

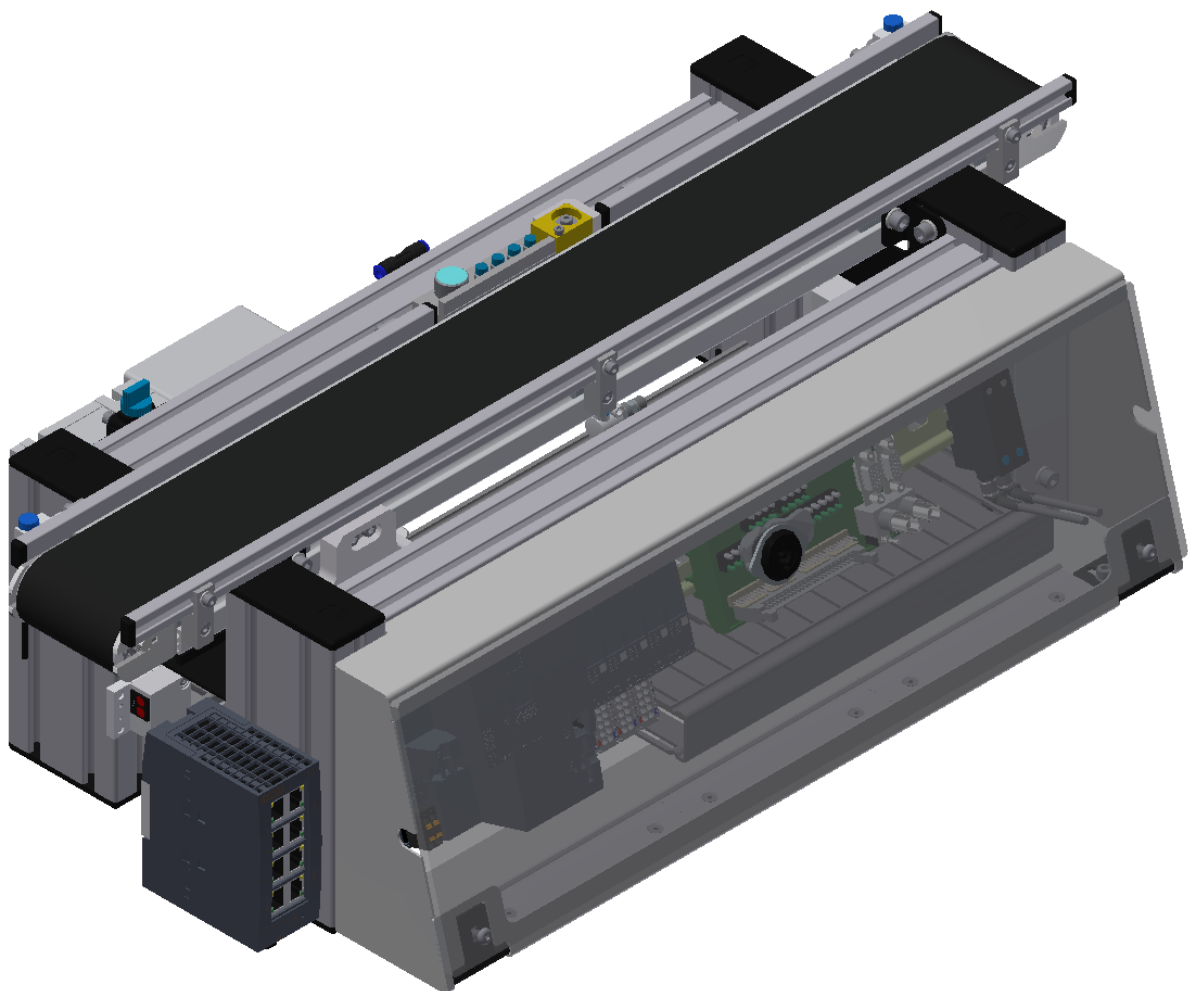
CP Lab conveyor

CP-L-Linear-C[11/13]-M[0/1/6]

FESTO

CP Factory/CP Lab

Translation of the
original operating
instructions



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Translation of the original instructions

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Where only pronouns such as he and him are used in these operating instructions, these pronouns are of course intended to refer to both male and female persons. The use of a single gender (e.g. he, him) should not be construed as gender discrimination; it is intended solely to make the manual easier to read and the formulations easier to understand.

	 CAUTION
	<p>These operating instructions must be available to the user at all times. The operating instructions must be read before commissioning. The safety instructions must be observed. Non-observance may result in severe personal injury or damage to property.</p>

Main document

Associated documents attached:

Safety instructions concerning transport (print/electronic)
Component datasheets (print/electronic)
Circuit diagram (print/electronic)

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1 Safety instructions



1.1 Warning notice system



These operating instructions contain notes that must be observed for your personal safety and in order to prevent property damage. The notes concerning your personal safety are indicated by a safety symbol.


Notes that only concern property damage are not indicated by a safety symbol.

The notes below are listed in order of hazard level.

	 DANGER
	<p>... indicates an imminently hazardous situation that will result in fatal or severe personal injury if not avoided.</p>

	 WARNING
	<p>... indicates a potentially hazardous situation which may result in fatal or severe personal injury if not avoided.</p>

	 CAUTION
	<p>... indicates a potentially hazardous situation that may result in moderate or slight personal injury or severe property damage if not avoided.</p>

	NOTE
	<p>... indicates a potentially hazardous situation that may result in property damage or loss of function if not avoided.</p>

In cases where more than one hazard level applies, the safety note with the highest hazard level will be shown. A safety note may concern both personal injury and property damage.

Hazards that will only result in property damage are indicated with the word "Note".

1.2 Pictograms

This document and the hardware described in it include warnings concerning possible hazards which may arise if the system is used incorrectly.

The following pictograms are used:



Hazard warning



Warning - dangerous electric voltage



Read and observe the operating and safety instructions prior to commissioning.



Switch off the device and unplug the connection for power supply from the plug socket before commencing installation, repair, maintenance or cleaning work.



Warning – hand injuries



Warning – risk of entanglement



Warning – lifting heavy loads



Electrostatically sensitive devices



Information and/or references to other documentation

1.3 General prerequisites for installing the product

- Festo Didactic products must only be used for the applications specified in their respective operating instructions. Products or components supplied by other manufacturers must only be used if recommended or approved by Festo.
- The products must be transported, stored, installed, assembled, commissioned, operated and maintained properly in order to ensure their safe operation.
- The approved ambient conditions must be observed. The specifications in the relevant operating instructions must be observed.
- The safety equipment must be tested every working day.
- Connecting cables must be checked for damage before each use. In case of damage, they must be replaced.

Connecting cables must correspond to the minimum specifications.

1.4 General prerequisites for operating the devices

General requirements for safe operation of the system:

- In industrial facilities, the national accident prevention regulations must be observed.
- The laboratory or classroom must be overseen by a supervisor.
 - A supervisor is a qualified electrician or a person who has been trained in electrical engineering, knows the respective safety requirements and safety regulations, and whose training has been documented accordingly.

The laboratory or the classroom must be equipped with the following devices:

- An emergency-off device must be provided.
 - At least one emergency-off device must be located inside the laboratory or the classroom, and at least one outside it.
- The laboratory or classroom must be secured so that the operating voltage and compressed air supply cannot be activated by any unauthorized persons, for example by means of:
 - e.g. a keyswitch
 - e.g. lockable shut off valves
- The laboratory or classroom must be protected by residual current devices (RCDs).
 - RCDs with a differential current of ≤ 30 mA, Type B. When operating machinery with unavoidable leakage current, suitable measures must be implemented and documented in the corresponding workplace risk assessment.
- The laboratory or classroom must be protected by overcurrent protection devices.
 - Fuses or circuit breakers
- Devices must not be used if they are damaged or defective.
 - Damaged devices must be barred from further use and removed from the laboratory or classroom.
 - Damaged connecting cables, pneumatic tubing and hydraulic hoses represent a safety risk and must be removed from the laboratory or classroom.
- Safety devices must be checked every working day to ensure that they are fully functional.
- Connecting cables and accessories must be checked for damage before each use.

2 Intended use

Festo Didactic systems and components must only be used:

- For their intended use in teaching and training applications
- When their safety functions are in perfect condition

The components and systems are designed in accordance with the latest technology and recognized safety rules. However, life and limb of the user and third parties may be endangered and the components may be impaired if they are used incorrectly.

The Festo Didactic learning system has been developed and produced exclusively for education and training in the field of automation technology. The training company and/or trainers must ensure that all trainees observe the safety precautions described in these operating instructions.

Training with complex machinery is a highly hazardous activity. The operating company must draw up and document a workplace risk assessment. The trainees must be briefed on all the relevant safety aspects before work commences.

Festo Didactic hereby excludes any and all liability for damages suffered by apprentices, the training company and/or any third parties, which occur during use of the device in situations which serve any purpose other than training and/or vocational education, unless such damages have been caused by Festo Didactic due to malicious intent or gross negligence.

All extensions and accessories must be approved by Festo Didactic, and are only permitted for use for their intended purpose.

The machine fulfils the requirements of the European directives that applied when it was commissioned. Any modification to the machine shall render the manufacturer's CE Declaration of Conformity null and void. The CE Declaration of Conformity must be renewed following each major modification.



3 For your safety

3.1 Important information

Knowledge of the basic safety instructions and safety regulations is a fundamental prerequisite for safe handling and trouble-free operation of Festo Didactic components and systems.

These operating instructions include the most important instructions for safe use of the components and systems. In particular, the safety instructions must be adhered to by all persons who work with these components and systems. Furthermore, all pertinent accident prevention rules and regulations that are applicable at the respective place of use must be adhered to.

	 WARNING
	<ul style="list-style-type: none">• Malfunctions which could impair safety must be eliminated immediately!

	 CAUTION
	<ul style="list-style-type: none">• Improper repairs or modifications may result in unforeseeable operating statuses. Do not carry out any repair or alternation work on components or systems that is not described in these operating instructions.

3.2 Qualified persons

- The product described in these operating instructions is only permitted for operation by persons who are qualified for the task in question in accordance with the operating instructions, especially the safety instructions.
- Qualified persons are defined as persons whose training and experience enables them to recognize risks and avoid potential dangers when working with this product.

3.3 Obligations of the operating company

It is the responsibility of the operating company to ensure that the station is operated safely.

The operating company undertakes to allow only those persons to work with the components and systems who:

- Are familiar with the basic regulations regarding occupational safety, with the safety instructions, and with the accident prevention regulations, and who have been instructed in the use of the components and systems
- Have read and understood the safety chapter and warnings in these operating instructions
- Are qualified to operate the components and systems in question
- Are governed by and trained in suitable organizational measures to ensure safe training

Personnel should be tested at regular intervals to ensure that they are safety-conscious in their work habits.



3.4 Obligations of the trainees

All persons who have been entrusted to work with the components and systems undertake to complete the following steps before beginning work:



- Read the chapter concerning safety and the warnings in these operating instructions
- Familiarize themselves with the basic regulations regarding occupational safety and accident prevention



4 Basic safety instructions

4.1 General information

	 CAUTION
	<ul style="list-style-type: none"> • Trainees must be supervised by an instructor at all times when working with the components and systems. • Observe the specifications included in the technical data for the individual components, and in particular all the safety instructions! • Wear your personal protective equipment (safety goggles, safety shoes). • Never leave objects lying on the top of protective enclosures. Vibrations could cause such objects to fall off.

4.2 Mechanical components

	 WARNING
	<ul style="list-style-type: none"> • Switch off the power supply! <ul style="list-style-type: none"> – Switch off both the operating power and the control power before commencing work on the circuit. – Never reach into the setup unless it is at a complete standstill. – Be aware of potential overtravel times for the actuators. • Risk of injury during troubleshooting! <ul style="list-style-type: none"> – Use a tool such as a screwdriver for actuating sensors.



	 CAUTION
	<ul style="list-style-type: none"> • Risk of burns due to hot surfaces <ul style="list-style-type: none"> – Devices can reach high temperatures during operation, as a result of which they can cause burns if touched. • Measures to take when maintenance is required. <ul style="list-style-type: none"> – Allow the device to cool off before commencing work. – Use suitable personal protective clothing, e.g. safety safety gloves.



4.3 Electrical for general product safety



Valid for (see chapter type code)

CP-L-LINEAR-C11-M0

CP-L-LINEAR-C13-M0

	 WARNING
	<ul style="list-style-type: none"> • Disconnect from all sources of electrical power! <ul style="list-style-type: none"> – Switch off the power supply before working on the circuit. – Please note that electrical energy may be stored in individual components. Further information on this issue is available in the datasheets and operating instructions included with the components. – Warning! Capacitors inside the device may still be charged even after being disconnected from all sources of voltage. • Danger due to malfunction <ul style="list-style-type: none"> – Never place or leave liquids (e.g. drinks) on the station in open containers. – The machine must not be switched on if there is condensation (moisture) on its surface. – Never lay pipes/hoses designed to carry liquid media near the machine. • Electric shock due to connection to unsuitable power supply! <ul style="list-style-type: none"> – When devices are connected to an unsuitable power supply, exposed components can cause dangerous electrical voltage that can lead to severe or fatal injury. – Always use power supplies that provide SELV (safety extra-low voltage) or PELV (protective extra-low voltage) output voltages for all the connections and terminals on the electronics modules. • Electric shock when there is no protective grounding in place <ul style="list-style-type: none"> – If there is no protective grounding terminal in place for a Protection Class I device, or if the protective grounding terminal has not been installed correctly, exposed, conductive parts may carry high voltages, thus causing severe or fatal injury if touched. – Ground the device in accordance with the applicable regulations.

	 WARNING
	<ul style="list-style-type: none"> • Risk of fire due to use of unsuitable power supply <ul style="list-style-type: none"> – If a device is connected to an unsuitable power supply, this can cause components to overheat, leading to a breakout of fire. – Always use limited power supplies (LPSs) for all the connections and terminals on the electronics modules.

	 CAUTION
	<ul style="list-style-type: none">• Always ensure that your connecting cables are designed for use with the electrical connections in question.• When laying connecting cables, make sure they are not kinked, sheared or pinched. Cables laid on the floor must be covered with a cable bridge to protect them.• Do not lay cables over hot surfaces.<ul style="list-style-type: none">– Hot surfaces are identified with a corresponding warning symbol.• Make sure that connecting cables are not subjected to continuous tensile loads.• Devices with a grounding terminal must always be grounded.<ul style="list-style-type: none">– If a ground connection (green-yellow laboratory socket) is available, it must always be connected to the protective grounding. The protective grounding must always be connected first (before voltage) and disconnected last (after disconnecting the voltage).– Some devices have high leakage current. These devices must be fitted with a grounding conductor for additional grounding.• When replacing fuses, always use specified fuses with the correct current rating and tripping characteristics.• The device is not equipped with a built-in fuse unless otherwise specified in the technical data.• Safe operation of the device is not possible in the event of any of the following circumstances:<ul style="list-style-type: none">Visible damageMalfunctionInappropriate storageIncorrect transport– Switch off the power supply immediately.• Protect the device to prevent it from being restarted accidentally.

4.4 Electrical for general machine safety



Valid for (see chapter type code)



CP-L-LINEAR-C11-M1



CP-L-LINEAR-C13-M1



CP-L-LINEAR-C11-M6

CP-L-LINEAR-C13-M6



	 DANGER
	<ul style="list-style-type: none"> • Risk of fatal injury in case of interrupted protective grounding conductor! <ul style="list-style-type: none"> – The protective grounding conductor (yellow-green) must not be interrupted, either inside or outside of the device. – The insulation of the protective grounding conductor must never be damaged or removed. • Risk of death from connecting power supply units in series! <p>Contact voltages of greater than 25 V AC or 60 V DC are not permissible. Contact with voltages of greater than 50 V AC or 120 V DC may be fatal.</p> <ul style="list-style-type: none"> – Do not connect power supplies in series. • Risk of death due to electric shock! <p>Protect the outputs of the power supplies (output sockets/terminals) and cables connected to them from direct contact.</p> <ul style="list-style-type: none"> – Always use connector cables with adequate insulation and electric strength. – Use safety sockets with fully shrouded contact points.



	 WARNING
	<ul style="list-style-type: none"> • Disconnect from all sources of electrical power! <ul style="list-style-type: none"> – Switch off the power supply before working on the circuit. – Please note that electrical energy may be stored in individual components. Further information on this issue is available in the datasheets and operating instructions included with the components. – Warning! Capacitors inside the device may still be charged even after being disconnected from all sources of voltage. • Danger due to malfunction <ul style="list-style-type: none"> – Never place or leave liquids (e.g. drinks) on the station in open containers. – The machine must not be switched on if there is condensation (moisture) on its surface. – Never lay pipes/hoses designed to carry liquid media near the machine. • Electric shock due to connection to unsuitable power supply! <ul style="list-style-type: none"> – When devices are connected to an unsuitable power supply, exposed components can cause dangerous electrical voltage that can lead to severe or fatal injury. – Always use power supplies that provide SELV (safety extra-low voltage) or PELV (protective extra-low voltage) output voltages for all the connections and terminals on the electronics modules. • Electric shock when there is no protective grounding in place <ul style="list-style-type: none"> – If there is no protective grounding terminal in place for a Protection Class I device, or if the protective grounding terminal has not been installed correctly, exposed, conductive parts may carry high voltages, thus causing severe or fatal injury if touched. – Ground the device in accordance with the applicable regulations.

	 WARNING
	<ul style="list-style-type: none"> • Risk of fire due to use of unsuitable power supply <ul style="list-style-type: none"> – If a device is connected to an unsuitable power supply, this can cause components to overheat, leading to a breakout of fire. – Always use limited power supplies (LPSs) for all the connections and terminals on the electronics modules.

 CAUTION	
	<ul style="list-style-type: none">• Always ensure that your connecting cables are designed for use with the electrical connections in question.• When laying connecting cables, make sure they are not kinked, sheared or pinched. Cables laid on the floor must be covered with a cable bridge to protect them.• Do not lay cables over hot surfaces.<ul style="list-style-type: none">– Hot surfaces are identified with a corresponding warning symbol.• Make sure that connecting cables are not subjected to continuous tensile loads.• Devices with a grounding terminal must always be grounded.<ul style="list-style-type: none">– If a ground connection (green-yellow laboratory socket) is available, it must always be connected to the protective grounding. The protective grounding must always be connected first (before voltage) and disconnected last (after disconnecting the voltage).– Some devices have high leakage current. These devices must be fitted with a grounding conductor for additional grounding.• When replacing fuses, always use specified fuses with the correct current rating and tripping characteristics.• The device is not equipped with a built-in fuse unless otherwise specified in the technical data.• Safe operation of the device is not possible in the event of any of the following circumstances:<ul style="list-style-type: none">– Visible damage– Malfunction– Inappropriate storage– Incorrect transport• Switch off the power supply immediately.• Protect the device to prevent it from being restarted accidentally.

4.5 Pneumatic components

	 WARNING
	<ul style="list-style-type: none">• Depressurize the system!<ul style="list-style-type: none">– Switch off the compressed air supply before working on the circuit.– Check the system using pressure gauges to make sure that the entire circuit is fully depressurized.– Please note that energy may be stored in reservoirs. Further information on this issue is available in the datasheets and operating instructions included with the components.• Risk of injury when switching on compressed air!<p>Cylinders may advance and retract automatically.</p>• Risk of accident due to advancing cylinders!<ul style="list-style-type: none">– Always position pneumatic cylinders so that the piston rod's working space is unobstructed along its entire stroke range.– Make sure that the piston rod cannot collide with any of the rigid components in the setup.• Risk of accident due to pneumatic tubing slipping off!<ul style="list-style-type: none">– Use shortest barbed tubing connectors possible.– If pneumatic tubing slips off, switch off the compressed air supply immediately.• Do not exceed the maximum permissible pressure of 600 kPa (6 bar).• Do not switch on the compressed air until all the barbed tubing connectors have been connected and secured.• Do not disconnect pneumatic tubing while it is under pressure.<ul style="list-style-type: none">– Do not attempt to seal or plug pneumatic tubing or plug connectors with your hands or fingers.• Check the condition of the condensate in the service unit regularly. If necessary, drain the condensate and dispose of it properly.

 CAUTION	
	<ul style="list-style-type: none">• Setting up pneumatic circuits<ul style="list-style-type: none">– Connect the devices with plastic tubing with an outside diameter of 4 or 6 mm.– Push the pneumatic tubing into the push-in connector as far as it will go.• Dismantling pneumatic circuits<ul style="list-style-type: none">– Switch off the compressed air supply before dismantling the circuit.– Press the blue release ring down so that the tubing can be pulled out.• Noise due to escaping compressed air<ul style="list-style-type: none">– Noise caused by escaping compressed air may damage your hearing. Reduce noise by using mufflers, or wear hearing protection if the noise cannot be avoided.– All of the exhaust ports on the components included in the equipment set are equipped with mufflers. Do not remove these mufflers.

4.6 Guarantee and liability for application examples

The application examples are not legally binding, and we cannot guarantee their completeness in terms of their configuration, their equipment or any events that may occur. The application examples are not representations of any specific customer solution; they are merely intended to illustrate typical tasks for which the product in question could be used. You bear the responsibility for ensuring that the products described here are operated properly. These application examples do not in any way relieve you of your responsibility to ensure that the system is handled safely when it is being used, installed, operated or maintained.



4.7 Cyber security

Note

Festo Didactic offers products with industrial security functions that aid the safe operation of plants, systems, machines and networks. In order to protect plants, systems, machines and networks from cyber threats, a comprehensive industrial security concept must be implemented and continuously updated.

Festo's products and services only constitute one part of such a concept.

The customer is responsible for preventing unauthorized access to their plants, systems, machines and networks. Systems, machines and components should only be connected to a company's network or the Internet if and as necessary, and only when the suitable security measures (e.g. firewalls and network segmentation) are in place. Furthermore, Festo's guidelines on suitable security measures should be observed. Festo products and solutions are constantly being developed further in order to make them more secure. Festo strongly recommends that customers install product updates as soon as they become available and always use the latest versions of its products. Any use of product versions that are no longer supported or any failure to install the latest updates may render the customer vulnerable to cyber attacks.

	 WARNING
	<ul style="list-style-type: none"> • Unsecure operating conditions due to software tampering <ul style="list-style-type: none"> – Forms of software tampering (e.g. viruses, Trojans, malware and worms) can lead to unsecure operating conditions in your system, which may in turn lead to severe or fatal injury or property damage. – Keep your software up to date. – Integrate the automation and actuator components into an overarching and comprehensive industrial security concept for the installation or machine in question that is in line with the latest technological developments. – Make sure that all the products you have installed are incorporated into your overarching industrial security concept. – Use suitable measures, such as a virus scanner, to protect files save on exchangeable storage media from malware.

4.8 Additional safety instructions

General requirements for safe operation of the devices:

- Do not lay cables over hot surfaces.
 - Hot surfaces are identified with a corresponding warning symbol.
- Maximum permissible current loads for connector cables and devices must not be exceeded.
 - Always compare the current ratings of the device, the cable and the fuse to ensure that they match.
 - If they do not match, use a separate upstream fuse in order to provide appropriate overcurrent protection.
- Devices with a grounding terminal must always be grounded.
 - If a ground terminal (green-yellow laboratory socket) is available, it must always be connected to protective ground. The protective grounding must always be connected first (before voltage) and disconnected last (after disconnecting the voltage).
- The device is not equipped with a built-in circuit unless otherwise specified in the technical data.



	<p data-bbox="756 792 1027 853"> WARNING</p> <ul style="list-style-type: none">• This product is designed for use in industrial environments, and may cause malfunctions if used in domestic or small commercial environments.
---	---


4.9 Guarantee and liability

Our General Terms and Conditions of Sale and Delivery shall apply at all times. These shall be made available to the operating company no later than upon conclusion of the sales contract. Guarantee and liability claims resulting from personal injury and/or property damage are excluded if they can be traced back to one or more of the following causes:

- Use of the equipment for purposes other than its intended use
- Improper installation, commissioning, operation or maintenance of the system
- Operation of the system with defective safety equipment, or with improperly attached or non-functional safety equipment and protective guards
- Non-compliance with directions included in the operating instructions with regard to transport, storage, installation, commissioning, operation, maintenance and setup of the system
- Unauthorized modifications to the system
- Improperly executed repairs
- Disasters resulting from the influence of foreign bodies and acts of God
- Dust generated during construction work must be kept away from the system (use coverings).
See the Environmental Requirements section (contamination level) for more details.

4.10 Transport

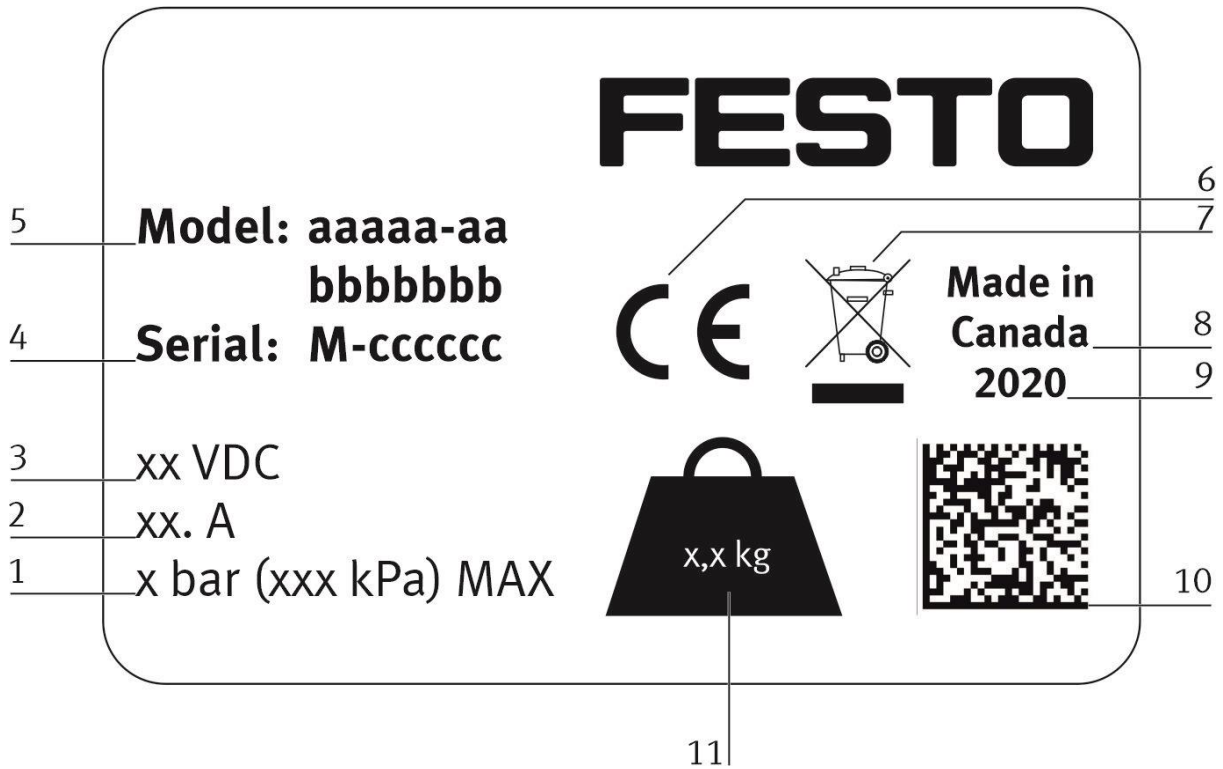
	 WARNING
	<ul style="list-style-type: none"> • Danger due to tipping over <ul style="list-style-type: none"> – Suitable packaging and transport equipment must be used when transporting the station. The station can be lifted from underneath using a forklift truck. Please note that eccentric centers of gravity can cause the station to tip over. – Stations with attachments at height will have a high center of gravity. – Take care to avoid tipping over during transportation.

	NOTE
	<ul style="list-style-type: none"> • Station contains delicate components! <ul style="list-style-type: none"> – Take care not to shake during transportation • The station is only permitted for installation on solid, non-vibrating surfaces. <ul style="list-style-type: none"> – Make sure that the ground underneath the station has sufficient load-bearing capacity.

4.11 Type code

Part number	Type code	Controller	Motor
8050101	D:CP-L-LINEAR-C11-M0	Siemens CPU 1512SP-F	DC 24V
8050102	D:CP-L-LINEAR-C13-M0	Siemens IM 155-6 PN HF	DC 24V
On demand	D:CP-L-LINEAR-C11-M1	Siemens CPU 1512SP-F	AC 230V
On demand	D:CP-L-LINEAR-C13-M1	Siemens IM 155-6 PN HF	AC 230V
8108237	D:CP-L-LINEAR-C11-M6	Siemens CPU 1512SP-F	AC 400V
On demand	D:CP-L-LINEAR-C13-M6	Siemens IM 155-6 PN HF	AC 400V

4.12 Name plates



Name plate example



Position	Description
1	Maximum pressure pneumatic (if available)
2	current consumption
3	Operating voltage
4	Serial number
5	Type number (Ordernumber) aaaaaa-aa (canadian nomenclature) bbbbbbbb (german nomenclature)
6	CE identification
7	WEEE identification
8	Country of origin
9	Production year
10	Data Matrix Code (Type-and serial number)
11	Weight

4.13 General product safety

Valid for (see chapter type code)

CP-L-LINEAR-C11-M0

CP-L-LINEAR-C13-M0

	 WARNING
	<ul style="list-style-type: none"> • General product safety, CE conformity <ul style="list-style-type: none"> – Product safety for the CP-Lab conveyor was evaluated as part of a risk assessment. – As a consequence of Changes (hardware / software) Additions or improper use – Product safety can no longer be guaranteed by the operator. – In this case, the manufacturer's CE declaration of conformity expires. The operator must re-evaluate the safety and determine the CE conformity.

4.14 General machine safety



Valid for (see chapter type code)

CP-L-LINEAR-C11-M1

CP-L-LINEAR-C13-M1



CP-L-LINEAR-C11-M6

CP-L-LINEAR-C13-M6

	 WARNING
	<ul style="list-style-type: none"> • General machine safety, CE conformity <ul style="list-style-type: none"> – The individual modules of this system contain control programs for which the safety of the machine has been evaluated. – The safety-related parameters and checksums of the safety function are listed in the operating instructions for the respective stations. – Changes to programs may impair the safety of the machine. A modified control program may constitute a major change to the machine. – In such cases, the manufacturer's CE Declaration of Conformity shall be rendered null and void. The operating company will need to re-evaluate the safety of the machine and confirm its CE conformity.

4.15 Protective devices

In order to reduce risks, this machine contains guards to prevent access to dangerous areas. These guards must not be removed or tampered with.

	 WARNING
	<ul style="list-style-type: none">• Damage to the safety window<ul style="list-style-type: none">– Windows must not be cleaned using aggressive or alcoholic cleaning agents. Risk of brittleness and breakage!– This protective device must be replaced if it shows any signs of damage. Please contact our Service department to arrange this.

4.15.1 Panel doors on underground control cabinet

Transparent, impact-resistant, polycarbonate plate with lock.

Can only be accessed with tool (control cabinet key); tool must be kept in a secure place!

Access reserved for qualified electricians.

The safety door is not monitored! Make sure the safety door is always closed.

4.15.2 Emergency stop

If a station has an emergency stop button, the emergency stop signal switches off all actuators. An acknowledgment by the operator is required for a restart, there is no automatic restart.

4.15.3 Additional protective devices

The individual components, such as the power supplies and the controllers, possess built-in safety functions such as short-circuit protection, overcurrent protection, overvoltage protection and thermal monitoring. If necessary, consult the instruction manual for the device in question for more information.

