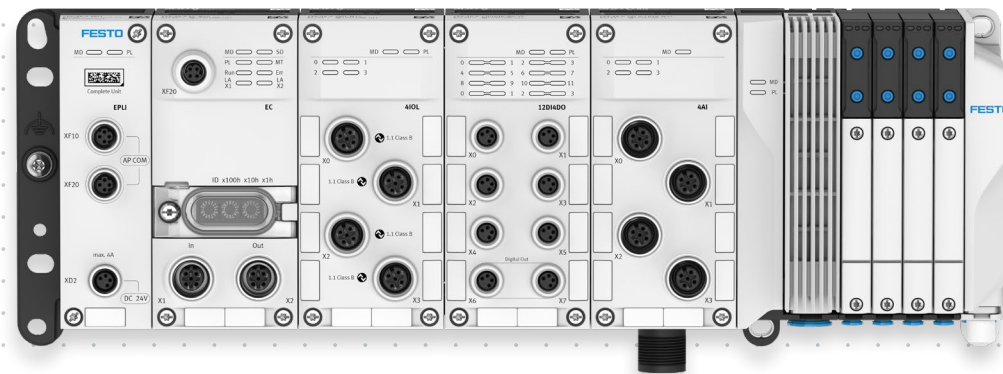




# Modular remote I/O system CPX-AP-A

## Stand-alone system or with valve terminal



### Highlights

- Highly flexible remote IO system in IP65/IP67
- Stand-alone system or in combination with a valve terminal from Festo
- Various I/O modules and IO-Link® are available, including for electric drives
- Maximum level of performance thanks to AP communication in real time: 200 MBaud and 250 µs cycle time
- Simple and convenient configuration, quick commissioning of the entire AP system architecture

The lightweight CPX-AP-A remote I/O system is integrated directly into Ethernet-based networks that are available worldwide. A variety of additional input and output modules as well as IO-Link master modules are also available. Pneumatic valve terminals and proportional technology as well as controlled pneumatics that are adapted directly or integrated via AP communication, can be used to create a scalable system topology. Electric drive technology for linear and rotary movements can be connected via IO-Link®.

### Modular

The complete terminal with up to 15 modules forms the backbone of state-of-the-art automation systems that are open for future developments. The CPX-AP-A is highly flexible, both in terms of electrics and mechanics thanks to I/O modules, flexible connection technology, valve terminals and a variable voltage concept. The AP communication combines modular and decentralised structures that are freely scalable in terms of terminal size and range of functions to match the requirements of the application.

### Highly communicative

The AP communication takes place in real time with a transmission rate of 200 Mbit full duplex and processes a large amount of incoming and outgoing process data of 2 kByte each. An AP communication system comprises up to 80 modules, including I/O modules and IO-Link master modules with powerful point-to-point communication from the CPX-AP-A and AP-I controlling valve terminals and sensors.



#### Additional information:

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

#### Product page

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

#### Engineering tools

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

#### Support tools

> [Conceptualisation and design](#)  
> [Assembly and commissioning](#)  
> [Operation and modernisation](#)



## The Automation Platform for real-time performance at a glance

Unrestricted and seamless connectivity, embedded in future-ready and compatible concepts for the flexible automation of complete machines or individual machine modules. That is why Festo offers mechanical, electric and intelligent automation modules that work

together perfectly and do not impose any technical restrictions. This includes mechanics, complete servo drive systems, state-of-the-art communication and control concepts as well as digitalisation with suitable cloud solutions.

### Combined on the Automation Platform (AP)

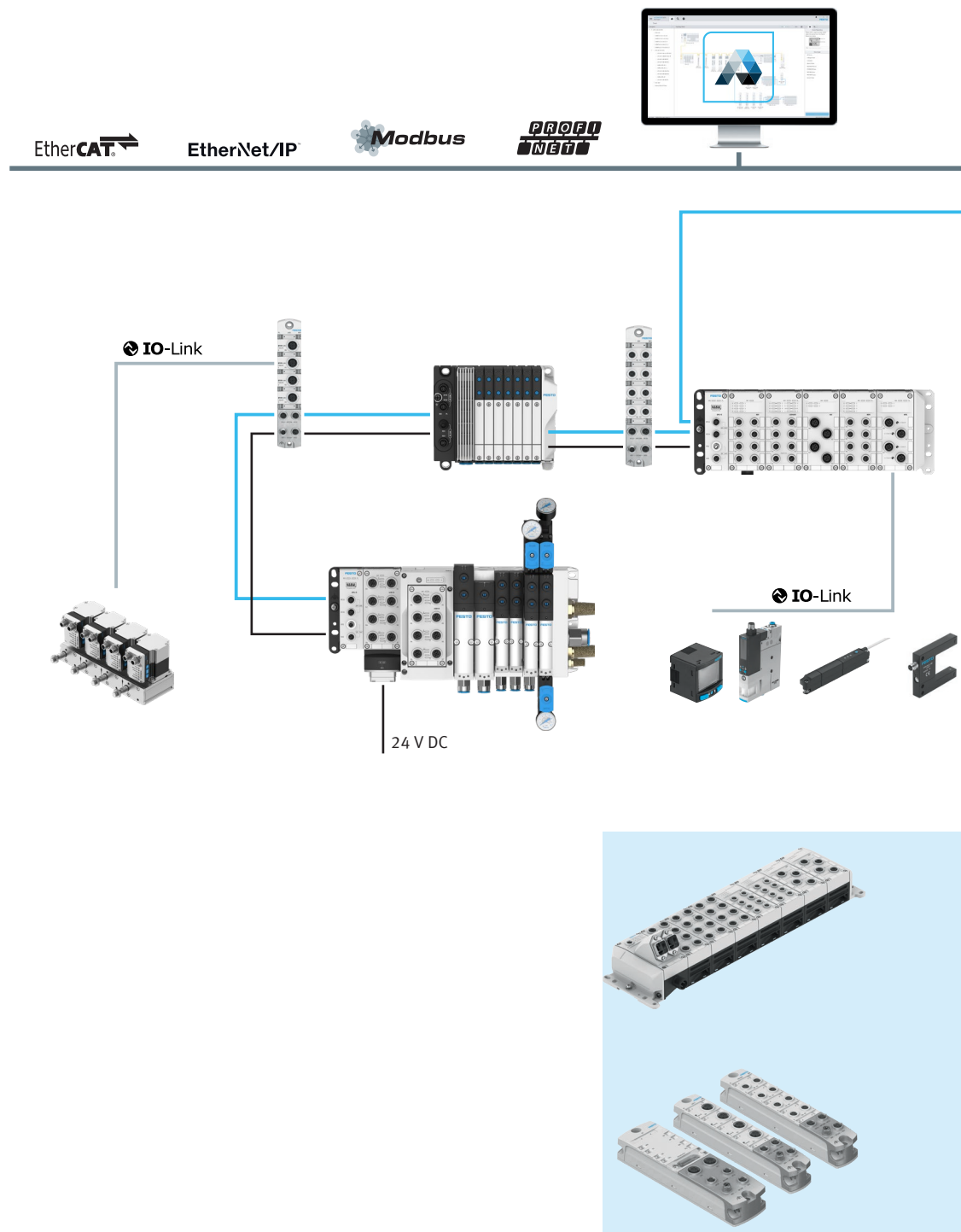
The Automation Platform (AP) from Festo forms the basis for a new generation of remote I/O systems that enables a freely scalable, flexible and powerful system architecture. The AP uses a hybrid approach to combine modular CPX-AP-A and decentralised CPX-AP-I structures. Remote I/O and control technology are thus combined with electric and pneumatic automation technology to create a comprehensive architecture.

### Combined with pneumatics

Many of the valve terminals from Festo, such as VTUX and VTUG, MPA-L and VTSA, can be very flexibly integrated into the system using AP communication. They are either connected directly to the CPX-AP-A, or integrated into a decentralised system as a stand-alone valve terminal using the AP interface. In addition, all IO-Link-capable valve terminals can be integrated into the AP via IO-Link master. This means that both CPX remote I/O systems and AP communication allow the valve terminals to be freely and flexibly integrated in the machine architecture.

### Combined with electric drives

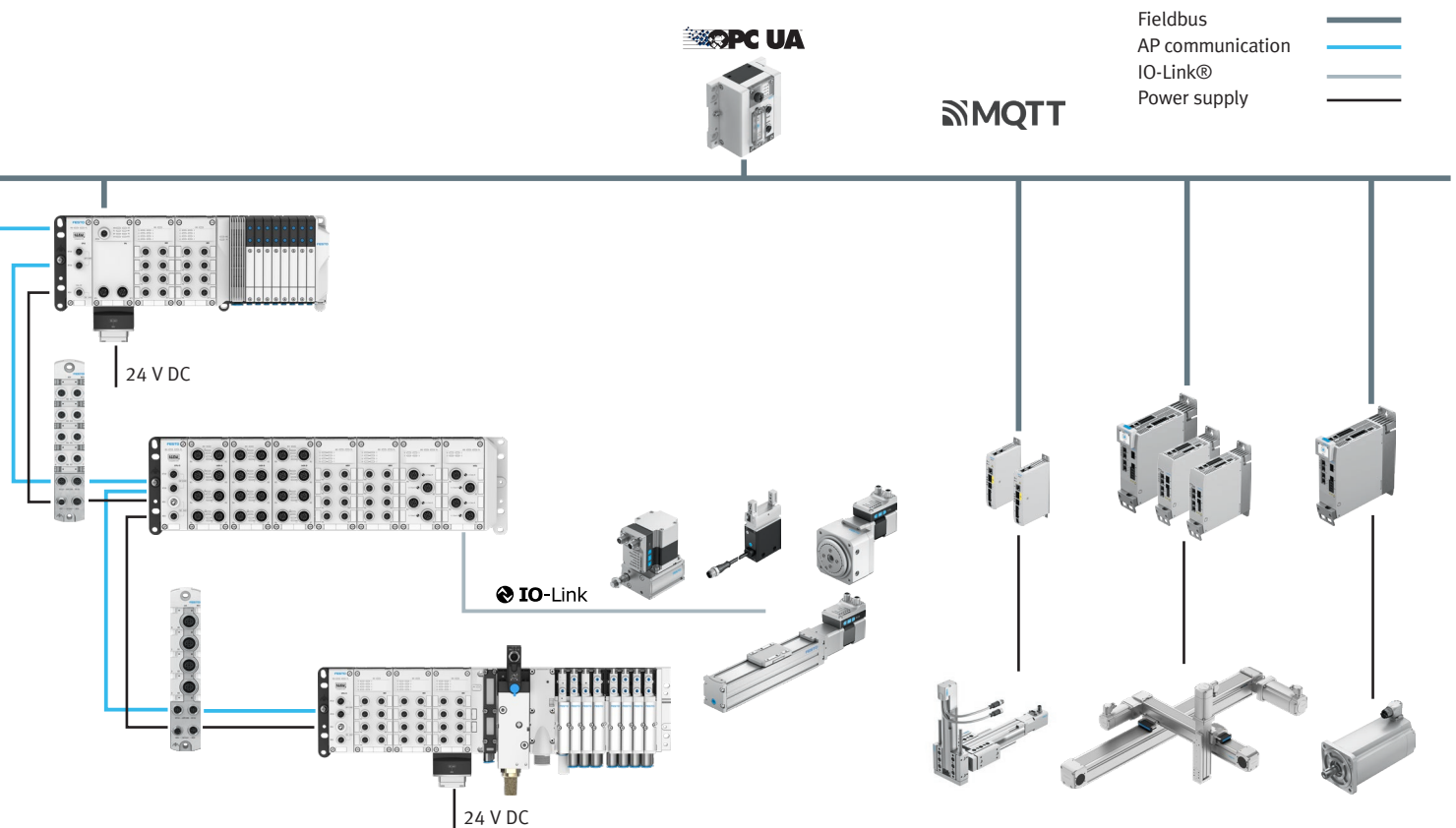
All electric drives from the Simplified Motion Series can be connected directly to the remote I/O systems via IO-Link®. A wide variety of linear and rotary electric movements can thus be an integral part of technology-independent automation concepts based on AP and can be flexibly integrated into different networks.





