

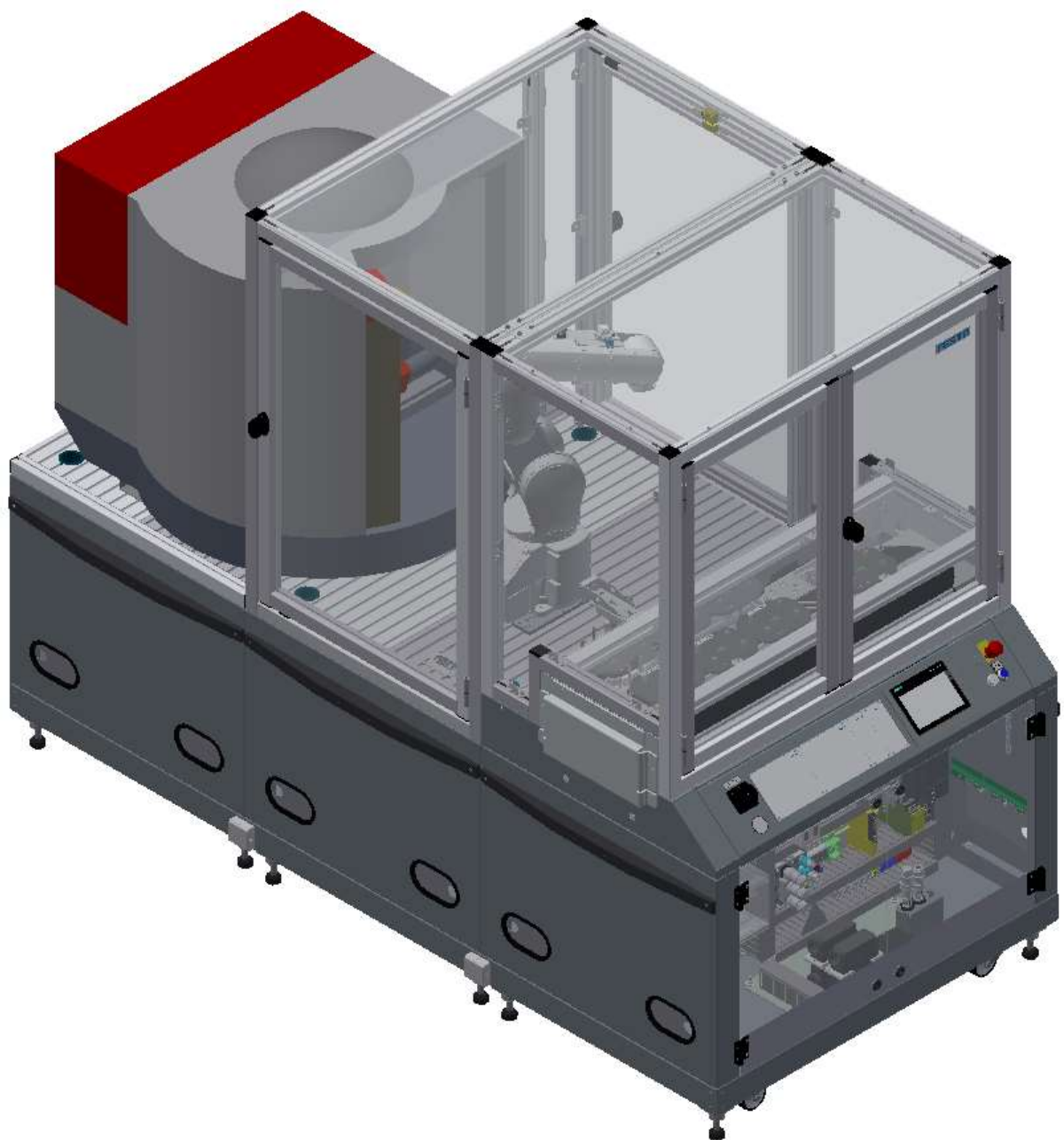
8063660

Robot feeding for mill

FESTO

CP Factory

original operating
instruction



Festo Didactic
8063660 en
11/2021



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Original operating instruction

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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.

| | |
|---|---|
|  | <p style="text-align: center;"> CAUTION</p> <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 – hot surface



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 gloves. |

4.3 Electrical components

| | |
|---|--|
|  |  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



- **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.**
 - 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.**
 - 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:**
 - Visible damage
 - Malfunction
 - Inappropriate storage
 - Incorrect transport
- **Switch off the power supply immediately.**
- **Protect the device to prevent it from being restarted accidentally.**

4.4 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!<ul style="list-style-type: none">– Cylinders may advance and retract automatically.• 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. |

4.5 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.



4.6 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. |

4.7 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="756 797 1027 853" style="text-align: center;"> 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. |
|---|---|

4.8 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.

4.9 Transport

| | |
|---|--|
|  | <div style="background-color: #c85130; color: white; padding: 5px; text-align: center;">  WARNING </div> <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. |
|  | <div style="background-color: #f1c40f; color: black; padding: 5px; text-align: center;">  CAUTION </div> <ul style="list-style-type: none"> • Danger due to broken castors! The castors on the device are not designed to be used for transportation. The castors are designed merely for positioning the station. The screw feet must relieve the castors of all the station's weight before commissioning begins. The screw feet must be set so that the station is horizontal and aligned at the same height as its neighboring station. <ul style="list-style-type: none"> – Safety shoes must be worn when transporting the station! |
|  | <div style="background-color: #2980b9; color: white; padding: 5px; text-align: center;"> NOTE </div> <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. – Make sure that the ground underneath the station has sufficient load-bearing capacity. |



4.10 Name plates stations



Name plate example



| Position | Description |
|----------|---|
| 1 | Description / Configuration |
| 2 | Intern material number |
| 3 | Order number, charge code, year of construction |
| 4 | Data electrical connection |
| 5 | Current consumption, short-circuits strength, input pressure compressed air (bar / psi) |
| 6 | Unique-ID, unique machine identification |
| 7 | Manufacturer's address |
| 8 | Data matrix code of a link to the website of the product |
| 9 | CE Identification |

4.11 CE Declaration of Conformity

| |  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. |

4.12 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. |

4.12.1 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.

