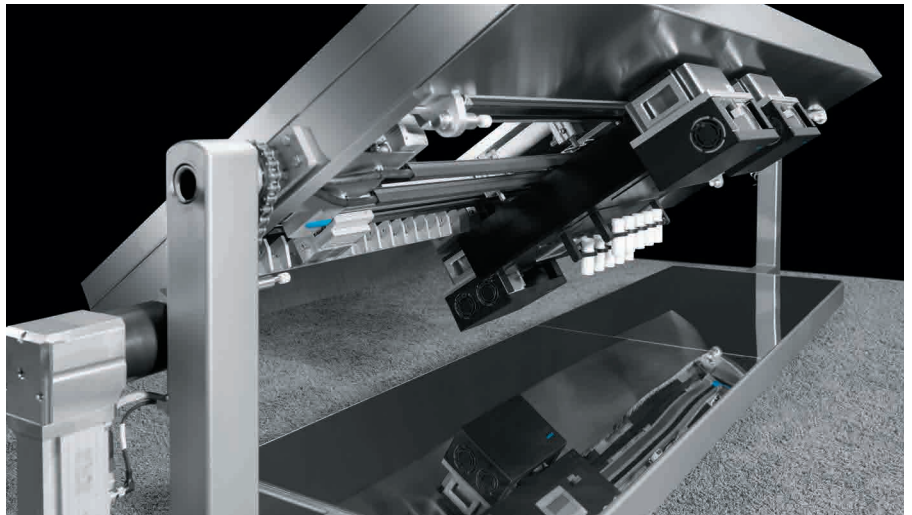
One example:

CPX as SupraMotion 2.0 controller

Superconductors open up completely new opportunities in industrial automation. This is why Festo has been working for several years now with superconductor technology, which enables permanent magnets to be “frozen” at a defined distance once their temperatures have been lowered to around 100 Kelvin (-173 °C). They remain right where

they are, stably suspended over the superconductor. The critical temperature of approx. 100 Kelvin allows active electrical cooling via compressors without the need for cooling media. A cryostat only uses as much energy as a light bulb: 80 watts. In the initial applications shown here, CPX-CEC takes over various control, measuring and communication functions.

Our Future Concepts are therefore tangible visions of the automation of the future, and blaze the trail towards Industry 4.0 thanks to the decentralised intelligence of CPX.



SupraHandling 2.0: linear motion in three mounting positions

Contactless, precise linear motion: the entire system can be rotated by up to 180 degrees around its longitudinal axis. This enables the slides to move along the floor, the wall or overhead, while the containers always remain the right way up.



You have ambitious targets?
You want to achieve more?
We expand your horizons.

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



Industry 4.0 – take the future into your own hands. With CPX and IoT.

Whether your challenges are in factory or process automation, we have a solution platform for both. The unique versatility, modularity and function integration of our automation platform make this possible. And thousands of applications show that it exceeds expectations. It can bring the future closer. CPX every time.

Extensive services for optimal performance

- Expert advice
- Software support during design and commissioning
- Automatic generation of pneumatic circuit diagrams for valve terminals in FluidDraw
- With the Handling Guide Online, you can configure and order your standard handling system in record time.
- Online shop with estimated prices and delivery dates, downloadable CAD data and order documents, drilling templates for configurable products, and tracking of orders and deliveries
- ePLAN function macros for approximately 22,000 products
- Engineering, commissioning and after-sales service
- Festo Didactic: basic and further training for Industry 4.0

Maximum productivity is a question of ambition – both now and for Industry 4.0

Sometimes there is only a small step between a very good result and market leadership. But that step is the crucial one. First-class productivity is part of that step.

If this is your goal, we have the right solutions for you – such as CPX. Whether you are looking for a technically sophisticated system solution or a very economical alternative for components, we are here to support you on the road to success. Ambitious and goal-oriented, with vision and awareness of our responsibilities – everything you expect from Festo and everything we are.