5 Technical data

5.1 Technical data für 24V variants

Valid for (see chapter type code)

CP-L-LINEAR-C11-M0

CP-L-LINEAR-C13-M0

Parameter	Value
Electrics	
Power supply	24 V DC, 4.0 A safety low voltage (PELV)
Ambient conditions	
Operating environment	Use inside building only
Ambient temperature	5°C ... 40°C
Rel. air humidity	80% up to 31°C
Pollution degree	2, Dry, non-conductive contamination
Operating height	Up to 2000 m above NN (sea level)
Noise emission level	$L_{pA} < 70$ dB
Certification	
CE marking in accordance with:	Machinery Directive EMC Directive RoHS Directive
EMC environment	Industrial environment, Class A (in acc. with EN 55011)
Measurements	
Length	810 mm
Width	415 mm
Height	289 mm
Weight	Ca. 35 kg
Subject to change	

5.2 Technical data for 230 V variants

Valid for (see chapter type code)

CP-L-LINEAR-C11-M1

CP-L-LINEAR-C13-M1

Parameter	Value
Electrics	
Operating voltage	1-phase 230 V AC±10%, 50 Hz
Power supply system	TNC-S, mains conductor L1, neutral conductor N, protective grounding PE
Full load power	1 A
Control voltage, Voltage for small actuators	24 V DC Protective extra-low voltage (PELV)
Power supply connection	IEC 60309, CEE 16 A
Max. backup fuse for installation	16 A
Leakage current	≤ 18 mA
Connecting cable between stations	System plug
Protection class	I, Operation with protective grounding only. Second protective grounding conductor required due to high leakage current
Overvoltage category	CAT II, Operation in building installation only
Short circuit current rating (SCCR)	10 kA
Compressed air	
Supply pressure	6 bar, 90 psi
Supply rate	≥ 40 l/min
Compressed air quality	EN ISO 8573-1
Pressure dew point (Class 4)	≤ +3°C
Ambient conditions	
Operating environment	Use inside building only
Ambient temperature	5°C ... 40°C
Rel. air humidity	80% up to 31°C
Pollution degree	2, Dry, non-conductive contamination
Operating height	Up to 2000 m above NN (sea level)
Noise emission level	L _{pA} < 70 dB
Certification	
CE marking in accordance with:	Machinery Directive EMC Directive RoHS Directive
EMC environment	Industrial environment, Class A (in acc. with EN 55011)
Subject to change	

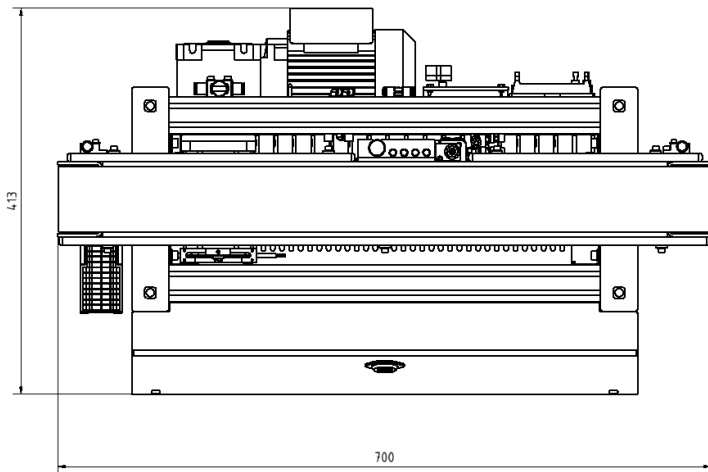
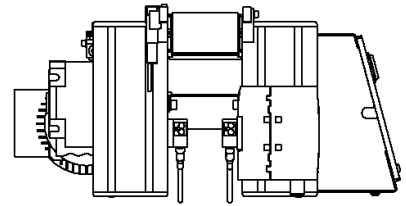
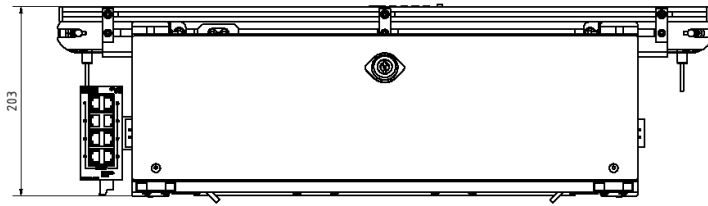
5.3 Technical data for 400 V variants

Valid for (see chapter type code)

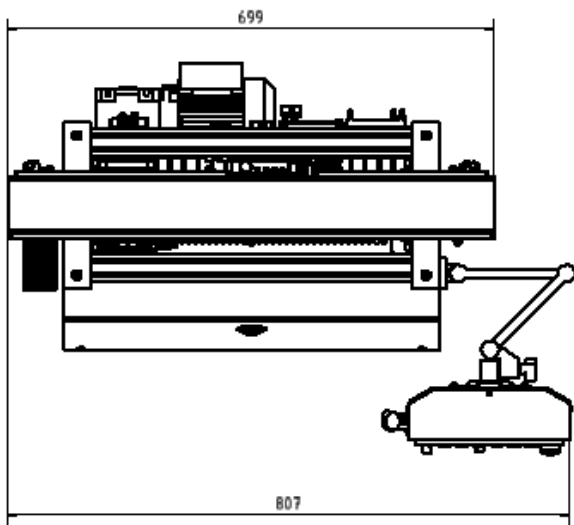
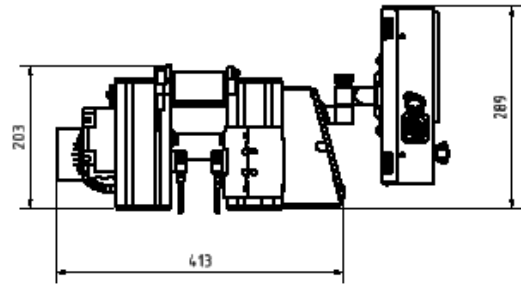
CP-L-LINEAR-C11-M6

CP-L-LINEAR-C13-M6

Parameter	Value
Electrics	
Operating voltage	3-phase 400 V AC±10%, 50 Hz
Power supply system	TNC-S, mains conductor L1, L2, L3, neutral conductor N, protective grounding PE
Full load power	1 A
Control voltage, Voltage for small actuators	24 V DC Protective extra-low voltage (PELV)
Power supply connection	IEC 60309, CEE 16 A
Max. backup fuse for installation	16 A
Leakage current	≤ 18 mA
Connecting cable between stations	System plug
Protection class	I, Operation with protective grounding only. Second protective grounding conductor required due to high leakage current
Overvoltage category	CAT II, Operation in building installation only
Short circuit current rating (SCCR)	10 kA
Compressed air	
Supply pressure	6 bar, 90 psi
Supply rate	≥ 40 l/min
Compressed air quality	EN ISO 8573-1
Pressure dew point (Class 4)	≤ +3°C
Ambient conditions	
Operating environment	Use inside building only
Ambient temperature	5°C ... 40°C
Rel. air humidity	80% up to 31°C
Pollution degree	2, Dry, non-conductive contamination
Operating height	Up to 2000 m above NN (sea level)
Noise emission level	L _{pA} < 70 dB
Certification	
CE marking in accordance with:	Machinery Directive EMC Directive RoHS Directive
EMC environment	Industrial environment, Class A (in acc. with EN 55011)
Subject to change	



Without HMI / Illustration similar



With HMI (option) / Illustration similar

6 Introduction

6.1 General information CP Lab system

The Festo Didactic Learning System is designed to meet a number of different training and vocational requirements. The CP Lab conveyor and the application modules of the system enable training and further education geared to operational reality. The hardware consists of didactically prepared industrial components.

The stations provide an appropriate system for practice-orientated education/classes of the following key qualifications

- Social competence,
- Technical competence and
- Method competence

Moreover, training can be provided to instil team spirit, willingness to cooperate and organizational skills. Actual project phases can be taught by means of training projects, such as:

- Planning,
- Assembly,
- Programming,
- Commissioning,
- Operation,
- Maintenance
- Fault finding and
- Trouble shooting.

This manual describes the handling of the CP Lab conveyor and the application modules. All necessary operations for operation are explained and described. In some cases, the facts are explained with the aid of graphics or pictures, which thus serve to facilitate communication.

The CP Lab system is developed for all apprentices who want to move something. It doesn't matter if the education is for electro- or metal profession, for mechatronics, technician- or engineer education.

Concept

During technical lessons for pupils we use our simple models with O-ring drive. In the CP Lab system the material flow is realized with a common industrial belt. In industrial, automated production, special belts are essential part of the production system. Products with different measurements are transported on belts with different widths or on double belts.

Transfer system with modules

The transfer system is a modular system which consists of two essential components. First the CP Lab conveyor which can be equipped with different drive concepts and second the constitutive modules for topics like sensors, electrical positioning, handling, assembling, camera inspection, barcode scanning, RFID and many others.

6.1.1 Application modules

- CP application module output
For removing workpieces from the system
Complexity medium, electro pneumatic module

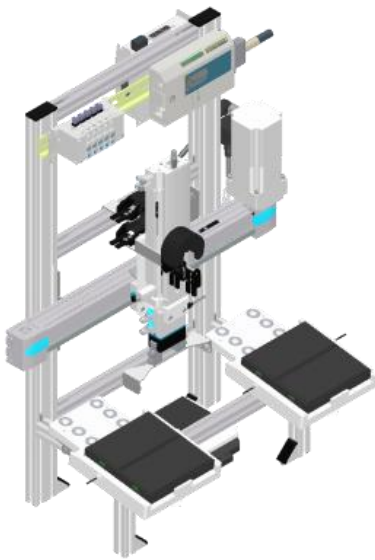


Illustration similar

- CP application module drilling
For drilling housing parts
Complexity simple, electro pneumatic module

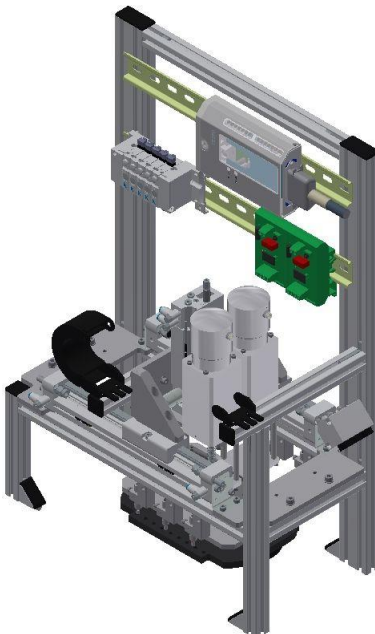


Illustration similar

- CP Factory cobot station
for assembly of various workpieces / with the help of a worker or without
High complexity, industrial, collaborative 6-axis robot

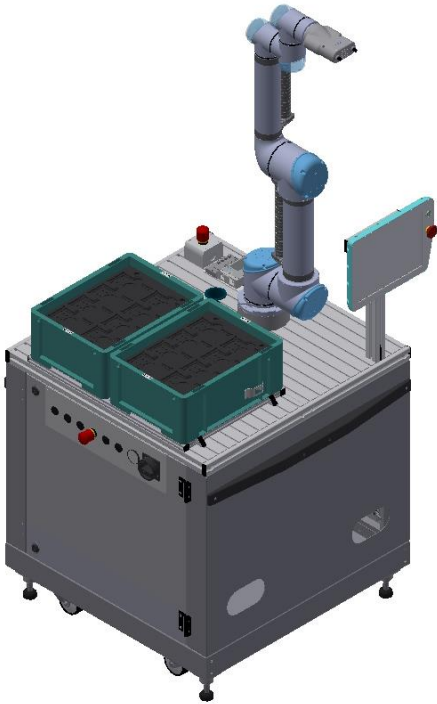


Illustration similar

- CP application module dispensing
to distribute balls in three different colors and diameters
Complexity high, electro pneumatic module

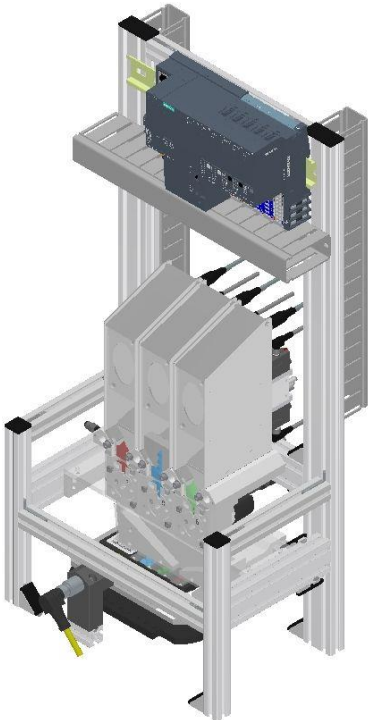


Illustration similar

- CP application module labeling
In order to label workpieces with a label
Complexity high, electro pneumatic module

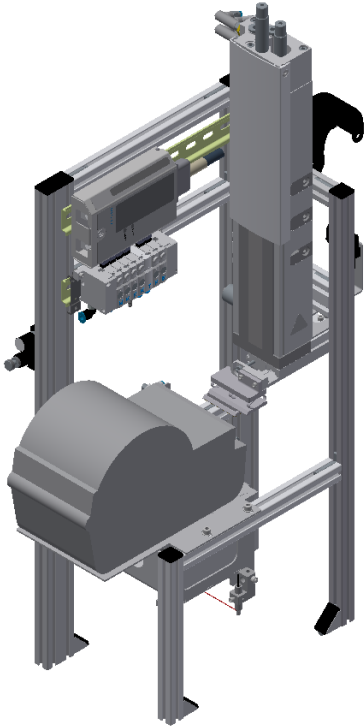


Illustration similar

- CP application module manual work
For the manual processing of pallets and / or workpieces on a stopper
Complexity simple, software module

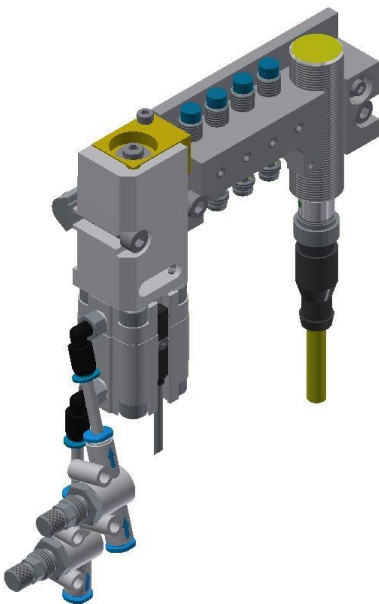


Illustration similar

- CP application module ASRS for workpieces for loading / unloading workpieces
Complexity high, 2 toothed belt axes

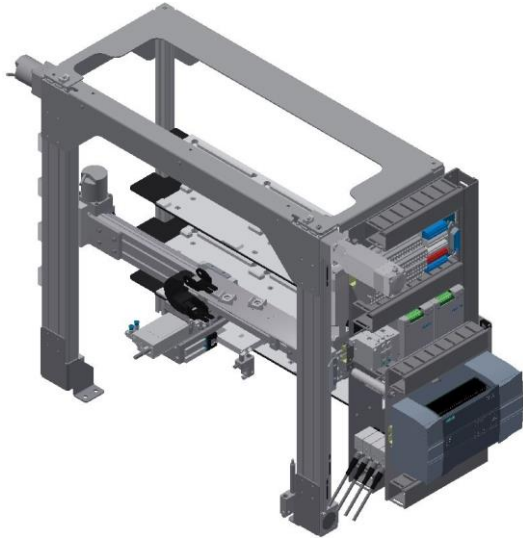


Illustration similar

- CP application module ASRS for workpieces for loading / unloading workpieces
Complexity high, 2 toothed belt axes

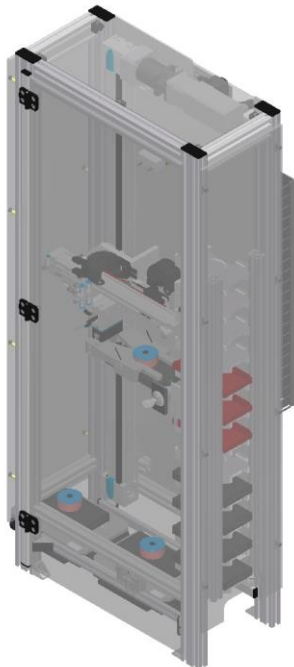


illustration similar

- CP application module iDrilling
For drilling housing parts
Complexity simple, electro-pneumatic module with controller with web interface for cyber-physical system

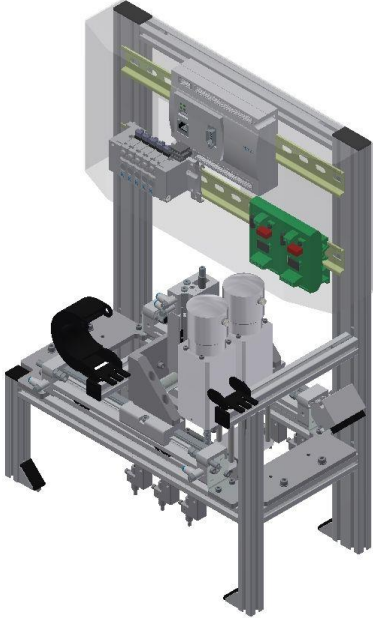


Illustration similar

- CP application module Camera inspection
With camera for checking object properties
Complexity high, Festo Camera system with evaluation software

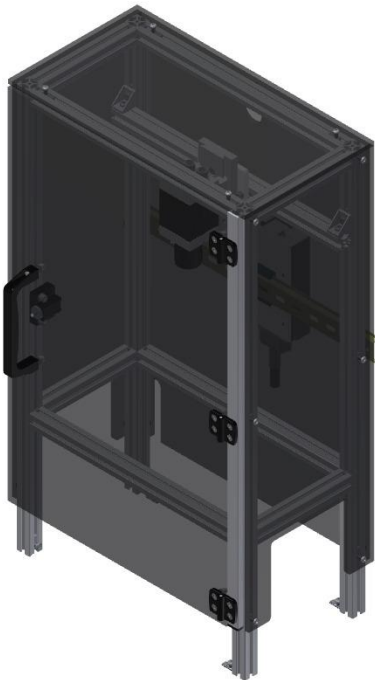


illustration similar

- CP application module magazine
For feeding housing parts. Different in the magazine rear cover and magazine front cover
Complexity simple, electro pneumatic module

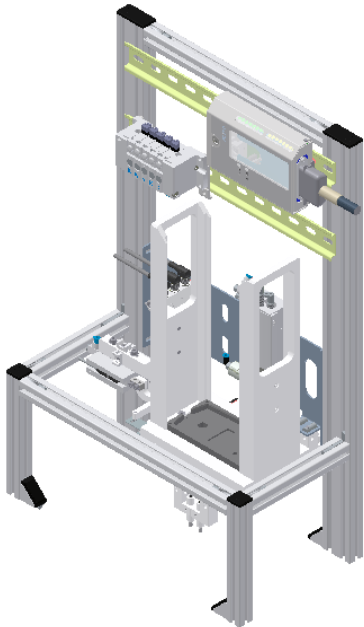


Illustration similar

- CP application module Measuring
For quality assurance
Complexity high, processing of analog input signals



Illustration similar

- CP application module Muscle press
For pressing the housing parts
Complexity simple, electro pneumatic module (pneumatic muscle)

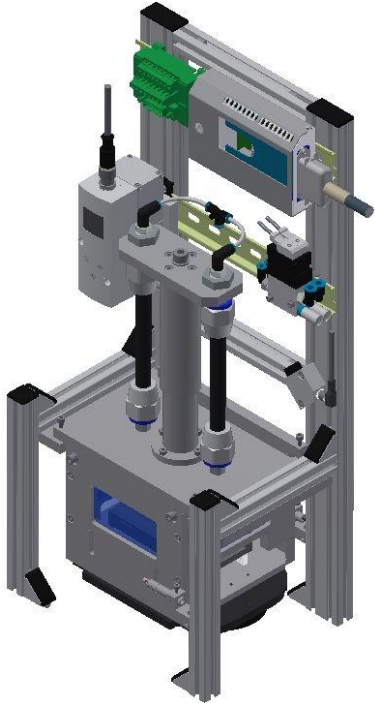


Illustration similar

- CP application module Pick by light
Hand workplace where workpieces are provided for assembly.
Complexity, electrical module

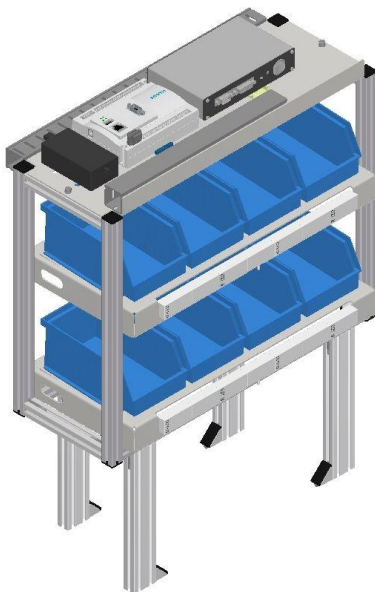


Illustration similar

- CP application module press
For pressing the housing parts
Complexity simple, electro pneumatic module

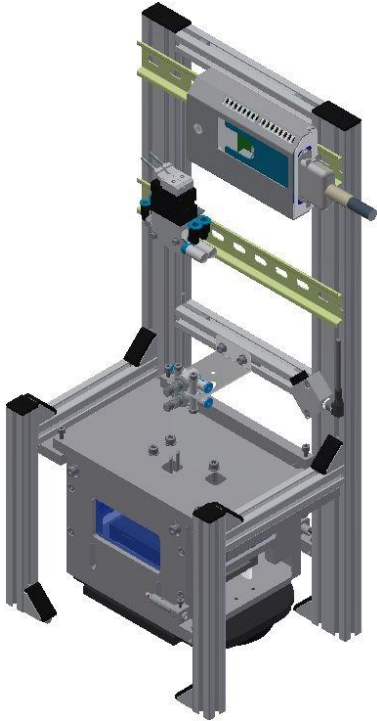


Illustration similar

- CP application module heat tunnel
For heating workpieces for thermal processing
Complexity medium to high, control engineering module with analog processing and PWM



Illustration similar

- CP application module turn over
For turning workpieces
Complexity medium, electro pneumatic module

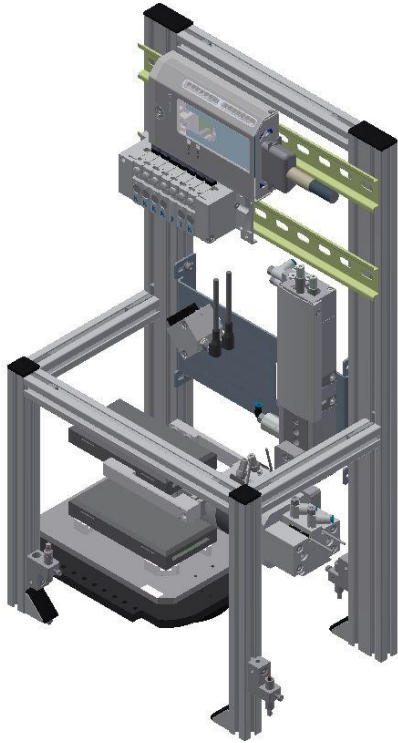


Illustration similar

6.1.2 Further modules

- Mobil robot Robotino® for workpiece carriers
The AGV system is used for the transport of workpieces.



Illustration similar

- CP Lab Bridge
The task of the CP Lab Bridge is to turn off workpiece carriers with and without workpieces on CP Factory Modules or a Robotino. In addition, workpiece carriers from CP Factory modules or from a Robotino can be imported into the CP Lab system.

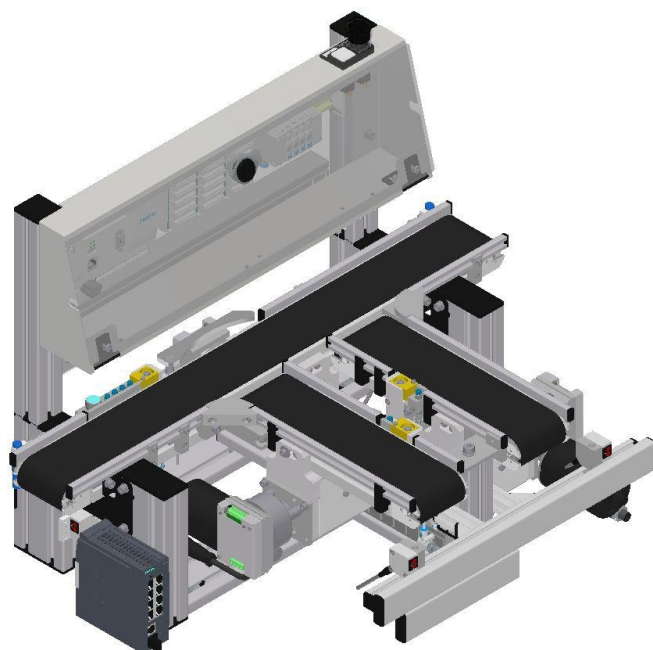


Illustration similar

- MSRS20

The application module MSRS20 is designed to store goods coming from a robotino. The operation is done with an iPad, a worker is handling the boxes with the goods manually.

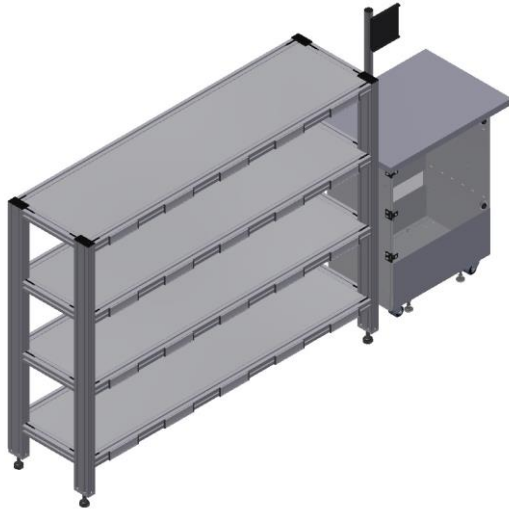
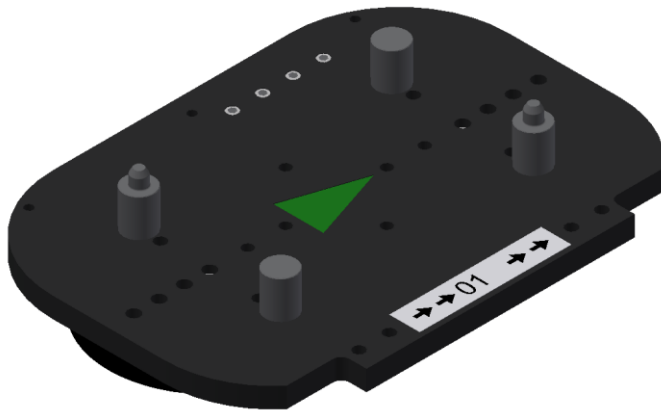


Illustration similar

6.2 Resources

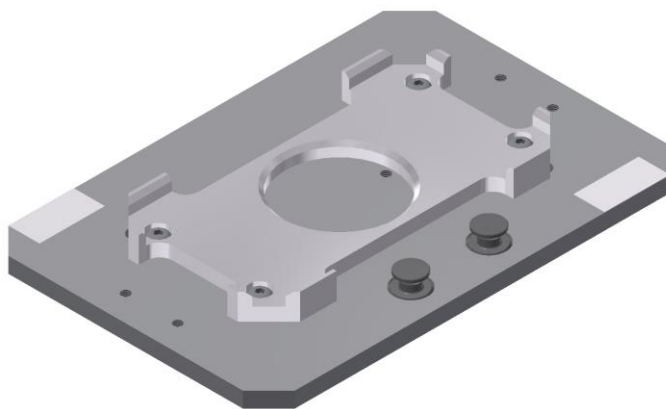
The training equipment of the system consists of several resources. They are used depending on the process selection.

The following resources are available:



Pallet carrier / illustration similar

These pallet carriers are available for transporting the pallets.
Partnumber in MES - 31

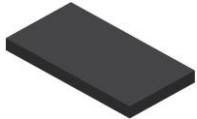
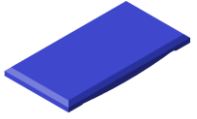
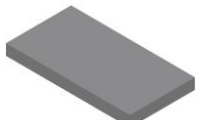
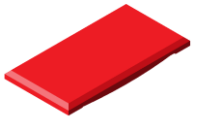
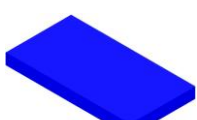
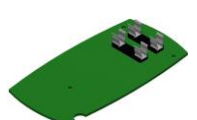




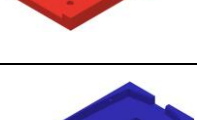

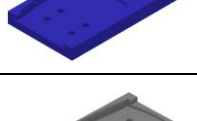
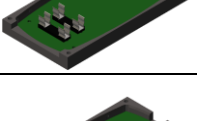

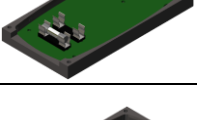

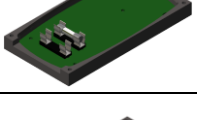
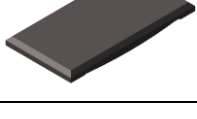


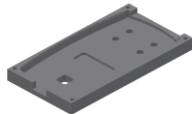

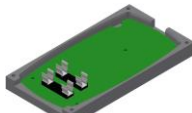
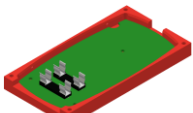

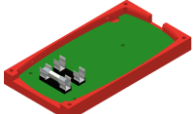
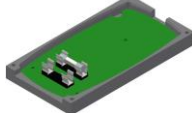
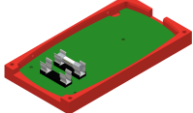
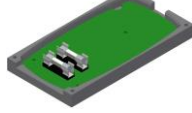
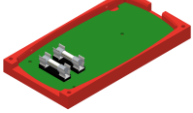
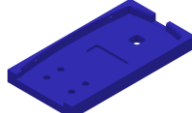
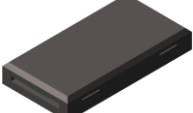
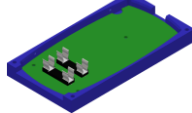
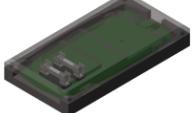
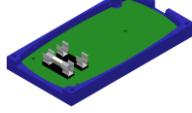
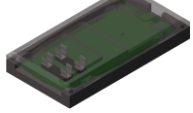
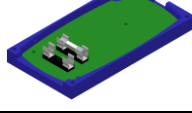
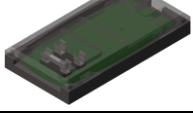
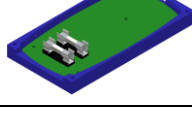
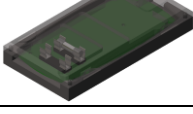
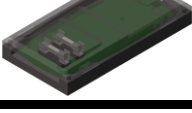
Pallet / illustration similar

These pallets are available for receiving always one workpiece.
Partnumber in MES - 25

Workpieces



The workpieces are differentiated according to the project into production parts and external production parts.



Workpieces	Description	Workpieces	Description
	CP raw material black No. 101		CP back cover blue No. 113
	CP raw material grey No. 102		CP back cover red No. 114
	CP raw material blue No. 103		CP – board No. 120
	CP raw material red No. 103		CP fuse No. 130
	CP front cover red No. 107		CP front cover black No. 210 – if there is a CNC milling machine integrated in the system, the front cover can also be produced there, thus becoming a production part.
	CP front cover blue No. 108		CP front cover black without fuses No. 211
	CP front cover grey No. 109		CP front cover black with fuse left No. 212
	CP front cover black No. 110		CP front cover black with fuse right No. 213
	CP back cover black No. 111		CP front cover black with both fuses No. 214
	CP back cover grey No. 112		



Workpieces	Description	Workpieces	Description
	CP front cover grey No. 310 – if there is a CNC milling machine integrated in the system, the front cover can also be produced there , thus becoming a production part.		CP front cover red No. 510 – if there is a CNC milling machine integrated in the system, the front cover can also be produced there , thus becoming a production part.
	CP front cover grey without fuses No. 311		CP front cover red without fuses No. 511
	CP front cover grey with fuse left No. 312		CP front cover red with fuse left No. 512
	CP front cover grey with fuse right No. 313		CP front cover red with fuse right No. 513
	CP front cover grey with both fuses No. 314		CP front cover red with both fuses No. 514
	CP front cover blue No. 410 – if there is a CNC milling machine integrated in the system, the front cover can also be produced there , thus becoming a production part.		CP black complete without board No. 1200
	CP front cover blue without fuses No. 411		CP part customer No. 1210 freely selectable
	CP front cover blue with fuse left No. 412		CP part black with no fuse No. 1211
	CP front cover blue with fuse right No. 413		CP part black with fuse on the left No. 1212
	CP front cover blue with both fuses No. 414		CP part black with fuse on the right No. 1213
			CP part black with both fuses No. 1214

7 Design and Function

7.1 Transport

	 WARNING
	<ul style="list-style-type: none"> • Damage to transport equipment when moving heavy machines/machine sections <ul style="list-style-type: none"> – When the stations are shipped out, extra care must be taken to ensure that heavy machines/machine sections are always transported using a suitable forklift truck. A single station can weigh up to 50 kg. – Always use suitable transport equipment. – Always use the lifting points provided to move the machine/machine sections. – Always use the designated load take-up point.

	 WARNING
	<ul style="list-style-type: none"> • Securing transit routes <ul style="list-style-type: none"> – The supply routes must be cleared prior to transport, and must be suitable for the forklift truck to pass through. If necessary, warning signs or barrier tape must be set up to keep the routes clear. • Caution <ul style="list-style-type: none"> – When opening transport boxes, care must be taken to ensure that any additional components delivered in the same box, such as computers, do not fall out.

	 WARNING
	<ul style="list-style-type: none"> • Danger of crushing for hands/feet <ul style="list-style-type: none"> – It is not permitted to grip onto or under the feet when handling the machine, as there is an increased risk of hands or feet getting crushed or trapped in these areas. – When setting down the station, make sure no persons have their feet under the machine's feet.



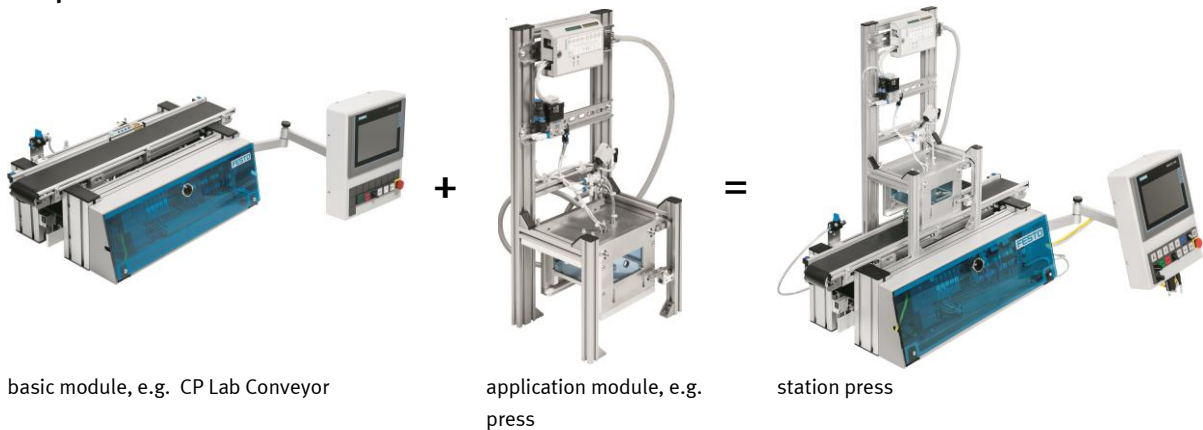
NOTE

- When opening the transport box, any additional components must be secured to prevent them from falling out, and removed first.
- Once this is done, the transport box can be removed/opened up fully, and the station can be taken out and moved to its intended location.
- Care must be taken with all components projecting from the machine, as sensors and similar small parts can easily be damaged if the machine is not transported correctly.
- Check that all the profile connectors are seated correctly using a size 4 – 6 Allen key. Unavoidable vibrations can loosen the connectors during transport.