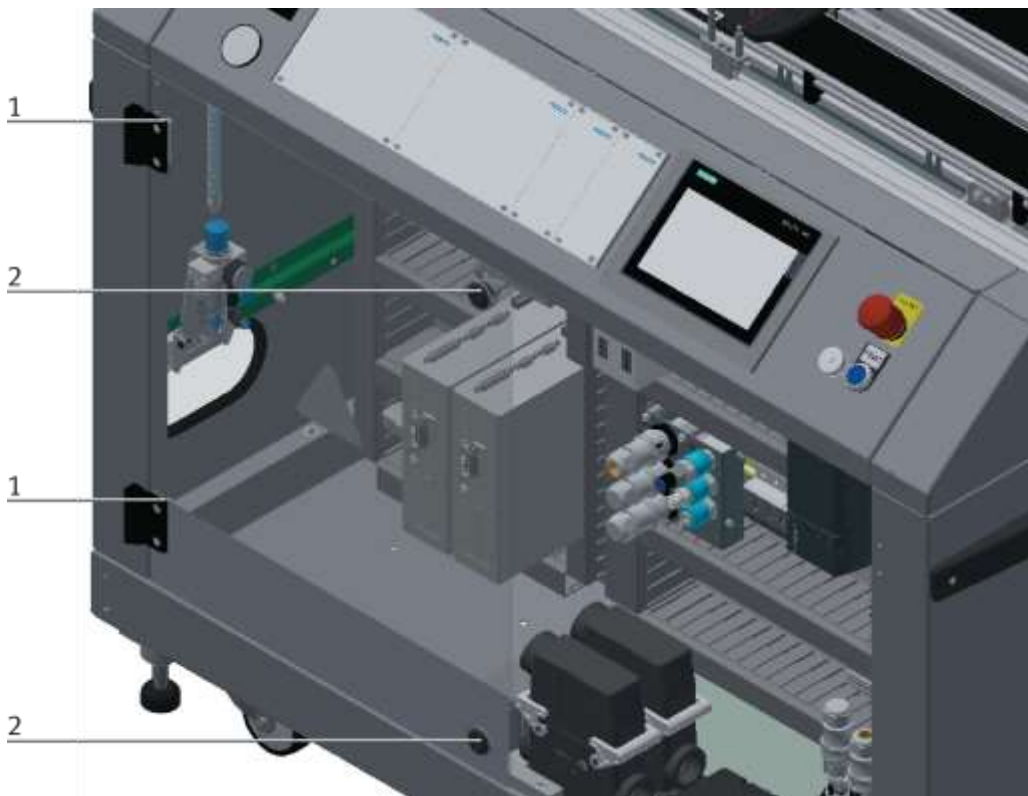


Illustration similar

The hinges of the control cabinet doors are provided with spring steel sheets (1). If the switch cabinet locks (2) are not locked, the door is automatically opened a crack and reminds the user to firmly lock the door with the switch cabinet locks.

4.12.2 Robot enclosure – fixed element

Transparent, impact-resistant, polycarbonate plate on sides and top

4.12.3 Robot enclosure – service doors

Transparent, impact-resistant, polycarbonate plate

Can be opened for service purposes.

Fitted with safety switches, 2-channel

Functional safety for robot circuit in accordance with EN ISO 13849-1, PL=d, Cat. 3

Automatic operation only possible when door closed

4.12.4 Protective unit at robot station



Illustration similar / example

1. If no other station is installed and the workpiece carriers are not transferred to a following station, the protective unit must be installed to prevent access to the station. This applies to both sides of the station.



Illustration similar / example

2. If another station is installed and the workpiece carriers are transferred to a following station, the protective unit of the station must be removed. This applies to both sides of the station.

4.12.5 Emergency stop

Every station contains an emergency stop mushroom actuator. All the emergency stop actuators in the system are interconnected. The emergency stop signal shuts off all the actuators. Operator confirmation is required to restart the system; there is no automatic restart.

4.12.6 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 datas

| 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 | 2,5 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 | |

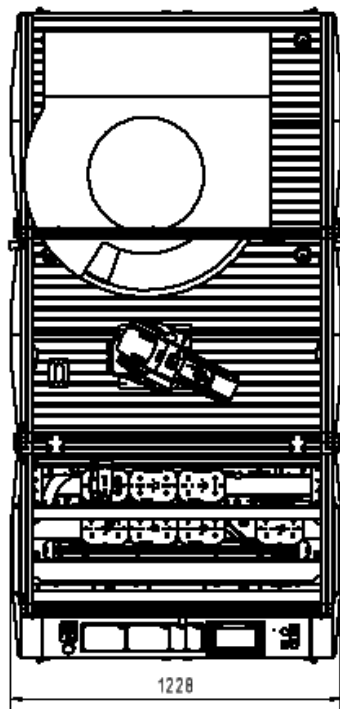
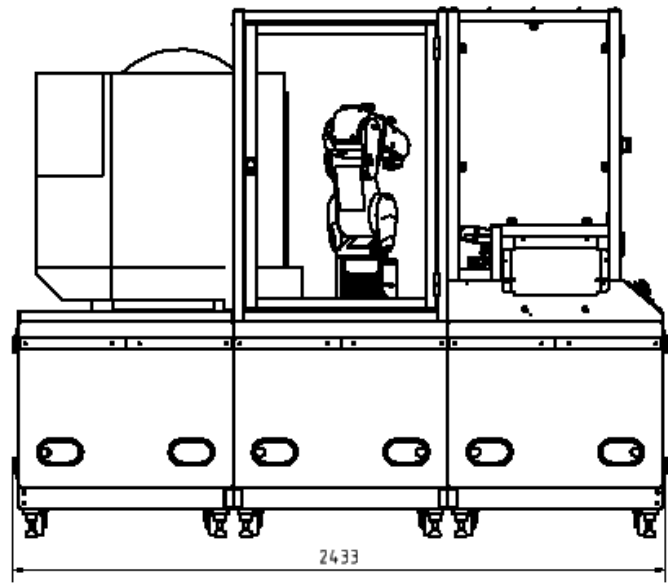
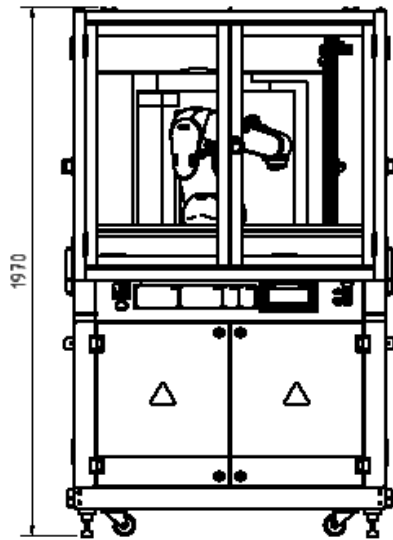


Illustration similar

5.1 General information about CP Factory

The CP Factory has been developed in close co-operation with teachers and instructors. The result is a training system meeting all demands on modularity, mobility, flexibility and openness due to its completely new characteristics.

The station provides an appropriate system for practice-orientated tuition of the following key qualifications

- Social competence,
- Professional competence and
- Methodological competence,

Which are required in today's complex world of employment. This is much easier now with use of the CP Factory.

The two-sided symmetrical basic modules with accompanying control board and control unit are identical. With their technical system „transfer line with drive unit and stopper unit“, they are ideal for the training in SPS programming and drive technology from basics to medium level.

Due to the patented passive pallet return systems, the continuous working process „pallet circulation“ is already possible when using one single basic module.