"You can adapt the automation architecture of your machine to your individual design philosophy at low cost and with little effort. With seamless connectivity from Festo, you can freely combine remote I/O systems with electric and pneumatic automation, and you are always supported by suitable engineering tools."

Samuel Haas  
Product Management Controls, Festo SE & Co. KG



**Real-time performance:  
modular remote I/O system CPX-AP-A**

The modular system combines valve terminals and decentralised CPX-AP-I modules in line or star typologies to create modern system architectures; it also communicates with many other products, such as electric drives, vacuum generators and proportional valves, via IO-Link master.

**Built-in performance:  
decentralised remote I/O system CPX-AP-I**

The individual, high-performance I/O modules are either integrated into the higher-level network via the fieldbus module or decentrally connected to the CPX-AP-A via AP communication, and supplemented by valve terminals with AP interfaces and electric drives via IO-Link®.

**A few technical highlights**

- Real-time communication with a data rate of 200 MBaud and a cycle time of up to 250 µs
- Wide range of modules, e.g. digital I/O up to 16-way, 32-way in future, analogue inputs, IO-Link master, fieldbus interfaces, etc.
- Protection class IP65/67 for direct installation in the machine
- Decentralised system with a cable length of up to 50 m between the AP participants

**A few technical highlights**

- Very sturdy line topology with up to 80 ultralight and compact modules in one or two lines
- Flexible system design with decentralised I/Os and valve terminals.
- Protection class IP65/67 for direct installation in the machine
- Cable length of up to 50 m between the AP participants



## Modular remote I/O system CPX-AP-A

### Machine concept requirements

- Very compact and simple machine with a small footprint
- Simple machine layout and short distances to the drives
- Remote I/O as a central communication node in the machine
- Control cabinet as small as possible

### The benefits to you of CPX-AP-A

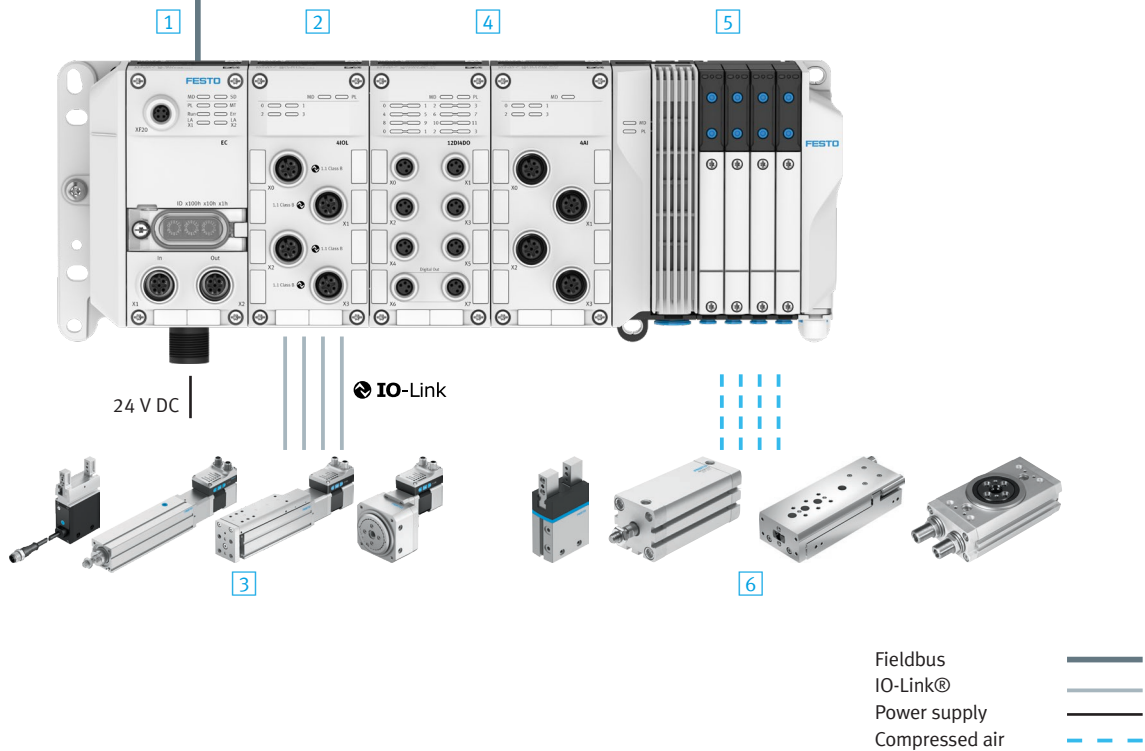
- Simple and clear machine concept with remote I/O in IP65/67 installed centrally in the machine
- Cost-efficient design with only 1 fieldbus module
- IO-Link master for connecting any devices from Festo and other manufacturers
- Short cables and tubing to the electric and pneumatic drives and sensors
- Very small control cabinet ensures a compact machine design

EtherCAT

EtherNet/IP

Modbus

PROFINET



- 1 Fieldbus module
  - For communication in Ethernet-based networks
  - The module can be positioned freely, independent of the system supply
- 2 IO-Link master
  - For exchanging data with any decentralised IO-Link® devices at field level
  - Module for 4 devices
- 3 Electric drives and grippers
  - Simplified Motion Series for linear and rotary movements
  - Electric grippers

- 4 Input and output modules
  - All modules can be freely connected in series and combined as required
  - Digital and analogue input and output modules
- 5 Valve terminal VTUX
  - Highly modular valve terminal in two sizes
  - Flow rate of up to 670 l/min
  - Optional vacuum function
- 6 Pneumatic drives and grippers
  - Linear and rotary actuators
  - From parallel to angle grippers

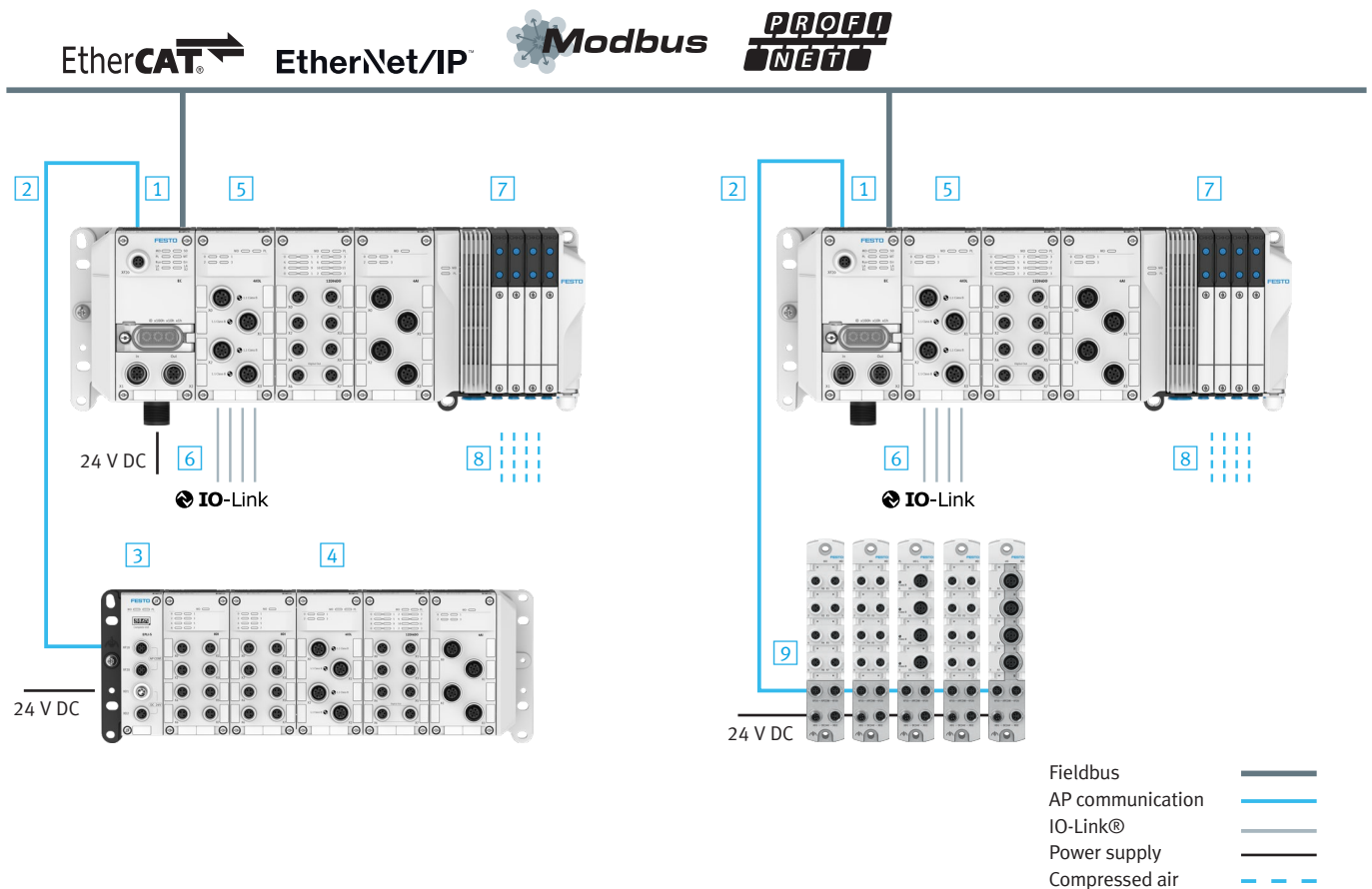


### Machine concept requirements

- Compact machine with a large number of external inputs and outputs
- Simple, cost-efficient machine layout and short distances to the drives
- Remote I/O as a central communication node in the machine
- Control cabinet as small as possible