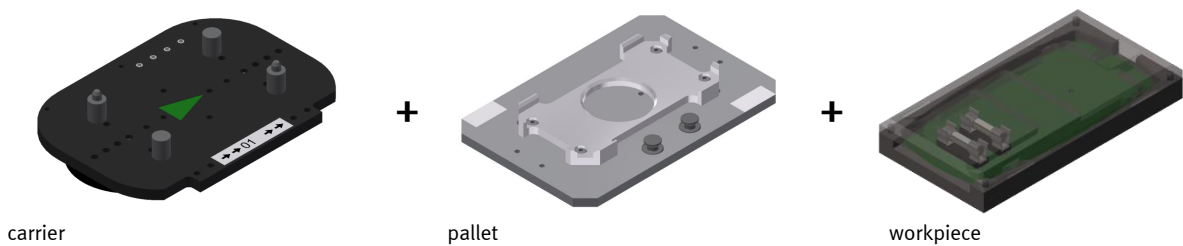
7.2 Overview of the System

CP Lab Conveyor, CP Factory Linear, CP Factory Shunt and CP Factory Bypass are called basic modules. If an application module, e.g. the CP Application Module press is attached to a basic module, it becomes a station.

Example

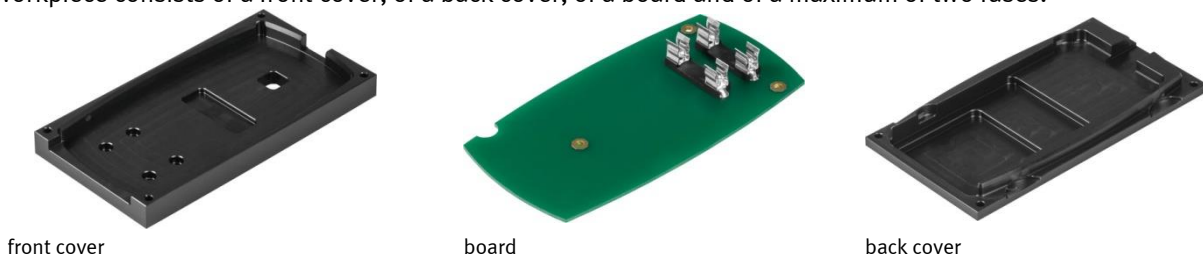


If several stations are put in a row one behind the other, this will form a production line.



Carriers are transported on the conveyors of the basic modules. And on the carriers, there are pallets with a fixed workpiece reception placed. The workpieces are placed on the workpiece reception or taken from it. Pallets can also be placed on a carrier in some stations or gripped from there.

The typical workpiece of a CP Factory/Lab System is the roughly simplified version of a mobile phone. The workpiece consists of a front cover, of a back cover, of a board and of a maximum of two fuses.

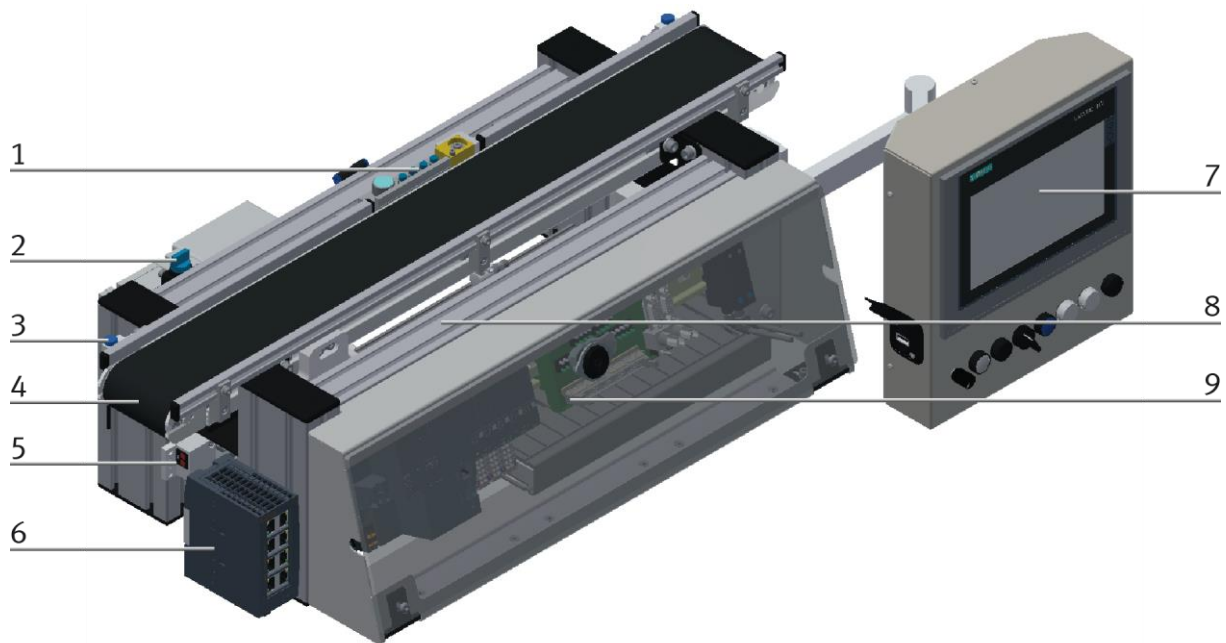


7.3 The CP Lab conveyor

The CP Lab conveyor consists of

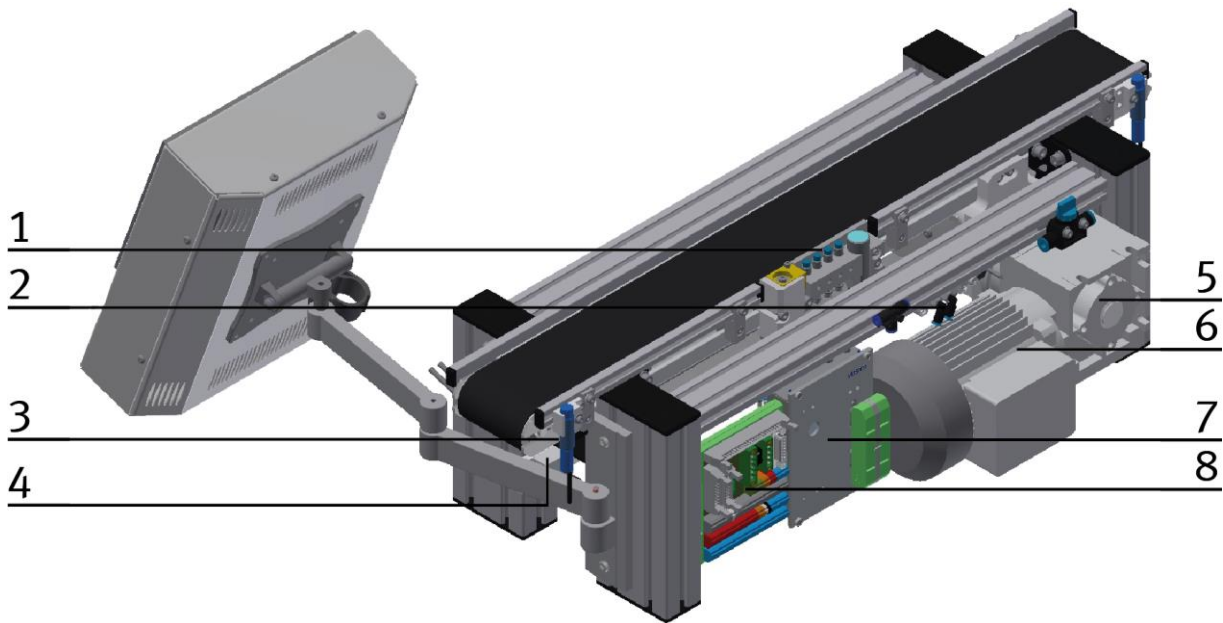
- a 80mm wide and 700mm long pallet transfer system
- a basic frame
- a control cabinet for controlling and further electrical components
- a control panel on a mike boom (option)
- On the basic frame, there are coupling sensors for an easy communication with other directly connected CP Lab conveyors.
- At the start and at the end of the CP Lab conveyor, there are capacitive sensors which recognize the pallet on the CP Lab conveyor.
- A stopper unit with different ways of identification which stops and identifies the pallet.
- A 24V geared motor which can be replaced by other motors (230 V / 400V). On the motor, there is an incremental encoder for detecting the rotational speed.

The CP Lab conveyor is designed for transporting pallets with workpieces to move back and forth or for transporting them to further CP Lab conveyors. Easy tasks can be realized here. It is also possible to extend the CP Lab conveyor with different applications. This way, the field of activity can be extended as desired.



Pallet transfer system front view / illustration similar

Position	Description	Position	Description
1	Stopping unit for carrier	6	Scalance XB008 Ethernet switch (optional) Partnumber 8032088
2	On-off valve	7	Control panel / Touch panel (CP-L-HMI T7 / optional) Partnumber 8091107
3	Capacitive sensor start of conveyor	8	Basic frame
4	Conveyor	9	Control cabinet for electrical components and controlling
5	Coupling sensor previous station		



CP Lab conveyor rear view / illustration similar

Position	Description	Position	Description
1	Stopper unit	5	2-quadrant controller for motor
2	Valve with manual override for stopper unit	6	alternatively 24 V motor / 230 V Motor / 400 V Motor
3	Capacitive sensor end of conveyor	7	IO-Link DA-Interface
4	Coupling sensor following station	8	Circuit board backside XZ2

7.4 Stopper unit

The stopper unit is located in the middle of the CP Lab conveyor. The carrier runs over the extended stopper unit. The screw (pos. 1 picture below) runs into the slot of the carrier. At the end of the slot the carrier is stopped.

With the help of the sensors at the stopper unit, the carrier can be identified. There are two ways for identifying:

- Variant 1
It is identified by 4 inductive sensors; for this exercise, the carriers may be provided with grub screws at different positions.
- Variant 2
The identity is read by the RFID sensor.

It is also possible to use the first of the inductive sensors for controlling; in this case the first grub screw is read and reports the position of the workpiece at the stopper.

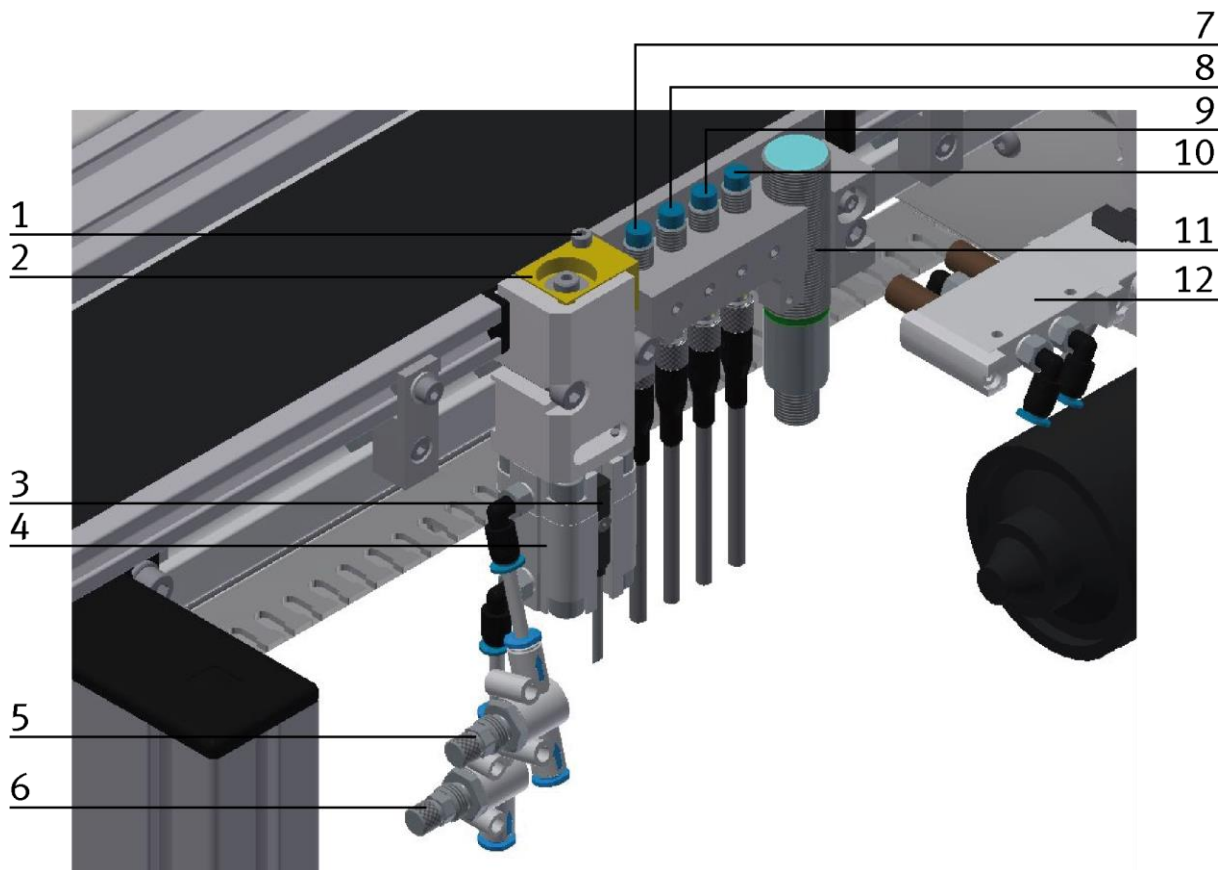
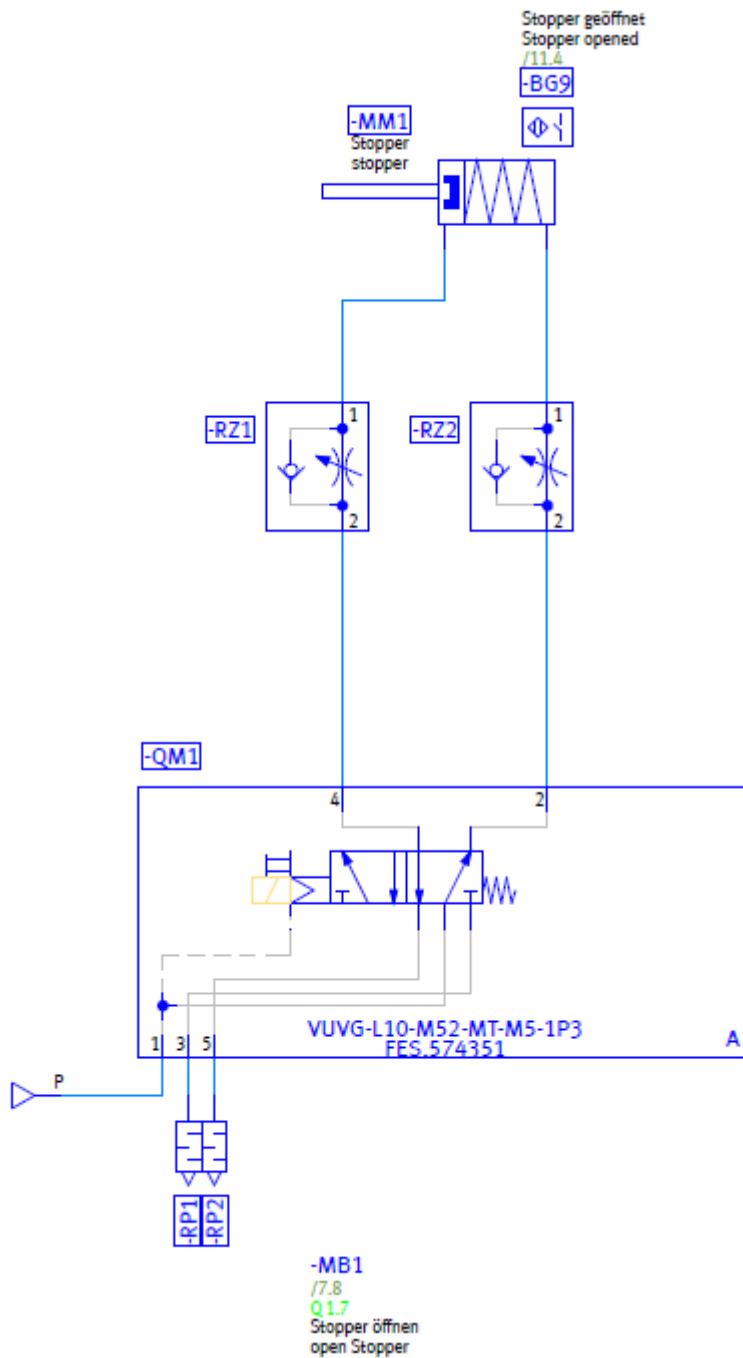


illustration similar

Position	Description	Position	Description
1	Stopper and guide screw for carrier	7	Inductive sensor 150395 / SIEN-M8NB-PS-S-L
2	Sprung stopper ratchet	8	Inductive sensor 150395 / SIEN-M8NB-PS-S-L
3	Sensor for stopper retracted 574334 / SMT-8M-A-PS-24V-E-0,3-M8D	9	Inductive sensor 150395 / SIEN-M8NB-PS-S-L
4	Stopper 157211 / AEVUZ-16-5-P-A	10	Inductive sensor 150395 / SIEN-M8NB-PS-S-L
5	Flow control supply air 193967 / GR-QS-4	11	RFID read-write head M18 Siemens 6GT2821-1AC32
6	Flow control exhaust air 193967 / GR-QS-4	12	Valve stopper with manual override 574351 / VUVG-L10-M52-MT-M5-1P3

The CP Factory / Lab stop unit consists of

- 1 spring-return cylinder AEVUZ-16-5-P-A with 2 pneumatic connections
- 2 One-way flow control valves (exhaust air throttles)
- 1 monostable 5/2-way valve (VUVG-L10-M52-MT-M5-1P3)
- 1 brass element
- 1 spring



Set up:

In the internal thread of the cylinder piston rod, a hexagon socket screw with washer is introduced. The washer forms a positive fit with the brass element as long as the brass element is not pressed down by hand and the cylinder is in the home position. Between brass element and cylinder body a spring is inserted. The cylinder is connected via two connections, each with a one way flow control valve. The one way flow control valves are connected to the monostable 5/2-way valve.

The use of the spring-return cylinder as a double-acting cylinder with a monostable 5/2-way valve is due to the following requirements for the stopper:

Stopper requirements:

- In the basic position the piston rod of the cylinder should extend.
- The speed for retracting and retracting the cylinder should be adjustable separately.
- Excessive noise during the extension and retraction movement of the cylinder should be avoided.
- In the event of compressed air or voltage drop, the cylinder must assume its basic position, ie extend.
- Compressed air and / or voltage must not lead to any hazard exposure.
- The extension of the cylinder must not exert excessive impact on an overlying carrier.
- The cylinder should be dimensioned as small as possible.

Analysis of the movement profile:

Situation:

In the depressurized state, the piston rod is in the upper end position due to the spring return, as it is a compact cylinder of the AEVUZ (pulling mode) series. Also, the brass element is in the upper end position, since due to the extended cylinder piston rod, the spring between brass element and cylinder body is relaxed.

Both the brass element, as well as the piston rod can be pressed down in the pressureless state. Brass element and piston rod then return to their normal position.

Compressed air connection / resistance:

As soon as the compressed air is switched on, the piston rod can no longer be pushed down by hand. However, the brass element already, since its position in the basic position of the cylinder depends only on the state of the spring between the brass element and the cylinder body.

The behavior with compressed air connection / resistance is comparable to the upward movement:

Upward movement:

The 5/2-way valve ventilates in the basic position, the lower chamber of the cylinder. The rising pressure in the lower chamber and the spring installed in the cylinder press the piston rod out of the cylinder housing until the upper end position is reached. In this case, the one way control valve -RZ2 allows the compressed air without throttling. The compressed air from the upper chamber escapes via the one way control valve -RZ1. This is therefore an exhaust air throttling. This allows the speed of the upward movement to be adjusted.

If no carrier is located above the stopper, the brass element also returns to its basic position. The upward movement of the piston rod relaxes the spring between the brass element and the cylindrical body during the movement. This also pushes the brass element upwards.

If a carrier is located above the stopper, the measuring element is pressed against the carrier by the force of the spring between the measuring element and the cylinder body. The spring force is low enough that the carrier is not pushed upwards and is strong enough for the measuring element to return to the basic position after the carrier has left the stopper.

Downward movement:

If the valve coil or manual control of the monostable 5/3-way valve is actuated, the valve changes to the working position. The lower chamber of the cylinder is vented through the throttle of the one way flow control valve -RZ2, while -RZ1 causes the compressed air to flow unimpeded into the upper chamber of the cylinder. This is therefore also an exhaust air throttling. Thus, the speed of the downward movement can be adjusted via -RZ2.

During the downward movement, the spring of the cylinder and the spring between the measuring element and the cylinder body are additionally pretensioned.

Monostable 3/2-way valve with throttling and single-acting cylinder

This variant can not be used since

- the speeds for the extension and retraction movement can not be set independently of each other
- due to the small size of the single-acting cylinder, a precise adjustment of the supply air throttle is made more difficult => noise
- In the case of small sizes of the single-acting cylinder with exhaust air throttling, no sufficiently large compressed air cushion can be built up in the chamber so that the mechanism of the exhaust air throttling has a positive effect

7.5 Drive versions

Whether DC motor or servo motor - the conveyor belt can be combined with all motors in just a few steps. Professional couplings or toothed belt transmissions convey maximum industrial practice with optimum didactic modularity.

7.5.1 Gear motor 24 V DC

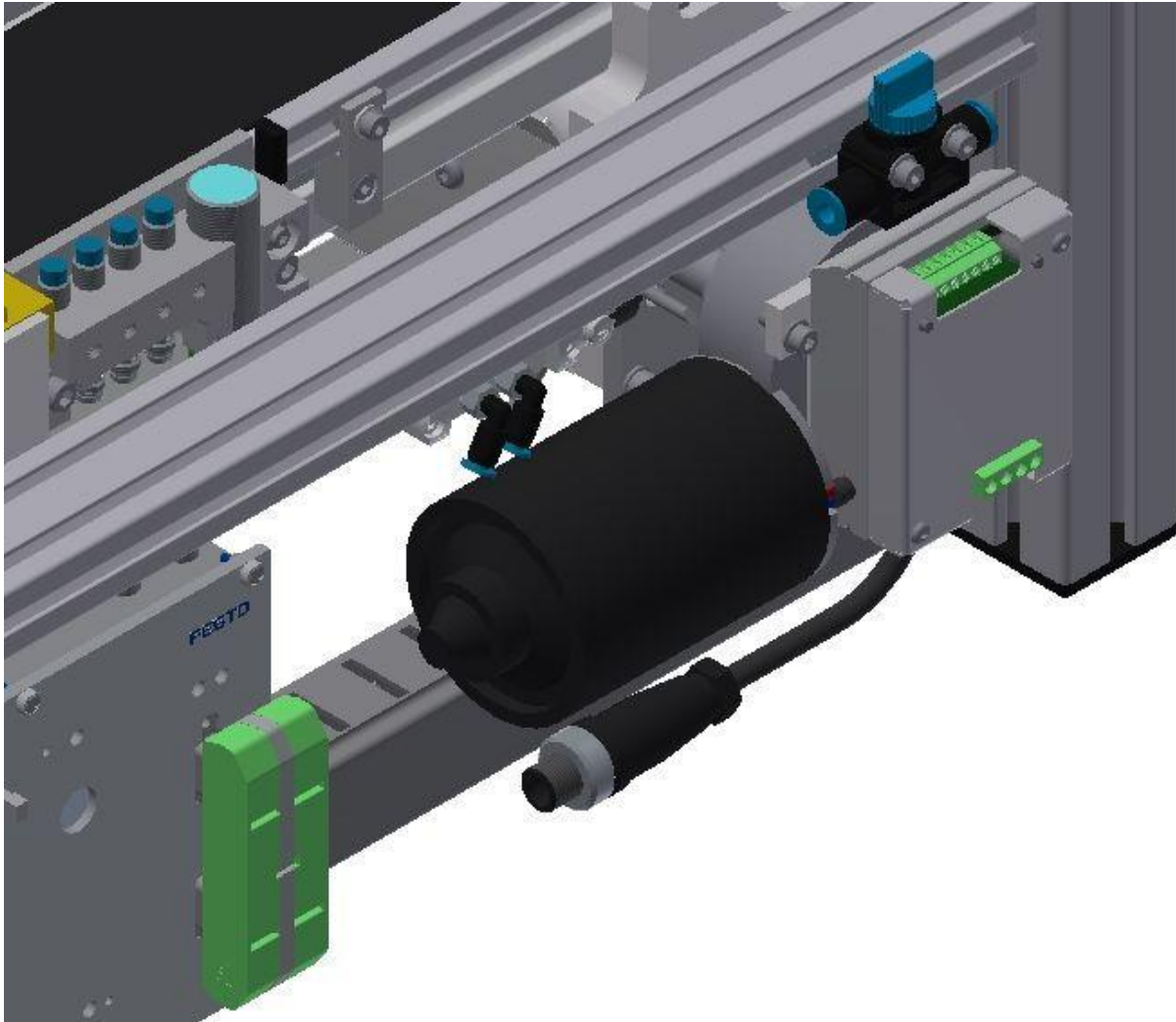


illustration similar

Valid for (see chapter type code)

CP-L-LINEAR-C11-M0

CP-L-LINEAR-C13-M0

7.5.2 Three-phase asynchronous motor with gearbox and self-ventilation 230 V AC

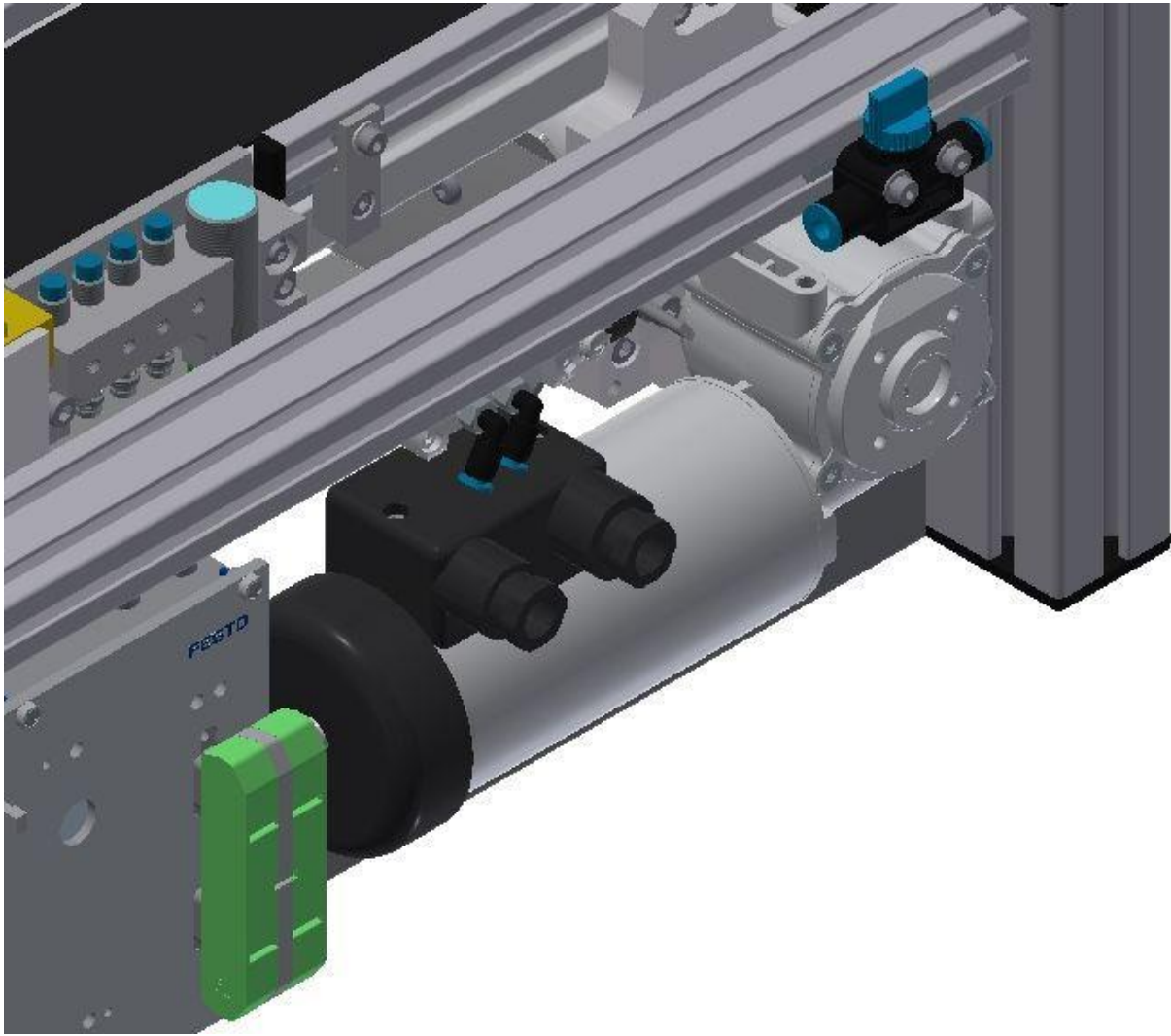


illustration similar

Valid for (see chapter type code)

CP-L-LINEAR-C11-M1

CP-L-LINEAR-C13-M1

7.5.3 Asynchronous motor with gearbox and self-ventilation 400 V AC

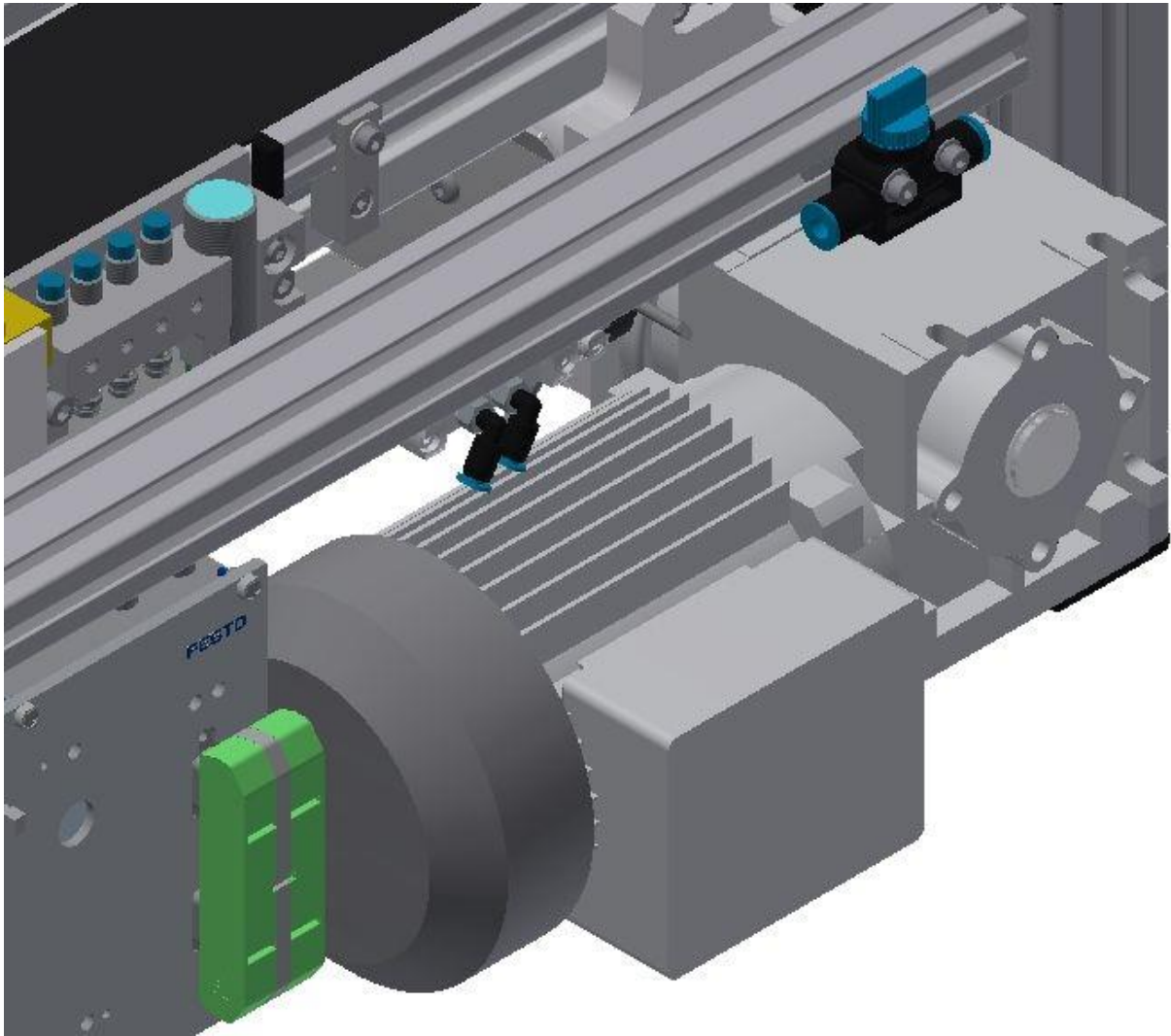


illustration similar

Valid for (see chapter type code)

CP-L-LINEAR-C11-M6

CP-L-LINEAR-C13-M6

7.6 Signal generator

The drive unit is provided with an encoder with 8 cut-outs. The encoder is interrogated by 2 light barriers, which makes the evaluation of the rotational speed possible.