The industrial-relevant basic process „pallet circulation“ already contains a large number of important course contents such as:

- drive technology with DC geared motor
- drive technology with asynchronous motor and converter (optional)
- drive technology with servo motor and servo converter (optional)
- pallet-stop setting
- pallet-stroke setting and pallet-indexing (optional)
- pallet identification by binary coding
- pallet identification by RFID
- speed and position recording by pulse generating disc (optional)
- basics on electro pneumatics (stop-cylinder model)
- basics on SPS programming
- SPS programming in steps
- SPS programming operating modes
- SPS programming binary coding
- SPS programming communication by frequency converter (optional)
- SPS programming communication by RFID (optional)
- SPS programming/visualization by touch panel (optional)

The basic module becomes a station by adding technology-specific application modules like magazines, handling or machining units. The standardized mechanical and electrical interface of application and basic module allows an unproblematic starting-up.

The CP Factory is a perfect platform for nearly all course contents. It helps to improve the co-operation of different teams and to extend the ability of understanding processes.

On this system, especially the topics about networking, communication and data acquisition can be shown in an easily comprehensible way and can be further trained.

5.2 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

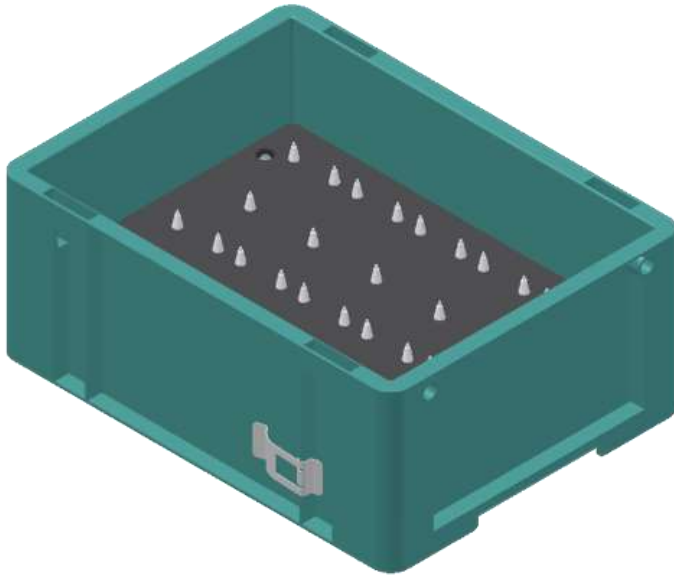


Illustration similar

Box with retainer for 10 PCB's
Partnumber in MES – 27






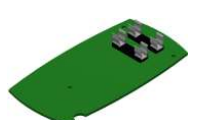



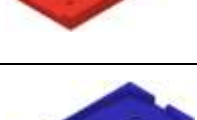






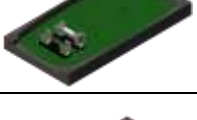


Illustration similar

Box with retainer for 8 front/backcovers or assembled workpieces
Partnumber in MES – 28

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 |

6 Design and Function

6.1 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 500 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. |

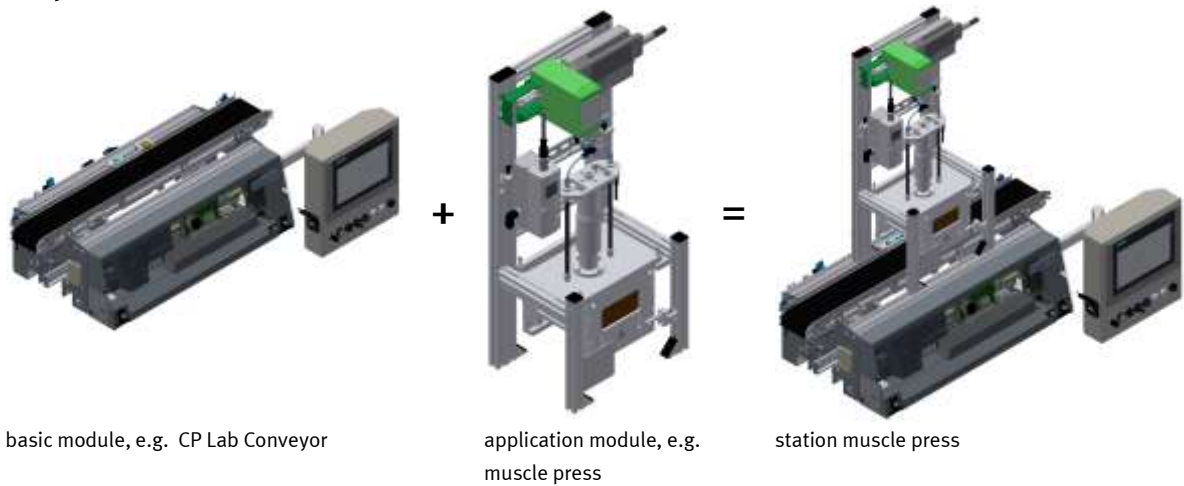
**NOTE**

- 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.

6.2 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 muscle press is attached to a basic module, it becomes a station.

Example

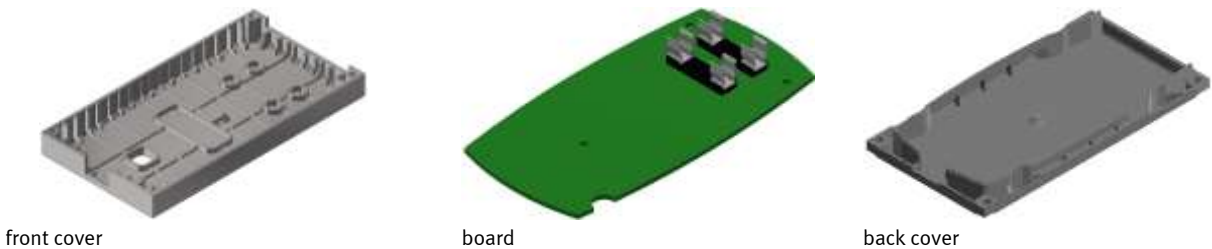


If several stations are put in a row one behind the other, this will form a production line.



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.



6.3 Robot feeding for mill

6.3.1 General information

The robot feeding for mill consists of a basic module bypass and a loading cell with robot as well as the CNC machine. The conveyor belts have a width of 80 mm and a length of 1200mm. Carriers with workpieces can be removed and transferred here for a longer processing. Thus, applications with a longer processing time can be mounted on the bypass. The workpiece flow is not affected by the bypass line.

The conveyors are for transporting boards on carriers. The carriers are equipped with a read/write ID-system. This ID-system represents an important item of the CP Factory System. Current data of the workpiece to be transported is written on the carriers. Thus all information essential for the process is transported together with the carrier and is therefore available at every station.

On bypass module an aluminum plate is mounted on a base frame. On this plate is a 6-axis robot and the associated periphery. The robot is responsible for handling all processes within the module. For machining the workpieces, a CNC machine is mounted on the base frame. The task of the station is to equip the CNC milling machine with workpieces and to process the workpieces according to the requirements in the CNC machine.

Different types of robots can be mounted, should there be differences in handling or the interfaces, this is indicated separately in the operating instructions.

