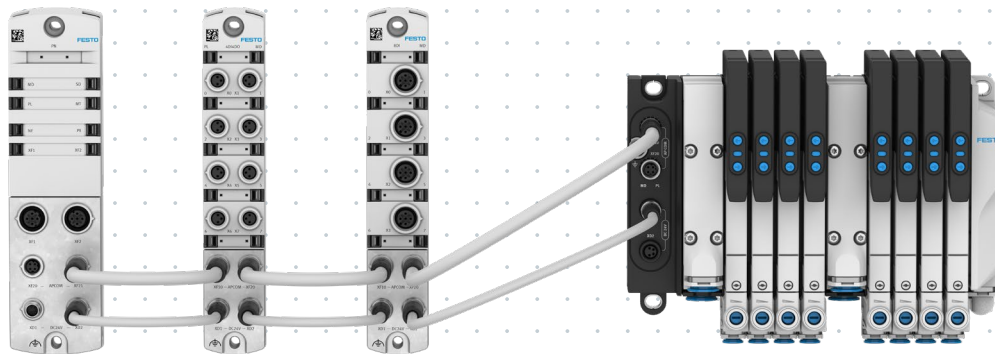




Decentralised remote I/O system CPX-AP-I

Highlights

- Ultralight and compact, yet very sturdy
- IO-Link master and Festo IO-Link® tool
- Short bus cycle times up to 250 µs
- 2 KB I/O process data
- Up to 80 modules including bus interface in line topology, distributed over one or two lines
- Cable lengths up to 50 m between stations
- Best price/performance ratio in combination with valve terminals and decentralised IOs



The new I/O system to IP65/ IP67 allows powerful input/output modules and existing valve terminal interfaces to be integrated into the most important host systems. Based on the innovative AP system communication from Festo and compatibility with market standards, CPX-AP-I ensures seamless communication from the work-piece to the cloud – tailored to your needs!

Technological excellence

A bus cycle time of up to 250 µs and a net data rate of 200 Mbit full duplex make the CPX-AP-I real-time capable and enable up to 2 KB I/O process data. This is ideal for fast and synchronous processes. The extremely flexible system is easily scalable with cable lengths up to 50 m. Load and logic power supply are galvanically isolated, which means that intermediate supplies, voltage zones or safe switch-off of the load voltage are possible.

Welcome to the world of AP

CPX-AP-I lets you connect up to 80 modules, including bus interface, to standard bus systems. Even existing valve terminals can be easily integrated in the system. Connection to the IoT gateway, easy integration and parameterisation of IO-Link® devices, a web server, and in the future the extended range of functions with the software Festo Automation Suite make your system fit for seamless connectivity!



Additional information:

Electric automation
> <https://www.festo.com/ea>

Product page

> <https://www.festo.com/cpx-api>
Online Shop
> [Electrical peripherals online](#)

Engineering tools

> [Festo Automation Suite](#)
> [Engineering tools](#)
> [Connectivity Finder](#)

Support tools

> [Conceptualise and design](#)
> [Assemble and commission](#)
> [Operate and modernise](#)



The CPX-AP-I system

So many benefits for you!

The remote I/O is compatible with all host systems commonly found on the market and, with up to 80 modules, can be flexibly integrated into applications of any scale. With its real-time capability and short bus cycles, the CPX-AP-I is suitable for fast production processes and high-speed data transfer. Its sturdy yet compact and ultra-lightweight design makes it suitable for assembly machines with limited installation space.

It is also perfect for handling and tool changing systems or in mobile applications, for example at the robot front end, where low weight and minimal installation space are crucial. With a cable length of up to 50 m between the individual modules, the CPX-AP-I also comes into its own in systems and intralogistics where long distances need to be covered.