One turn is 125,6mm

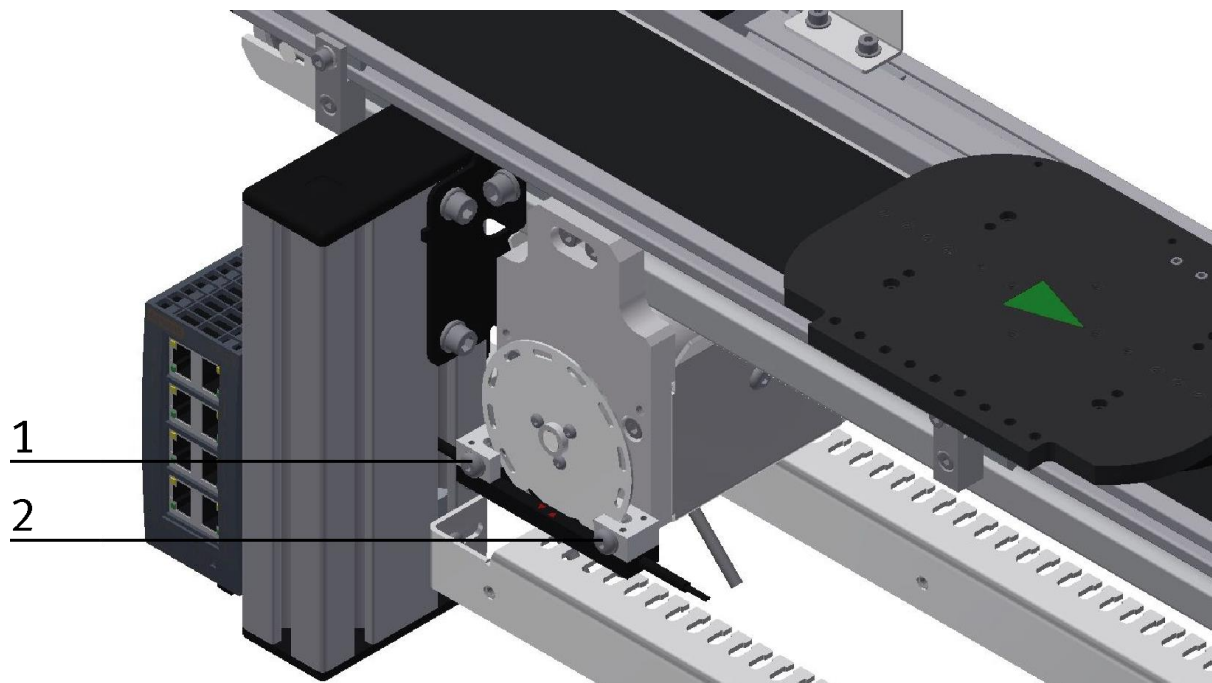
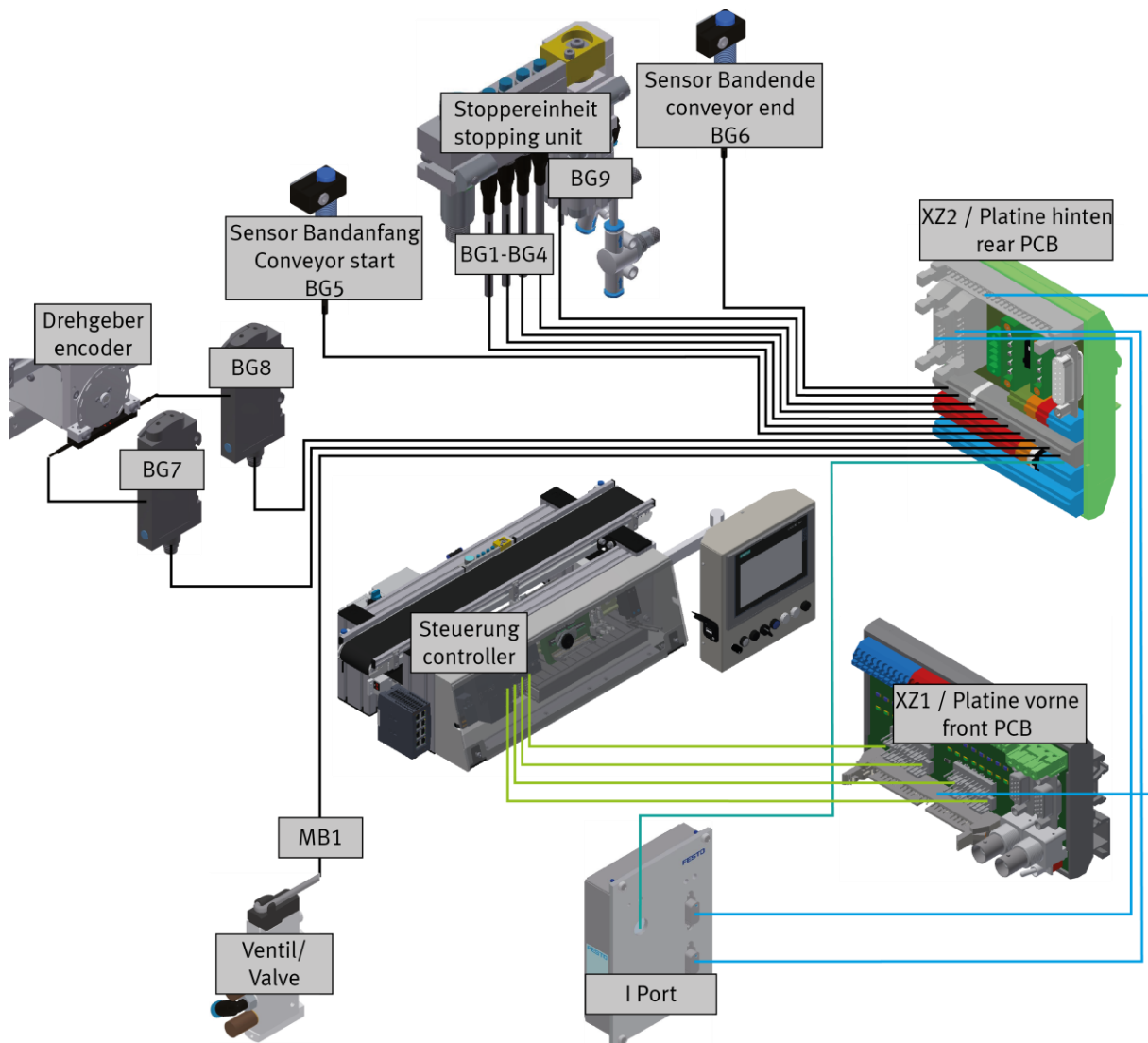


illustration similar

Position	Description
1	Light barrier channel B (BG7) / signal or coupling sensor is selectable with switch on the circuit board (left turning signal, right coupling sensor)
2	Light barrier channel A (BG8) / signal or coupling sensor is selectable with switch on the circuit board (left turning signal, right coupling sensor)

7.7 Electrical connections

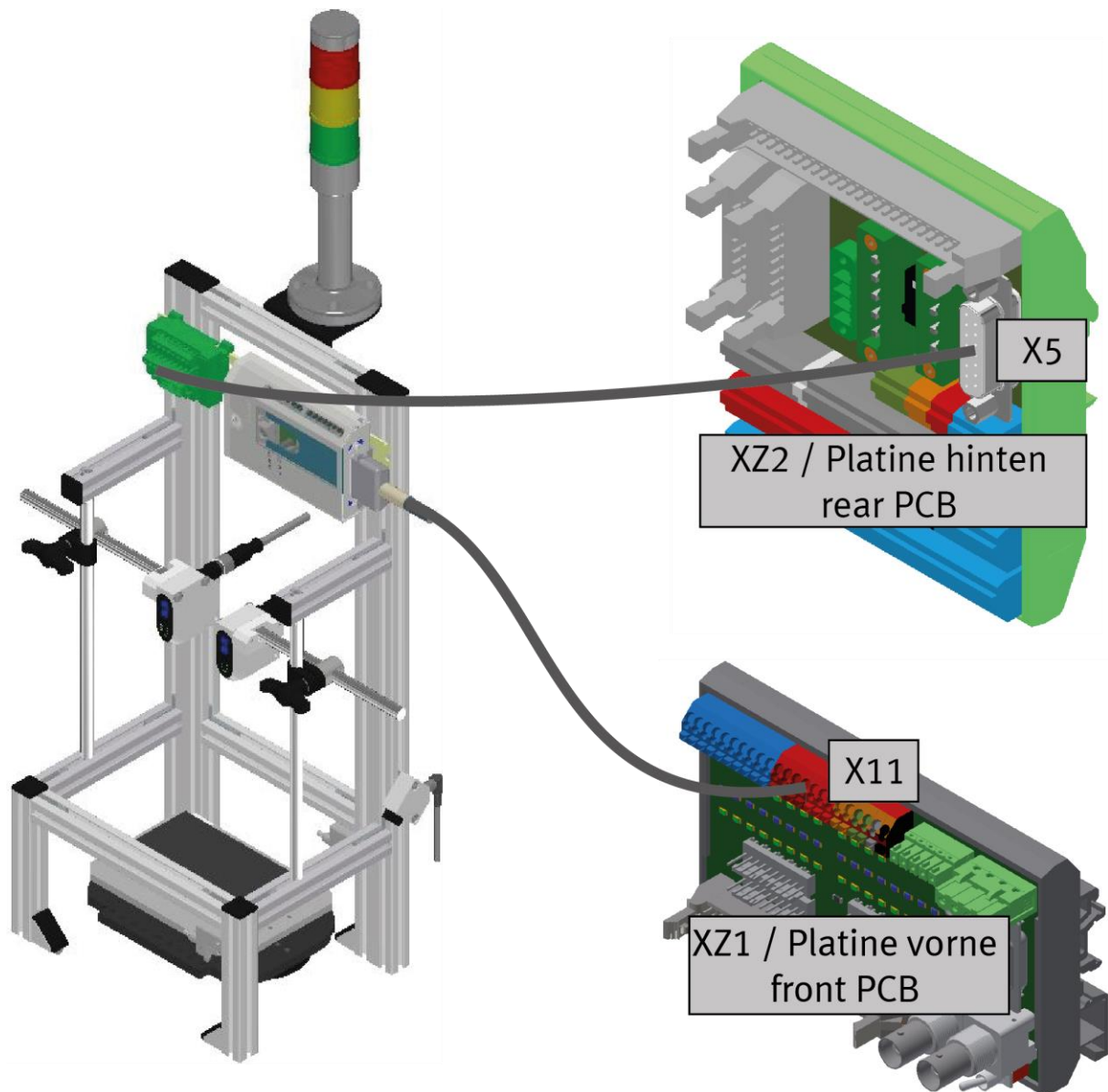


Electrical connections / illustration similar

The shaft encoder has got 2 channels, channel A is connected with the output unit BG8, channel B is connected with the output unit BG7. The output units can be connected alternatively to the coupling sensors. (left turning signal, right coupling sensor)

The iPort is connected to the I/O link master of the ET200 SP.

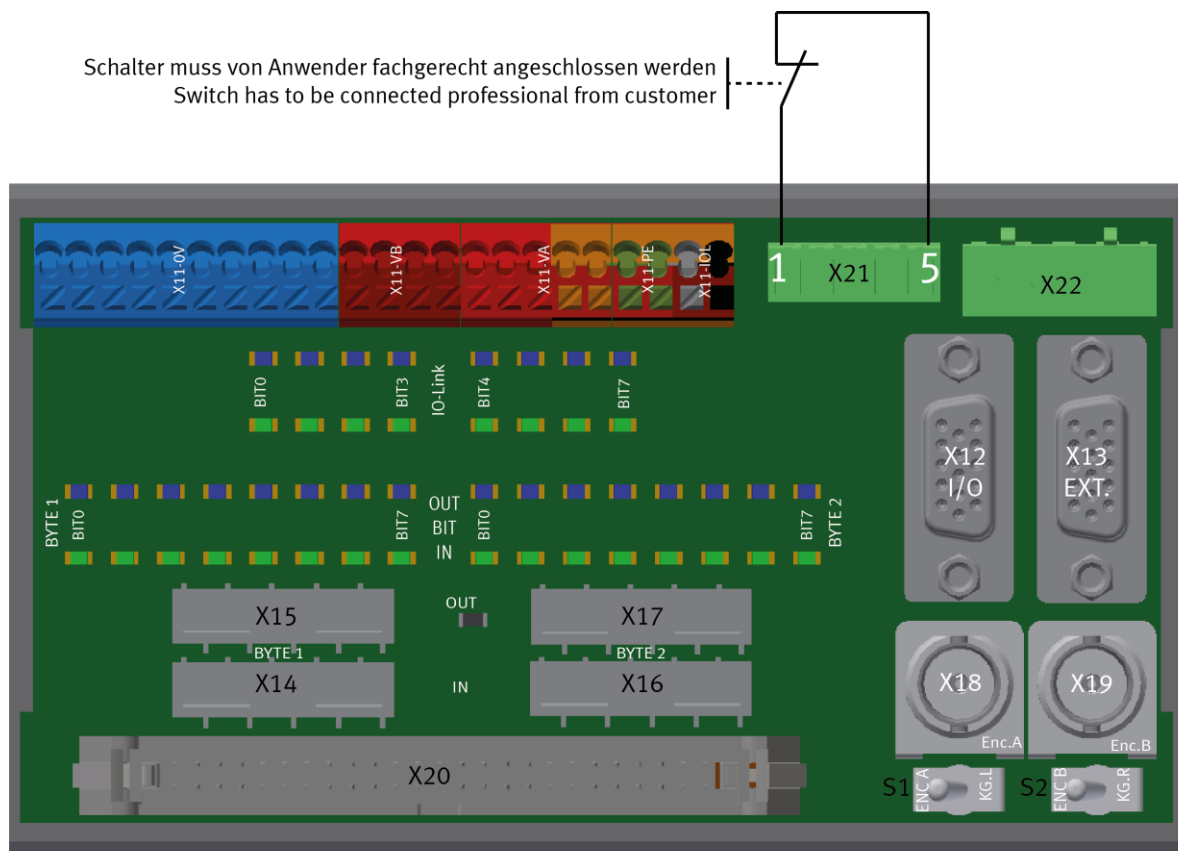
Instead of the controller, it is possible to install a I/O Terminal.



Electirc connection application module / illustration similar

If an application module is connected to the CP Lab conveyor, the cable that is hardwired to X11 is plugged into the SYS-Link connector of the I / O terminal. If the application module has an analogue interface, the analogue terminal is plugged into the rear XZ2 board at interface X5.

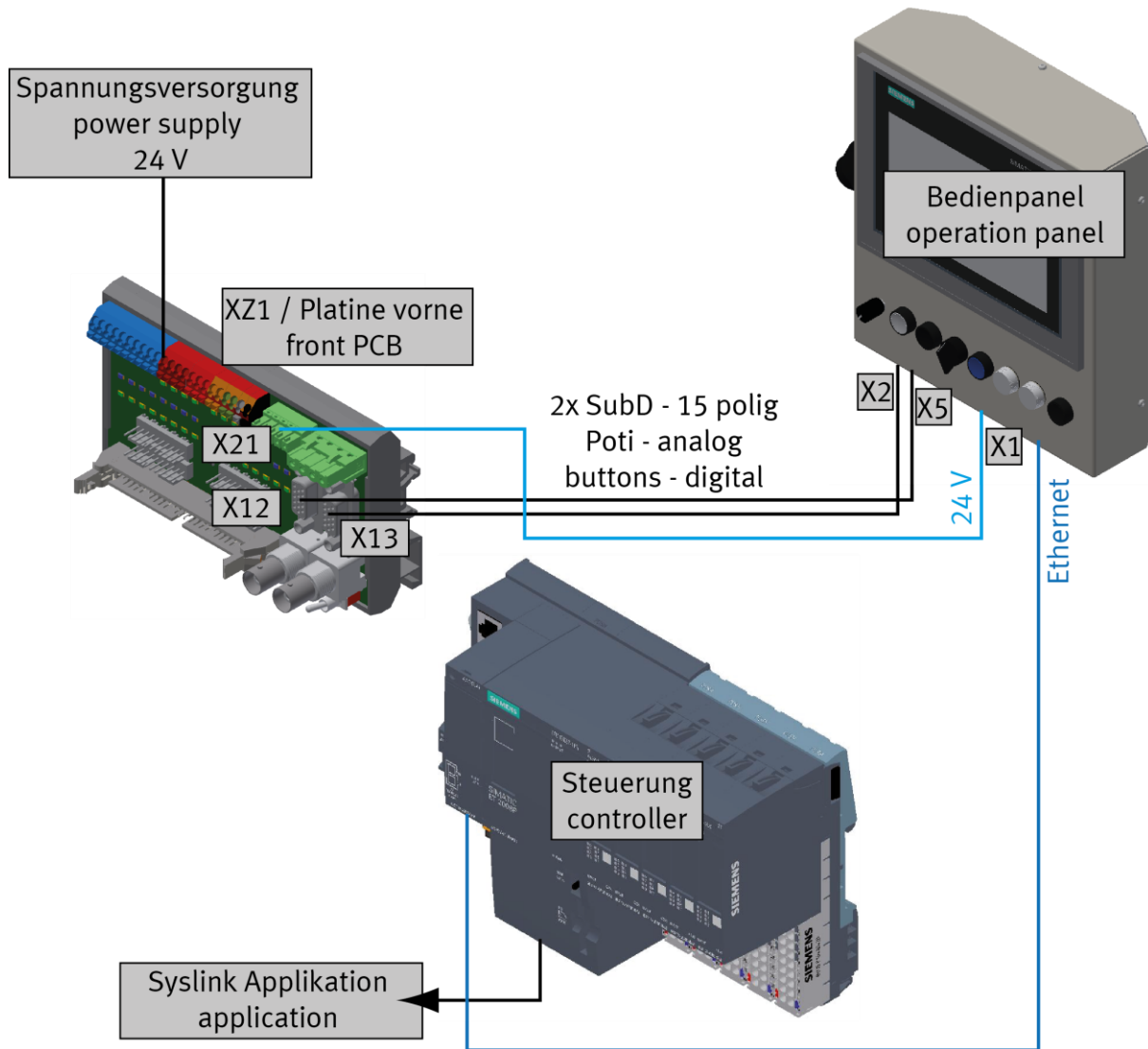
7.7.1 Connections without HMI



Further electrical connections / illustration similar

If there is no HMI Touchpanel, a switch has to be connected at the front PCB. Connect clamp 1 from X21 plug with clamp 5 from X22.

7.7.2 Connections with HMi (option)



Further electrical connections / illustration similar

The potentiometers of the control panel are connected to the 15 pole SubD plug on the control panel. There are also 4 I/O signals on this plug. The cable is connected to XZ1 /X12.

The external power supply is connected with lab cables at the XZ1.

With the SYSlink plug, applications are connected to the controller.

7.8 Activation motors

7.8.1 Motor version 24V

Valid for (see chapter type code)

CP-L-LINEAR-C11-M0

CP-L-LINEAR-C13-M0

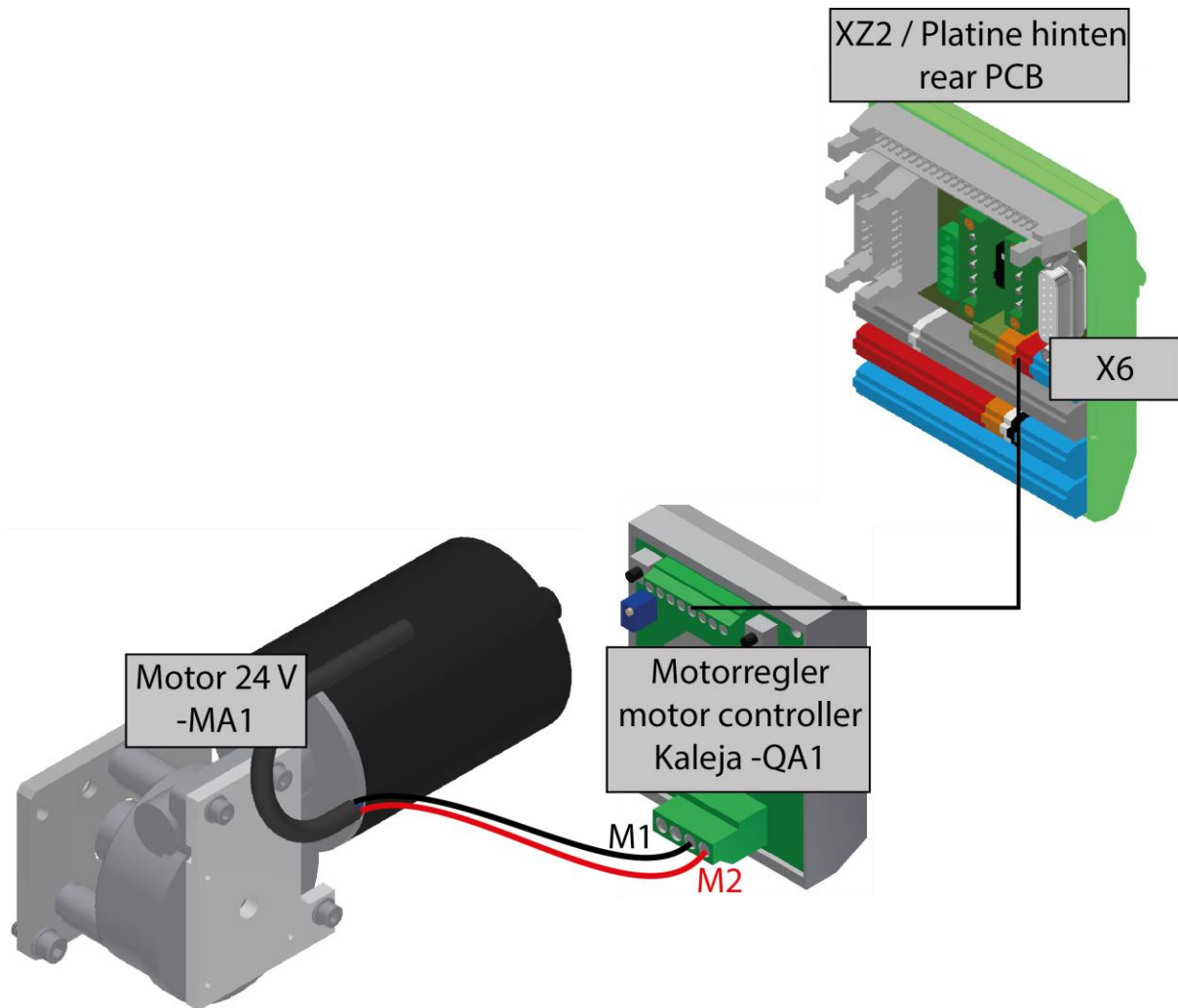


illustration similar

7.8.2 Motor version 230V

Valid for (see chapter type code)

CP-L-LINEAR-C11-M1

CP-L-LINEAR-C13-M1

Configured in triangle.

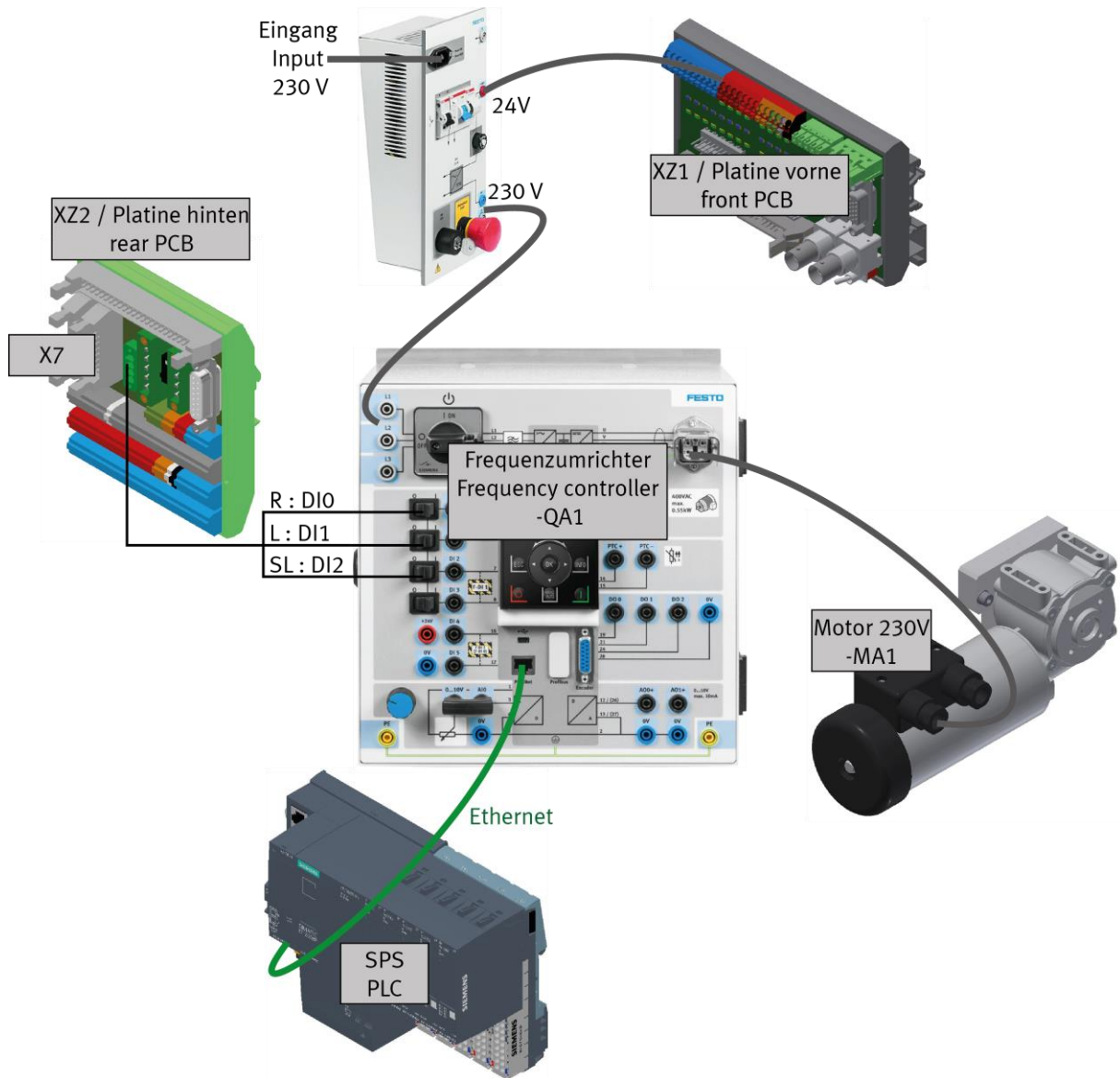



illustration similar

Motor MA1 – Clamps	G120 CU240-2PN / QA1- Clamps
U1	X1:1
V1	X1:2
W1	X1:3
PE	X1:PE

8 Commissioning

	NOTE
	<ul style="list-style-type: none"> – The following applies to the start-up as well as to the restart.

- The CP Lab conveyor is delivered pre-assembled.
- All attachment parts are individually packaged.
- All components, tubings and cablings have been clearly marked in order to guarantee a problem-free retrieving of all connections.

8.1 Visual Inspection

	 WARNING
	<ul style="list-style-type: none"> • Any damages must always be repaired instantly.

Visual inspection has to be carried out prior to every commissioning!

Before you start the CP Lab conveyor, you must always inspect the following parts regarding visual damages and function:

- Electrical connections
- Mechanical components and connections
- Emergency Stop devices

8.2 Safety Regulations

	 WARNING
	<ul style="list-style-type: none"> • Any damages must always be repaired instantly.

The CP Lab conveyor may only be operated on the following conditions:

- The technical condition – mechanically and electrically – of the CP Lab conveyor is perfect.
- The CP Lab conveyor is used in accordance with the regulations.
- The operating instructions have been read and understood.
- All safety devices are available and active.


8.3 Workplace

The commissioning of the CP Lab conveyor requires:

- a CP Lab conveyor
- a carrier with a pallet and a workpiece
- an on-site electrical connection in the room
- an on-site pneumatically connection in the room

8.4 Function extension by application modules

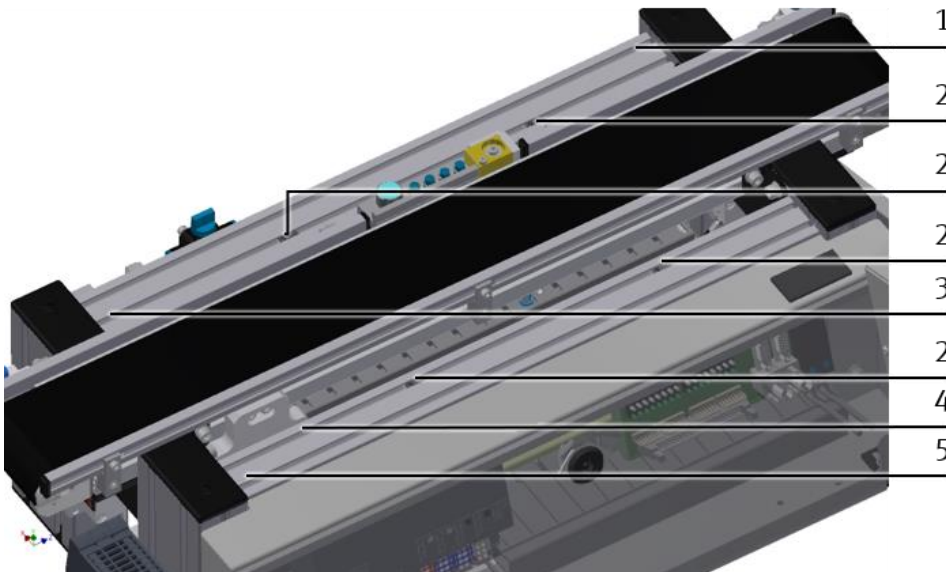
8.4.1 Assembly of an CP application module

	NOTE
	<p>– The procedure of attaching the CP application module to a basic module is the same as with all basic modules. The following description for the attachment to a basic module CP Lab Conveyor is an example for all basic modules and all application modules.</p>

Positioning slot nuts in the cross profiles of the basic module CP Lab Conveyor

Mounting the CP application module is very easy:

- Two M5-slot nuts (2) have to be put into the inner front slot of the cross profile (4) of the basic module CP Lab Conveyor.
- Then put two additional M5-slot nuts (2) into the inner back slot of the cross profile (3) of the basic module CP Lab conveyor.
- Then you have to position the slot nuts (2) approximately to the distance of the vertical cross profiles of the CP application module.