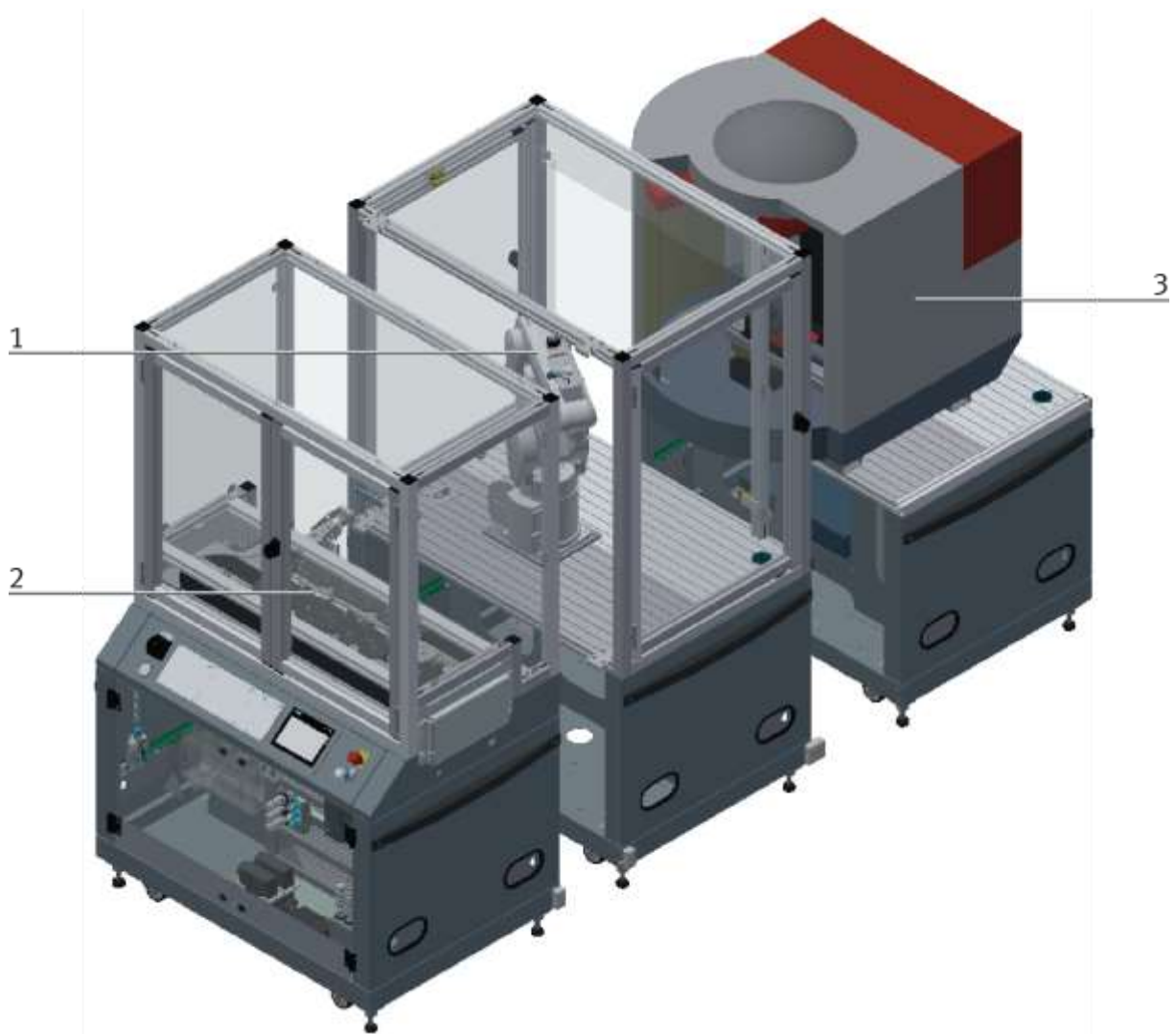
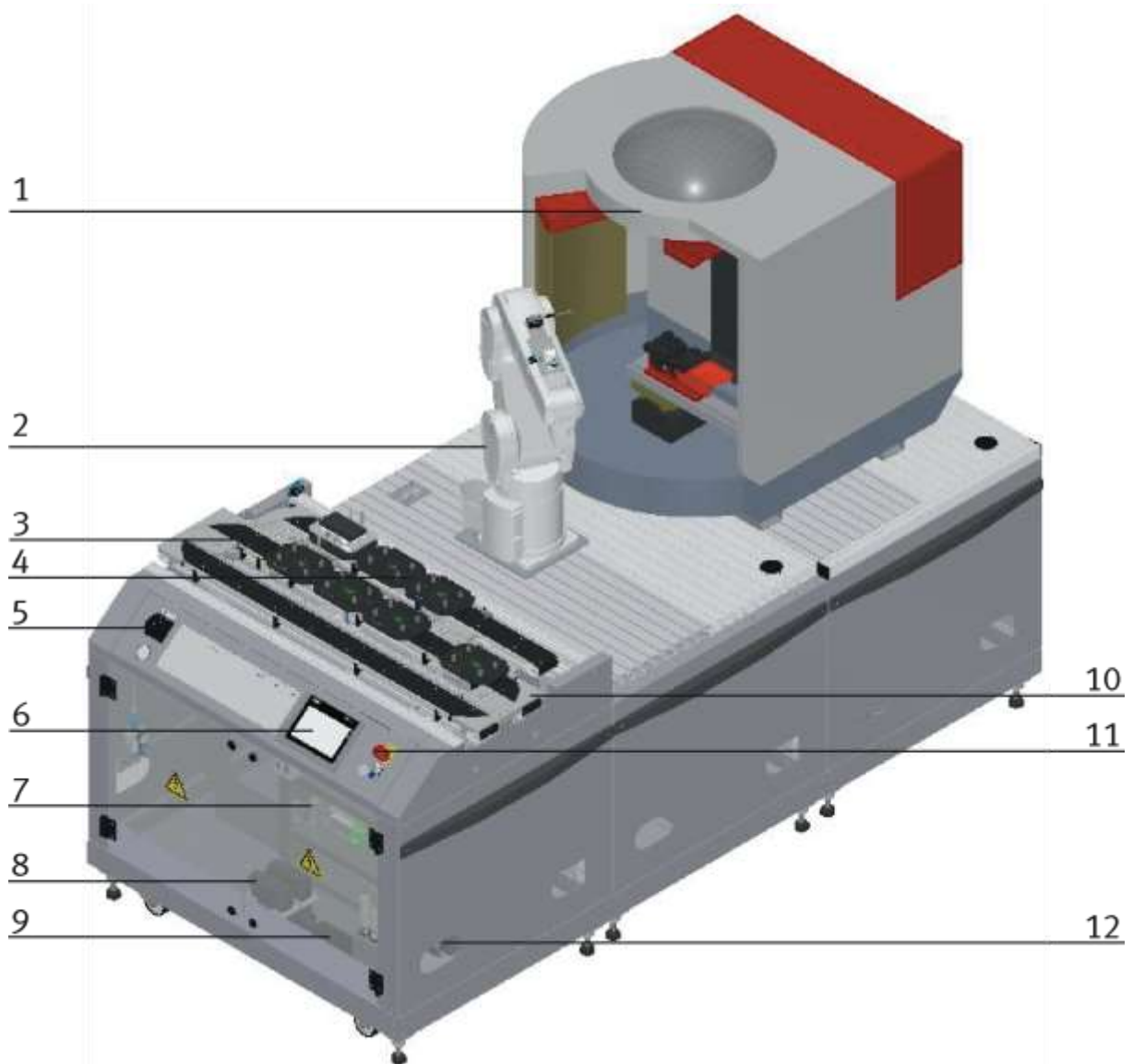