### The benefits to you of CPX-AP-A

- Simple and clear machine concept with remote I/O systems in IP65/67 installed directly in the machine
- Second remote I/O system, modular with the CPX-AP-A or decentralised with individual CPX-AP-I modules
- Cost-efficient design with only 1 fieldbus module on the CPX-AP-A and without additional FB nodes in the decentralised AP string
- IO-Link master for connecting any devices from Festo and other manufacturers
- Short cables and tubing to the electric and pneumatic drives and sensors
- Small control cabinet and compact machine design thanks to decentralised installation of IP65/67 components



- |  |  |   |
|--|--|---|
| <p><b>1</b> Fieldbus module</p> <ul style="list-style-type: none"> <li>– Communication in the Ethernet network</li> <li>– Freely positionable, independent of the system supply</li> </ul> <p><b>2</b> AP communication in real time</p> <ul style="list-style-type: none"> <li>– AP interface on the fieldbus module for additional AP participants</li> </ul> <p><b>3</b> AP interface</p> <ul style="list-style-type: none"> <li>– Intelligent end plate with AP communication input/output</li> <li>– Voltage supply for the remote I/O</li> </ul> | <p><b>4</b> Stand-alone remote I/O CPX-AP-A</p> <ul style="list-style-type: none"> <li>– All I/O modules can be freely connected in series and combined as required</li> </ul> <p><b>5</b> IO-Link master for 4 devices</p> <ul style="list-style-type: none"> <li>– For exchanging data with any decentralised IO-Link® devices at field level</li> </ul> <p><b>6</b> Electric drives and grippers</p> <ul style="list-style-type: none"> <li>– Simplified Motion Series for linear and rotary movements</li> <li>– Electric parallel grippers</li> </ul> | <p><b>7</b> Valve terminal VTUX</p> <ul style="list-style-type: none"> <li>– Highly modular valve terminal in two sizes</li> <li>– Flow rate of up to 670 l/min</li> <li>– Optional vacuum function</li> </ul> <p><b>8</b> Pneumatic drives and grippers</p> <ul style="list-style-type: none"> <li>– Linear and rotary actuators</li> <li>– From parallel to angle grippers</li> </ul> <p><b>9</b> Remote I/O modules CPX-AP-I</p> <ul style="list-style-type: none"> <li>– Decentralised input and output modules</li> <li>– IO-Link master module</li> </ul> |
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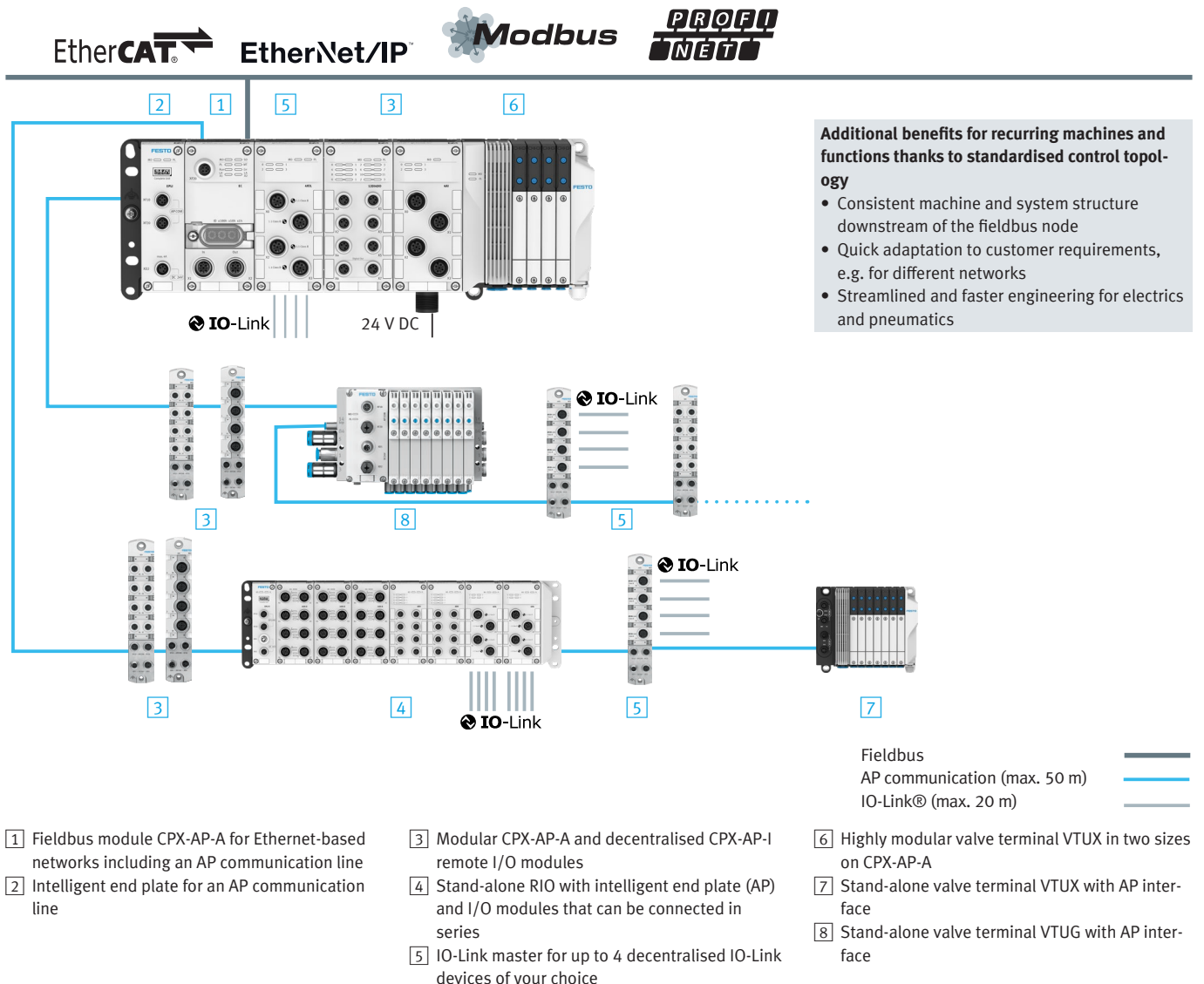
## Decentralised remote I/O system architecture: CPX-AP-A and CPX-AP-I in combination

### Machine concept requirements

- Large machines or interlinked system modules with decentralised topology
- Remote I/O with fieldbus interface as a central communication node in the machine or system
- Large number of external inputs and outputs as well as numerous movements
- Decentralised communication strings to allow shorter cables and tubing to the drives and sensors
- Cost-efficient concept with simple and clear topology

### The benefits to you of CPX-AP-A

- Clear and cost-efficient machine and system concept
- Only 1 fieldbus node for reduced overheads
- Decentralised system topology with several AP communication strings in IP65/67 to allow short cables and tubing to the electric and pneumatic drives and sensors
- Each AP string can be freely combined: CPX-AP-A and CPX-AP-I remote I/O modules, as well as valve terminals with AP interface
- IO-Link master for connecting any devices from Festo and other manufacturers
- Simplified assembly and reduced control cabinet installation requirements facilitate a compact machine and system design



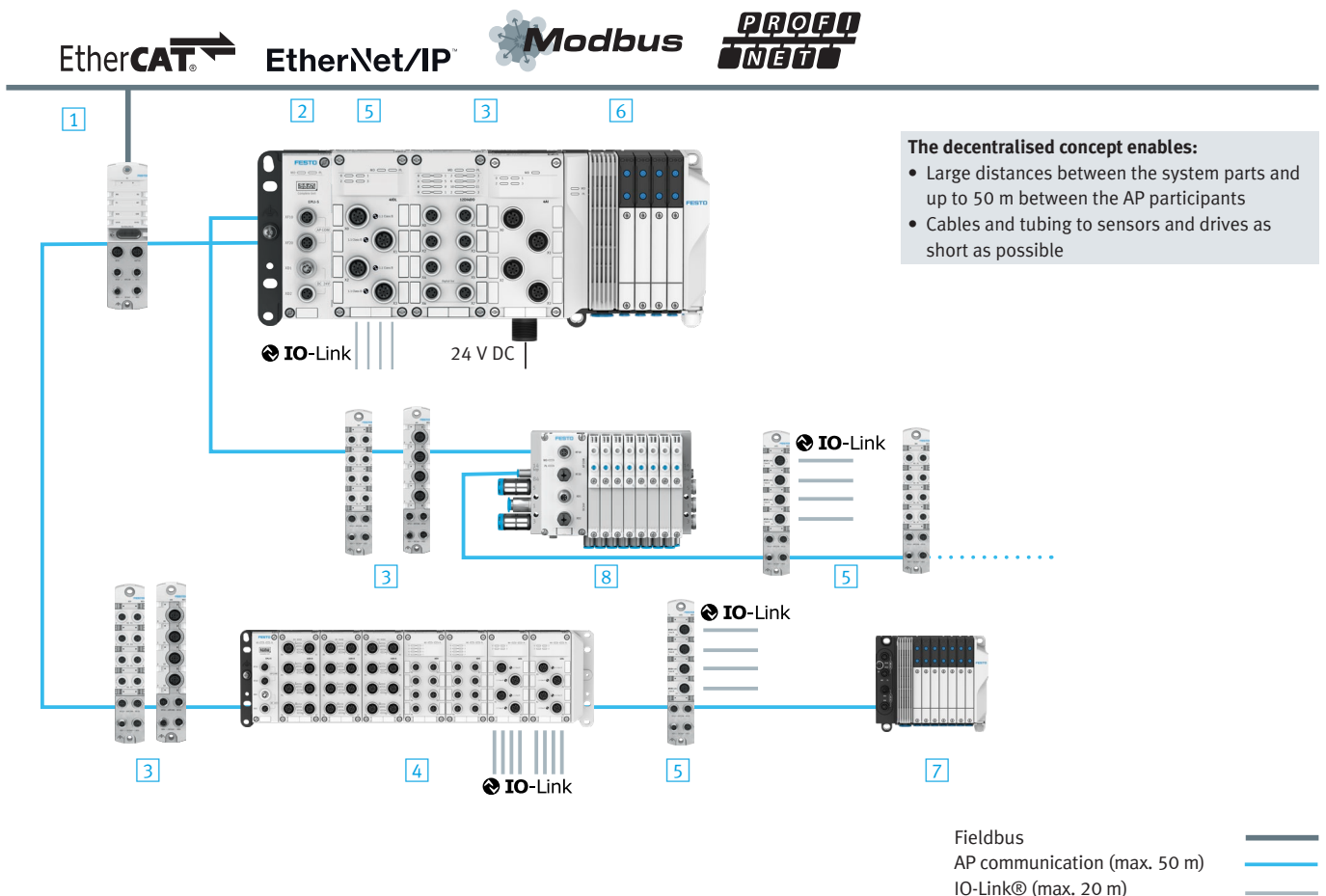


### Machine concept requirements

- Extensive, networked systems or intralogistics solutions with a large number of external inputs and outputs and individual movements
- Decentralised IP65 system technology without control cabinet and with multiple communication strings
- Remote I/O with fieldbus interface as central communication node
- Short cables to sensors and electric and pneumatic drives
- Cost-efficient layout with simple, clear topology and low installation effort
- Real-time communication with all participants