Fieldbus communication

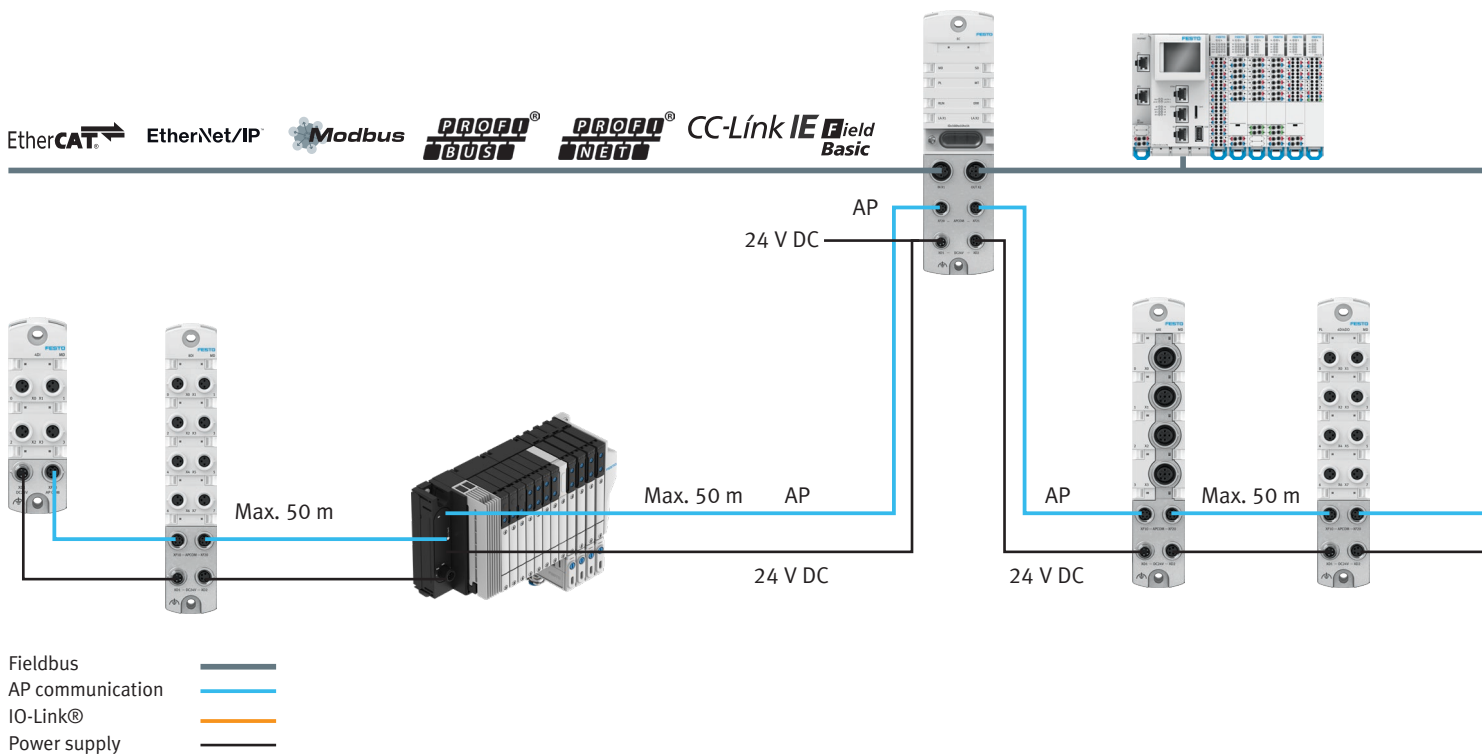
The bus interface is used to connect the CPX-AP-I to the higher-level controller via Ether-

net-based bus protocols as well as EtherCAT® or PROFIBUS.

System topology

Starting from the bus interface, one or two lines can be set up using the daisy chain principle. In

future, there will also be options for star and tree topology.



AP system communication

The new AP communication technology combines a host PLC with IO-Link® devices, digital and analogue inputs and outputs, and data transfer to the cloud in a simple package.

What makes it unique is the direct integration of existing Festo valve terminals into the remote I/O system.

- Simplified engineering without additional software
- Real-time communication to the valve terminal

Power supply concept

The automation system CPX-AP-I has separate cables for communication and power supply as well as two separate circuits.

- Power can be supplied separately for each individual module or shared from module to module as a central supply
- Possible to create different voltage zones
- Stable data transfer

Seamless connectivity is automation without any compromises! Everything is interlinked: from pneumatics to electrics, from the workpiece to the cloud.