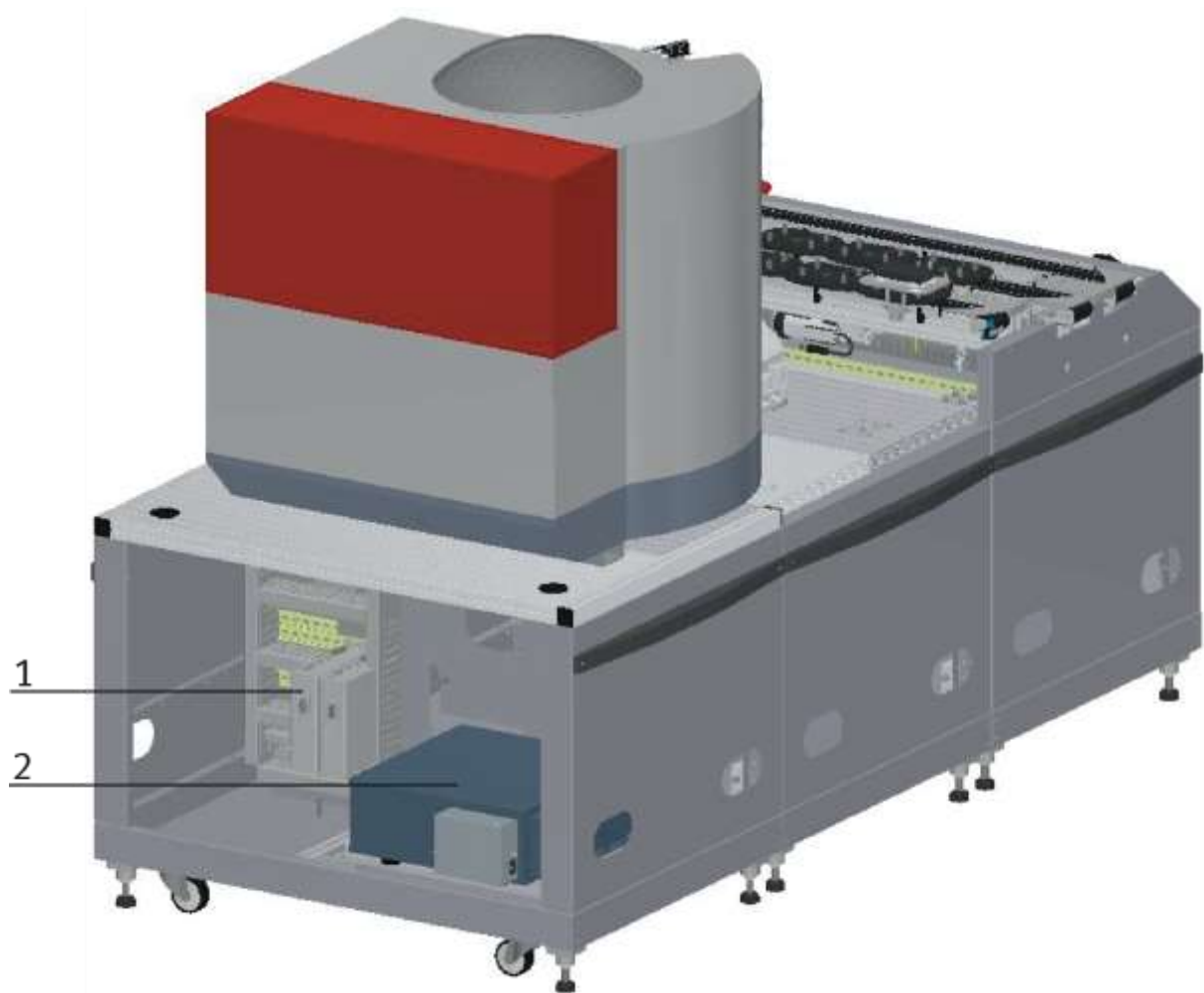
Illustration similar

| Position | Description |
|----------|------------------------|
| 1 | Feeding robot for mill |
| 2 | Basic module bypass |
| 3 | CNC milling machine |



CP Factory robot feeding for mill – front side / illustration similar

| Position | Description |
|----------|---|
| 1 | CNC machine |
| 2 | Robot |
| 3 | Conveyor |
| 4 | Working position / workpiece carrier output slide |
| 5 | Main switch operation panel |
| 6 | Touchpanel |
| 7 | E-Board for basic module bypass |
| 8 | Multi contact plug |
| 9 | Pressure switch (option for energy monitoring) and RFID |
| 10 | removable corner pulley /other module available |
| 11 | Emergency stop |
| 12 | Passage for power supply |



CP Factory robot feeding for mill – back side / illustration similar

| Position | Description |
|----------|---------------------|
| 1 | E-Board application |
| 2 | Drive Unit |

6.4 Mechanical structure

The robot feeding for mill is designed for one-sided operation (1). The module is equipped with mechanically adjustable feet. Should it be necessary to move the module to another place, it can be lowered to its rollers and thus be transported easily.