### The benefits to you of CPX-AP-A

- Extensive topologies with a clear, cost-efficient layout
- Only 1 fieldbus node of the decentralised remote I/O system CPX-AP-I required to ensure reduced overheads and real-time communication with all AP participants
- Each AP string can be freely combined: CPX-AP-A and CPX-AP-I remote I/O modules, as well as valve terminals with AP interface
- IO-Link master for connecting any devices from Festo and other manufacturers
- Reduced installation effort thanks to very short cables and tubing to the electric and pneumatic drives and sensors
- Can be realised entirely without a control cabinet thanks to IP65/67 components



**The decentralised concept enables:**

- Large distances between the system parts and up to 50 m between the AP participants
- Cables and tubing to sensors and drives as short as possible

- |   |  |   |
|---|--|---|
| <p>1 Fieldbus module CPX-AP-I for Ethernet-based networks and two AP communication lines</p> <p>2 Intelligent end plate with AP communication interface</p> <p>3 Modular CPX-AP-A and decentralised CPX-AP-I remote I/O modules</p> | <p>4 Stand-alone RIO with intelligent end plate (AP) and I/O modules that can be connected in series</p> <p>5 IO-Link master for up to 4 decentralised IO-Link devices of your choice</p> <p>6 Highly modular valve terminal VTUX in two sizes on CPX-AP-A</p> | <p>7 Stand-alone valve terminal VTUX with AP interface</p> <p>8 Stand-alone valve terminal VTUG with AP interface</p> |
|---|--|---|



## Modularity at a glance

The remote I/O system CPX-AP-A is all about modularity. The modules can be combined and positioned as required and they can be arranged to suit your control concept. Rearranging them later on is not a problem either, and can be done mechanically or during commissioning and programming using the Festo Automation Suite. All I/O modules, the IO-Link master and especially the fieldbus module

provide this high degree of flexibility. All modules can be freely positioned, independently of the power supply and possible voltage zones. This high level of modularity applies equally to electric and pneumatic systems, with the most being important being the valve terminals.

### 1 Intelligent end plate

Cost-effective and compact AP communication interface on the stand-alone RIO or RIO terminal with valve terminal

- For connection with other AP participants
  - Modular RIO terminal CPA-AP-A
  - Decentralised RIO modules CPX-AP-I
  - Valve terminals with AP interface
- Two variants for 24 V DC power supply
  - Only voltage output for additional AP participants, internal power supply with system supply at the RIO terminal
  - Voltage input for the RIO and voltage output for other AP participants without valve terminals
- Mounted in place of the left-hand end plate

### 2 Input and output modules

All modules can be combined as required and can be flexibly connected in series.

- Digital 8/16-way input and output modules, in future also 32-way
- Analogue 4/8-way input and output modules
- Various connection technologies: M8 and M12, in future also push-in connection (IP20)

### 3 Interlinking module

The modules without power supply forward voltage and communication from one module to the next and to the valve terminal.

### 4 LEDs for diagnostics

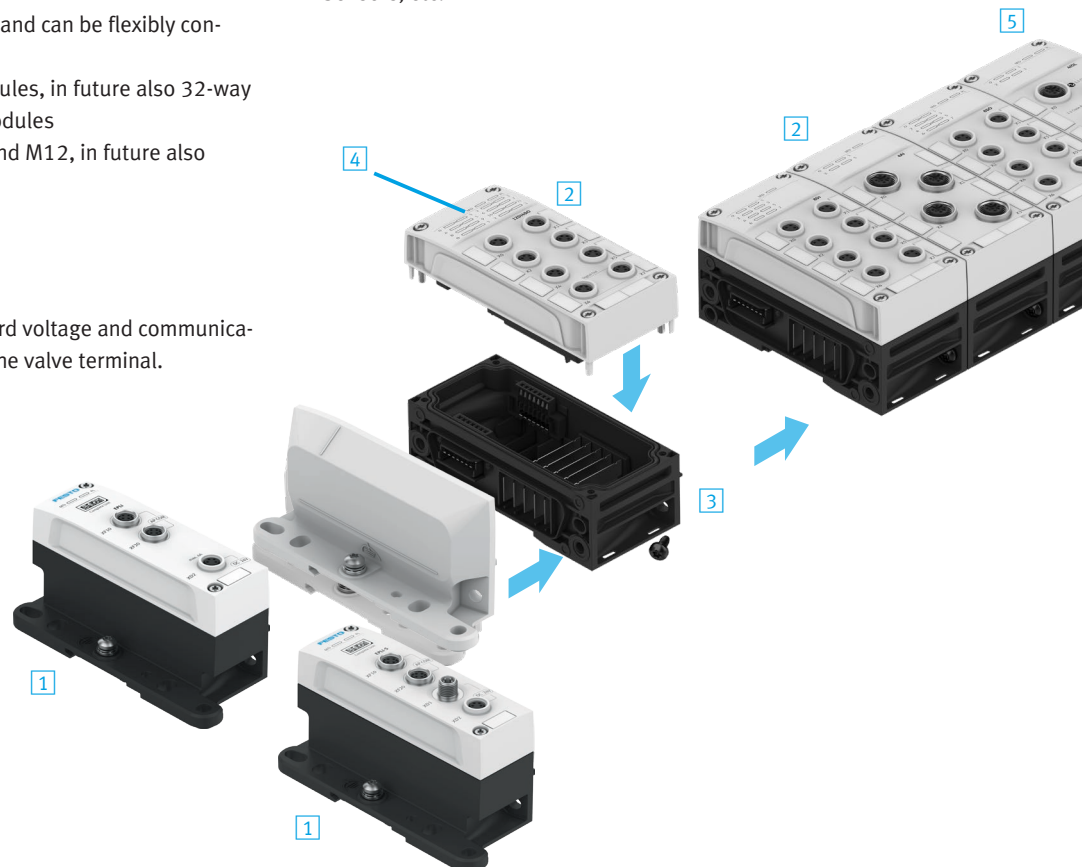
Module-specific LEDs indicate the operating status of the module or the connected sensors and actuators, such as

- Communication
- Power supply
- Channel status
- Input/output diagnostics

### 5 IO-Link master

For exchanging data with any decentralised IO-Link® devices at field level, such as

- Electric drives
- Proportional valves
- Vacuum generators
- Sensors, etc.







#### 6 Fieldbus module

- The CPX-AP-A is connected to a higher-level control system via the bus interface for communication in Ethernet-based networks connects.
- High data transfer rate
- Transmission of non-real-time-critical information, e.g. for diagnostics and configuration
- Sufficient Ethernet bandwidth to transmit real-time and non-real-time data in parallel
- The position of the module can be freely selected, regardless of the 24 V DC system supply.

#### 8 Pneumatic interface

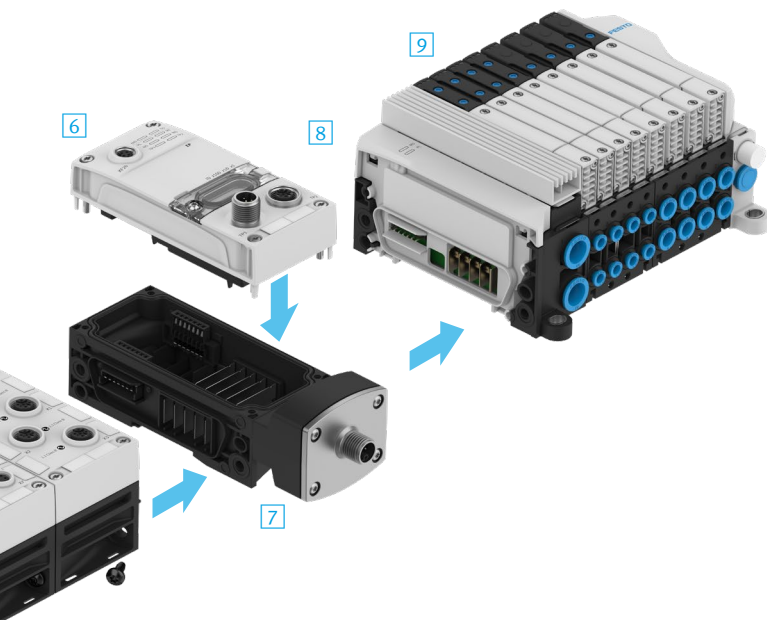
The pneumatic interface is the mechanical adapter between the RIO modules and the attached valve terminal

- Interfaces for VTUX and MPA-S
  - Integrated flat plate silencer
  - Compressed air supply port
  - Internal auxiliary pilot air / external auxiliary pilot air
- Interface for valve terminals VTSA
  - Module position for any CPX-AP-A module, e.g. bus interface, I/O module, IO-Link master
  - Optional voltage supply and voltage forwarding
  - Short-circuit shutdown, short-circuit diagnosis

#### 9 Valve terminal variants

There is a choice of different valve terminals. These are permanently connected to the modular RIO via their pneumatic interface:

- Highly modular: VTUX
- Very compact: MPA-S
- Sturdy and powerful: VTSA



#### 7 Interlinking module with power feed

24 V DC supply voltage is fed into the CPX-AP-A via the interlinking modules and reliably forwarded to the CPX-AP-A modules and the valve terminal:

- Electronics of the automation system CPX-AP-A (system voltage)
- Inputs, outputs and valves (load voltage)

In addition, there are special variants for supplying outputs, as well as valves for creating voltage zones. The electronics are still supplied by the main power supply:

- Supply to the right
- Supply to the left only

In each case, one side is separated from the other. There are also interlinking modules with 24 V DC forwarding supply. These supply additional AP participants or external components.

#### Material selection

The modules and interlinking blocks are made of sturdy, high-quality polymer with fibreglass.

- Flame retardant and halogen-free, e.g. for welding
  - High electromagnetic compatibility
  - Light in weight
  - Without epoxy resin, environmentally friendly and easily recyclable
- Metal is used wherever necessary because of standard requirements or for assembly.
- Metal screw connections on the system supply
  - Metal sleeves for shielding on plug connectors
  - End plates and pneumatic interfaces between the electrical system and valve terminal

#### Assembly of the CPX-AP-A remote I/O

The interlinking blocks are made of high-quality polymer with fibreglass and are mechanically connected using screws instead of tie rods.

- The connection can be undone and fastened again several times.
- The RIO terminal can therefore be flexibly expanded at any time.

#### Maximum number of modules per terminal: 15

These consist of a fieldbus, intelligent end plate, inputs and outputs, IO-Link master.