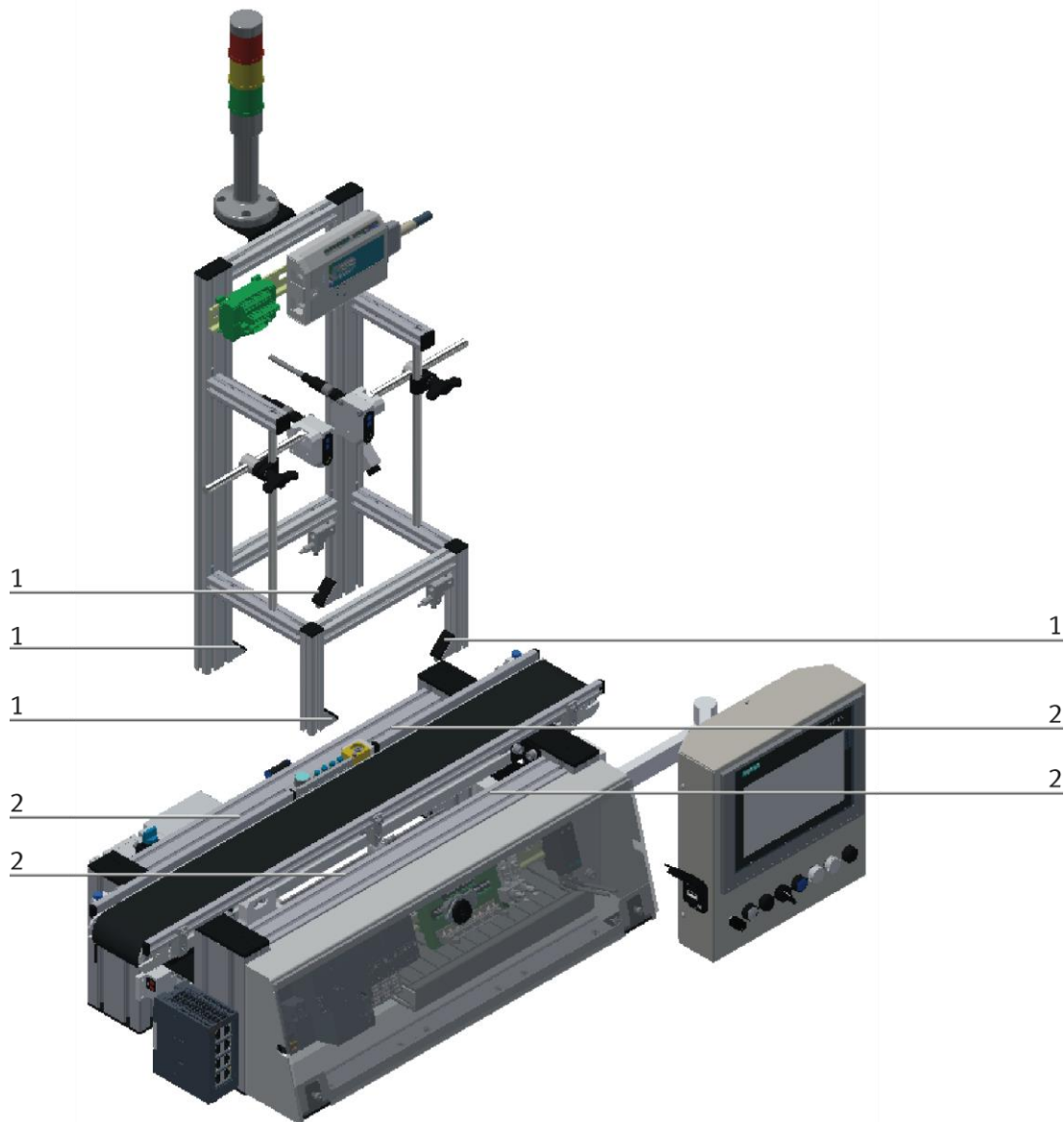
Positioning slot nuts / illustration similar

Position	Description
1	back cross profile
2	slot nut
3	Inner slot (back cross profile)
4	Inner slot (front cross profile)
5	front cross profile

Attaching the application module to the basic module CP Lab Conveyor

- Put the CP application module on the basic module CP Lab Conveyor.
- Position the slot nuts (2) underneath the mounting brackets (1) of the CP application module so that the internal threads of the slot nuts are visible underneath the elongated holes of the mounting brackets.

	NOTE
	<p>– Use Allen keys for lateral adjustment of the slot nuts.</p>

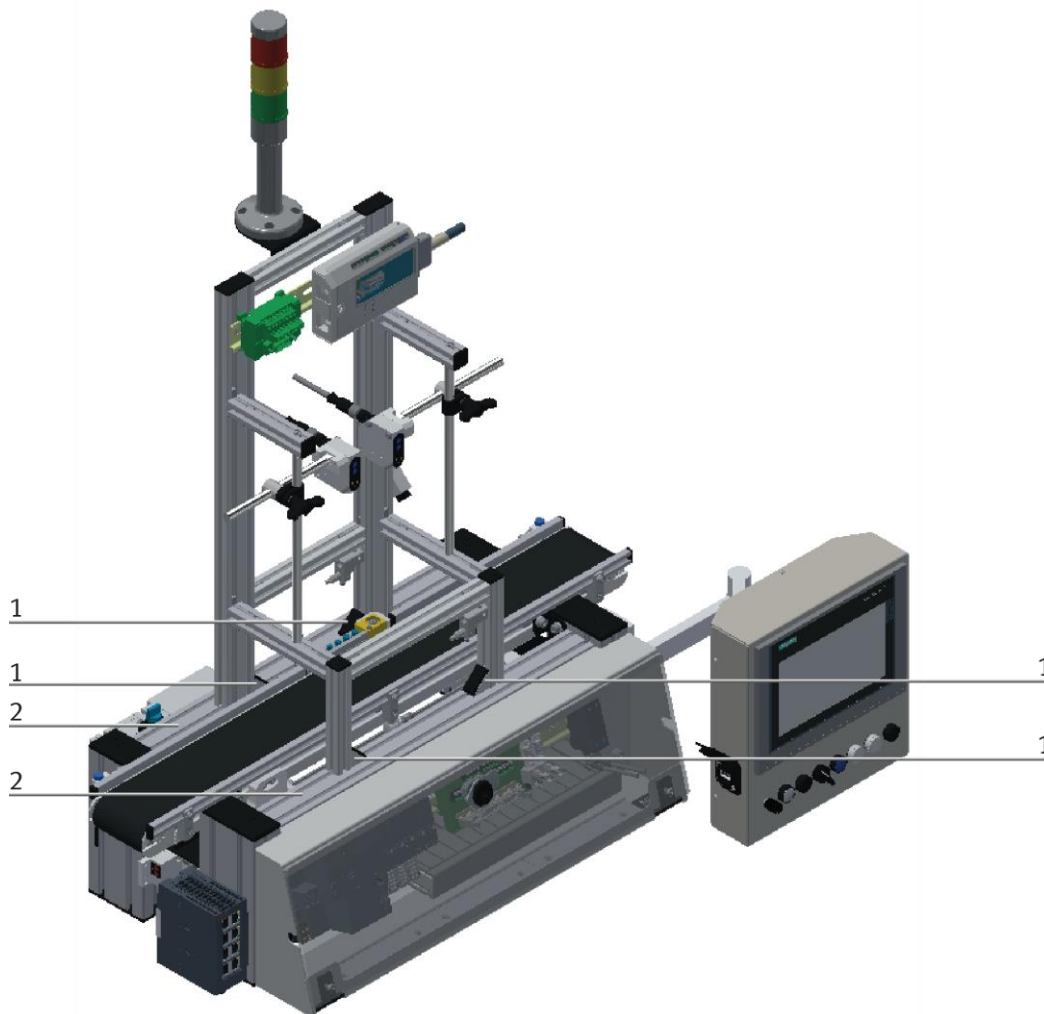


How to put on the CP application module / illustration similar

Position	Description
1	CP application module: mounting bracket
2	slot nut

Adjusting the CP application module and fixing it on the basic module CP Lab Conveyor


- Use raised head screws M5x8, in order to connect the mounting brackets (1) of the CP application module Measuring, at first loosely, with the cross profiles (2) of the basic module CP Lab Conveyor.
- After setting all raised head screws, you can still move the CP application module to the position required.
- Push a carrier with pallet and front cover to the stopper position. The front cover points with its inside upwards. The drilled hole of the front cover is on the left side.
- Have a visual inspection to make sure that the two distance sensors are capable of registering the front cover more or less in medium range.
- Now tighten the raised head screws.
- Then put the black covers onto the mounting brackets.



Tightening the CP application module / illustration similar

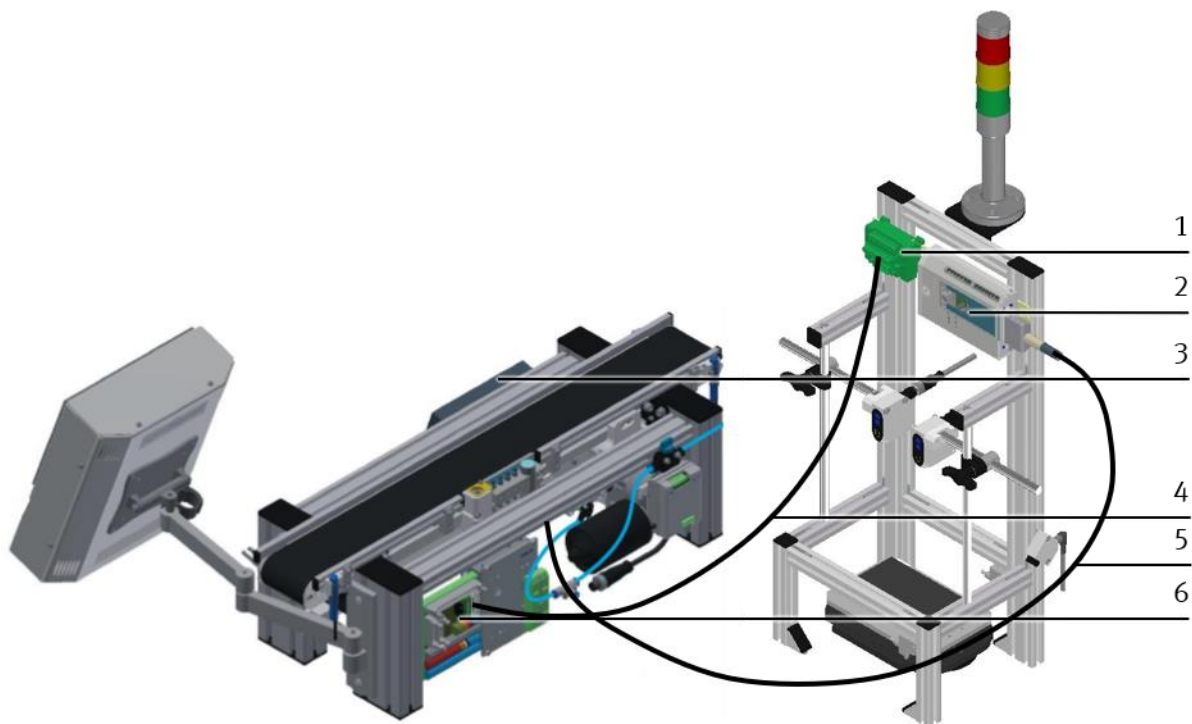
Position	Description
1	CP application module: mounting bracket with cover
2	basic module CP Lab Conveyor: cross profile

8.4.2 Connecting the CP application module electrically to basic module CP Lab Conveyor SysLink-interface for digital signals

	NOTE
<p>– With special variants of the basic module CP Lab Conveyor, you absolutely have to observe the corresponding operation instructions of the basic module CP Lab Conveyor!</p>	

The CP application module exchanges digital input and output signals with the basic module via the SysLink interface:

- Connect the I/O terminal (2) of the CP application module with the control (3) of the basic module CP Lab Conveyor. Therefore use the connecting cable with SysLink plugs (5) which has already been attached to the control and is led out on the back side of the basic module CP Lab Conveyor.



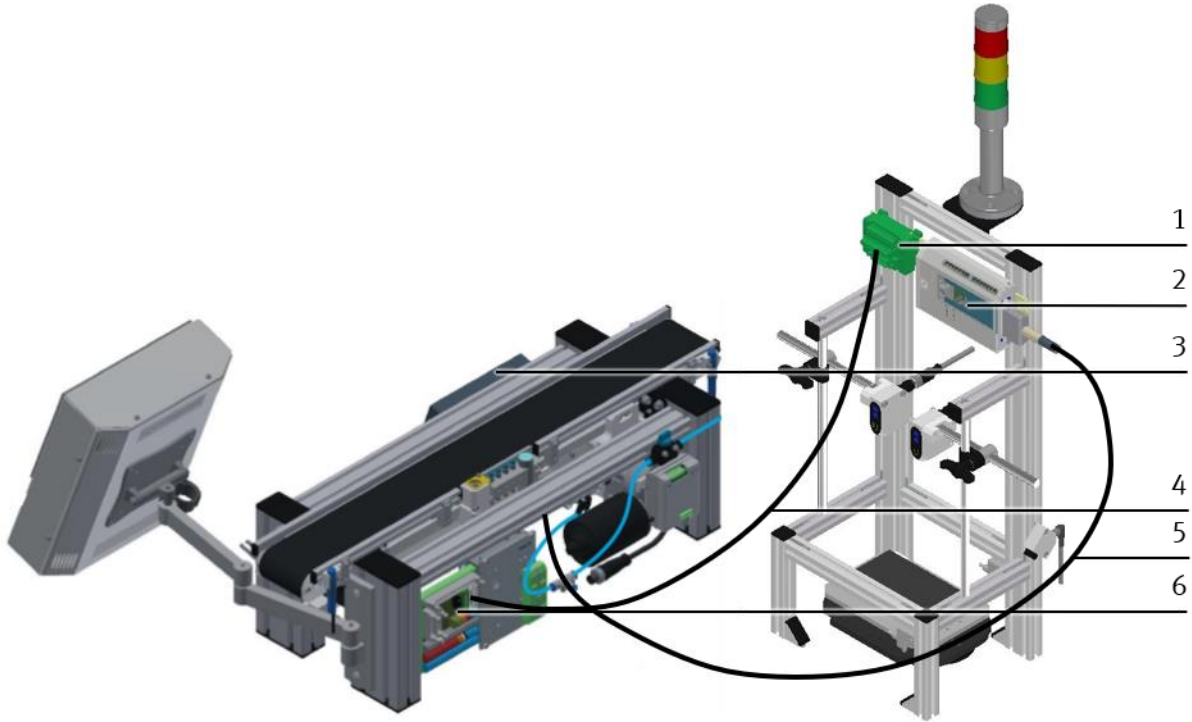
Electrical connections / illustration similar

Position	Description
1	CP application module: analogue terminal (+BG-XD2A)
2	CP application module: I/O terminal (+BG-XD1)
3	basic module CP Lab Conveyor: control or decentralized periphery
4	connecting cable with 15-pin standard D-Sub-plugs
5	connecting cable with a SysLink-plug (SysLink-cable)
6	basic module CP Lab Conveyor: board at the back (+G1-XZ2)

D-Sub-interface for analogue signals

The CP application module produces two analogue output signals with the distance sensors. These are put on the analogue terminal (1) and must be connected with the analogue inputs of the basic module:

- Connect the analogue terminal (1) of the CP application module with the D-Sub-interface for analogue signals (6) on the rear board of the basic module CP Lab Conveyor. Therefore use the provided connecting cable (4) with standard D-Sub plugs: 15-pin, two-rowed.

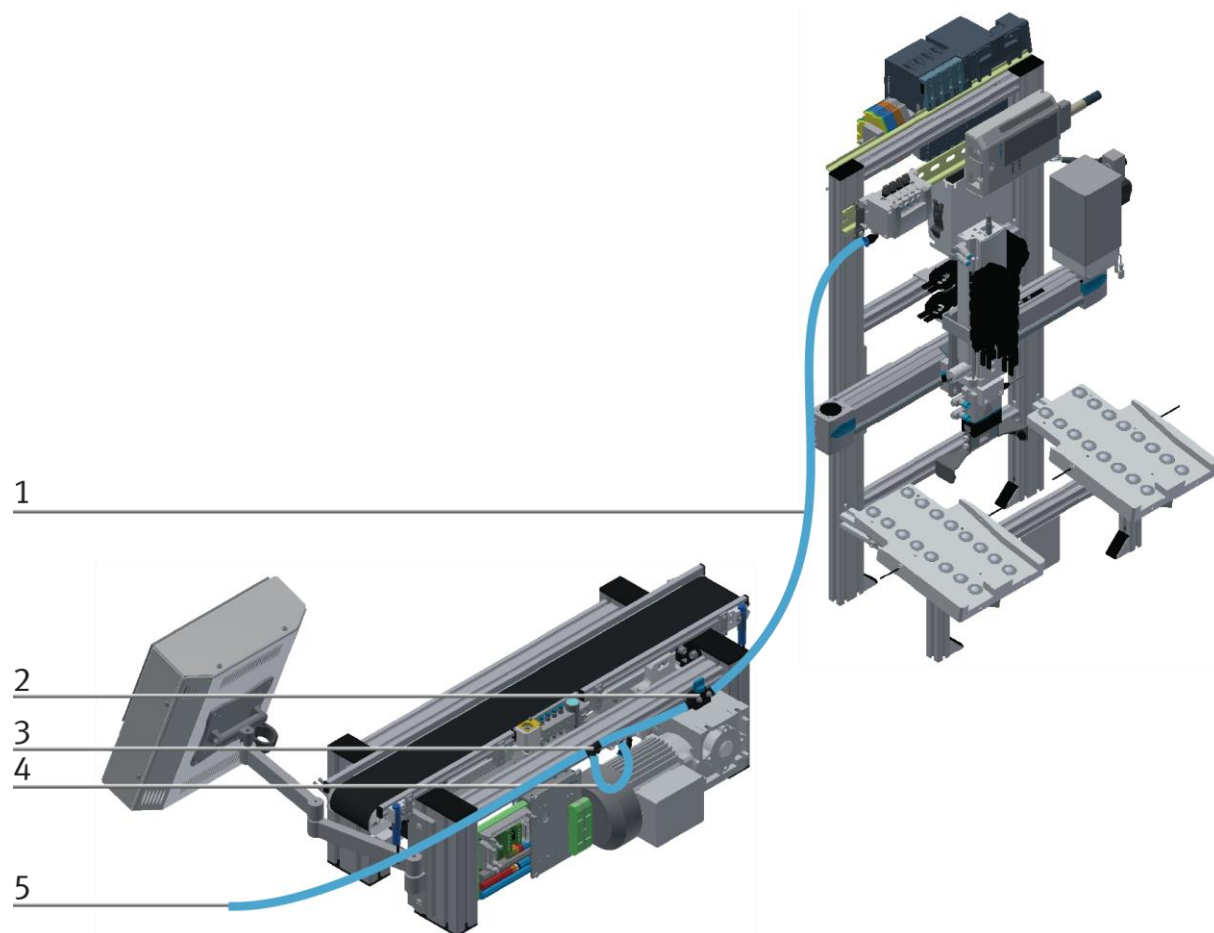


Electrical connections / illustration similar

Position	Description
1	CP application module: analogue-terminal (+BG-XD2A)
2	CP application module: I/O terminal (+BG-XD1)
3	basic module CP Lab Conveyor: control or decentralized periphery
4	connecting cable with 15-pin standard D-Sub-plugs
5	connecting cable with a SysLink-plug (SysLink-cable)
6	basic module CP Lab Conveyor: board at the back (+G1-XZ2)

8.4.3 Pneumatic connection from application modules

The pneumatic connection is based on the principle of the following sketch. The application module is connected from the valve terminal to the shut-off valve (2) on the conveyor belt. The hose (1) (nominal width 4) is simply inserted into the QS connector. The supply line (5) is plugged into the T-plug (3). The CP Lab Band is also supplied with a T-connector (4).



Pneumatically connect application module / illustration similar

8.5 Electrical Commissioning

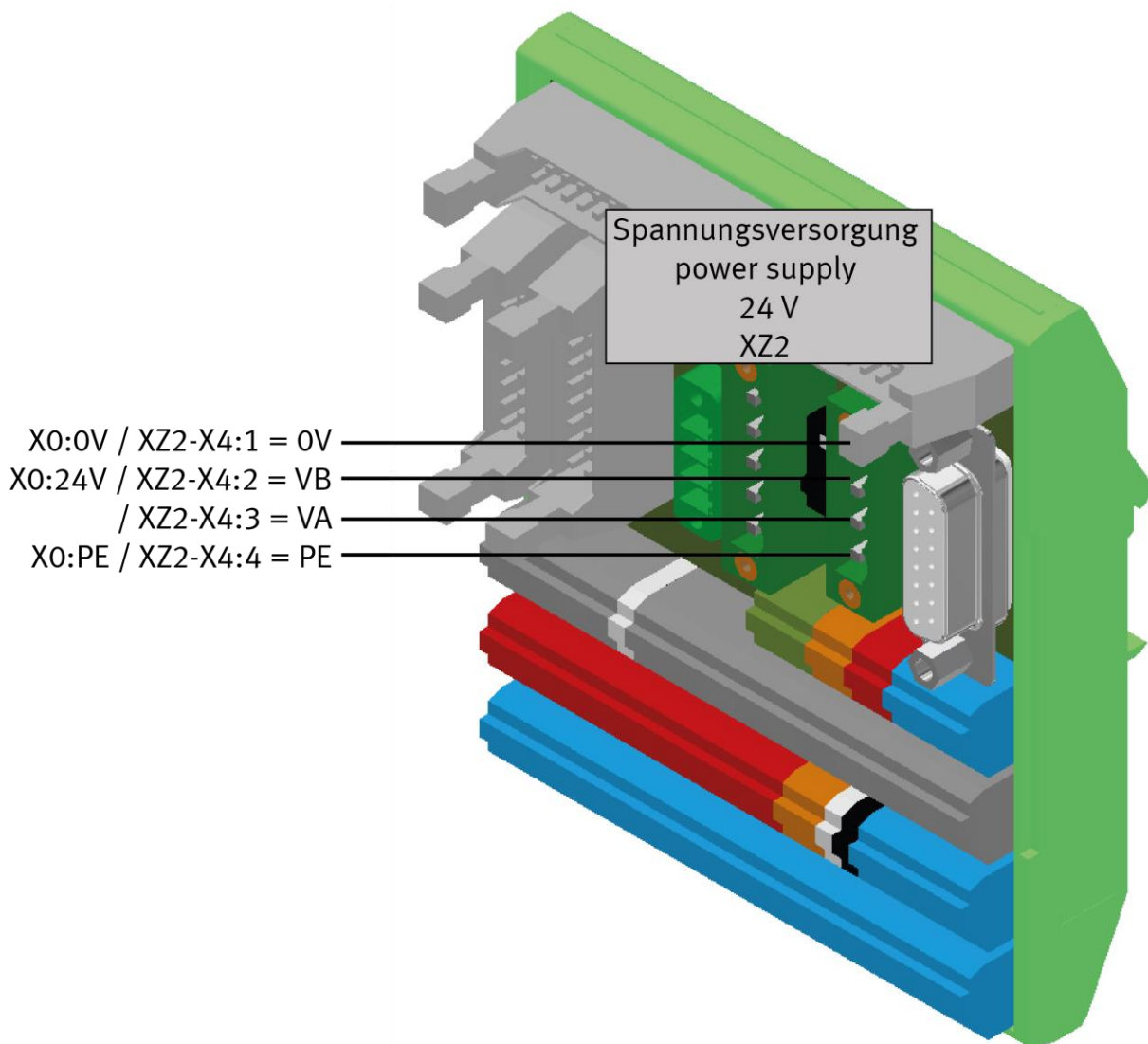
Now the CP Lab conveyor has to be supplied with electric power (24V). The external power supply has to be connected as follows:

0V to XZ2 clamp 1

24V to XZ2 clamp 2

PE to XZ2 clamp 4

The appliances are connected to the other corresponding clamps.



Wiring the CP Lab conveyor / illustration similar

8.5.1 Modus switch

Independent if the Festo Didactic IO-Link-DA-Interface is used as IO-Link-Device or an field bus node, the wiring of the I-Port-interface has to be changed. This is done by the circuit board:

Switch position:

Lower position 1=CTEU: A field bus node can be set on the Festo Didactic IO-Link-DA-Interface.

Upper position 2= IO-Link: The Festo Didactic IO-Link-DA-Interface is used as an IO-Link-device.

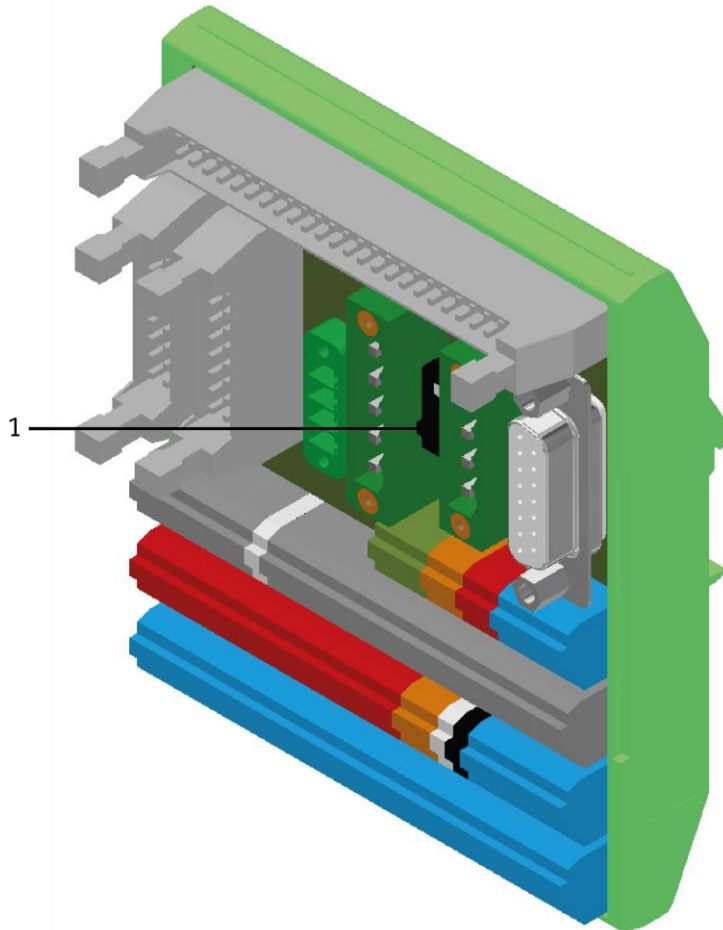


illustration similar

8.5.2 Off Button system

The touch panel is provided with an OFF button actuator. With a 5 pole cable, the OFF button is connected to the power supply XZ1.

The voltage (24VDC) is supplied to the system with the clamp XZ1 from an external power supply unit. As a permanent positive (24VB), this voltage is then lead into the touch panel with the M12 cable. In the touch panel, the contact of the OFF button connects the switched positive (24VNA) with 24VB. That means, if you press the OFF button, the 24VNA will be separated from 24VB as well as all other objects at clamp XZ1 supplied by 24VNA.

The second contact of the OFF button is used as a signal contact for the SPS and is located on input 1.5.

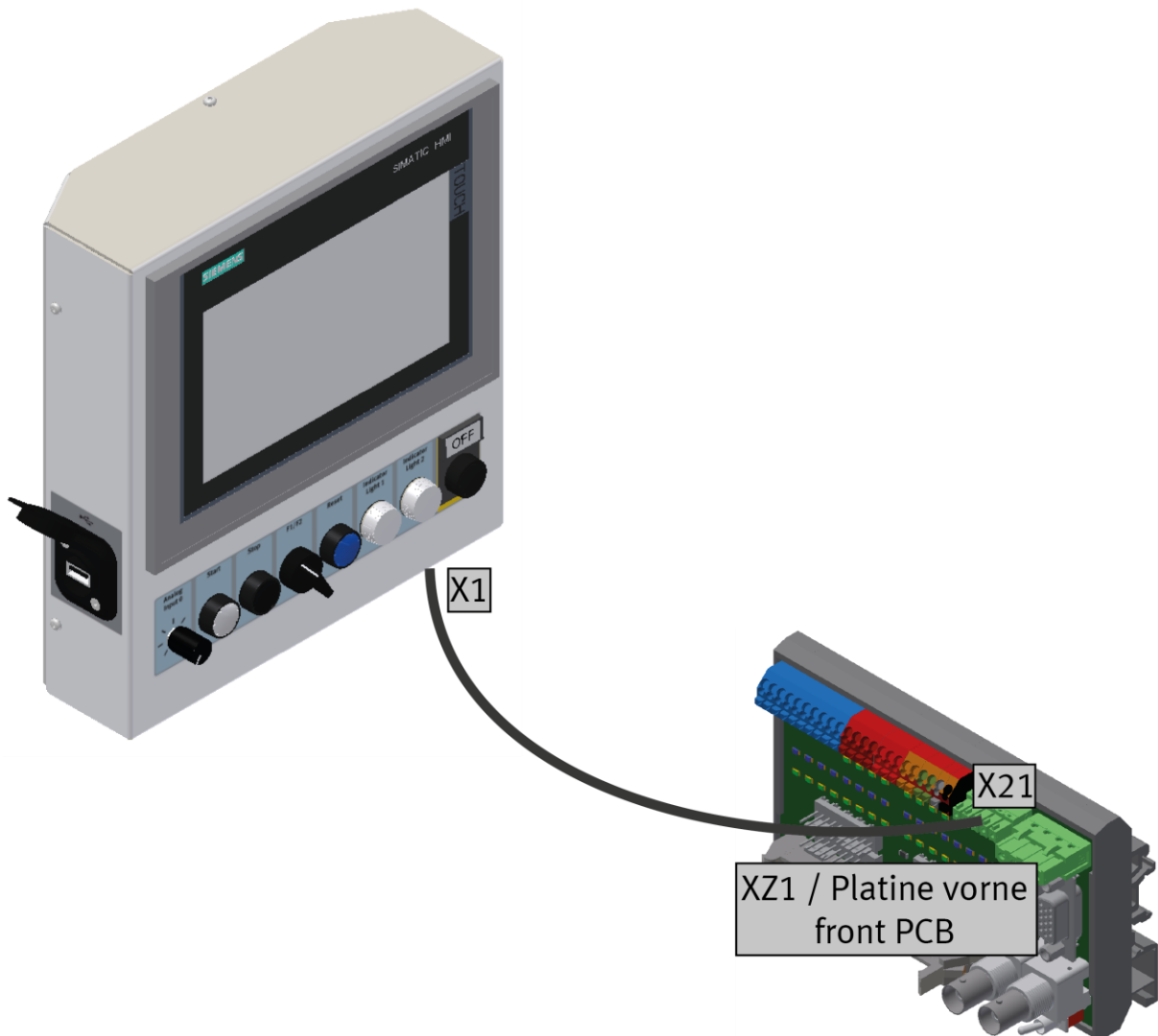


illustration similar

8.5.3 IN/Outputs

Description Interface Inputs

Name	Clamp at ET200 SP	SysLink cable	SysLink plug
Application IN0	KF2 / clamp: 1 (I0)	WG21 / GYPk	XG2: 1
Application IN1	KF2 / clamp: 2 (I1)	WG21 / RDBU	XG2: 2
Application IN2	KF2 / clamp: 3 (I2)	WG21 / WHGN	XG2: 3
Application IN3	KF2 / clamp: 4 (I3)	WG21 / BNGN	XG2: 4
Application IN4	KF2 / clamp: 5 (I4)	WG21 / WHYE	XG2: 5
Application IN5	KF2 / clamp: 6 (I5)	WG21 / YEBN	XG2: 6
Application IN6	KF2 / clamp: 7 (I6)	WG21 / WHGY	XG2: 7
Application IN7	KF2 / clamp: 8 (I7)	WG21 / GYBN	XG2: 8

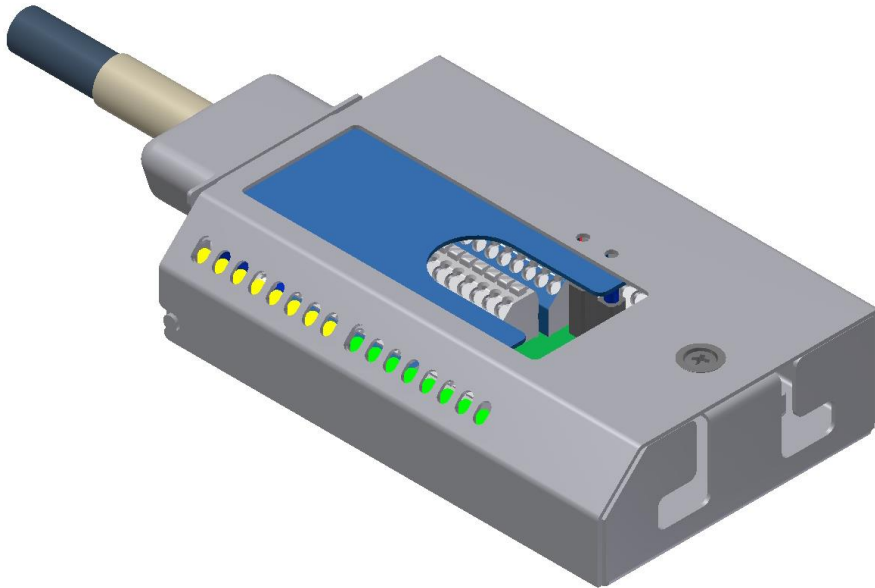
Description Interface Outputs

Name	Clamp at ET200 SP	SysLink cable	SysLink plug
Application OUT0	KF4 / clamp: 1 (O0)	WG21 / WH	XG4: 1
Application OUT1	KF4 / clamp: 2 (O1)	WG21 / BN	XG4: 2
Application OUT2	KF4 / clamp: 3 (O2)	WG21 / GN	XG4: 3
Application OUT3	KF4 / clamp: 4 (O3)	WG21 / YE	XG4: 4
Application OUT4	KF4 / clamp: 5 (O4)	WG21 / GY	XG4: 5
Application OUT5	KF4 / clamp: 6 (O5)	WG21 / PK	XG4: 6
Application OUT6	KF4 / clamp: 7 (O6)	WG21 / BU	XG4: 7
Application OUT7	KF4 / clamp: 8 (O7)	WG21 / RD	XG4: 8

Description Interface Voltage

Name	SysLink cable	SysLink plug
24VB	WG21 / WHPK	XZ1/X11: VB
0VB	WG21 / WHBU	XZ1/X11: 0 XZ1/X11: 0V
24VA	WG21 / BK	XZ1/X11: VA
0VA	WG21 / PKBN	XZ1/X11: 0V
0VA	WG21 / PUR	XZ1/X11: 0V



I/O terminal



I/O terminal XD1 / illustration similar

XZ1 out	XD1 in	XD1 out	To application
X11 - VB	XG1: 24VB	XJ1:22	APP_24VB
X11: 0V	XG1: 0VB	XJ1:23	APP_24VB
X11: VA	XG1: 24VA	XJ1:10	APP_24VB
X11: 0V	XG1: 0VA	XJ1:11+12	APP_24VB
X14:1	XG1:1 / I0	XJ1:13	APP_DI0
X14:2	XG1:2 / I1	XJ1:14	APP_DI1
X14:3	XG1:3 / I2	XJ1:15	APP_DI2
X14:4	XG1:4 / I3	XJ1:16	APP_DI3
X14:5	XG1:5 / I4	XJ1:17	APP_DI4
X14:6	XG1:6 / I5	XJ1:18	APP_DI5
X14:7	XG1:7 / I6	XJ1:19	APP_DI6
X14:8	XG1:8 / I7	XJ1:20	APP_DI7
X15:1	XG1:9 / O0	XJ1:1	APP_DO0
X15:2	XG1:10 / O1	XJ1:2	APP_DO1
X15:3	XG1:11 / O2	XJ1:3	APP_DO2
X15:4	XG1:12 / O3	XJ1:4	APP_DO3
X15:5	XG1:13 / O4	XJ1:5	APP_DO4
X15:6	XG1:14 / O5	XJ1:6	APP_DO5
X15:7	XG1:15 / O6	XJ1:7	APP_DO6
X15:8	XG1:16 / O7	XJ1:8	APP_DO7

8.6 Commissioning

	 WARNING
	<ul style="list-style-type: none"> • Danger of being pulled in at the conveyors <ul style="list-style-type: none"> – When the automatic mode starts, the belts of the conveyor belts start to move, creating a risk of being pulled in. – When starting, do not stand directly at the ends of the belt or hold on to them, keep enough distance. – Failure to heed the information given can lead to injuries.