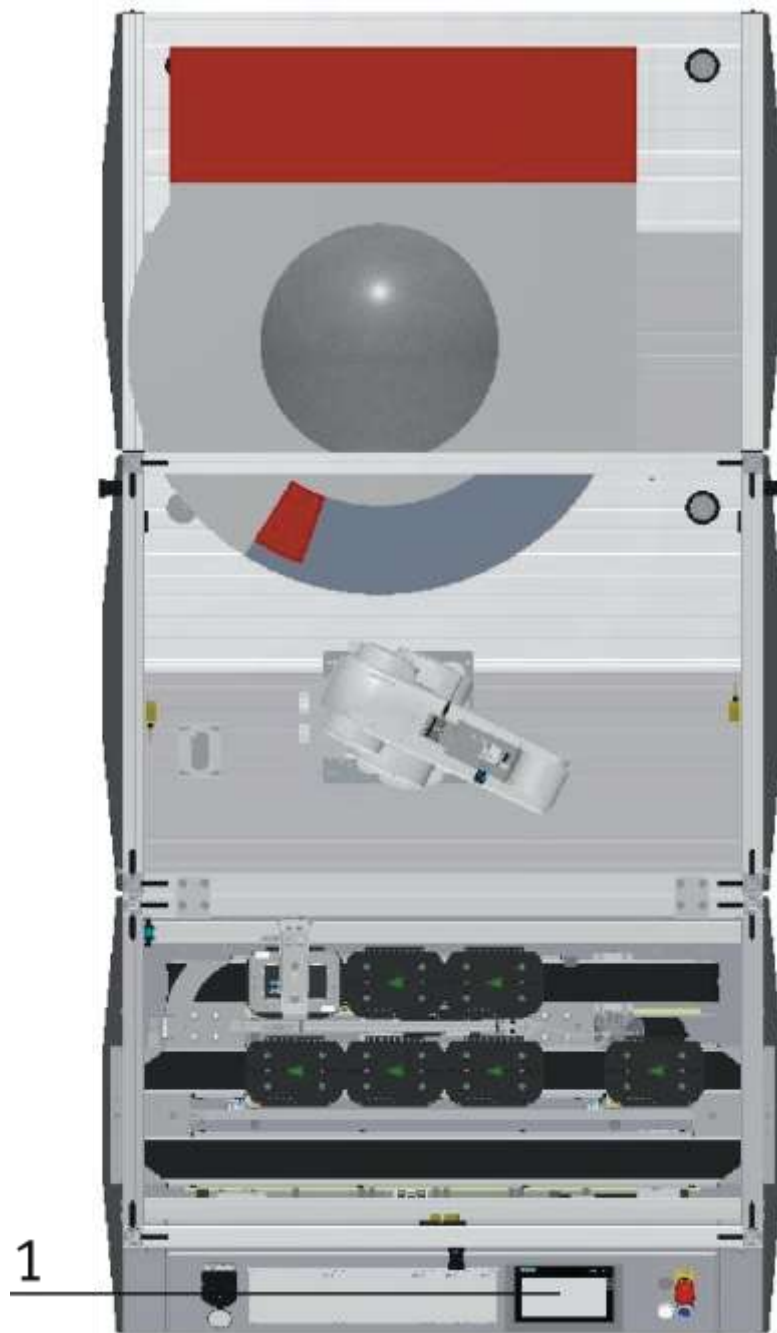
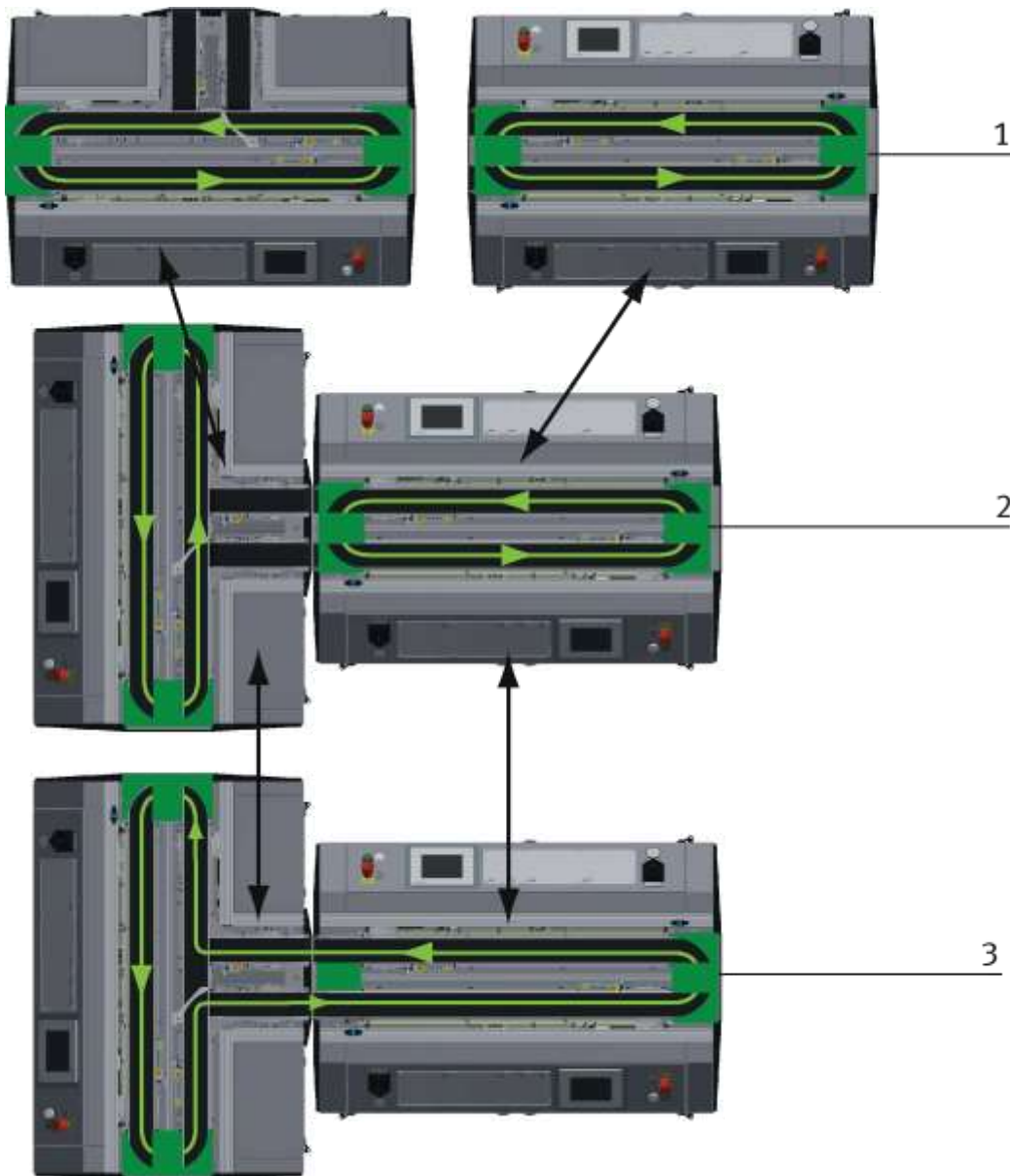


Illustration similar

The modules can be operated in two ways - as a single station or in a chain with further modules. When connected to a further module, it is necessary to replace the deflection at the end of the band by means of a support plate. The switch is an exception, if this is operated as a single station, it is not possible to eject or introduce workpieces via the switches.