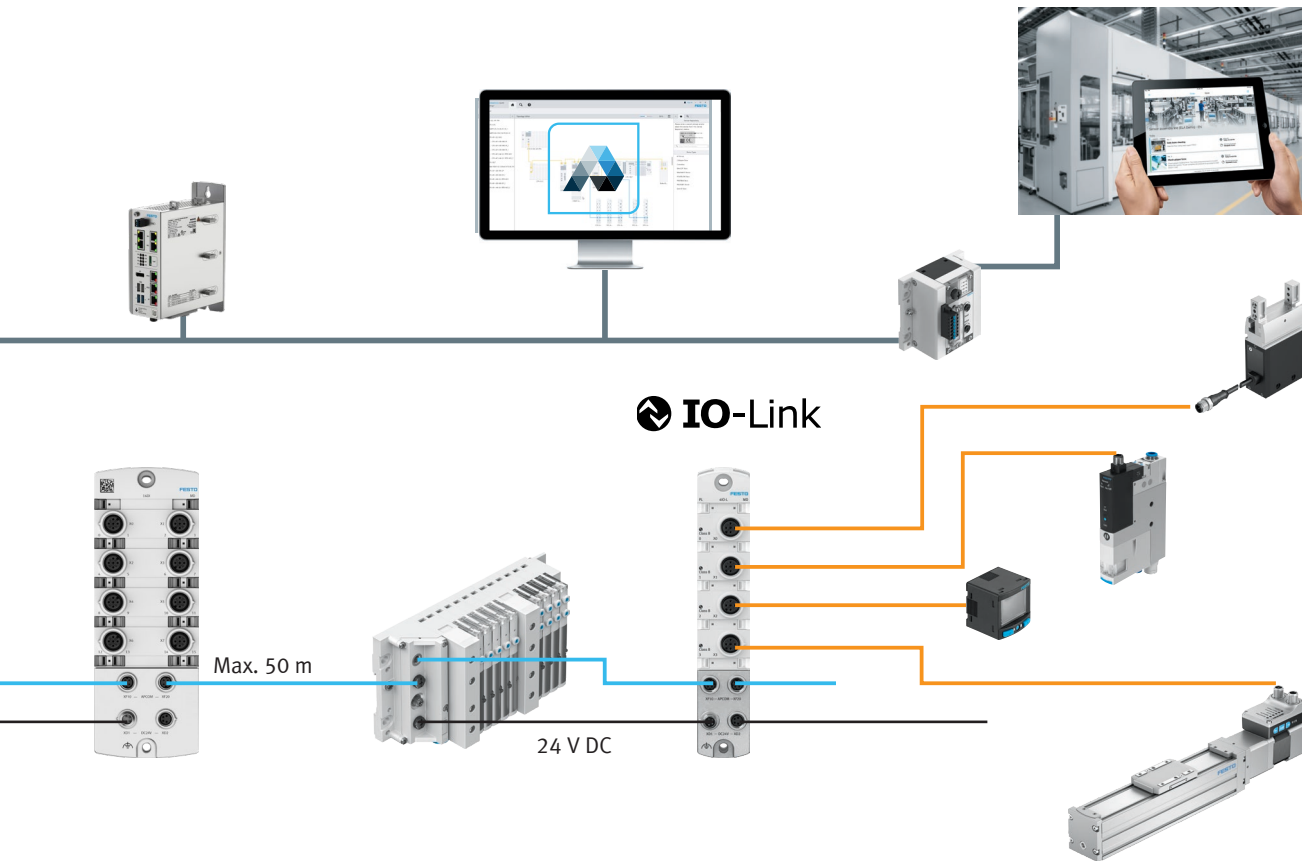
Festo Automation Suite

The integration into the commissioning software enables firmware updates, smart engineering and enhanced diagnostics.

Digitalisation and Industry 4.0

When connected to the IoT gateway from Festo, CPX-AP-I communicates right up to the cloud via standard cloud protocols such as MQTT and OPC UA.

This will make it easy in future to carry out predictive maintenance and condition monitoring.



IO-Link® with CPX-AP-I

Up to four IO-Link® devices per IO-Link master can be integrated into the CPX-AP-I system and several IO-Link masters can be connected to a bus interface.

IO-Link® products from Festo:

- Simplified Motion Series
- Servo drives
- Grippers
- Sensors
- Festo valve terminals
- Proportional pressure regulators
- Vacuum generators

Modules of CPX-AP-I

An automation system CPX-AP-I consists of the bus interface and at least one other input/output module or an IO-Link master. In the system, up to 79 modules can be connected to the bus interface in any combination.