For the CP Lab conveyor, an initial start-up has been made ex works.

Please follow the following instructions in order to be able to work with CP Lab conveyor as well as with a possibly present application:

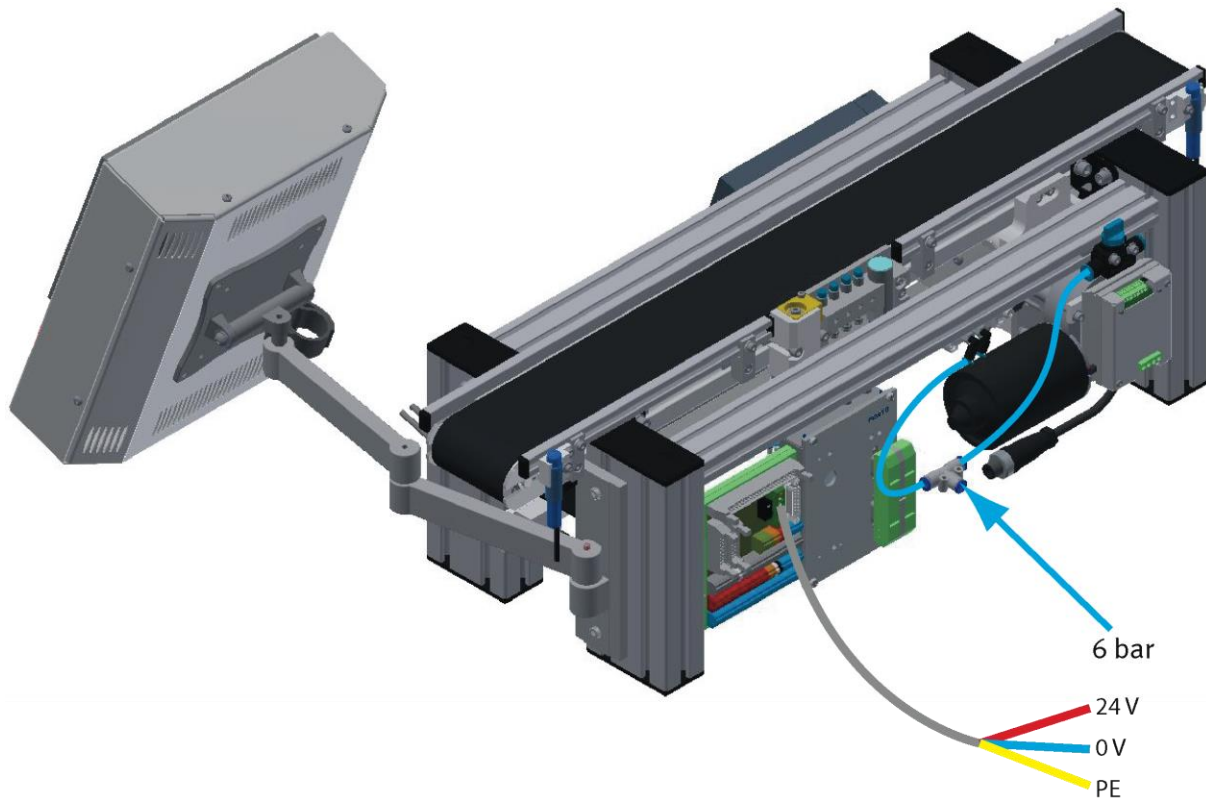


illustration similar

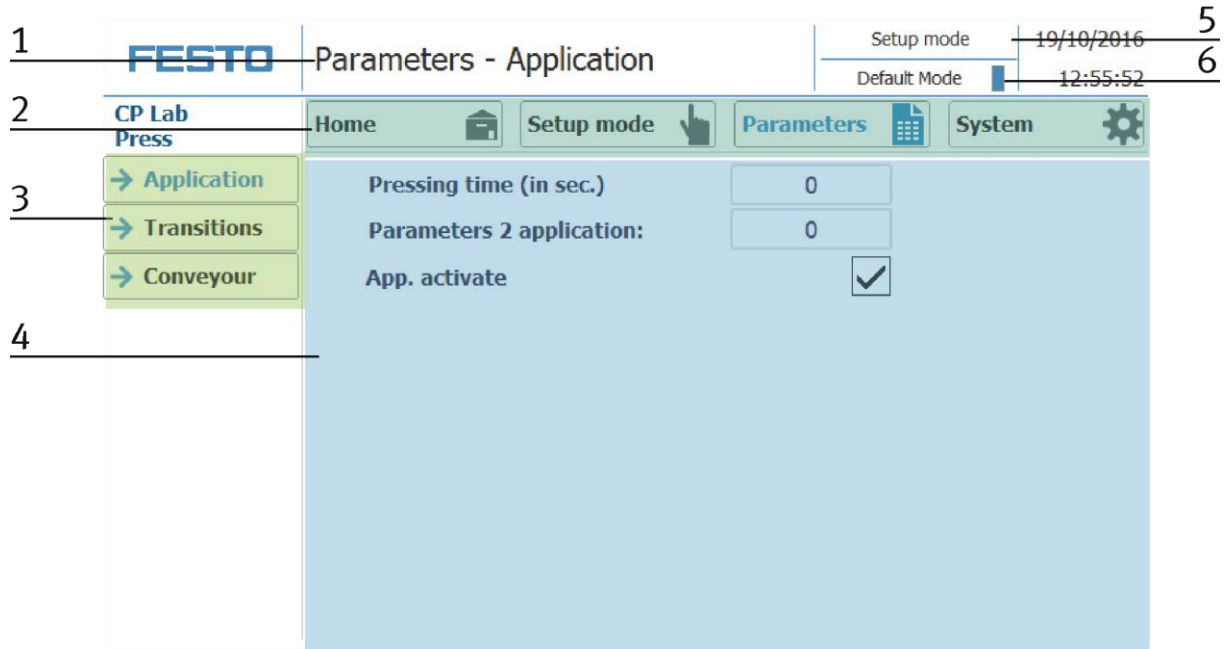
1. CP-L-CONV with 24 V DC motor: Connect the power supply 230 V AC for the power supply unit and connect the 24 V supply cable of the module.
 CP-L-CONV with 230 V AC motor and G120 Edutrainner: Connect the the supply unit Edutrainner with 230 V. Connect the 24 V supply calbe of the module and connect the the supply cable of the G120.
 CP-L-CONV with 400 V AC motor and G120 Edutrainner: Connect the the supply unit Edutrainner with 400 V. Connect the 24 V supply calbe of the module and connect the the supply cable of the G120.

2. The power supply is correctly connected to the CP Lab conveyor, but not yet switched on yet.
3. The CP Lab conveyor is supplied with approx. 6 bar compressed air. When commissioning for the first time, make sure to increase the pressure slowly. This prevents unpredictable events.
4. All EMERGENCY STOP signaling devices (pushbutton, door contact, light barriers, etc.) are not actuated or activated and unlocked.
5. Check any installed application for visual damage and repair if necessary
6. Remove workpieces
7. For CP-L-CONV with 24 V DC motor: Switch on the power supply to the power supply unit.
For CP-L-CONV with 230 V AC motor and G120 Edutainer: Switch on the Edutainer and G120 supply unit.
For CP-L-CONV with 400 V AC motor and G120 Edutainer: Switch on the Edutainer and G120 supply unit.
8. The HMI (touch panel) is started and starts up
9. Illuminated button Q1 on the control panel flashes
10. Press illuminated button Q1
11. Q1 illuminated pushbutton lights up.
12. Acknowledge the error message on the HMI
13. On the HMI, select the straightening mode and press the straightening button
14. Select Automatic on the HMI and press the Automatic button

9 Operation

The operation is explained with the help of an example. There might be deviations with other applications.

9.1 Menu structure of the CP Lab screen



Position	Description
1	Menu designation (main menu or submenu) OR in case of an active error or an error message, this field also serves as a display
2	Main menu
3	Submenu in main menu
4	Content varies depending on the main menu and the submenu
5	Display of operation mode
6	Display Default or MES Mode

9.1.1 Menu prompting
Home – Operation Mode

Home - Overview

Home – User Mode

FESTO Home - User Automatic mode 19/10/2016
Default Mode █ 12:51:19

CP Lab Press Home Setup mode Parameters System

→ Operat. mode
→ Overview
→ User
→ IO Test

User dialog

User	Password	Group	Logoff time
festo	*****	Bedienen	5

Home – I/O Test

FESTO Home - User Automatic mode 19/10/2016
Default Mode █ 12:52:03

CP Lab Press Home Setup mode Parameters System

→ Operat. mode
→ Overview
→ User
→ IO Test

Inputs				Outputs		
In0	SF1	BG1		Out0	PF1	PH2.0
In1	SF2	BG2		Out1	PF2	PH2.1
In2	SF3	BG3		Out2	PF3	PH2.2
In3	SF4	BG4		Out3	PF4	PH2.3
In4	BG1	KG1		Out4	QA1-A1	GF1
In5	NA	KG2		Out5	QA1-A2	GF2
In6	BG5	BG8		Out6	QA1-A3	AGNDA
In7	BG6	BG9		Out7	MB1	AGNDE
IW19	0	IB21	0			
IW22	0	IB24	0			

Enable Outputs
CAUTION
Program return of OB1
No cyclic program call

Setup - Application

Setup - Appl. pressing

Automatic mode 19/10/2016

Default Mode █ 12:52:51

CP Lab Press
Home
Setup mode
Parameters
System

→ Application

→ Belt

→ Stopper

Up (HL_MB1)	HL_BG1	Press	HL_BG2	Down (HL_MB2)
00000ms		5		00000ms

Pallet/Front cover available HL_BG8

Setup - belt

Setup - belt

Automatic mode 19/10/2016

Default Mode █ 12:53:28

CP Lab Press
Home
Setup mode
Parameters
System

→ Application

→ Belt

→ Stopper

Left	Drive	Right
To left (QA1_A2)	Presel. slow	Slow (QA1_A3)
	To right (QA1_A1)	

Carrier in position

Setup - belt

Setup mode 19/10/2016
Default Mode 12:53:42

CP Lab Press

→ Application

→ Belt

→ Stopper

Home

Setup mode

Parameters

System

Left
Drive
Right

To left (QA1_A2)
Presel. slow
Slow (QA1_A3)
To right (QA1_A1)

Carrier in position

G1-BG1

conveyor left end

G1-BG5

Conveyor right end

G1-BG6

Setup - Stopper

Setup - Stopper

Setup mode 19/10/2016
Default Mode 12:54:14

CP Lab Press

→ Application

→ Belt

→ Stopper

Home

Setup mode

Parameters

System

Down (MB1)
G1_BG9
Stopper

00000ms
5

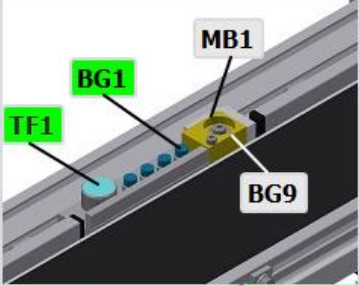
	RFID (TF1)				
init					Tag present
read	MES Mode	Carrier ID: <input type="text" value="0"/>	PNo: <input type="text" value="+0"/>		Ready
write		ONo: <input type="text" value="+0"/>	Resource: <input type="text" value="+0"/>		Busy
Delete data		OPos: <input type="text" value="+0"/>	Operation: <input type="text" value="+0"/>		Error
	Default Mode	State code: <input type="text" value="0"/>			Timeout
		Par. 1: <input type="text" value="+0"/>	Par. 2: <input type="text" value="+0"/>		
		Par. 3: <input type="text" value="+0"/>	Par. 4: <input type="text" value="+0"/>		

FESTO RFID Timeout triggered!! Please check RFID sensor and chip. Setup mode 19/10/2016
 Default Mode 12:54:50

CP Lab Press Home Setup mode Parameters System

Application
 Belt
 Stopper

Down (MB1)	G1_BG9	Stopper
00000ms		5



RFID (TF1)

init	Carrier ID: 0	PNo: +0	Tag present
read	ONo: +0	Resource: +0	Ready
write	OPos: +0	Operation: +0	Busy
Delete data	State code: 0		Error
	Par. 1: +0	Par. 2: +0	Timeout
	Par. 3: +0	Par. 4: +0	

Parameter - Application


FESTO Parameters - Application Setup mode 19/10/2016
 Default Mode 12:55:52

CP Lab Press Home Setup mode Parameters System

Application
 Transitions
 Conveyour

Pressing time (in sec.)	0
Parameters 2 application:	0
App. activate	<input checked="" type="checkbox"/>

Parameter - Transitions







Parameters - Transitions

Setup mode 19/10/2016
Default Mode 12:55:59


CP Lab Press

- Application
- Transitions
- Conveyour

Home 
Setup mode 
Parameters 
System 

No.	Start condition	Application execute	Press time	Parameter	---	End condition
Init	none	<input checked="" type="checkbox"/>	0	0	0	0
1	0	<input checked="" type="checkbox"/>	0	0	0	0
2	0	<input checked="" type="checkbox"/>	0	0	0	0
3	0	<input checked="" type="checkbox"/>	0	0	0	0
4	0	<input checked="" type="checkbox"/>	0	0	0	0
5	0	<input checked="" type="checkbox"/>	0	0	0	0
6	0	<input checked="" type="checkbox"/>	0	0	0	0
7	0	<input checked="" type="checkbox"/>	0	0	0	0
8	0	<input checked="" type="checkbox"/>	0	0	0	0
9	0	<input checked="" type="checkbox"/>	0	0	0	0
10	0	<input checked="" type="checkbox"/>	0	0	0	0

Parameter - Conveyor







Parameters - Conveyour

Setup mode 19/10/2016
Default Mode 12:56:30


CP Lab Press

- Application
- Transitions
- Conveyour

Home 
Setup mode 
Parameters 
System 

- Stop belt before start application
- Belt start/stop by sensors
- Belt energy saving by sensors

System - Settings



System - Settings

Setup mode 19/10/2016
Default Mode 12:57:10


CP Lab Press

Home Setup mode Parameters System

Settings

Calibrate screen System control Terminate Runtime

Call cleaning screen Transfer

Switch language 

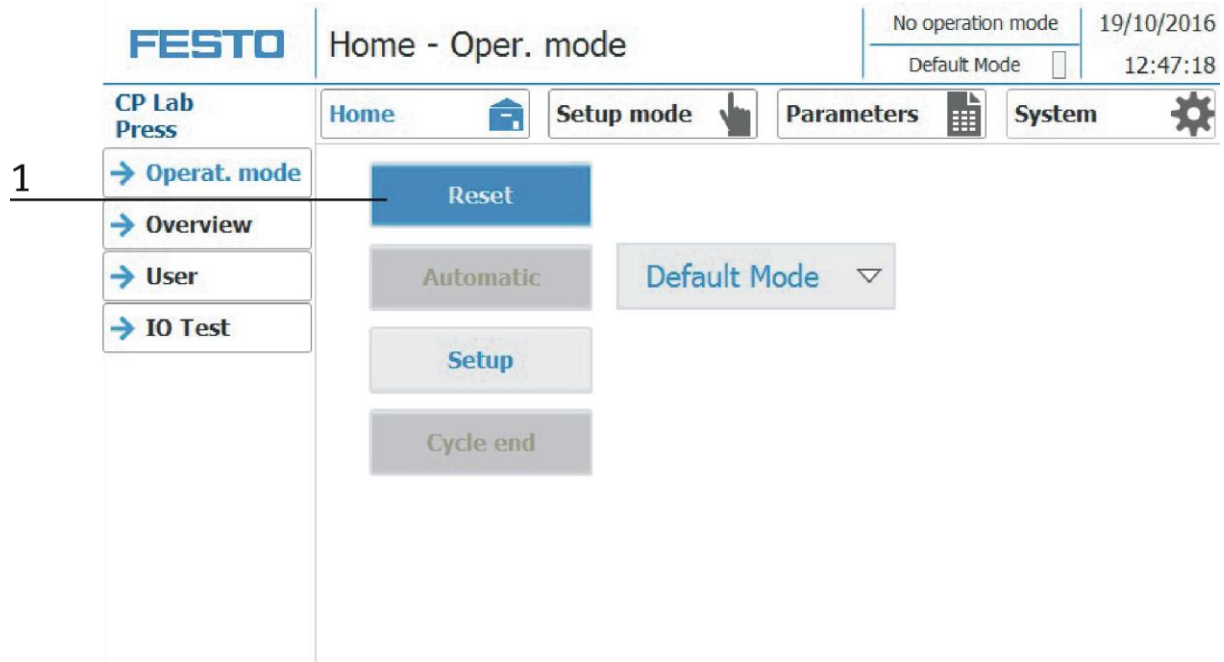
Set Time& date 01/01/1990 00:00:00

PLC 19/10/2016 12:56:20
HMI 19/10/2016 12:57:10

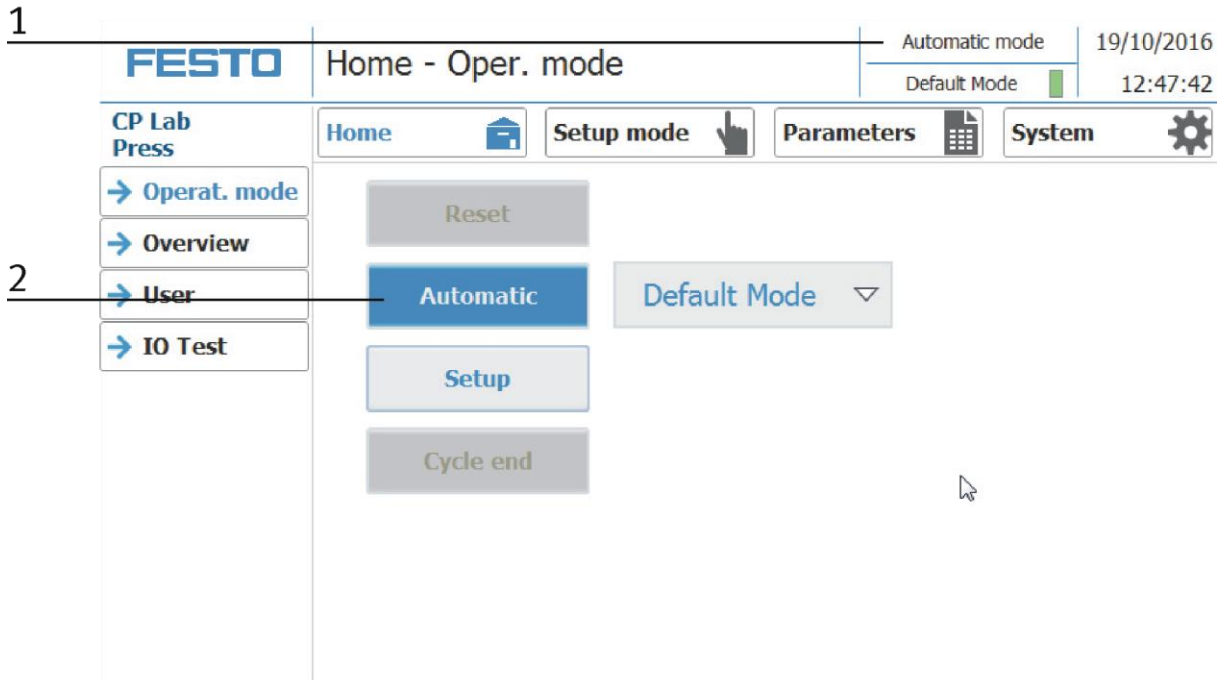
MES IP address 192.168.0.210
Res. 7 Port Qry 2000 Port State 2001

9.2 Operation

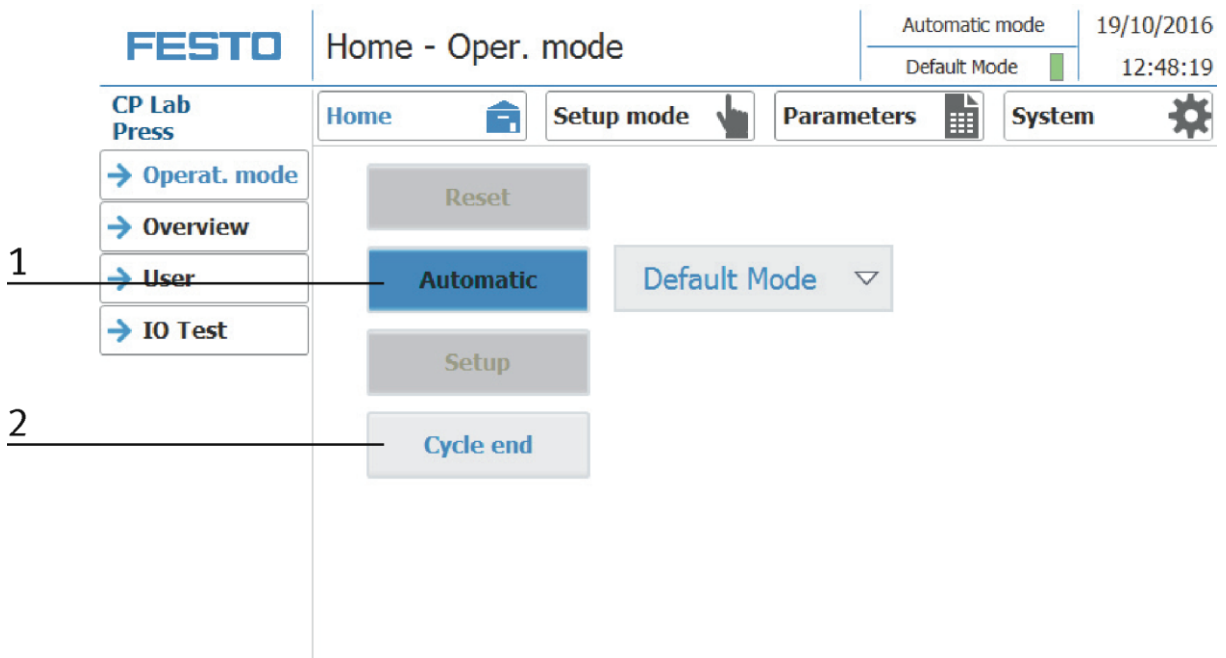
A flashing button invites the user to carry out an action. A button with a statically blue background indicates that the function described in the button text is active.



Position	Description
1	Flashing button demands adjusting (release for adjusting mode has been given) – press button – adjusting mode is made active

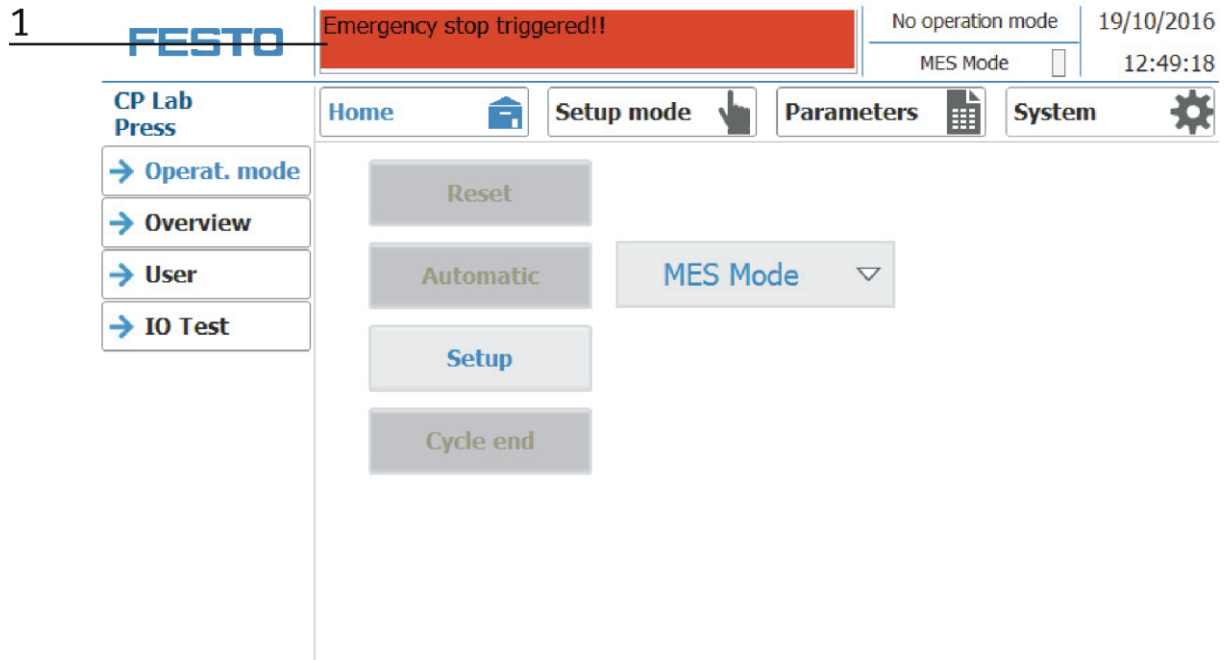


Position	Description
1	Automatic mode is displayed
2	=> press button – Automatic mode is made active

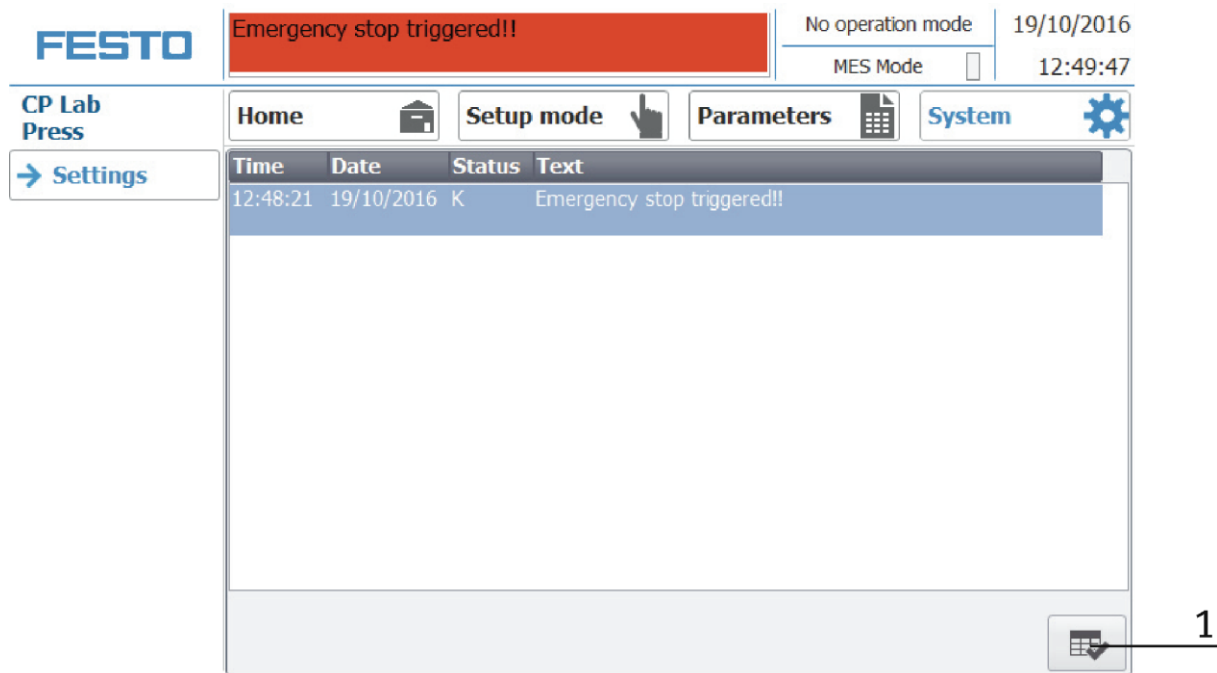


Position	Description
1	Flashing button indicates that automatic mode is active
2	Automatic mode can be stopped at the end of the cycle of the active process

9.2.1 Message line and window




Position	Description
1	Error/warning is active – if you click on the message line, the message window will be called up



Position	Description
1	The error/warning is displayed in the message window and can be acknowledged with this button. The acknowledgement is effected as a single acknowledgement.

9.2.2 Display of objects



Setup - Appl. pressing


Automatic mode 19/10/2016
 Default Mode █ 12:52:51


CP Lab Press


→ Application


→ Belt

→ Stopper

Home 

Setup mode 

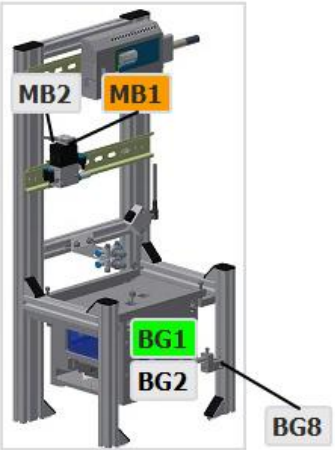
Parameters 

System 

Up (HL_MB1)	HL_BG1	Press	HL_BG2	Down (HL_MB2)
00000ms		5		00000ms

Pallet/Front cover available

HL_BG8



It generally applies:

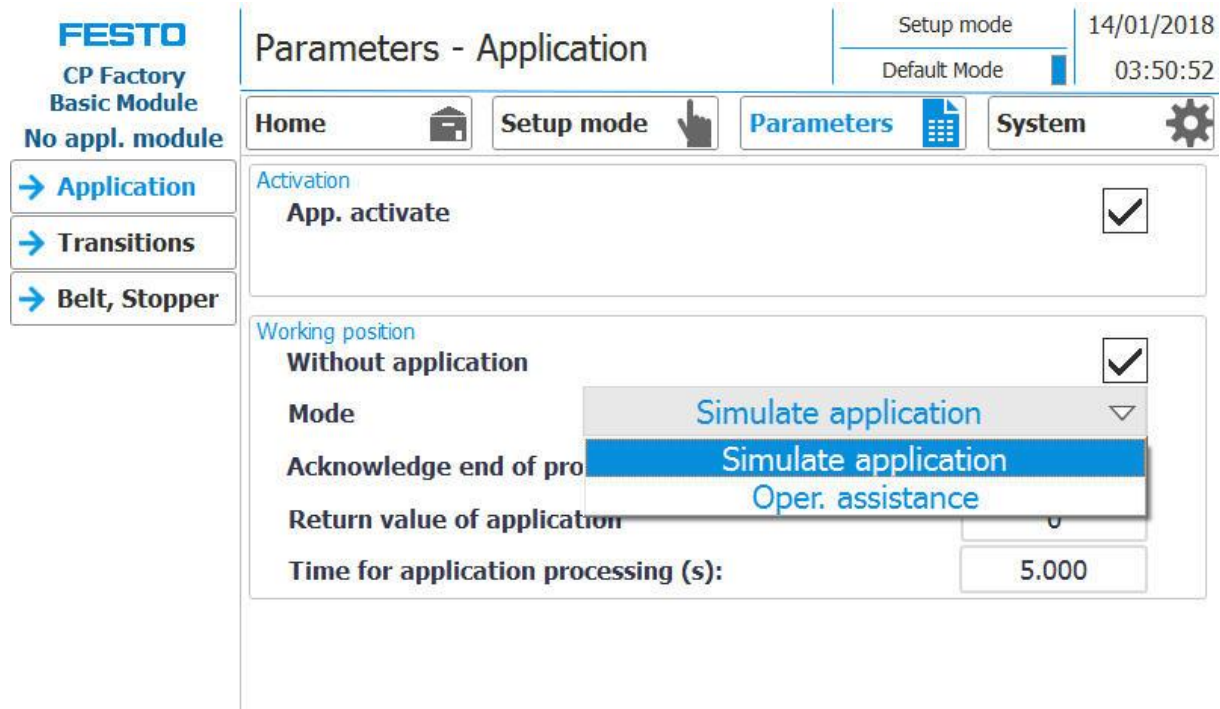
Inputs: green when active

Outputs: orange when active

Buttons/User interactive fields: grey backgrounds with blue text change to blue backgrounds with black text as soon as they are active.

9.3 Operator assistance and simulate application on free AP

The following chapter is valid for all basic modules (Bypass, Linear, branch). It is explained by way of example on the basic module Linear.



Selection of the mode via the touch panel

Each free application position, which is not equipped with an application module, can provide a simple operator assistance and a simulate application.