Installation Options example / illustration similar

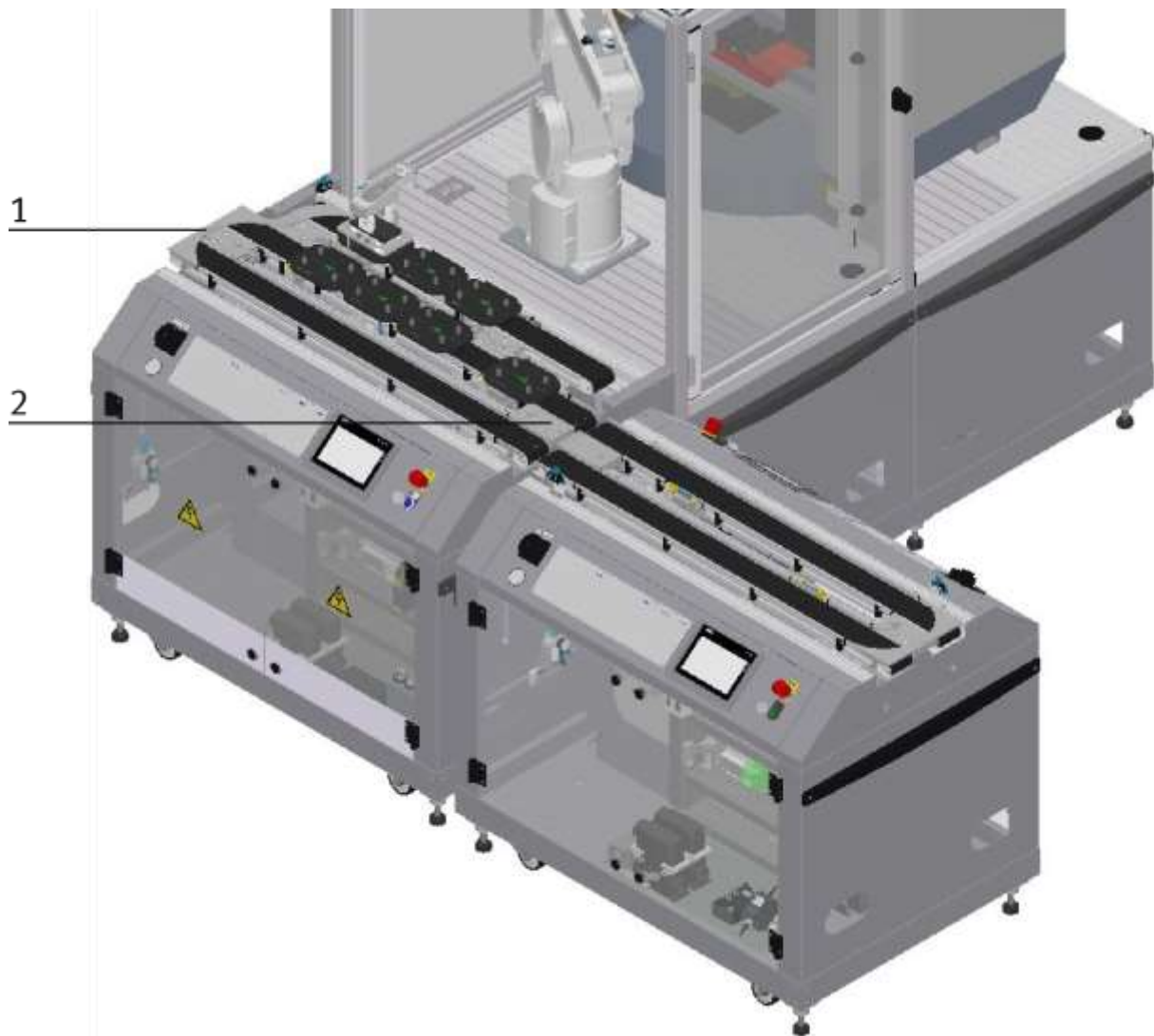
With the pluggable tape deflections there are different possibilities to control the transport flow. Depending on this, different modules can be operated individually or in combination.

| Position | Description |
|----------|--|
| 1 | Operation as independent Basic Module /not put together |
| 2 | Operation as independent Basic Module /Basic Module put together |
| 3 | Operation connected with another Basic Module |



Installation as independent module / illustration similar

| Position | Description |
|----------|--|
| 1+2 | corner pulley – the pallet carrier is reversed from one conveyor to the other on the Basic Module ByPass |

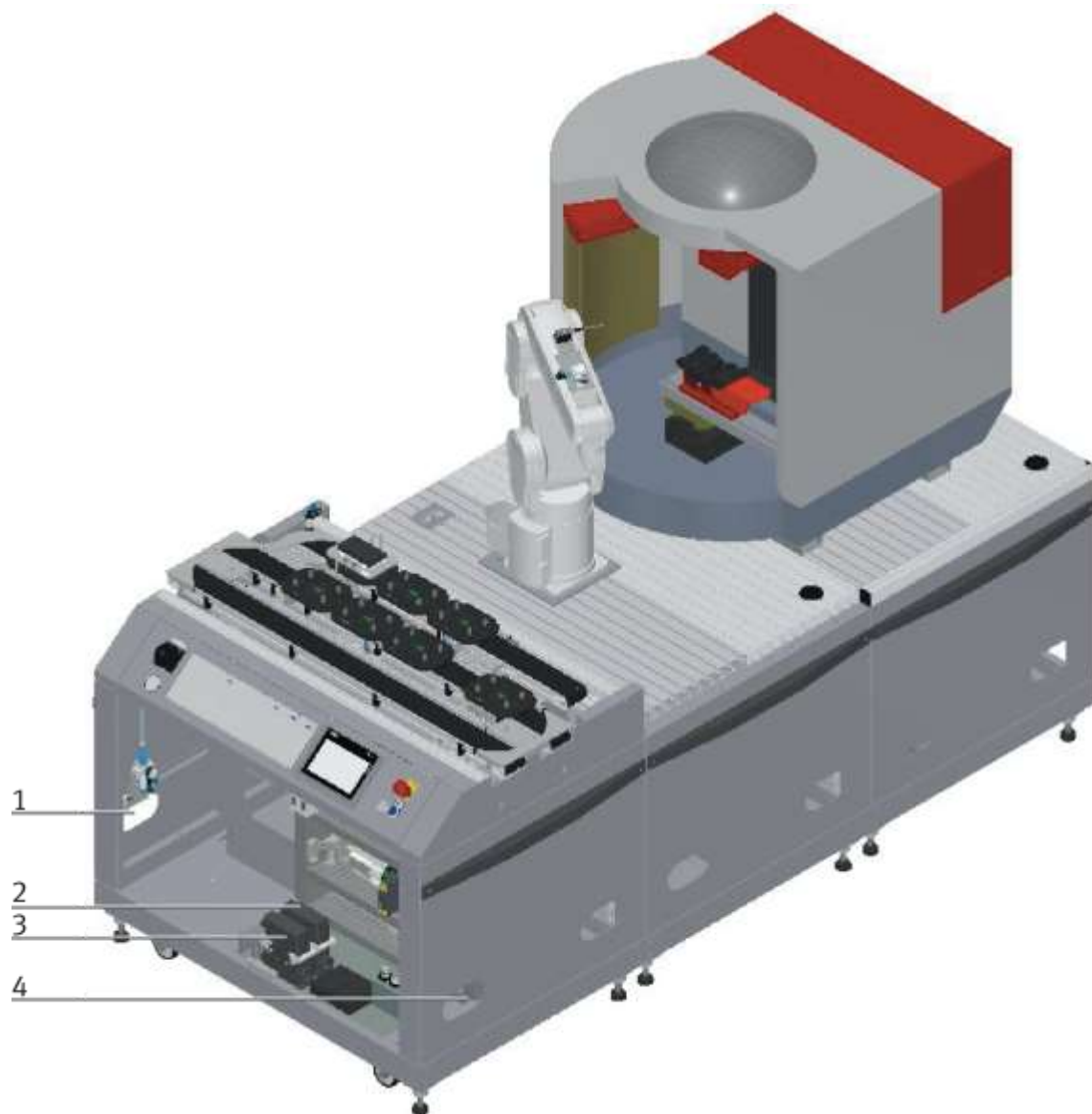


Installation in combination with a Basic Module linear / illustration similar

| Position | Description |
|----------|---|
| 1 | Replacement guide board (support plate) if connected to another module – the pallet carrier is not reversed but directed to the next module |
| 2 | corner pulley – the pallet carrier is reversed from one conveyor to the other conveyor on the Basic Module ByPass |