- IO-Link master
- Digital input/output modules
- Analogue input module

- Bus interfaces



The new AP system communication

Seamless connectivity with IO-Link®

No modern, integrated I/O system is complete without IO-Link® connectivity. With CPX-AP-I, the IO-Link master is connected to the bus interface via the AP protocol. This enables seamless digitalisation down to the drives and sensors at the field level. The other way round,

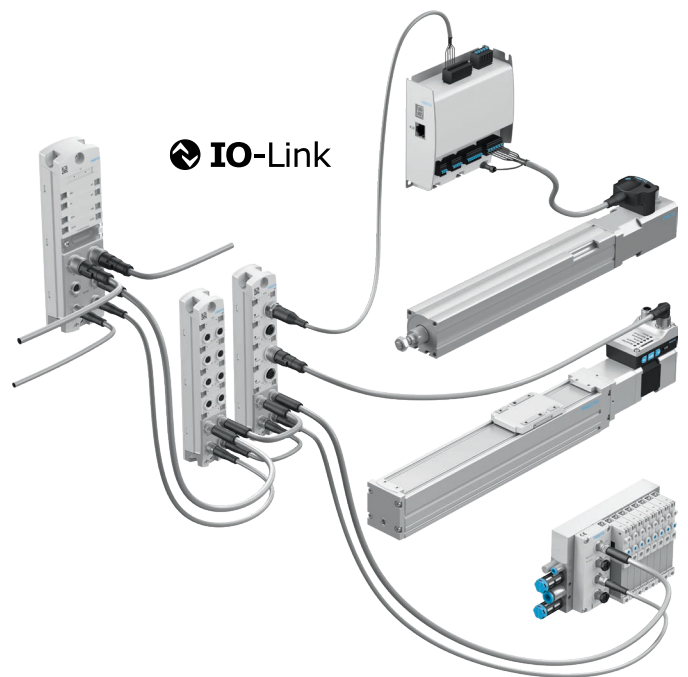
data and parameters relating to the Festo automation platform are transferred to the host PLC or, if the IoT gateway from Festo is being used, to the cloud.

Any devices from Festo and third-party suppliers as well as Festo components with I-Port connection can be connected to the automation system CPX-AP-I via the IO-Link master and the Festo IO-Link® tool. Up to four IO-Link® devices can be connected to the IO-Link master and integrated into the remote I/O system. In theory, it is already possible to have up to 316 IO-Link® devices per bus interface.

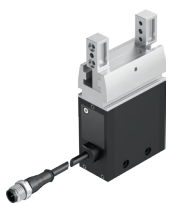
Parameter and master port settings can be conveniently carried out via the software's graphic interface with the help of the Festo IO-Link® tool.

What's more, the IO device descriptions of connected IO-Link® devices are automatically loaded from the IODD finder portal so parameterisation can be carried out with just a few clicks.

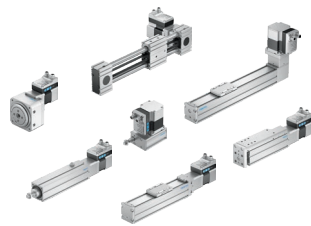
Note: The full functionality of IO-Link® is also available without the Festo IO-Link® tool, in which case it must be programmed using the control software of your choice. To minimise the engineering effort, Festo provides appropriate functions blocks.



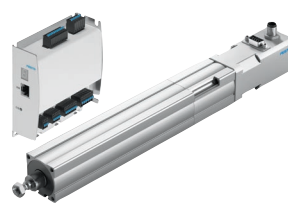
Festo offers the widest IO-Link® product portfolio on the market



Electric parallel gripper EHPS



Simplified Motion Series



Motor controller CMMO-ST and electric cylinder EPCO



Proportional-pressure regulator VPPM



Third-party products with IO-Link®



Sensors for position, pressure and flow rate



Valve terminal

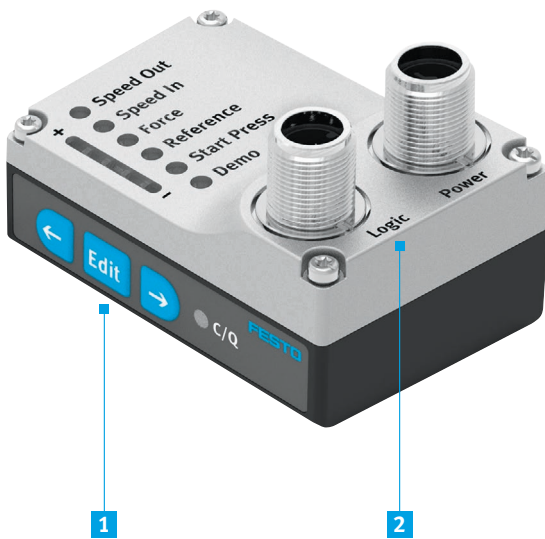


Vacuum generator OVEM

Easy electric automation with Simplified Motion Series and communication with IO-Link®