Thus every free AP provides the following functions in default mode as well as in MES mode:

1. Generic sequence simulation
2. Operator assistance

The application function is added with a fitted application module

1. Process simulation of the application
2. Operator assistance
3. Application Function

9.3.1 Generic sequence simulation

1. If the mode is simulate application and a carrier moves into the application, it is stopped. The application procedure is simulated, this is indicated by the following screen.

Processing time nominal	10.000
Processing time actual	3.719
Return value	+0

Progress

2. The processing time in this case is 10 sec. This can be set in the parameters. The current time is indicated by the bar in progress. At the end of the simulation, the return value is transferred to MES.
3. The carrier is released from the application position.

9.3.2 Operator assistance with display of pictures

FESTO
CP Factory
Basic Module
Oper. assistance

Parameters - Application

Automatic mode 02/02/2018
Default Mode 03:23:01

Home Setup mode Parameters System

→ Application
→ Transitions
→ Belt, Stopper

Activation
App. activate
Application mode Standard

Working position
Without application
Mode Oper. assistance

Attention! If simulation is done as handwork, the parameters in the transition table have other meanings!

1. If the mode is set to operator assistance (application mode must be set to Standard) and a carrier moves into the application, it will be stopped.
2. The worker now has to complete the specified work task. This is specified in the transition table and consists of the element (parameter 1) and the action (parameter 2).

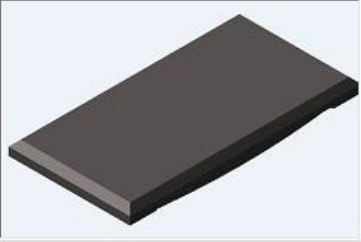
Parameter 1 / Element		Parameter 2 / Aktion	
0	No element	0	No action
1	Front cover	1	Check
2	Back cover	2	Extract
3	Printed circuit board	3	Assemble
4	Front fuse (in direction of transport)	4	Insert
5	Rear fuse (in direction of transport)	5	Apply
6	Both fuses	6	Rework
7	Workpiece	7	Reserve_7
8	Reserve_8	8	Reserve_8
9	Reserve_9	9	Reserve_9
10	Reserve_10	10	Reserve_10

Operator assistance

Handwork place:

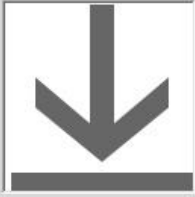
Parameter 1 : Element

Back cover



Parameter 2 : Action

Insert



Time required: **2.569**

Order / operation step:

Refuse

Confirm

3. In this case, element 2 and action 4 are specified in the transitions. The worker must insert a backcover.
4. If the worker has completed the task, he must press the Confirm button to complete the task. The data is transmitted to MES
5. The carrier is released from the application position.

9.3.3 Operator assistance with call of htm-page

1. If the mode of the application is set to "operator assistance" (application mode must be set to call of HTML page / only possible in MES mode) and a carrier moves into the application, it will be stopped.
2. The worker now has to complete the specified work task. This is described on a html page, which must be created by the customer. The URL of this page, which must be present on the MES PC, can be specified in the work plan of the MES. This worker guide (depending on the html page content) is started if the OpNo 510 is selected for the AP in the work plan and the URL points to this URL link in the work step



3. In this case, the html page was designed so that a work instruction for mounting the front fuse appears in the worker's guidance.
4. If the worker has completed the task, he must press the Confirm button to complete the task. The data is transmitted to MES
5. The carrier is released from the working position.

9.4 HMI extension with G120 frequency converter

The extension with one frequency converter requires a different motor, the DC motor is replaced by a controllable AC motor. The control is taken over by a frequency converter. Here comes a G120 used. The frequency converter can be controlled manually in set-up mode. The control signals are automatically set in automatic mode. The state of previously set signals in the setup is overwritten. It is possible to specify a speed setpoint for the belt.

1. To do this, switch to setup mode
2. Select the G120
3. The outputs can be switched in this field (control word 1) (explanation below)
4. The override can be set in this field (explanation below)
5. The inputs / signals are displayed in this field (status word 1) (explanation below)

FESTO CP Factory Basic Module

Setup - G120 Controller Setup mode 12/02/2019
Default Mode 18:15:33

1 Home Setup mode Parameters System

2 Application
Belt
Stopper
G120

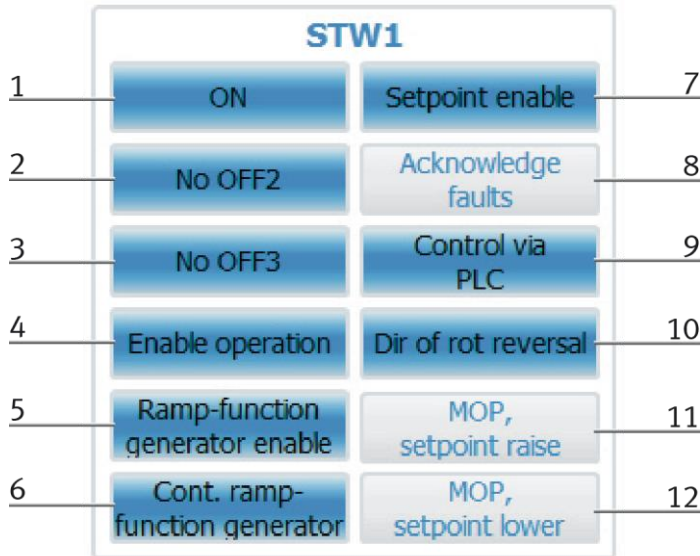
3

4

5

STW1		ZSW1	
ON	Setpoint enable	Ready for switching on	Act. value deviation within tolerance
No OFF2	Acknowledge faults	Ready for operation	Control requested
No OFF3	Control via PLC	Operation enabled	n comparison value reached
Enable operation	Dir of rot reversal	Fault present	I, M, or P limit not reached
Ramp-function generator enable	MOP, setpoint raise	OFF2 inactive	holding brake open
Cont. ramp-function generator	MOP, setpoint lower	OFF3 inactive	No motor overtemperature
Nom	OVRD	Act	Motor rotates forwards
+2600.00	100.0	+0.00	No thermal overload

If the outputs are set, they are highlighted in blue. See training manual G120 page 124.



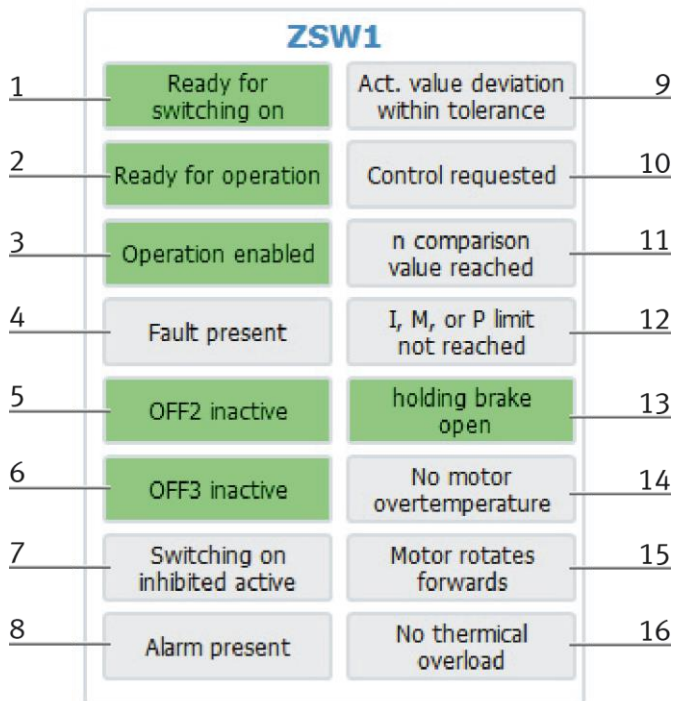
Position	Description
1	ON - Set the inverter to the "Ready to run" state, the direction of rotation must be set via Bit11.
2	No OFF2 - Coast to a standstill, immediate pulse inhibit, drive spins to a stop.
3	No OFF3 - Quick stop, fast stop: Shut down with the fastest possible deceleration rate.
4	Enable operation Control and inverter pulses are enabled.
5	Ramp-function generator enable
6	Enable HLG - enable ramp function generator
7	Enable setpoint - the value selected at the HLG input is enabled.
8	Acknowledge fault - A fault is acknowledged with a positive edge, and the inverter then switches to the "start-up inhibit" state.
9	Guidance by PLC - Control via interface, process data valid
10	Direction reversal - motor will run counterclockwise in response to a positive setpoint.
11	MOP higher - set the motor potentiometer higher
12	MOP lower - Lower the motor potentiometer



The setpoint can only be changed in set mode. However, this setpoint is also adopted for automatic mode. It is thus possible to adapt the conveyor belt speed to the respective conditions.

Position	Description
1	Setpoint value - entry of the setpoint value by clicking in the field - an input mask appears and the desired setpoint can be entered. Only changeable in setup mode [rpm]
2	Display of override - Change between 50/100 depending on the area code in the conveyor belt setup
3	Actual value - display of the current override

Display of inverter status, active displays are highlighted in green.
 See training manual G120 - page 125.



Position	Description
1	Ready for switching on - power supply is switched on, electronics are initialized, pulses are blocked.
2	Ready for operation - Inverter is switched on (ON command is pending), no fault is active, inverter can start as soon as the command "Enable operation" is given. See control word 1, bit =
3	Operation enabled - drive follows setpoint. See control word 1, bit 3.
4	Fault present - drive faulty. There is a fault in the drive, which means that it is not in operation and switches to the "startup inhibit" state after successful rectification and acknowledgment of the fault.
5	OFF2 inactive - "coast to standstill" command is pending.
6	OFF3 inactive - Quick stop command is active.
7	Switch-on disable active - The drive is only switched back to the "switched on" state if the commands "no coast down" AND "no quick stop" - followed by "ON" - are given.
8	Alarm present - drive still in operation; Warning in service / maintenance parameter; no acknowledgment; see alarm parameter r2110.
9	Act. value deviation within tolerance - setpoint-actual value deviation within the tolerance range.
10	Control requested - The automation system is requested to take over control.
11	N comparison value reached
12	I, M, or P-limit not reached
13	Holding brake open - signal can be used to control a holding brake
14	No motor overtemperature
15	Motor rotates forwards
16	No thermal overload

10 Components

10.1 Touch panel CP-L-HMI-T7 (option)

You control the system with the touch panel. The upper control row is optionally available.

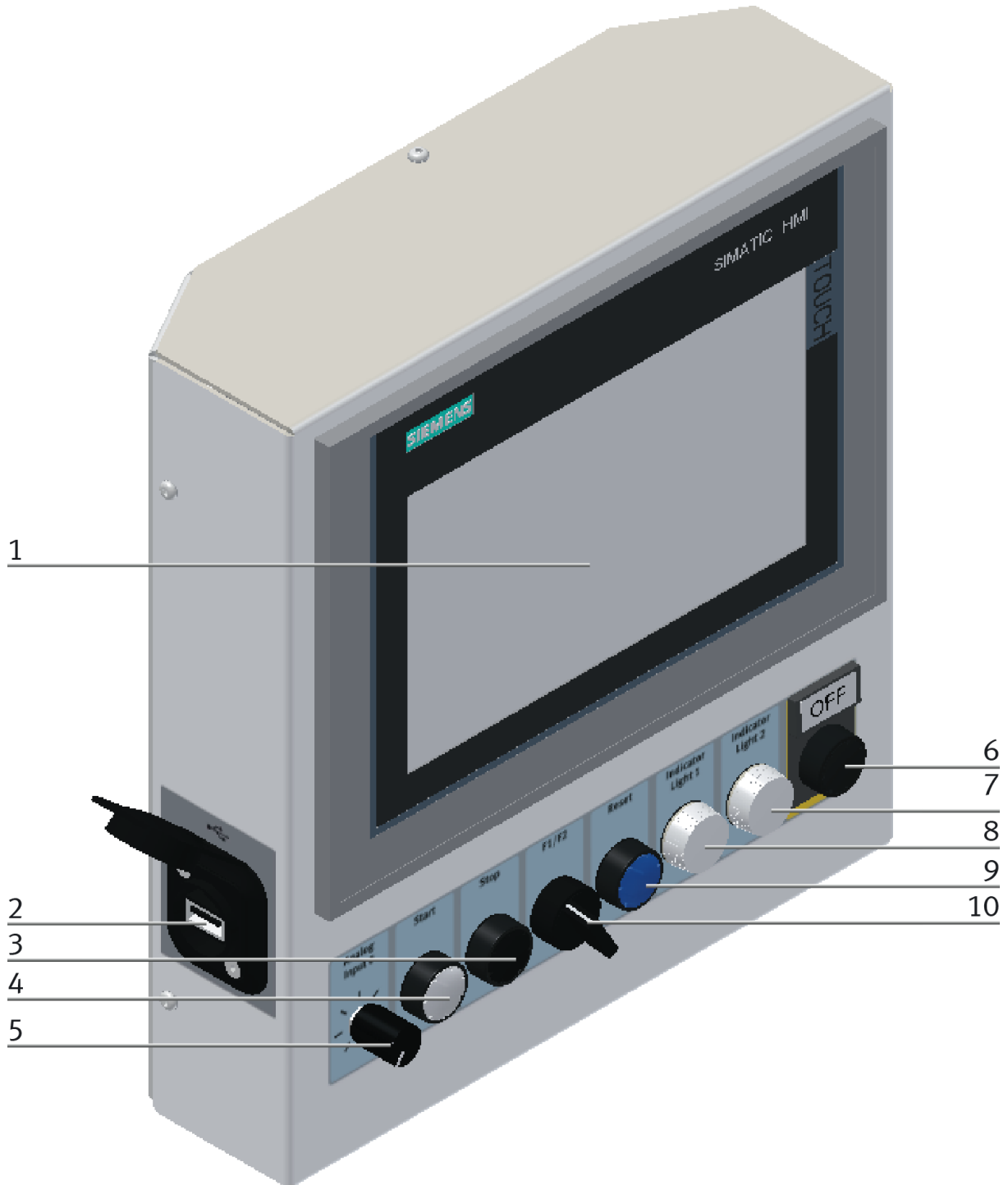


Illustration similar

Position	Description	X2 Sub D 15 pole/ input	X2 Sub D 15pole /output
1	Touch screen		
2	USB socket X6		
3	STOP button black /button SF2	SF2 / X2: 3 / I1	
4	START illuminated push-button white/ button SF1/ light PF1	SF1 / X2: 1 / I0	PF1 / X2: 2 / Q0
5	Potentiometer RA 1		
6	OFF button SF5 – at M12 panel plug		
7	Q2 indicator light white / light PF4		PF4 / X2: 8 / Q3
8	Q1 indicator light white / light PF3		PF3 / X2: 6 / Q2
9	RESET illuminated push-button blue / button SF4 / light PF2	SF4 / X2: 7 / I3	PF2 / X2: 4 / Q1
10	Selector switch 00 Auto/F1/SF3	SF3 / X2:5 / I2	

10.1.1 Front PCB XZ1

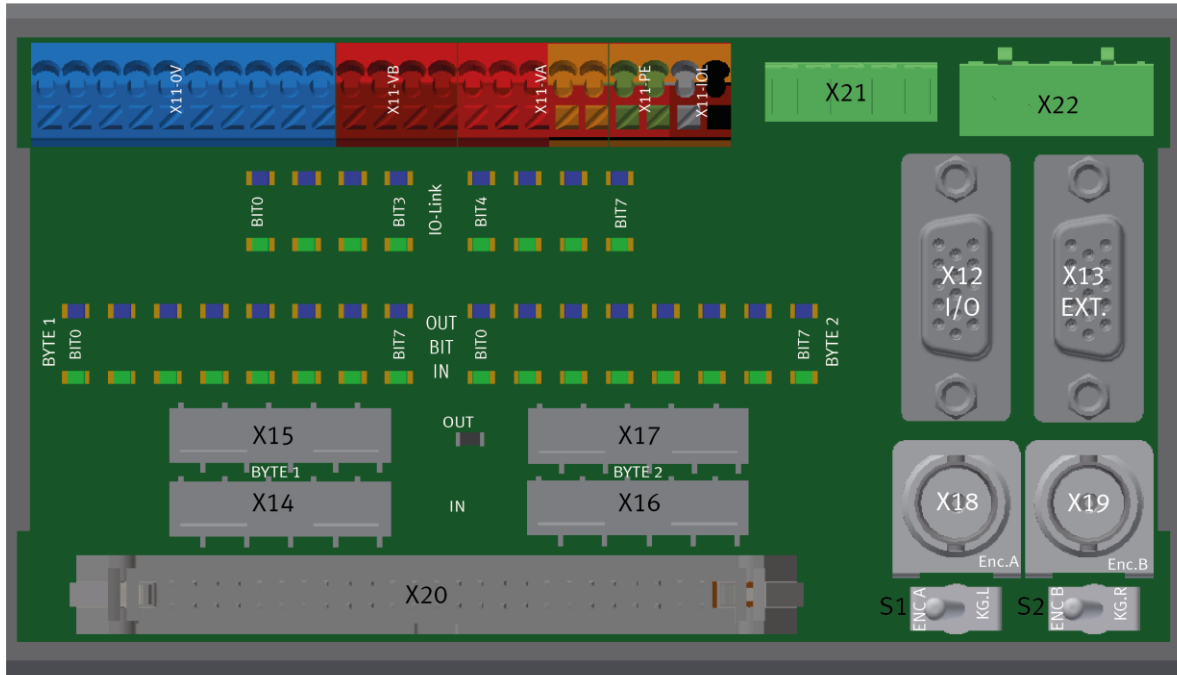


Illustration similar

XZ1 PCB operation panel connection

Function	XZ1
Start Button / SF1	X12:1
Stop button / SF2	X12:3
Switch operation panel / SF3	X12:5
Reset button / SF4	X12:7
Start lamp / PF1	X12:2
Reset lampn / PF2	X12:4
Lamp Q1 / PF3	X12:6
Lamp Q2 / PF4	X12:8

- XZ1-X17 = Output-Byte 2
- XZ1-X16 = Input-Byte 2
- XZ1-X15 = Output-Byte 1
- XZ1-X14 = Input-Byte 1
- XZ1-X12 = controlpanel basic functions
- XZ1-X13 = controlpanel additional buttons
- XZ1-X18 = incremental encoder BNC-Connector 1
- XZ1-X19 = incremental encoder BNC-Connector 2
- XZ1-X11 = terminals PCB front side
- XZ1-X20 = connection to opposite PCB
- XZ1-X1 = connection to opposite PCB
- XZ1-X21 = Powersupply HMI
- XZ1-X22 = external Emergency-Stop Connector

10.1.2 Back PCB XZ2

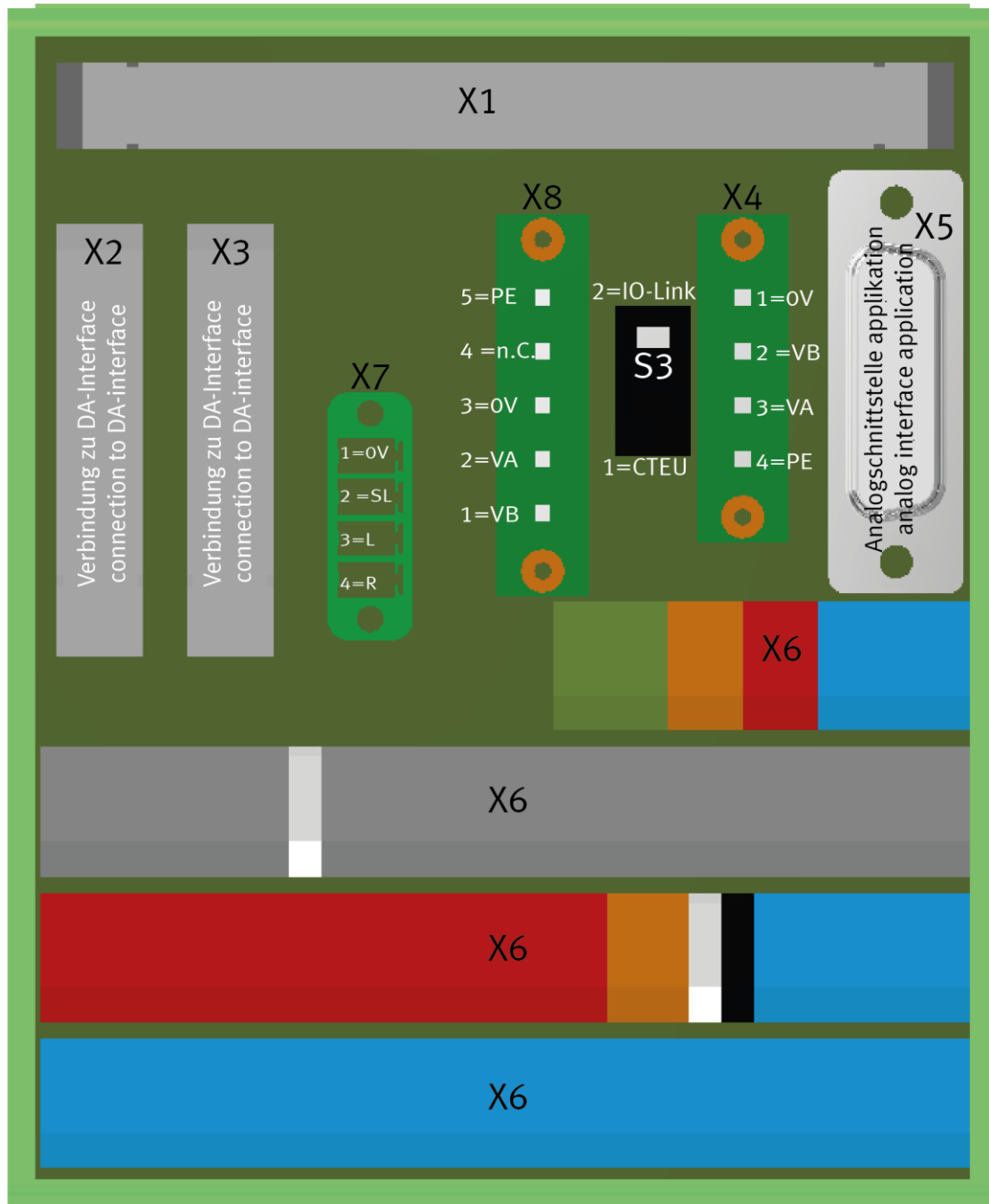


Illustration similar

- XZ2-X4 = power supply
- XZ2-X2 = connection 1 to DA-Interface
- XZ2-X3 = connection 2 to DA-Interface
- XZ2-X5 = analog signals for application
- XZ2-X6 = terminals PCB rear side
- XZ2-X7 = connection to external Motorcontroller
- XZ2-X8 = 24V application modules

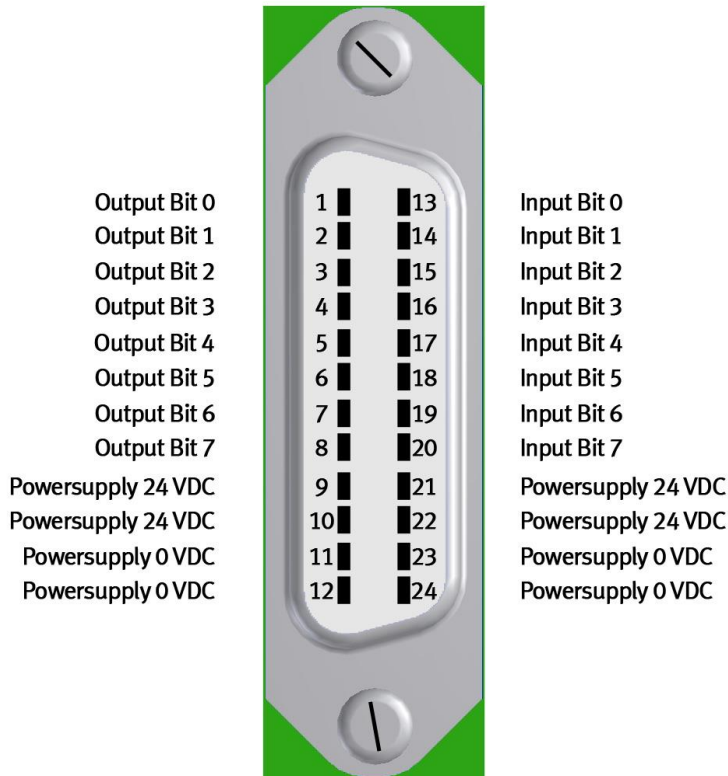
XZ2 Connections to PLC

Function	Controller	XZ2 in	XZ2 out	Sensor / Actor
Identcode Bit 0	KF21:I18.0 / XZ3:A1	X2:1	X6:1	BG1 / Identcode Bit 0
Identcode Bit 1	KF21:I18.1 / XZ3:A3	X2:3	X6:2	BG2 / Identcode Bit 1
Identcode Bit 2	KF21:I18.2 / XZ3:A5	X2:5	X6:3	BG3 / Identcode Bit 2
Identcode Bit 3	KF21:I18.3 / XZ3:A7	X2:7	X6:4	BG4 / Identcode Bit 3
Reserve	KF21:Q18.0 / XZ3:A1	X2:2	X6:19	
Reserve	KF21:Q18.1 / XZ3:A3	X2:4	X6:20	
Reserve	KF21:Q18.2 / XZ3:A5	X2:6	X6:21	
Reserve	KF21:Q18.3 / XZ3:A7	X2:8	X6:22	

Function	Controller	XZ2 out	Sensor / Actor
Pallet at left end	KF3:I1.6 / XG3:7	X6:13	BG5
Pallet at right end	KF3:I1.7 / XG3:8	X6:14	BG6
Transport direction to right	KF5:Q1.4 / XG5:5	X6:27	QA1:RE motor controller
Transport direction to left	KF5:Q1.5 / XG5:6	X6:28	QA1:LI motor controller
Transport slow speed	KF5:Q1.6 / XG5:7	X6:29	QA1:SL motor controller
Open stopper	KF5:Q1.7 / XG5:8	X6:30	QM1-MB1

Function	Controller	XZ2 in	XZ2 out	Sensor / Actor
Coupling receiver right	KF21:I18.4 / XZ3:B1	X3:1	X6:5	KG1
Coupling receiver left	KF21:I18.5 / XZ3:B3	X3:3	X6:6	KG2
Stopper opened	KF21:I18.7 / XZ3:B7	X3:7	X6:8	BG9
Coupling sender left	KF21:Q18.4 / XZ3:B2	X3:2	X6:23	GF1
Coupling sender right	KF21:I18.5 / XZ3:B4	X3:3	X6:24	GF2

10.1.3 SYS link Cable - Interface

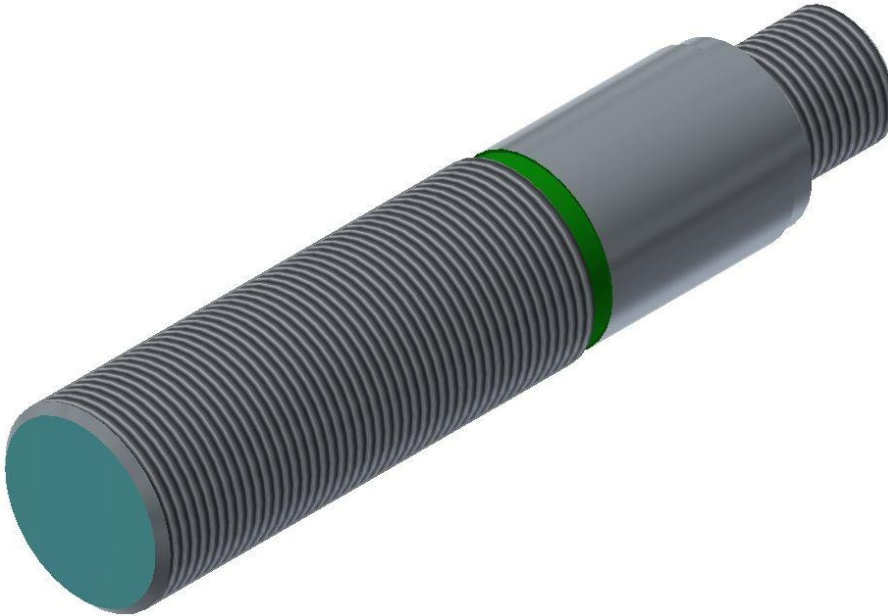


Syslink – allocation

SYSlink PIN	Bit	Name	Syslink PIN	Bit	Function
01	0	Output AX.0	13	0	Input EX.0
02	1	Output AX.1	14	1	Input EX.1
03	2	Output AX.2	15	2	Input EX.2
04	3	Output AX.3	16	3	Input EX.3
05	4	Output AX.4	17	4	Input EX.4
06	5	Output AX.5	18	5	Input EX.5
07	6	Output AX.6	19	6	Input EX.6
08	7	Output AX.7	20	7	Input EX.7
09	24V	Power supply	21	24V	Power supply
10	24V	Power supply	22	24V	Power supply
11	0V	Power supply	23	0V	Power supply
12	0V	Power supply	24	0V	Power supply

10.1.4 RFID Read/Write system

The RFID read-write head describes and/or reads the data from a RFID data storage medium which is located on the bottom of the carrier. Any information concerning the workpiece can be read or transmitted. The read-write head is directly connected to the I/O link of the ET200SP.



Read-write head RF210R IO-Link / illustration similar

There are 2 different read / write heads which are addressed differently in the software, this must be considered.

Reader RF210R, order number 6GT2821-1AC32 with interface IO-Link V1.0

Reader RF210R, order number 6GT2821-1BC32 with interface IO-Link V1.1

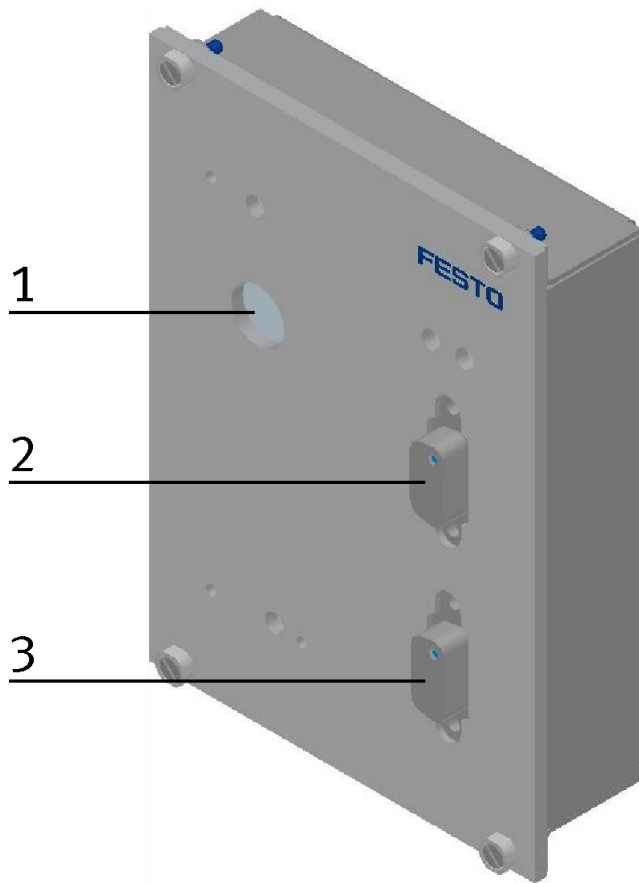


TW-R16-B128 RFID data storage medium / illustration similar

Clamp read-write head	Cable	I/O Link
TF1:1 / 24 V	XTF1:1 / BN	XG1/X12:1 - L+
TF1:3 / 0V	XTF1:3 / BU	XG1/X12:3 - L-
TF1:4 / Data	XTF1:4 / BK	XG1/X12:2 - C/Q

10.1.5 IO-Link DA-Interface (digital-analogue interface)

The I- port is an interface between the ET200SP and the sensors and actuators wired on the mini I/O terminals. The order number is 8038559.