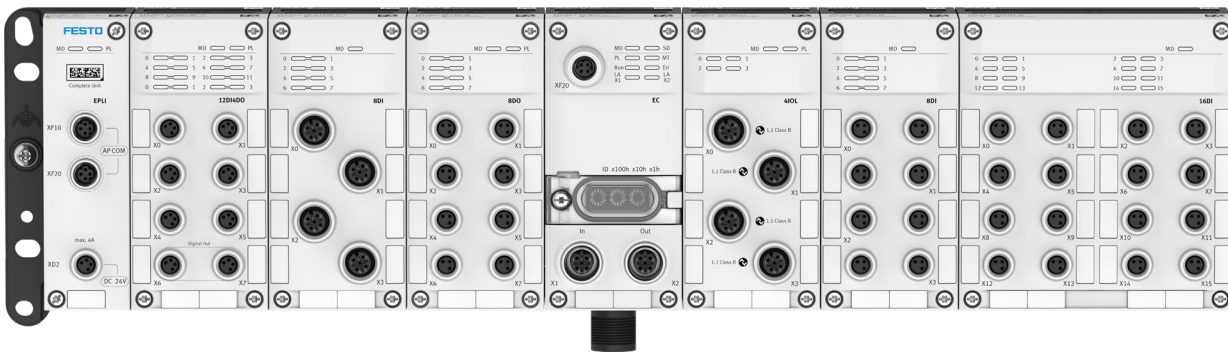
## A complete terminal: modular remote I/O plus directly adapted valve terminal

Up to 15 modules in IP65/67 can be integrated into the modular remote I/O CPX-AP-A. Together with the connected valve terminals, which are also available as industry and application-specific versions, this creates a complete terminal with a high level of functional integration. This terminal can be installed directly in the machine, both in terms of the electrics and the pneumatics.

It can be quickly, easily and reliably configured and commissioned as a single unit in the Online Shop using the Festo Automation Suite. The product is delivered fully assembled and always fully tested.

### 3 Highlights

- 1 terminal: electric RIO and pneumatic valve terminal
- Many I/O modules and valve terminal types to choose from
- Configuration, ordering, delivery and assembly as a full-service unit



The advantages of this combination speak for themselves: the remote I/O with the valve terminal represents 1 component that you can simply install directly in the application. This makes your system layout clearer, as everything is centralised in one place in the machine. And seamless engineering from initial configuration through to commissioning greatly reduces your workload.

- Freely selectable module sequence
- 1 type code for RIO and VI
- Delivered fully tested
- Simple, direct access to the machine
- Clear machine layout
- Cost-efficient design

### A technical sensation with many highlights

- Remote I/O with protection class IP65/67
- Up to 15 modules in the RIO, connected in series as required
- Communication via Ethernet-based fieldbus and AP communication
- 4/8-way input and output modules, in future also 32-way
- Freely positionable voltage supply
- Separated system voltage and load voltage
- Intermediate supply for voltage zones
- Power forwarding for other system components
- Lightweight thanks to sturdy, high-quality polymer with fibreglass
- Application-optimised valve terminal variants
- Full range of functions and valve terminal range in every size
- Pneumatic interface with diagnostics LED and special additional features for each valve terminal type
- Fully tested, electrically, mechanically and pneumatically
- Digitalisation of pneumatics all the way to the cloud via AP



### Valve terminal VTUX – maximum functionality and modularity

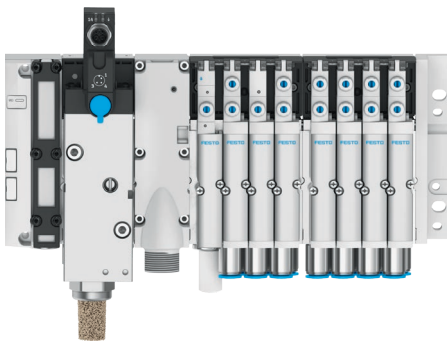


- 10 mm wide, compact spool valves
- Valve functions: 5/2, 5/3 and 2x 3/2-way
- Up to 128 valve coils per terminal

Compact and lightweight: the versatile, highly modular valve terminal VTUX is ideal for electronics and battery production. The valves and the two sub-base sizes can be positioned in any order within the terminal. There are two sub-base sizes: compact and high-flow. The high-performance valve size offers a maximum flow rate of up to 670 l/min with different tubing diameters.

- Sub-bases: 2 sizes for up to 670 l/min with tubing diameters of 6 and 8 mm
- Sub-base: individual for maximum modularity, 4-way block in fixed grid for even greater cost-efficiency

### Valve terminal MPA-S – compact and versatile



- Valve functions: 5/2, 5/3 and 2x 3/2, as well as 2x 2/2-way with special functions
- Up to 128 valve functions / 64 valve positions
- Two sizes with max. 360 or 670 l/min
- Proportional pressure regulator and pressure sensor 0 ... 10 bar

The compact and versatile valve terminal MPA-S with aluminium base plates offers two valve sizes, and can be mixed and matched on the valve terminal. There is also an option to integrate functions for proportional valves, pressure sensors as well as vertical stacking. Manual override and the two-colour diagnostics LED on each valve ensure reliable commissioning.

- Vertical stacking with valve pressure shut-off plate, manual pressure regulator with pressure gauge
- Pressurised zones, additional exhaust air and multiple power supply points are possible

### Valve terminal VTSA – standardised and versatile



- Many valve variants with multiple functions: 5/2, 5/3 and 2x 3/2, as well as 2x 2/2-way with special functions
- Up to 96 solenoid coils in multiple voltage zones (VTSA-F-CB-AP)
- High flow rate range from 550 ... 2,900 l/min

This flexibly configurable valve terminal is sturdy and durable, and is available in several sizes in accordance with ISO 15407-2 / 5599-2 (VTSA-FB-AP) or as flow-optimised variant (VTSA-F-FB-AP / VTSA-F-CB-AP). Four sizes can be mixed and matched without an adapter plate. The VTSA features various options for function integration, innovative functional modules (pneumatic and mechanical) and numerous safety functions.

- Comprehensive vertical stacking, e.g.
  - Pressure regulating plates on one or both sides, with pressure gauge
  - Throttle plates and pressure shut-off plates
- Option to create multiple pressure zones thanks to additional supply and exhaust plates



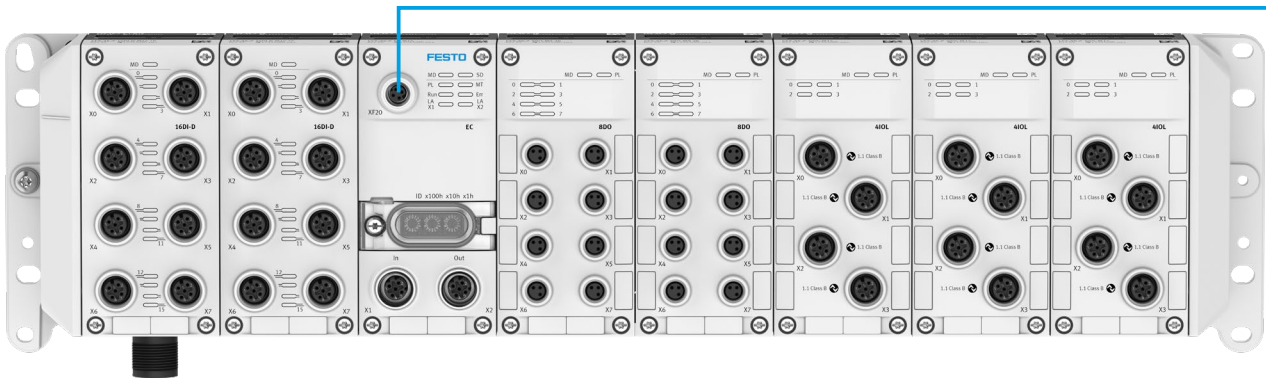
## Decentralised architecture: modular remote I/O stand-alone system plus valve terminals via AP communication

The modular stand-alone RIO CPX-AP-I communicates with up to 15 modules in real time. The valve terminals are connected via AP communication. Thanks to protection class IP65/67, the RIO and the terminals can be directly installed in the machine, even in the case of industry- and application-specific valve terminals.

Configuration of the individual modules in the Online Shop is flexible, quick, easy and reliable, while they can all be commissioned together via the Festo Automation Suite.

### 3 Highlights

- The modular stand-alone RIO and pneumatic valve terminal communicate in real time
- Wide range of I/O modules and valve terminal types to choose from
- Quick and easy commissioning of all participants as a system using the Festo Automation Suite



Designing the electric and pneumatic machine structure is straightforward. The decentralised installation of the valve terminal close to the consumer in the machine ensures a clear layout. Overheads are reduced as only 1 fieldbus is required for all AP participants to communicate with the higher-level control system. Last but not least, commissioning of all communicating devices is very simple and carried out with a single tool, the Festo Automation Suite.

- Consumer-optimised machine layout
- Flexible electric (remote I/O) and pneumatic (valve terminal) system design
- Cost-efficient design and reduced overheads
- Real-time communication of all AP participants
- Joint commissioning using 1 tool

### A technical sensation with many highlights

- Remote I/O with protection class IP65/67
- Up to 15 freely stackable modules in the RIO
- Communication with the higher-level control system via Ethernet-based fieldbus
- AP communication between the RIO and the valve terminal and other AP participants
- 4/8-way input and output modules, in future also 32-way
- 24 V DC voltage input and forwarding on the AP interface for electronics and valves
- Freely positionable voltage supply on the RIO
- Voltage forwarding for other system components on the RIO
- Lightweight thanks to sturdy, high-quality polymer with fibreglass
- Application-optimised valve terminal variants
- Full range of functions and valve terminal range in every size
- AP interface on valve terminal with AP input and output
- Fully tested, electrically, mechanically and pneumatically
- Digitalisation of pneumatics all the way to the cloud via AP



### Valve terminal VTUX with AP interface



The extremely modular valve terminal is characterised by its compactness and low weight, while the glass fibre-reinforced, high-performance polymer material makes the valves and sub-base sturdy enough for use in harsh conditions. The compact and high-flow versions are available with a high-performing valve size for two sub-base sizes. The VTUX is suitable for electronics and battery production.

- 10 mm valve width on the sub-base with 8 mm tubing and a flow rate of up to 670 l/min
- Valve functions: 5/2, 5/3 and 2x 3/2-way
- Up to 128 valve coils per terminal
- Individual sub-base for maximum modularity and 4-way block in fixed grid for even greater cost-efficiency

### Valve terminal MPA-L with AP interface



The compact, flat and modular valve terminal MPA-L is equipped with high-performance valves in a sturdy metal housing. The three valve sizes, the numerous options for vertical stacking, the additional supply and exhaust can be flexibly combined on the MPA. Commissioning is very reliable thanks to the manual override and LEDs for diagnostics.

- Three sizes with a flow rate of up to 870 l/min
- Wide range of functions
  - 5/2, 5/3, 3/2 and 2 x 2/2-way valves
  - Pressure regulator plate, pressure shut-off plate, supply plate for 1 valve position
- Flexibly configurable up to 32 solenoid coils
- Choice to position the compressed air supply and exhaust air on the end plate or on the side for a more compact design

### Valve terminal VTSA with AP interface



The versatile and configurable standard valve terminal VTSA offers many optional function integrations and safety functions. The 4 valve sizes can be combined on a valve terminal without an adapter plate. Up to 96 solenoid coils can be fitted in several voltage zones on one valve terminal VTSA. Thanks to its sturdy and durable components the VTSA is also suitable for demanding industrial applications.