Simplified Motion Series combines the simplicity of pneumatics with the advantages of electric automation. The integrated drives are the perfect electric alternative for simple linear and rotary movements between two mechanical end positions and do not require the usual

commissioning process for traditional electric drive systems, which can often be quite complex. There is no need for any software since operation is based on the plug and work principle.

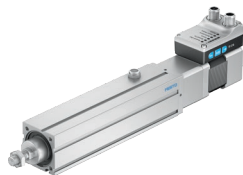


The integrated drive is connected directly to the controller via IO-Link® and offers flexible control including additional functions. Control is also possible via digital I/O (DIO) directly from the controller; however, remote configuration or the additional functions are not then available. Commissioning can be performed quickly and easily without software, computer or other accessories, and without the drive having to be connected to the controller. A 24 V DC power supply is all that is needed, and all parameters are set manually directly on the drive.

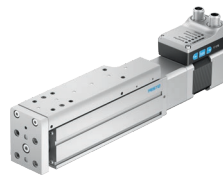
- 1 For commissioning, simply set all relevant parameters directly on the drive:
 - Speed for “out” and “in” movement
 - Force of the drive in the “out” position
 - Setting the reference end position
 - Setting the position “Start force-controlled movement”
 - Manual start (similar to manual override)
- 2 Extended functions via IO-Link® possible:
 - Remote configuration of motion parameters
 - Copy and backup function for transferring parameters
 - Reading function of essential process parameters



Electric cylinder EPCE



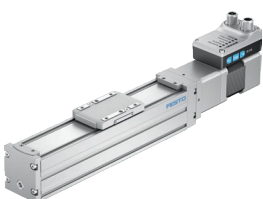
Electric cylinder EPCS



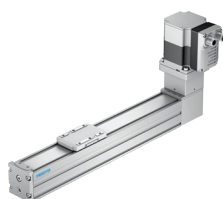
Mini slide EGSS



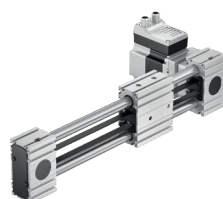
Rotary drive ERMS



Ball screw axis ELGS-BS



Toothed belt axis ELGS-TB



Toothed belt axis ELGE

Note

Simplified Motion Series is designed for movements between two end positions (end to end) and is not suitable for flexible positioning applications.



The new AP system communication

Valve terminals can be integrated directly into the CPX-AP-I system

The AP system communication, included in all future valve terminals from Festo, makes it easy to incorporate these valve terminals into your application. Right now, existing valve terminal series like VTUG or MPA-L can already be easily and directly integrated into the system via their AP interface. They can additionally be upgraded with new func-

tions like a switching cycle counter or load voltage monitoring. It will also be possible to connect them to the cloud. This will pave the way for the use of intelligent tools such as dashboards for preventive maintenance and condition monitoring.



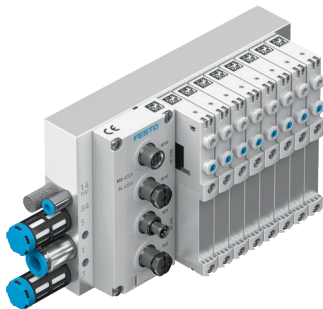
Valve terminal VTUX with AP interface VABX-AP

Valve terminal VTUX

The VTUX sets a new standard in terms of material, modularity and communication. The successor to the established CPV, MPA-L, MPA-S and VTUG offers an impressively high flow rate and, with the AP-I and AP-A communication systems, is the ideal platform for digitalised production!