I-Port KF11 / illustration similar

Position	Description
1	<p>I-Port –here the data are transmitted to the I/O link of the ET200SP. It is possible to remove the 5 pole cable and to replace it by an adapter plug. With the help of the CTEU bus knot it will be possible to adapt different bus systems to the system.</p> <p>The following bus systems are available presently: PN, PB, CC-Link, CAN, DeviceNet, Ether Cat</p> <p>The allocation of the 5 pole cable is as follows: Clamp 1 – 24 VB / cable has a brown stranded wire Clamp 2 – 24 A / cable has a white stranded wire Clamp 3 – OVB / cable has a blue stranded wire Clamp 4 – Data / cable has a black stranded wire Clamp 5 – OVA / cable has a grey stranded wire</p>
2	Data channel A
3	Data channel B

10.2 Scalance Ethernet Switch



Siemens Scalance Ethernet switch / illustration similar

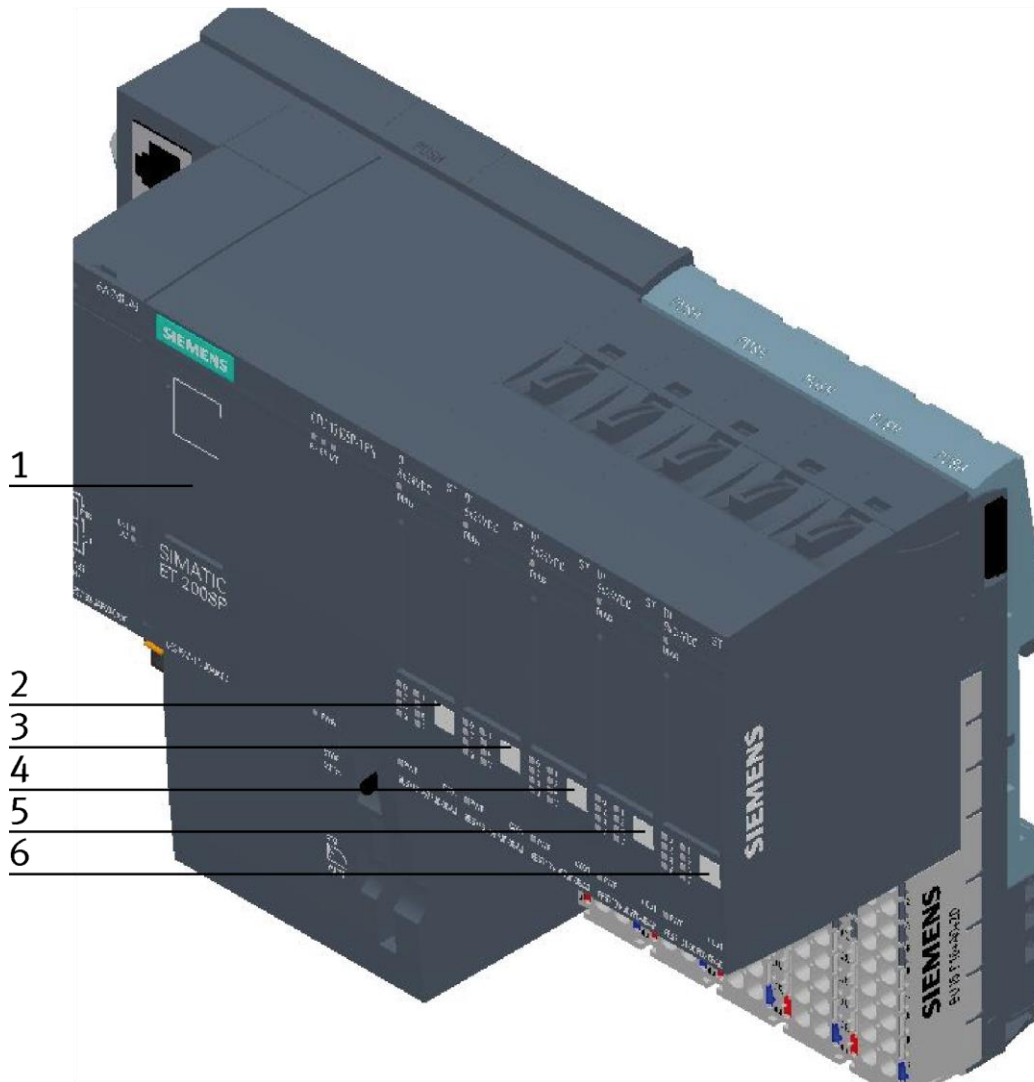
The SCALANCE X208 has eight RJ-45 jacks for the connection of end devices or other network segments.

10.2.1 Control systems

The control unit regulates all processes as well as the communication in the CP Lab conveyor. Different control systems can be used.

It is possible that a I/O Terminal is installed instead of an controller.

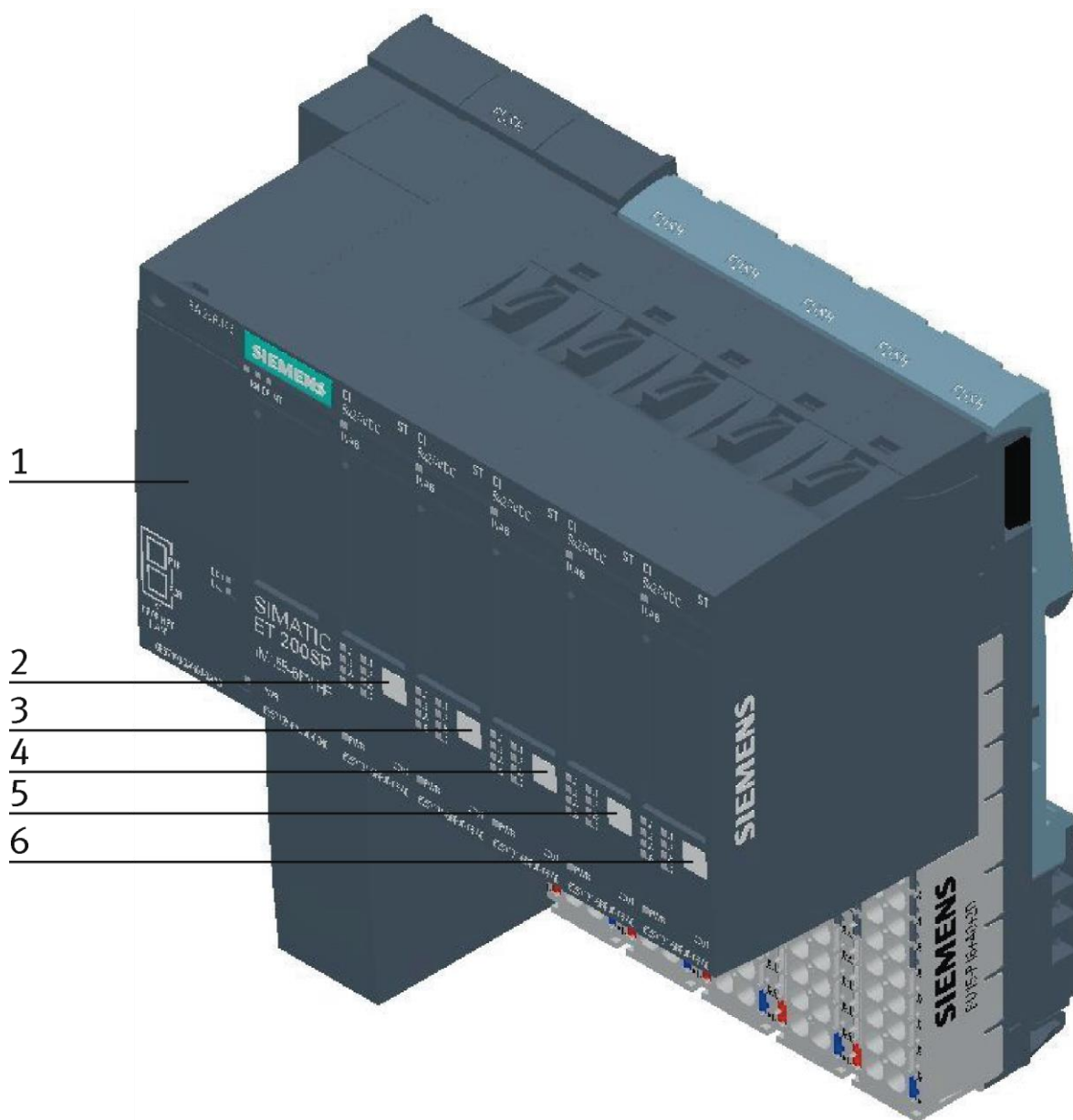
ET200SP with CPU1512



ET200 SP / illustration similar

Position	Description
1	ET200SP / CPU1512SP F-1PN / K1-KF1 / 6ES7512-1SK00-0AB0
2	DI / 8x 24VDC / K1-KF2 / 6ES7131-6BF00-0CA0
3	DI / 8x 24VDC / K1-KF3 / 6ES7131-6BF00-0CA0
4	DO / 8x 24VDC 0,5A / K1-KF4 / 6ES7132-6BF00-0CA0
5	DO / 8x 24VDC 0,5A / K1-KF5 / 6ES7132-6BF00-0CA0
6	CM / 4x IO-Link ST / K1-KF6 / 6ES7137-6BD00-0BA0

ET200SP with IM155



ET200 SP / illustration similar

Position	Description
1	ET200SP / IM155-6 PN HF / K1-KF1 / 6ES7155-6AU00-0CNO
2	DI / 8x 24VDC / K1-KF2 / 6ES7131-6BF00-0CA0
3	DI / 8x 24VDC / K1-KF3 / 6ES7131-6BF00-0CA0
4	DO / 8x 24VDC 0,5A / K1-KF4 / 6ES7132-6BF00-0CA0
5	DO / 8x 24VDC 0,5A / K1-KF5 / 6ES7132-6BF00-0CA0
6	CM / 4x IO-Link ST / K1-KF6 / 6ES7137-6BD00-0BA0

10.2.2 Signal Converter

The signal converter is a fibre optic unit with a teachable switching point.



Signal converter 552796 / SOE4-FO-L-HF2-1P-M8 / illustration similar

WARNING

Not to be used as a safety component! Electric voltage! Before you work on the electricity, you have to switch off the voltage.

Mounting and Setting

Connecting the plastic fibre optic cable

1. Open the clamp strap.
2. Insert the fibre optic cable to the stop into the holder (you have to overcome the resistance when inserting at the O ring)
3. Close clamp strap.

Setting sensitivity in a running process (turning conveyor motor)

1. Adjust the fibre optic cable to the object: \Rightarrow LED green is flashing, LED yellow is undefined.
2. Only the running process is in the optical path; press the button for approx. 3s until both LEDs are flashing simultaneously.
3. Press button again until there is at least one process cycle executed in the optical path.
 - a) green LED is flashing for a short time and starts lighting up, \Rightarrow sensitivity settings are saved, sensor is ready for operation.
 - b) both LEDs are flashing simultaneously \Rightarrow Sensor cannot detect the object, no sensitivity settings are saved.

Setting the start function (N.O. / N.C.)

1. Press button for approx. 13 s \Rightarrow LEDs are flashing alternately.
2. Release button: \Rightarrow green LED is flashing.
3. While the green LED is flashing, on every pressing of the button, the start function is inverted. The current function is indicated by the yellow LED.
4. Don't press the button for 10 s: \Rightarrow set function is saved, sensor is ready for operation.

Factory setting / maximum sensitivity (default)

1. No object in the sensing range. Press button for approx. 3 s until both LEDs are flashing simultaneously.
2. No object in the sensing range. Press button for approx. 1 s.
 \Rightarrow Sensor is set at maximum sensitivity.
 \Rightarrow Sensor has its factory setting again

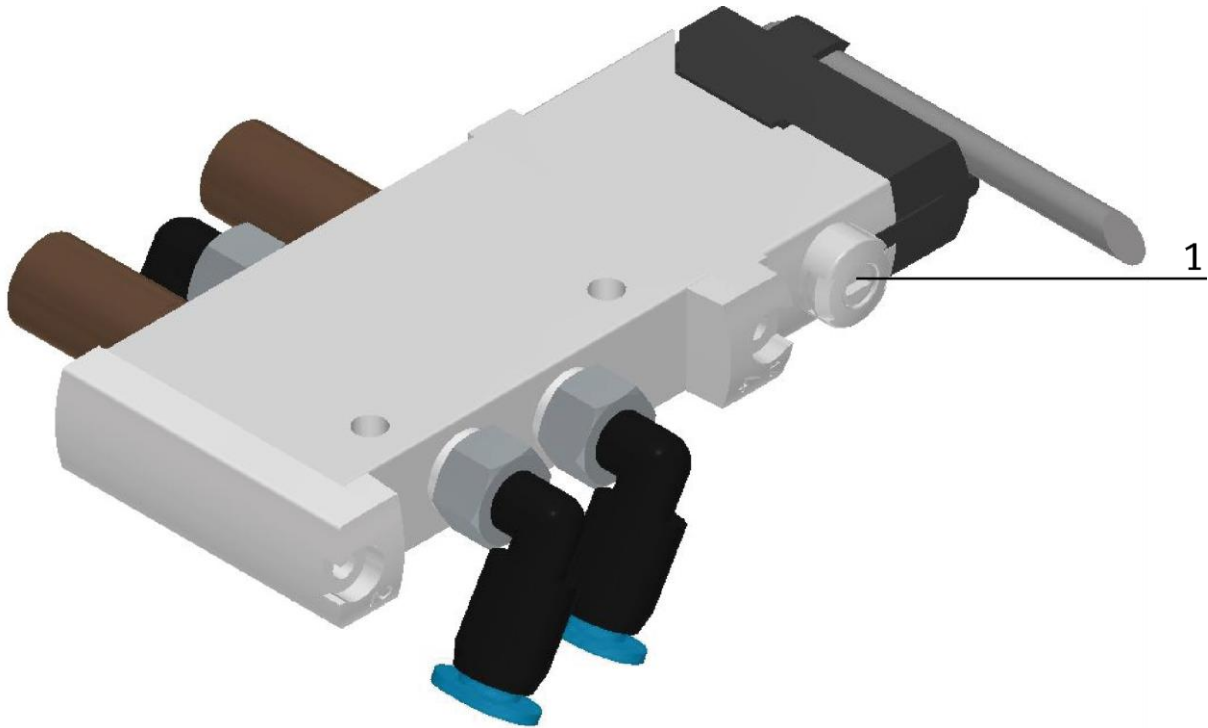
Pilot line (ET) / Process of external Teach-in

- 3 s at $+U_B$ / determine teach point 1
- open
- 3 s at $+U_B$ / determine teach point 2
- open setting saved, end of external Teach

10.2.3 Solenoid valve

The solenoid valve controls the cylinder of the stopper unit. The solenoid valve has got a manual override (see pos.1).

When you press it (non-locking), the cylinder drives the stopper unit down as long as you press it. When you press the manual override and turn it (locking), the cylinder drives down with long-lasting effect.



Solenoid valve 574351 / VUVG-L10-M52-MT-M5-1P3 / illustration similar

11 Extensions

11.1 Extension with an active corner

In order to make a circulation of several CP Lab conveyors, it is possible to assemble the CP Lab conveyors in the rectangle and to connect the conveyors with active corners. A motor drives the corner and the carrier is transported to the following CP Lab conveyor. The active corners are connected in parallel to the motor used, the corner is mounted on the left side of the CP Lab conveyor. The coupling sensors of the conveyors are simply forwarded to the following CP Lab conveyor using light guide bridges.



Example concatenation 4 CP Lab conveyors with active corners / illustration similar

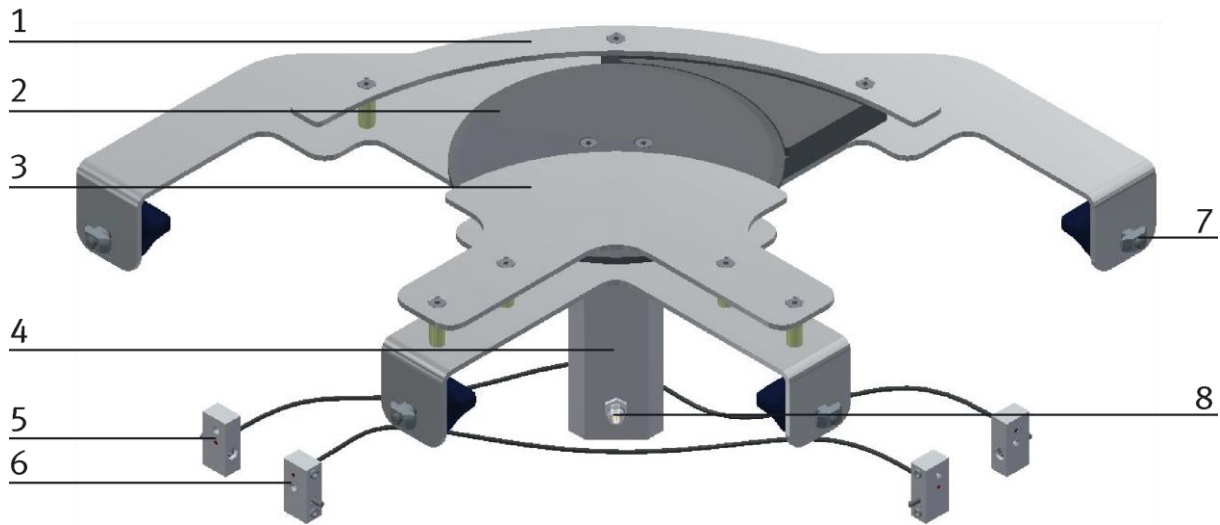


illustration similar

Position	Description
1	Outside guard railing
2	Turning table
3	Inside guard railing
4	Motor
5	Coupling sensor transmission
6	Coupling sensor transmission
7	Screw
8	Motor connection (see Circuit diagram p.13)

11.2 Extension with a passive corner

In order to achieve a circulation from several CP Lab conveyors, it is possible to assemble the CP Lab conveyor in the rectangle and to connect the conveyors with passive corners. The corners are equipped with balls which enable the carrier to be transported without drive to a further band mounted at a right angle. The coupling sensors of the conveyors are simply forwarded to the following CP Lab conveyor using light guide bridges.

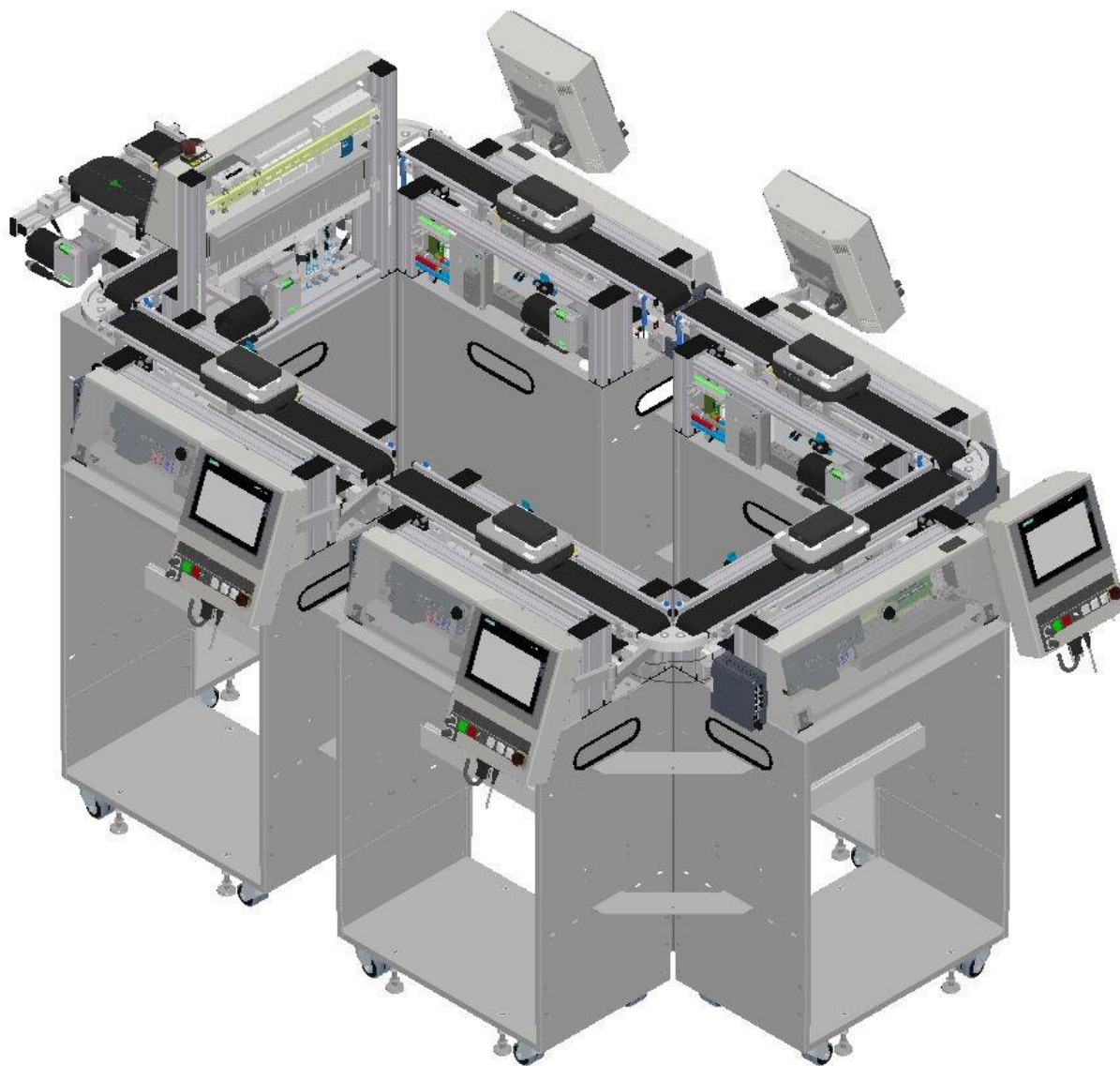


illustration similar

Example concatenation 6 CP Lab conveyors with passive corners

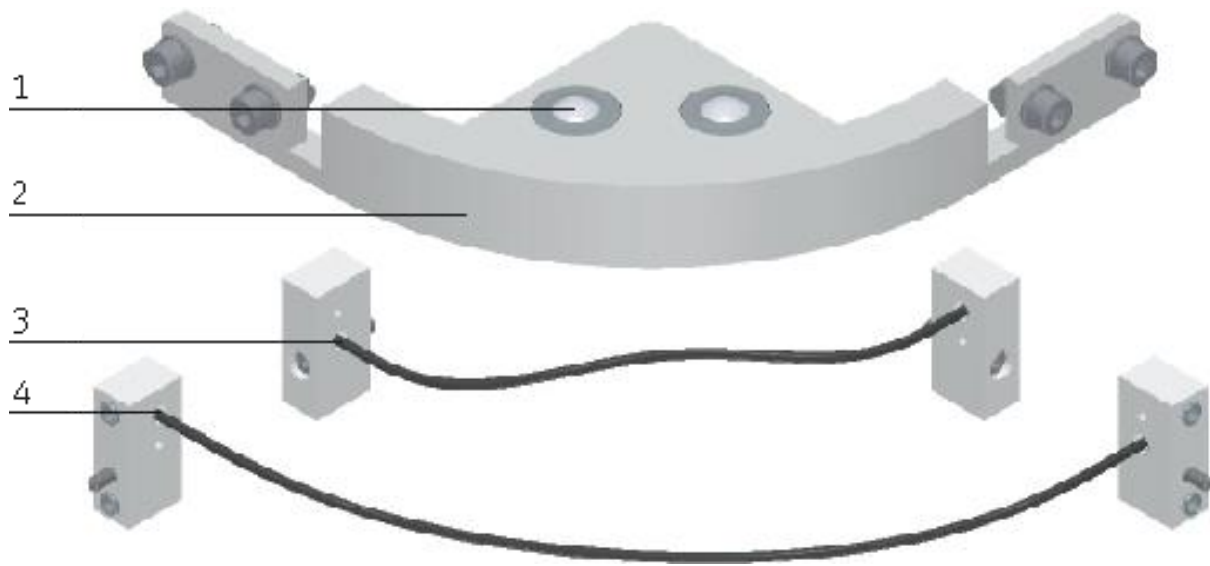


illustration similar

Position	Description
1	Ball caster
2	Passive guard railing
3	Coupling sensor transmission
4	Coupling sensor transmission

11.3 Robotino docking extension

To dock a robotino to a CP Lab conveyor, a small profile construction is necessary. The necessary sensors are already available on the conveyor. Although they are not disassembled, the inputs of the coupling sensors are now used for the coupling of the robotinos.

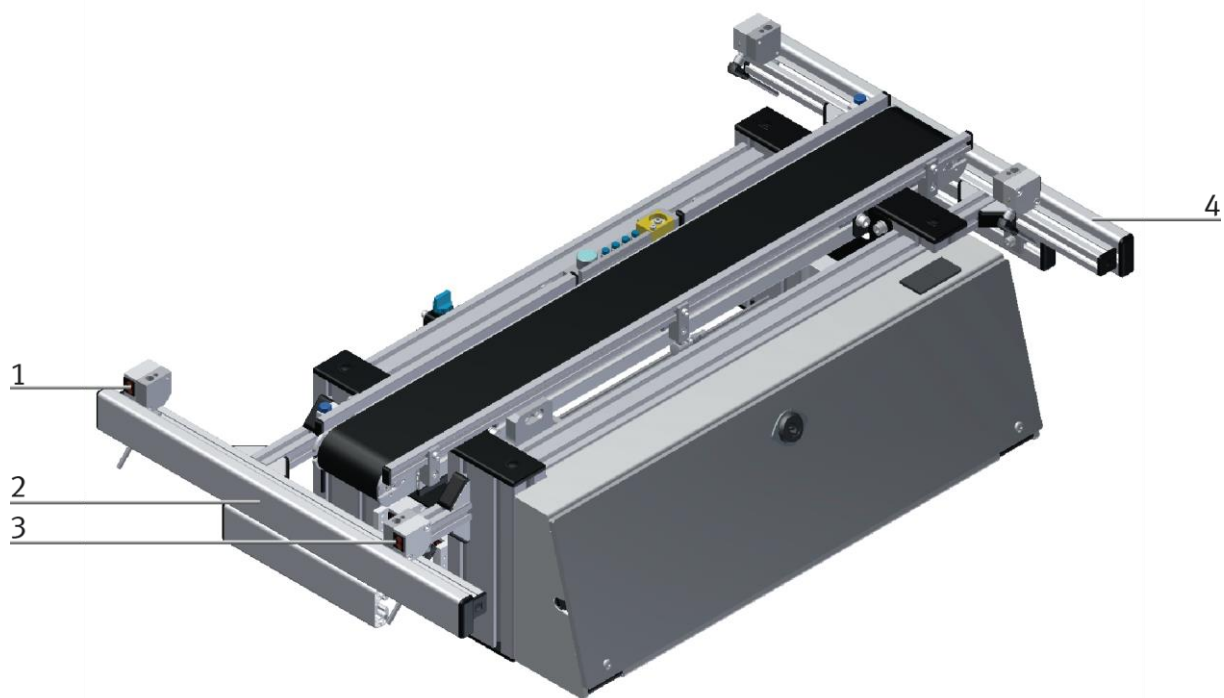


illustration similar

Position	Description
1	Coupling sensor robotino
2	Profile construction to dock a robotino on the left side
3	Coupling sensor robotino
4	Profile construction to dock a robotino on the right side

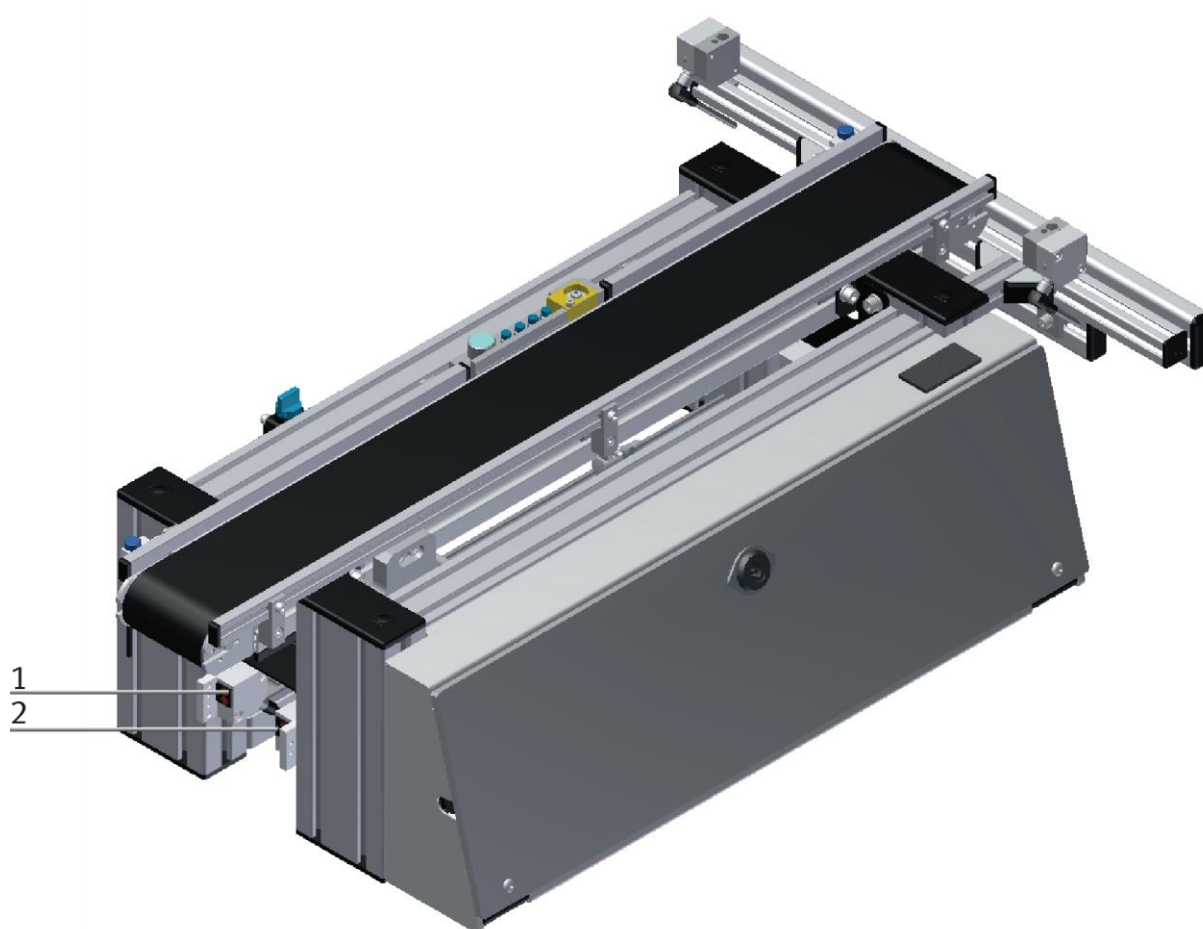


illustration similar

At positions 1 and 2 the deactivated sensors can be seen, they remain at the conveyor but are no longer connected.

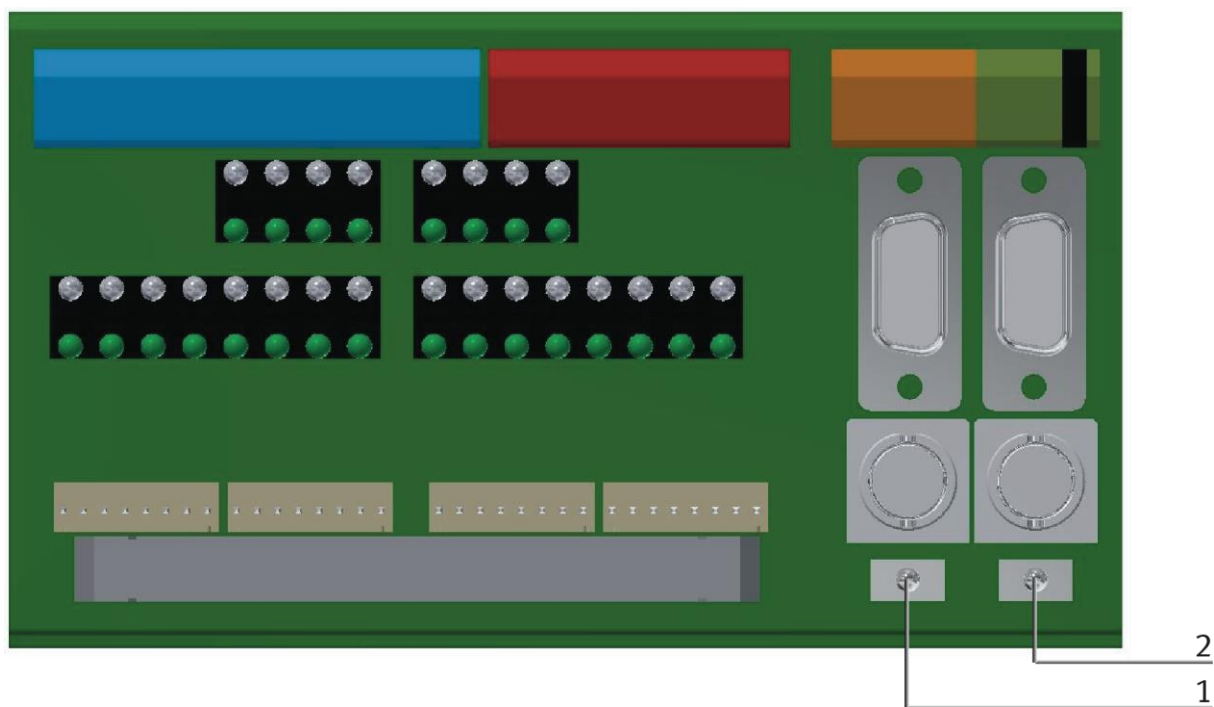


illustration similar

Position	Description
1	Switch S1
2	Switch S2

If the docking extension is used for the robotino, the two toggle switches S1 and S2 must be changed over.

Left position - encoder is used / docking extension deactivated

Right position - Encoder is not used / docking extension activated

12 Spare part list

- Key 8027302
- 24V cable 381525


13 Service and cleaning

The components and systems from Festo Didactic are maintenance-free.

At regular intervals you should have checked:

- the lenses of the optical sensors, fibre optics and reflectors
- the active surface of the proximity switch
- the entire station

can be cleaned with a soft, lint-free cloth or brush.

	<i>NOTE</i>
	Do not use aggressive or abrasive cleaners.

Protective covers must not be cleaned with alcoholic cleaning agents, there is a risk of embrittlement.


14 Further information and updating

Further information and updates on the technical documentation of Festo Didactic components and systems can be found on the Internet at:

www.ip.festo-didactic.com



15 Disposal

	<p style="text-align: center;"><i>NOTE</i></p> <p>Electronic waste contains recyclable materials and must not be disposed of with the domestic waste. Bring electronic waste to a designated municipal collection point.</p>
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