- Numerous valve variants with a wide range of functions: 5/2, 5/3 and 2x 3/2 as well as 2x 2/2-way valves
- Large variety of vertical stacking options
- Supply and exhaust plates for multiple pressure zones are available

### Valve terminal VTUG with AP interface



The compact valve terminal VTUG with sub-base and semi in-line valves is available in 3 sizes. The sturdy and durable valves have an LED indicator and manual override. Up to 24 valves with reduced power consumption can be installed on a single valve terminal.

- Three sizes with a flow rate of up to 1,200 l/min
- Valve functions: 5/2, 5/3, 3/2 and 2x 3/2-way valves
- Various sub-bases for semi in-line and sub-base valves
- For sub-base valves in control cabinet installation: optional downwards outlet direction of the working ports

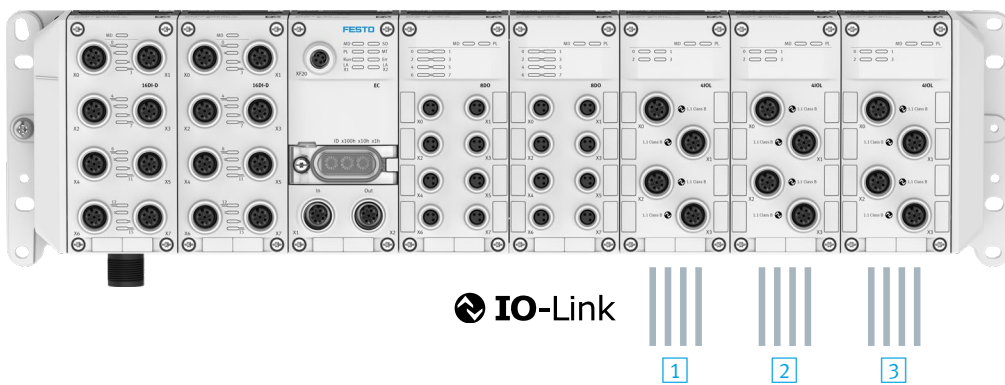


## Powerful, decentralised point-to-point communication: modular remote I/O system with IO-Link Master

The modular RIO CPX-AP-I can accommodate up to 15 I/O modules and IO-Link master modules on one terminal, either as a stand-alone system or with a valve terminal. Thanks to IP65/67, the system can be installed directly in the machine and then configured and commissioned using the Festo Automation Suite. The device descriptions (IODD) are readily available in the tool. Simply download these and then parameterise the system using the IO-Link® plug-ins

### 3 Highlights

- Modular RIO stand-alone system with up to 4 devices per IO-Link master module
- You can search for and directly download device descriptions (IODD) in the Festo Automation Suite
- Fast and convenient commissioning as a system using the Festo Automation Suite



### IO-Link® configuration

The IO-Link® tool and the IO-Link® extensions are already integrated in the Festo Automation Suite (FAS). Search for the relevant device descriptions (IODD) in the FAS search field, download them and save them in the repository. All you have to do now is configure the IO-Link® product in the FAS, and to parameterise it using the corresponding IO-Link plug-ins. Done! This applies to all IO-Link® products from Festo, but also to products from other manufacturers. You can find out more about the Festo Automation Suite on page 20.

### 1 Integrating pneumatic components into AP communication via IO-Link®

There are many aspects to realising cost-efficient pneumatics: product costs, installation costs, compressed air consumption, as well as process speed and cycle times. All these costs are lower the closer to the consuming device the compressed air distribution is located, and production is more efficient. The aim of modern automation should be to realise small, decentralised solutions that are positioned as closely to the consuming device as possible.

#### Proportional pressure regulator VPPM with IO-Link®



The VPPM can be selected as an individual valve or sub-base valve for different pressure ranges. It is characterised by high dynamic response and great repeat accuracy. Digital setpoint and actual values as well as diagnostics are transmitted via IO-Link® and fieldbus.

- Multi-sensor control for improved regulation accuracy and dynamics
- Choice of regulation characteristics

- Flow rate of up to 7,000 l/min and adjustable pressure range of 0.02 ... 10 bar

#### Vacuum generators OVEM with IO-Link®



The compact OVEM generates the required vacuum on site and monitors the set evacuation and ejection times. The air saving function minimises compressed air costs. The adjustable ejector pulse enables the workpiece to be set down precisely and reliably.

- Short switching times thanks to integrated solenoid valves
- Monitoring by a vacuum sensor and output of automatic error messages

- Maintenance-free operation and reduced noise level thanks to an integrated, open silencer with an inspection window



### Valve Terminals

#### VTUX with IO-Link®



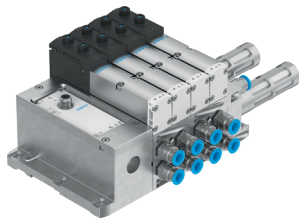
Compact and lightweight: the versatile, highly modular valve terminal VTUX is ideal for electronics and battery production. The valves and the two sub-base sizes can be positioned in any order within the terminal. There are two sub-base sizes: compact

and high-flow.

- 10 mm wide valves with a flow rate of up to 670 l/min on a sub-base with  $\varnothing$  8 mm tubing connection
- Valve functions: 5/2, 5/3 and 2 x 3/2-way

- Individual sub-base for maximum modularity and 4-way block in fixed grid for even greater cost-efficiency

#### VTSA with IO-Link®

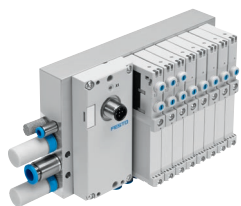


The versatile and configurable standard valve terminal VTSA offers many optional function integrations and safety functions. Thanks to its sturdy and durable components the VTSA is also suitable for demanding industrial applications.

- Numerous valve variants with a wide range of functions: 5/2, 5/3, 2 x 3/2 and 2x 2/2-way valves

- High flow rate range from 550 ... 2,900 l/min
- Large variety of vertical stacking options

#### Valve terminal VTUG with IO-Link®



The sturdy and durable valves of the compact valve terminal VTUG have an LED indicator and manual override. Up to 24 valves with reduced power consumption can be installed on a single valve terminal.

- Three sizes with a flow rate of

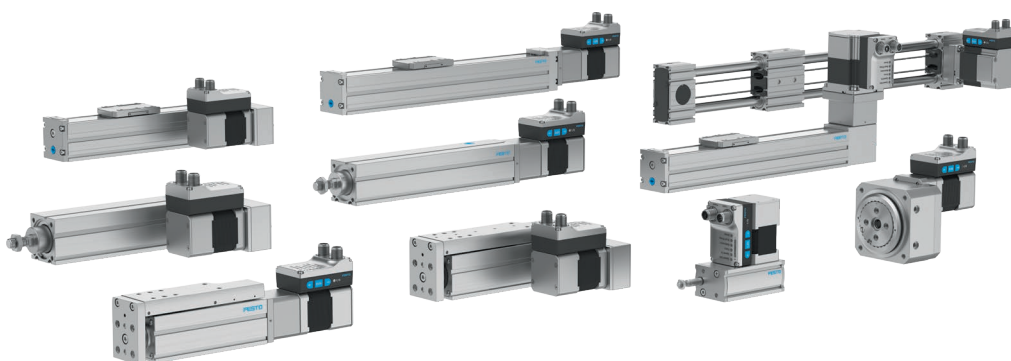
up to 1,200 l/min

- Valve functions: 5/2, 5/3, 2x 3/2 and 3/2-way valves
- Various sub-bases for semi in-line and sub-base valves

## 2 Integrating electric drives into AP communication via IO-Link

The Simplified Motion Series consists of various linear and rotary electromechanical systems with an application-optimised combination of motor and integrated drive that do not require a control cabinet. The units are optimised for simple movements between two mechanical end positions, including a freely selectable intermediate position. This can be used as a holding position, for example. Simple positioning tasks can be realised through multiple changes of the intermediate position. In addition, the Simplified Motion Series offers optimised motion characteristics, gently cushioned travel to the end position, as well as a simplified press-fitting and clamping function. Commissioning is very convenient thanks to the Festo Automation Suite. All parameters can also be easily set manually directly on the drive.

More information about the Simplified Motion Series is available at [www.festo.com/sms](http://www.festo.com/sms)



- Simplified functionality for movements between two end positions plus intermediate position
- Wide variety of movements thanks to separate linear and rotary mechanical systems

- Quick, easy and convenient – commissioning without the need for special expertise with the Festo Automation Suite or directly on the integrated drive

### The Festo portfolio

- Electric cylinder units EPCE and EPCS
- Spindle axis unit ELGS-BS
- Toothed belt axis units ELGS-TB and ELGE-TB
- Mini slide unit EGSS
- Rotary drive unit ERMS



## Powerful, decentralised point-to-point communication: modular remote I/O system with IO-Link Master

### 3 Integrating sensors into the AP communication via IO-Link

The wide ranging sensor series from Festo with IO-Link® includes position transmitters, proximity switches as well as pressure, vacuum and flow sensors, and opto-electric sensors. Proximity switches allow a position to be easily and reliably detected, whereas position transmitters provide an analogue, displacement-proportional output signal. Both are compatible with pneumatic as well as electric drive technology. The pressure and vacuum sensors ensure the system's process reliability. Remote maintenance and monitoring as well as a standardised operating and display concept are all part of the package.

#### Position transmitter SDAT



Universal transmitter solution with programmable IO-Link output. The transmitter can be programmed as a proximity switch, window or hysteresis comparator.

- Detection range: 50, 80, 100, 125 or 150 mm
- Repetition accuracy: 0.1 mm

#### Pressure sensor SPAN



The attractively priced pressure sensor for pressure measurement and monitoring, leak testing and object detection is very compact and versatile. The SPAN has switchable electrical outputs, covers a wide range of pressure measurement ranges and features many pneumatic

connection options

- 14 measuring ranges for compressed air and vacuum, as well as non-corrosive gases
- Easy and intuitive operation with clear, high-contrast display

#### Fork light barrier SOOF-M



The through-beam sensor combines the transmitter and receiver in a single housing. The sturdy yet compact design is very easy and effortless to install and without the need for any time-consuming alignment.

- High shock and vibration resistance of the IP67 housing
- Variety: 4 fork gap widths and different switching output variants

#### More sensors from Festo with IO-Link

- Position transmitter SDAS
- Pressure transmitter SPAE
- Pressure sensor SPAU
- Flow sensors SFAH, SFAB and SFAW
- Opto-electric sensor SOOE
- Air gap sensor SOPA for high-precision control in the  $\mu\text{m}$  range

#### IO-Link products from other manufacturers

The IO-Link master of the CPX-AP-A is compatible with IO-Link® products from other manufactur-

ers. These can also be parameterised and commissioned using the Festo Automation Suite.