Highlights

- High flow rates of up to 730 l/min
- Lightweight, made of high-performance polymer
- Extremely flexible to use and highly modular for communication and machine concepts
- Vacuum integration with solutions for a wide range of tasks
- Integrated, space-saving switching position feedback directly assigned to the pneumatics
- Open for future developments
- In summary, it combines all the benefits of CPX, MPA and VTUG in one platform



Valve terminal VTUG with AP interface VAEM-AP

Valve terminal VTUG

VTUG is a state-of-the-art valve terminal with a high flow rate and numerous valve functions and options as well as with up to 24 valve positions. In addition to the option of control with IO-Link®, the AP interface VAEM-AP also allows the valve terminal VTUG to be operated as an integral component of the automation system CPX-AP-I.

Highlights

- Low-cost fixed grid
- Extremely easy to assemble
- Exchangeable electrical actuation
- IO-Link® capable
- Valves VUVG with individual electrical connection can be integrated
- Also available with pneumatic multi-pin
- Energy-efficient thanks to reverse operation and targeted pressure reduction
- Optimised and space-saving variant available for installation in control cabinets
- Variants with hot-swap connections: valves can be replaced during operation
- Variants recommended for production systems for manufacturing Li-ion batteries



Valve terminal MPA-L with AP interface VMPAL-AP

Valve terminal MPA-L

The MPA-L with its sub-bases made from polymer technology is highly modular and attractively priced as well as very robust and resistant to corrosion. Aside from IO-Link® and a variety of fieldbus interfaces, a particularly striking feature of MPA-L is the AP interface VMPAL-AP, which enables the direct integration of the MPA-L into the CPX-AP-I automation system.

Highlights

- Valve terminal with sub-base in polymer technology.
- Maximum modularity
- System can be extended as required with individual sub-bases and modular tie rods
- Polymer sub-base
- 3 valve sizes
- Tamper-proof fixed flow restrictor
- Fieldbus interface via CPX
- IO-Link® capable

Note

All valve terminals with IO-Link® interface such as VTOC, VTUB and CPV can be connected to the IO-Link master of CPX-AP-I via IO-Link®.

Ready for digitalisation in the age of Industry 4.0

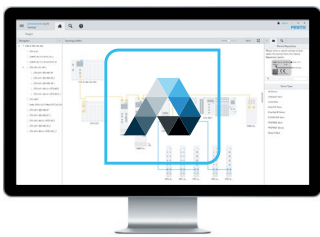


- Predictive maintenance
- Condition monitoring

When connected to the IoT gateway from Festo, CPX-AP-I will communicate via standard cloud protocols such as OPC-UA and MQTT. The data provided by this for cloud/edge applications can be used for enhanced diagnostic options, optimised maintenance and reduced downtimes as well

as to increase the overall equipment effectiveness (OEE). The great thing about it is that the system's real-time capability is not affected by handling big data. Smart predictive maintenance features are already available, for example switching cycle counter, cable length indication and load

voltage monitoring. The diagnostic portfolio is continuously extended, for example with helpful features such as cable quality and actuator travel time monitoring, additional commissioning aids as well as extended connectivity functionalities.



Festo Automation Suite

- Smart engineering
- Enhanced diagnostics

Parameterisable I/O modules help to ensure that each application is individually optimised with CPX-AP-I. Cross-communication between the modules opens up entirely new options for fast applications and decisions.

When you integrate the platform into the Festo Automation Suite commissioning software in the future, engineering, condition monitoring and diagnostics will also be easier for you.

Seamless communication with all common host environments is possible at any time – even without engineering tools from Festo!

Technical data for the decentralised remote I/O system CPX-AP-I at a glance

CPX-AP-I	
Net data rate	200 Mbit full duplex (400 Mbaud)
Process data	2 KB input/output
Number of AP modules in the system	Up to 500, from market launch: 80 including bus interface
Connecting cables	Pre-assembled, standard CAT6e, 4-pin, D-coded M8 connectors for communication and power Cable length: up to 50 m, from market launch: up to 15 m
Topology	Daisy chain as line (from market launch, later also star and tree topology)
Assembly/installation	Mounting: Assembly from above or on the side of the module Any mounting position: lying or sideways/inverted
Power supply	24 V DC, additional supply possible at each module 2x 4 A, separate load/logic supply
Diagnostics	Module- and channel-specific diagnostics on site via LED or via bus interface: Network error, module status monitoring, monitoring of system communication, IO-Link® events Voltage monitoring, power supply to electronics/sensors and load Over/undervoltage load, short circuit, overload
IP protection	IP65/IP67