More information about the commissioning tool can be found on page 20





## Online configurator for the CPX-AP-A and directly integrated valve terminals

Having good support, right from the start and in line with requirements, is important – and this also applies to digital support. One example of this is the quick and easy online configuration of complex products with a wide range of variants and options. This is certainly the case for the modular remote I/O system CPX-AP-A with all its different modules and functions, whether as a stand-alone RIO or combined with a valve terminal to form a complete unit. You will be provided with a price and delivery time for your combination, and can then order it directly in the configurator. All relevant technical docu-

ments and CAD models are readily available for download.

- Configure the CPX-AP-A RIO and the matching valve terminal online simply and conveniently with the help of graphics
- Check the price and delivery time online and download technical documents and the CAD model
- Simply save the order code of the configuration and reuse and adapt it for further configurations

**Ventilinsel VTSA-F-FB mit CPX-AP-A Terminal**

Bestellcode 1  
70E-LKALKA3NMLMLM-PMSG+2BD2H

Bestellcode 2  
45P-N-V-6B-3MZDTAMKK3|ZIU|ZFUGE+U

Preis und Lieferzeit

In den Warenkorb legen

Änderungen übernehmen

Basisangaben – CPX Modulplatz – Modulplatz – Ventilplatz – Zubehör – Übersicht

Ab 6 Verkettungs-/Versorgungsplatten ist der Befestigungswinkel +U (Zubehör Pneumatik) empfohlen

Tellennummer: siehe Bestellcode

**Basisangaben**

Ventilinsel, elektrischer Teil  
70E

Preis und Lieferzeit

CAD/EPLAN

Ersatzteile

Zubehör

### 1 Order code / configuration of the CPX-AP-A RIO and the valve terminal

The order code for the two modules, the RIO CPX-AP-A and valve terminal, here using the example of a VTSA, is gradually built up online, and this is also applicable for determining the individual module and valve positions. You can simply save the code for documentation purposes or later use. Just insert an existing order code that was created previously and adapt it as necessary, either directly in the configuration code or during the individual configuration at 4.

- Order code 1 for the remote I/O system and order code 2 for the valve terminal

### 2 Graphical representation of the remote I/O

The graphical visualisation of the RIO is also built up gradually online, as per the definition of the individual CPX module positions and functions. It shows the individual modules of the RIO with their respective position on the terminal and then a clear overall configuration of the RIO with the layout sequence of the individual modules. The visualisation is supplemented by the voltage concept including supply details and, depending on the configuration, information about additional intermediate supply or power forwarding.

- Just copy the code and save it in the project documents or for use in other projects
- Insert the existing standard configuration code of a machine and adapt it as necessary with just a few clicks

1 Order code / configuration of the RIO CPX-AP-A and the valve terminal

- Clear illustration of the RIO and the associated voltage concept
- Easy to visually check the selected functions and positions of the modules on the terminal

In case of any changes: simply click on the module and apply your correction at configuration level 4



## Online configurator for the CPX-AP-A and directly integrated valve terminals

**Ventilinsel VTSA-F-FB mit CPX-AP-A Terminal**

Bestellcode 1  
70E-LKALK3NMLMLM-PMSG+2BD2H

Bestellcode 2  
45P-N-V-6B-3MZDTMXXK3ZIUJZFUGE+U

Basissangaben — CPX Modulplatz — Modulplatz — Ventilplatz — Zubehör — Übersicht

Ab 6 Verkettungs-/Versorgungsplatten ist der Befestigungswinkel +U (Zubehör Pneumatik) empfohlen

Teilenummer: siehe Bestellcode

**Basissangaben**

Ventilinsel, elektrischer Teil  
70E

Preis und Lieferzeit  
CAD/EPLAN  
Ersatzteile  
Zubehör

### 3 Functional diagram of the valve terminal

The visualisation of the individual valve functions for each module position and the end plate clearly shows the valve terminal's functionality and the circuit symbols for the valve position. This includes vertical stacking, compressed air and exhaust air concept, and type code identification. This illustration is also built up gradually online, in line with the definition of the individual valve positions and switching functions.

### 4 Configuration level for all functions of the RIO and the valve terminal

The RIO and the valve terminal are configured in detail at this level. First, the basic data is set and then each module and valve position is specified individually. The module function is selected for each module position on the RIO, the valve function is selected for the valve terminal, and for the VTSA vertical stacking is also specified. Each module position can be easily duplicated. This considerably speeds up the configuration process. Any changes to the configuration are shown at the top of order code 1 as well as in the graphical illustration 2 or the functional diagram 3

- Clear visualisation of the valve terminal and the compressed air concept
- Easy to visually check the selected valve functions and vertical stacking for each valve position
- In case of changes to the valve function or vertical stacking: simply click on the valve position at configuration level 4 and make the necessary changes

- Clear list of all module and valve positions including all configuration options for each position
- Simple selection via accordion module(s). Exclusion criteria and error messages for subsequent changes to invalid configuration elements are included
- When configuring the CPX, the module function is defined for each position. There is also an option to choose the system supply or power forwarding in 24 V DC.
- For the valve terminal VTSA used in the example, the valve size and other basic pneumatic functions can be selected for each position. The valve function and vertical stacking can also be selected for each valve position.



### 5 Additional information on the chosen configuration

Festo provides plenty of additional information and downloadable files for the chosen configuration in the support area. In addition to the delivery time, the specific price for the selected configuration is also shown. In addition, we provide all relevant configuration data and technical data for the RIO online, including the details of the valve terminal. For even greater convenience, you can download the configuration-specific CAD data for the mechanical design of the machine, EPLAN data for the electrical design, as well as the pneumatic circuit diagram

- Free of charge and no need to log in: the technical data, product documentation and summarised overview of the configuration can be viewed and downloaded online
- The delivery time is also displayed without needing to log in
- Once you do log in, you are able to request the downloadable CAD and EPLAN data of the final configuration, as well as individual pricing information

### Valve terminal



VTSA-F-FB-AP

8130719

70E-LKALKA3NMLMLM-PNSG+2BD2H  
45P-N-V-6B-3M2DTMXKK3IZIUJZFUGE+U

Product information

6

CAD data

Spare parts

Product Documentation

Technical data

Please log in for pricing

– 1 + Pieces

Calculate delivery date

Add to Cart

+ Compare

### 6 Ordering in the Online Shop

Once the RIO and valve terminal have been successfully configured, the complete terminal can be ordered easily and conveniently. Simply click "Add to cart" and the two order codes and all other relevant data will be transmitted. You can then view the order in the cart, check the delivery date, add any missing accessories, download documentation, and finally order the terminal.

- Clear list of all order-relevant data
- Another opportunity to add accessories for the RIO and the valve terminal to the order
- Display of price (login required) and delivery time

### Online configurator



The online configurator for the CPX-AP-A remote I/O system and the associated valve terminals with all available product options can be found at [www.festo.com/catalogue/cpx-apa](http://www.festo.com/catalogue/cpx-apa). Create your individual configuration of the RIO as a stand-alone system or with a valve terminal quickly and easily, and then conveniently order your product directly from the Festo Online Shop.



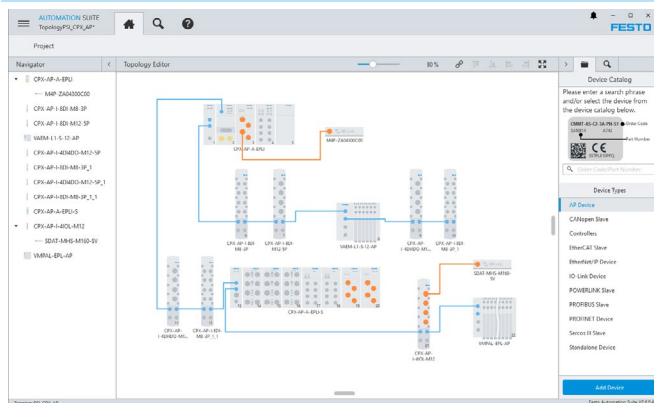
## Festo Automation Suite: Quick and easy commissioning of CPX-AP-A and -AP-I remote I/O systems

Commissioning complete system topologies with remote I/O systems is quick and easy when using the Festo Automation Suite. The software's intuitive operation makes configuring and parameterising the topologies a walk in the park. 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 decisive advantages include:

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

- Graphic-based, easy and convenient configuration of the CPX-AP-A remote I/O offline or by online scanning
- Configuration and parameterisation of the entire topology with all participants in the AP string and all IO-Link® devices
- Direct access to device firmware, description files and manuals

### Topology editor



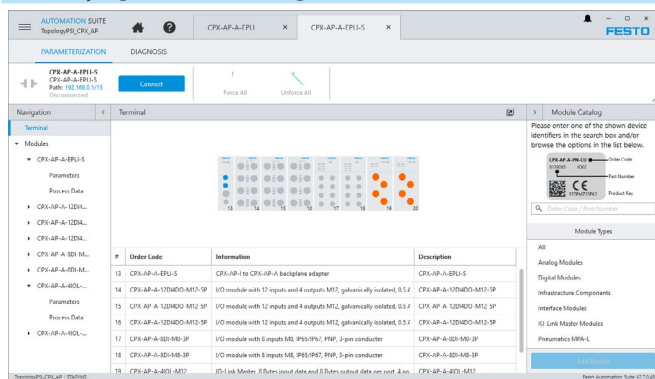
The Festo Automation Suite enables you to configure the entire CPX-AP remote I/O topology of the machine project offline in no time at all. The AP modules are added by dragging and dropping from the Device Catalogue/Types on the right-hand sidebar and are automatically connected to the previously selected device, if required. This is indicated in the sample screenshot by the blue line of the AP bus.

This not only saves time, but also minimises errors during configuration. In addition, other devices connected to the CPX-AP system, such as IO-Link® devices, can also be easily parameterised.

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



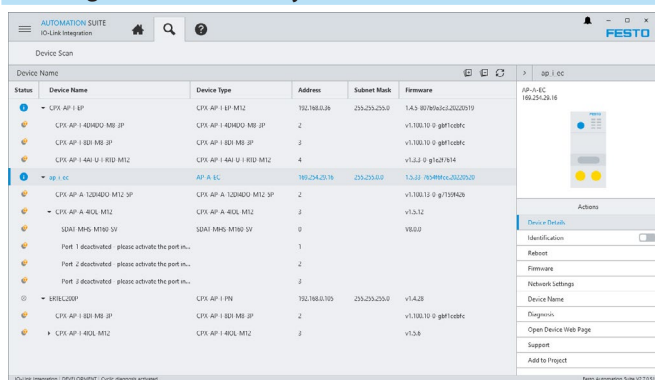
## CPX-AP plug-in terminal configuration



CPX-AP-A terminals can be configured based on graphics, and modules can be moved, deleted or inserted. Process data can be "forced" directly in the plug-in during pre-commissioning in order to carry out an I/O check. All of this is possible without a controller and complex programming.

- Convenient configuration of the CPX-AP-A terminal using a graphics-based configurator
- The module parameters can be set quickly on the parameter pages
- Monitoring and "forcing" of process data during commissioning via I/O check
- Reading out diagnostic messages

## Scanning the AP-A and AP-I system



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 adjusted on the page. In addition, the scan view allows you to update the firmware for the CPX-AP modules and to access product-specific manuals and device description files via the "Support" tab. In the scan view, you can also easily import connected devices into the project. This increases efficiency when setting up and configuring automation systems.

- Convenient, multi-stage scan of all connected devices (entire topology)
- Comparison of the target and actual configuration of the entire topology line of the CPX-AP
- Transferring the imported devices to the project
- Updating the device firmware and downloading the device description files

## Online configurator



## Download the Festo Automation Suite free of charge now

- PC-based software
- Intuitive and user-friendly design
- Clearly structured with graphical user interface
- Download free of charge now



## Overview of the variety of CPX-AP-A modules

### Fieldbus modules

Bus interfaces for communication with CPX-AP-A in Ethernet-based networks.

- High data transmission rate, e.g. for I/O data from sensors, actuators, PLCs or process equipment
- Transmission of non-real-time critical information such as diagnostics and configuration information
- Sufficient Ethernet bandwidth to transmit real-time and non-real-time data in parallel
- The position of the modules can be freely selected, independent of the system supply (24 V DC)



PROFINET interface M12



PROFINET interface push-pull



PROFINET interface Push-pull  
FOC



ETHERCAT interface M12  
FOC



EtherNet/IP interface M12

### End plates

Affordable and compact AP communication interface on the stand-alone RIO or on the RIO terminal with valve terminal

- For connection with other AP participants
  - Modular RIO terminal CPA-AP-A
  - Decentralised RIO modules CPX-AP-I
  - Valve terminals with AP interface
- Two variants for 24 V DC power supply
  - Only voltage output for additional AP participants, internal power supply with system supply at the RIO terminal
  - Voltage input for the RIO and voltage output for other AP participants (no power supply for valve terminals)
- Mounted in place of the left-hand end plate
- Die-cast metal end plates for mounting the CPX-AP-A on the wall, on an H-rail and a carrier system



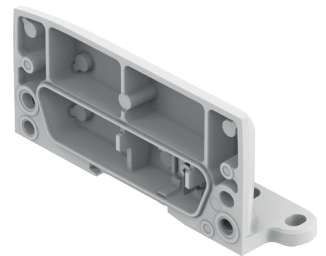
AP communication interface  
with voltage output



AP communication interface  
with voltage in- and output



Left-hand end plate



Right-hand end plate



### Interlinking blocks and modules

The 24 V DC supply voltage is fed into the CPX-AP-A via the interlinking modules and safely forwarded to the CPX-AP-A modules and the valve terminal.

- Electronics of the automation system CPX-AP-A (system voltage)
- Inputs, outputs and valves (load voltage)

In addition, special versions are available for the supply (load voltage) of outputs as well as valves for creating voltage zones. The electronics are still supplied by the main power supply.

- Supply to the right
- Supply to the left only
- In each case, one side is separated from the other.

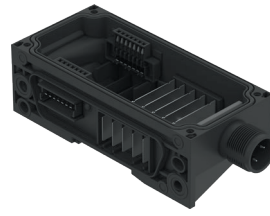
Interlinking modules with 24 V DC forwarding supply for additional AP participants and external components are also available. Modules without a power supply forward voltage and communication from one module to the next and to the valve terminal.



Interlinking block with system supply M12x1, L-coded



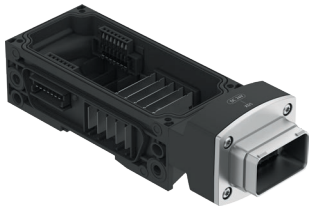
Interlinking block with system supply and M12x1 voltage forwarding, L-coded



Interlinking block with system supply M18x1



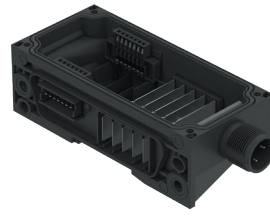
Interlinking block with system supply 7/8"



Interlinking block with system supply, push-pull



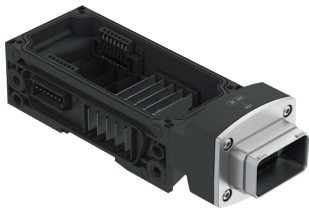
Interlinking block with additional supply M12x1, L-coded



Interlinking block with additional supply M18x1



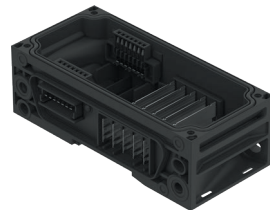
Interlinking block with additional supply 7/8"



Interlinking block with additional supply, push-pull



Interlinking block with push-pull forwarding supply



Interlinking module without power supply



## Overview of the variety of CPX-AP-A modules

### Input and output modules

All modules can be combined as required and can be flexibly connected in series.

- Digital 8/16-way input and output modules, in future also 32-way
- Analogue 4/8-way input and output modules
- Various connection technologies: M8 and M12, in future also push-in connection (IP20)



Digital input module M12 with 8 inputs



Digital input module M8 with 8 inputs



Digital input module M12 with 32 inputs



Digital input module M8 with 16 inputs



Digital plug-in input module with 8 inputs



Digital input module M12 with 16 inputs



Analogue input module M12 with 4 inputs



Digital output module M12 with 8 outputs



Digital output module M8 with 8 outputs



Digital plug-in output module with 8 outputs



Digital input/output module M12 with 12 inputs and 4 outputs



Digital input/output module M8 with 12 inputs and 4 outputs



Digital plug-in input/output module with 12 inputs and 4 outputs





### IO-Link master

For exchanging data with any decentralised IO-Link® devices at field level, e.g. electric drives, proportional valves, vacuum generators, sensors, etc.

- Connect up to 4 devices per module



IO-Link Master

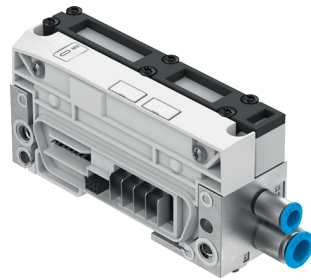
### Pneumatic interface for valve terminals

There is a choice of different valve terminals. These are connected to the modular RIO via their pneumatic interface.



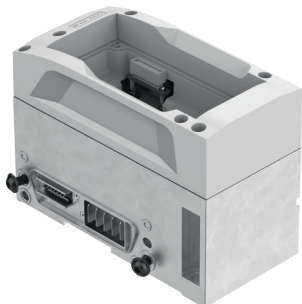
For VTUX

- Without power supply
- With flat plate silencer and pressure feed
- With status LEDs



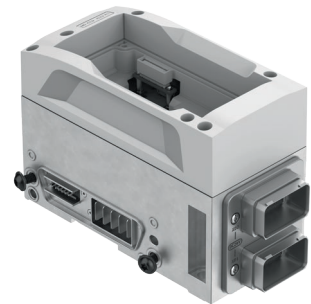
For MPA-S

- Without power supply
- With flat plate silencer and pressure feed
- With status LEDs



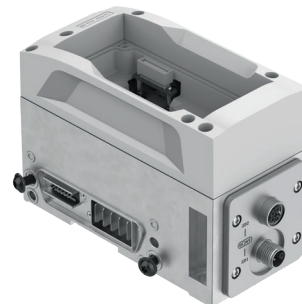
For VTSA, VTSA-F and VTSA-F-CB

- Without power supply
- Position for CPX-AP-A IO module
- With status LEDs



For VTSA, VTSA-F and VTSA-F-CB

- Push-pull power supply
- Position for CPX-AP-A IO module
- With status LEDs



For VTSA-F-CB

- M12 power supply
- Position for CPX-AP-A IO module
- With status LEDs



## Decentralised CPX-AP-I remote I/O

The high-performance modules of the extremely flexible remote I/O system CPX-AP-I in IP65/67 are perfect for decentralised topologies with cable lengths of up to 50 m between the devices. They enable end-to-end communication from the workpiece to the cloud and use the IO-Link master module to integrate all IO-Link® devices from Festo as well as common devices from third-party manufacturers. Their load and logic power supply are galvanically isolated. This allows planning for intermediate supplies, voltage zones or safe switch-off of the load

voltage. The modules are easy to install. Configuration and commissioning are quick and easy thanks to the Festo Automation Suite.

- Ultra-lightweight and compact, yet very robust modules in line topology
- Outstanding performance thanks to AP communication in real time with 250 µs cycle time and 200 Mbaud data rate
- Cable lengths of up to 50 m between devices

### Bus interface

#### EtherNet/IP



#### EtherCAT



#### PROFINET



#### PROFIBUS



The bus interface for connecting to a higher-level control system enables communication in an industrial environment via Ethernet-based bus protocols. As a starting point for up to 80 modules in 1 or 2 AP communication lines, it connects AP participants in the decentralised system topology and enables the data transfer to the cloud.

- Two fieldbus interfaces (M12x1)
- Two connections for system communication (M8x1)
- Two connections for power supply and forwarding (M8x1)
- LED status and error indicators for voltage and fieldbus

### Input modules – digital and analogue



The digital modules enable sensors and actuators with an operating voltage of 24 V DC, such as pressure switches, proximity switches and light barriers, to be connected. The analogue modules record analogue input signals such as pressure measurement curves, or they measure current, voltage and temperature.

- Digital: PNP (positive switching)
- Analogue: Adjustable current, voltage, temperature and resistance measurement
- Input connections: M8x1 or M12x1
- LED status and error indicators



### IO-Link master module

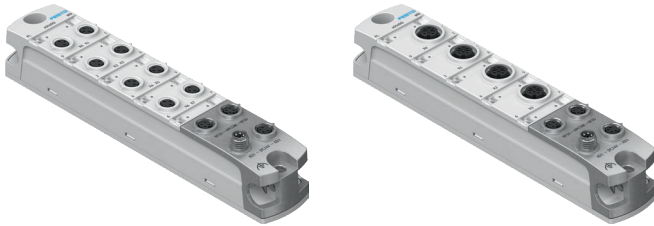


 IO-Link

Enables any IO-Link® components from Festo and other manufacturers to be integrated into the AP system. 1 device can be connected to each of the 4 ports (star technology). Parameterisation and commissioning are very convenient using the Festo Automation Suite

- IO-Link® device connections: M12x1
- LED status and fieldbus indicators

### Digital input/output modules



The digital input/output modules enable sensors and electric consumers with an operating voltage of 24 V DC to be connected. 4 inputs and 4 outputs are combined in one module. Switching logic of the inputs and outputs: PNP (positive switching)

- Input connections: M8x1 or M12x1
- LED status and error indicators

### CPX-AP-I in the shop



The decentralised remote I/O system CPX-AP-I with all the available modules and matching accessories can be found at [www.festo.com/catalogue/cpx-api](http://www.festo.com/catalogue/cpx-api). Configure your decentralised remote I/O system quickly and conveniently and order all modules and matching accessories directly in the Festo Online Shop.