Decentralised remote I/O system CPX-AP-I

Fieldbus modules



PROFINET fieldbus module CPX-AP-I-PN-M12

- Webserver
- Isochronous real-time (IRT)
- Fast start-up (FSU)
- Redundancy mechanisms MRP, MRPD, S2
- Support for LLDP, DCP, CiR, SNMP, SNTP
- Electrical connection M8x1, 4-pin



PROFIBUS fieldbus module CPX-AP-I-PB-M12

- Class 1 and Class 2 capable
- Electrical connection M8x1, 4-pin



EtherNet/IP™

EtherNet/IP fieldbus module CPX-AP-I-EP-M12

- Webserver
- QuickConnect
- Redundancy mechanism DLR
- Modbus TCP
- CIP sync (in the future)
- Electrical connection M8x1, 4-pin



EtherCAT®

EtherCAT® fieldbus module CPX-AP-I-EC-M12

- EtherCAT® profiles: CoE, EoE, FoE
- Fast Hot Connect, distributed clocks
- Electrical connection M8x1, 4-pin

Fieldbus modules



CC-Link IE Field Basic

CC-Link fieldbus module CPX-AP-I-CCB

- CC-Link IE Field Basic
- SLMP
- Electrical connection M8x1, 4-pin

IO-Link master



IO-Link

IO-Link master CPX-AP-I-4IOL-M12

- IO-Link master Class B
- Festo IO-Link® tool
- 2 A output current per port (4 A total current of all ports)
- Electrical connection M12x1, 5-pin

I/O module



Digital input modules CPX-AP-I-4DI-M8-3P

- 4-way compact module
- M8 connection technology
- Smallest and lightest I/O module on the market

CPX-AP-I-8DI-M12-5P CPX-AP-I-8DI-M8-3P

- 8-way module
- Electrical connection M12x1, 5-pin or M8x1, 3-pin
- Parameterisation of input debounce time



Analogue input module CPX-AP-I-4AI-U-I-RTD-M12

- Measuring range/method:
 - 0/4 ... 20 mA, 0 ... 10 V,
 - 1 ... 5 V, ± 5 V, ± 10 V,
 - PT100/Ni100, 500 Ω
- 16-bit analogue value
- 1 ms cycle time
- Linear scaling
- Electrical connection M12x1, 5-pin



Digital input/output modules CPX-AP-I-4DI4DO-M12-5P CPX-AP-I-4DI4DO-M8-3P

- Isolated outputs
- 0.5 A nominal current per output
- Electrical connection M12x1, 5-pin or M8x1, 3-pin



Digital output module CPX-AP-I-8DO-M12-5P

- 8-way module
- Electrical connection M12x1, 5-pin



Digital output module CPX-AP-I-8DO-M8-3P

- 8-way module
- Electrical connection M8x1, 3-pin



Digital input module CPX-AP-I-16DI-M12-5P

- 16-way module
- Electrical connection M12x1, 5-pin
- PNP (positive switching)



Digital input module CPX-AP-I-16DI-M8-3P

- 16-way module
- Electrical connection M8x1, 3-pin
- PNP (positive switching)



Digital input module CPX-AP-I-16NDI-M8-3P

- 16-way module
- Electrical connection M8x1, 3-pin
- NPN (negative switching)



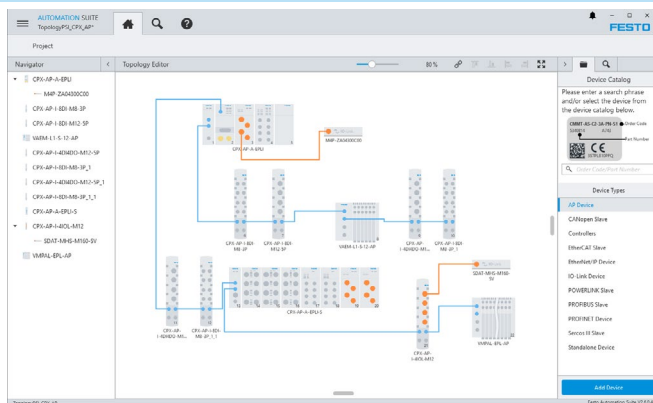
Festo Automation Suite: Quick and easy commissioning of remote I/O systems CPX-AP-A and -AP-I

The quick and easy commissioning of complete system topologies with remote I/O systems is at the heart of the Festo Automation Suite. The intuitive user interface makes configuring and parameterising topologies child's play. This applies to the CPX-AP remote I/O systems as well as to many valve terminals and IO-Link® devices such as actuators and sensors, but also to all electromechanical servo drive solutions. Other key advantages include, for example:

- “Forcing” of process data without controller and complex programming during commissioning
- Updating the device firmware
- Access and download the device description files
- Direct access to manuals

- Graphically supported, easy and convenient offline configuration of the CPX-AP-A remote I/O or online scanning
- Configuration and parameterisation of the entire topology with all stations across the AP string and all IO-Link® devices.
- Direct access to device firmware, description files, and manuals

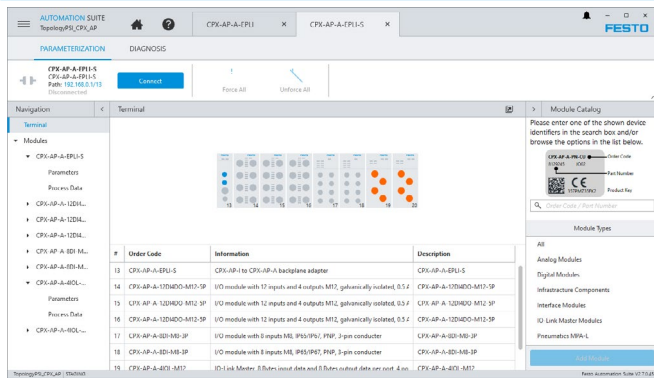
Topology editor



With the Festo Automation Suite, the entire CPX-AP remote I/O topology of the machine project can be configured clearly and graphically offline in no time. The AP modules are added via drag and drop using the so-called device catalogue (device catalogue/types) in the right sidebar and, if necessary, are automatically connected to the previously selected device. This can be seen in the screenshot, for example, by the blue line of the AP bus. This not only saves you time, but also minimises configuration errors. Furthermore, other devices connected to the CPX-AP system, such as IO-Link® devices, can also be conveniently parameterised.

- Quick and easy configuration and display of the CPX-AP topology
- Data export of module configuration and parameter settings for control systems
- Overview of device status in online mode
- Parameterisation of connected IO-Link® devices such as electric drives of the Simplified Motion Series, sensors, vacuum generators OVEM or pneumatic proportional valves VPPM, etc.

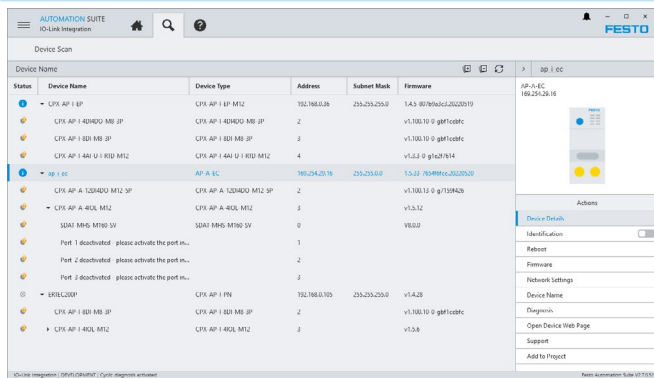
Configuration of the CPX-AP-A terminal



Configure CPX-AP-A terminals graphically, but also move, delete or add modules. Process data can be "forced" directly in the plug-in during pre-commissioning to perform an I/O check – all without controller and complex programming.

- Convenient configuration of the CPX-AP-A terminal using a graphics-based configurator
- Quickly adjust module parameters on the parameter pages
- Monitoring and "forcing" process data during commissioning with I/O checks
- Reading diagnostic messages

Scan of the AP-A and AP-I systems



In the online scan view, the Festo Automation Suite recognises connected devices and displays them in the listed order. The network settings of the devices can be configured in the sidebar. In addition, the scan view allows the firmware for the CPX-AP modules to be updated and product-specific manuals and device description files can be accessed under the "Support" tab. In the scan view, you can also conveniently import connected devices into the project. This increases efficiency when setting up and configuring automation systems.

- Convenient and multi-stage scan of all connected devices (complete topology)
- Comparison of the target and actual configuration of the entire topology string of the CPX-AP
- Integration of the imported devices into the project
- Updating the device firmware and downloading the device description files

Online configurator



Download Festo Automation Suite for free now

- PC-based software
- Designed to be intuitive and user-friendly
- Clearly structured with a graphical user interface
- Download now for free