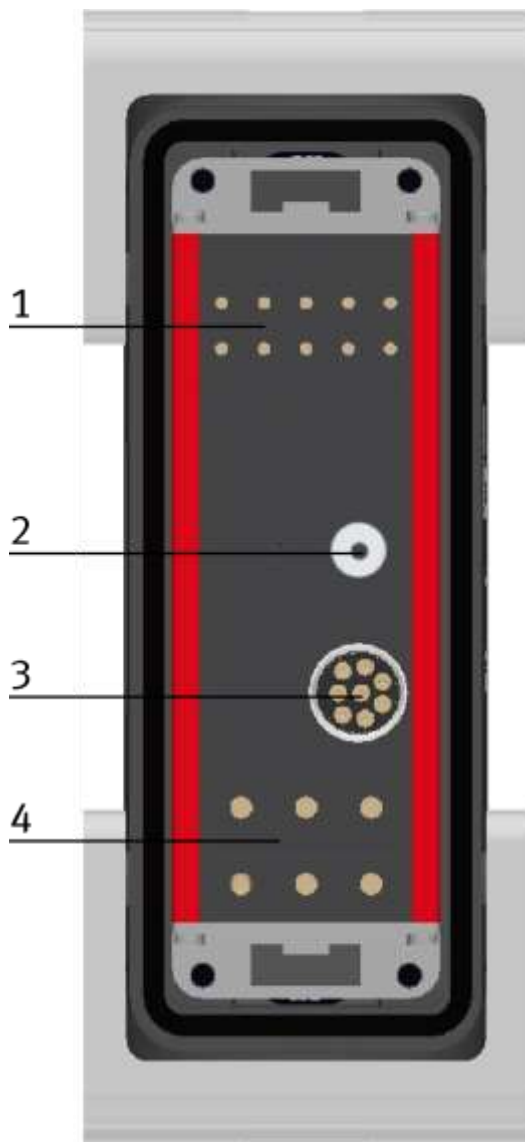
The corner pulley and the support plate are only pinned and can be changed easily without tools.

6.4.1 Supply of the Robot feeding for mill



CP Factory supply / illustration similar

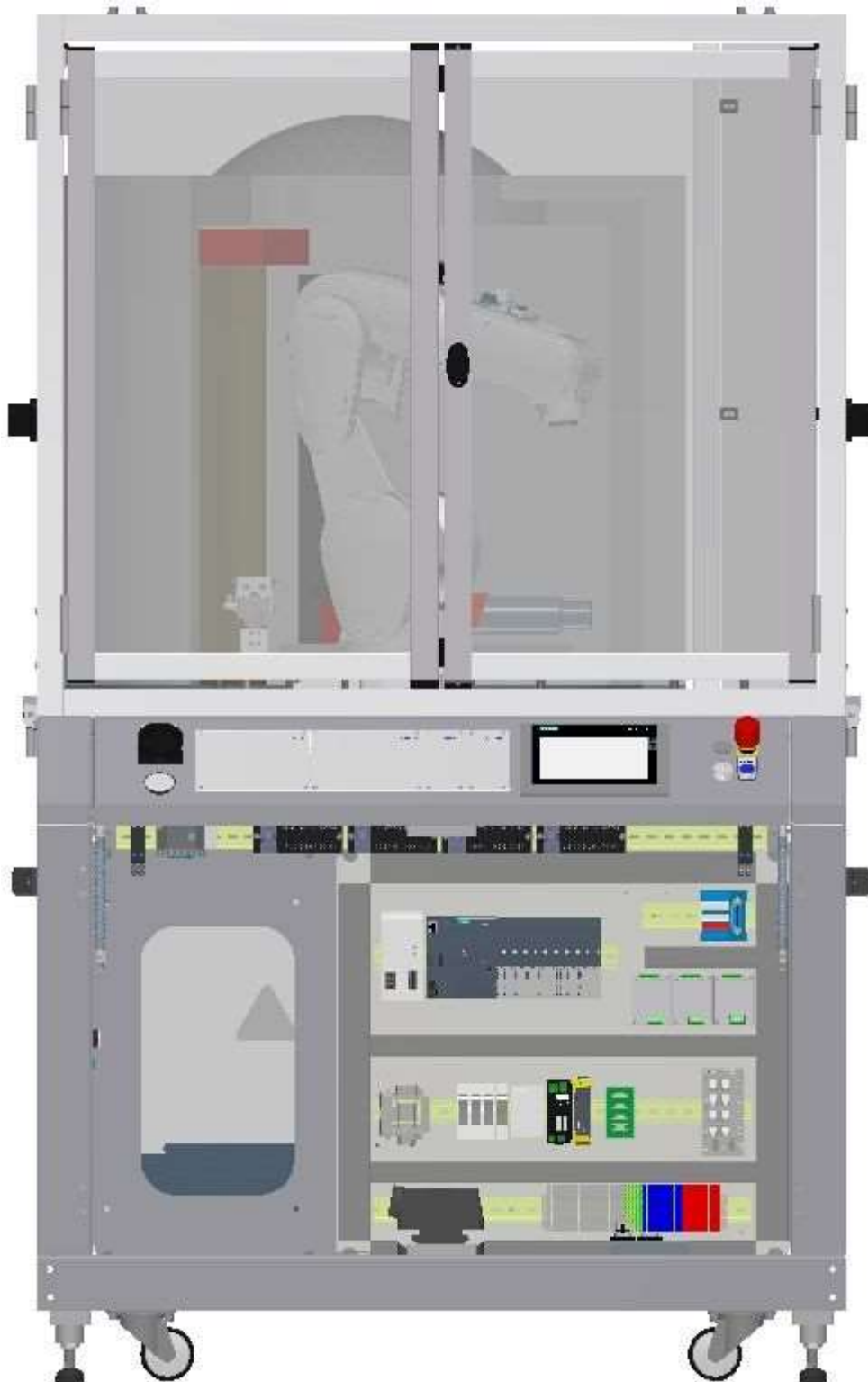
| Position | Description |
|----------|---|
| 1 | Inlet port for connection tube with voltage, communication and pneumatics |
| 2 | Connection plug K2-XZ1 |
| 3 | Connection plug K2-XZ2 |
| 4 | Outlet port for the connection tube of a further module |



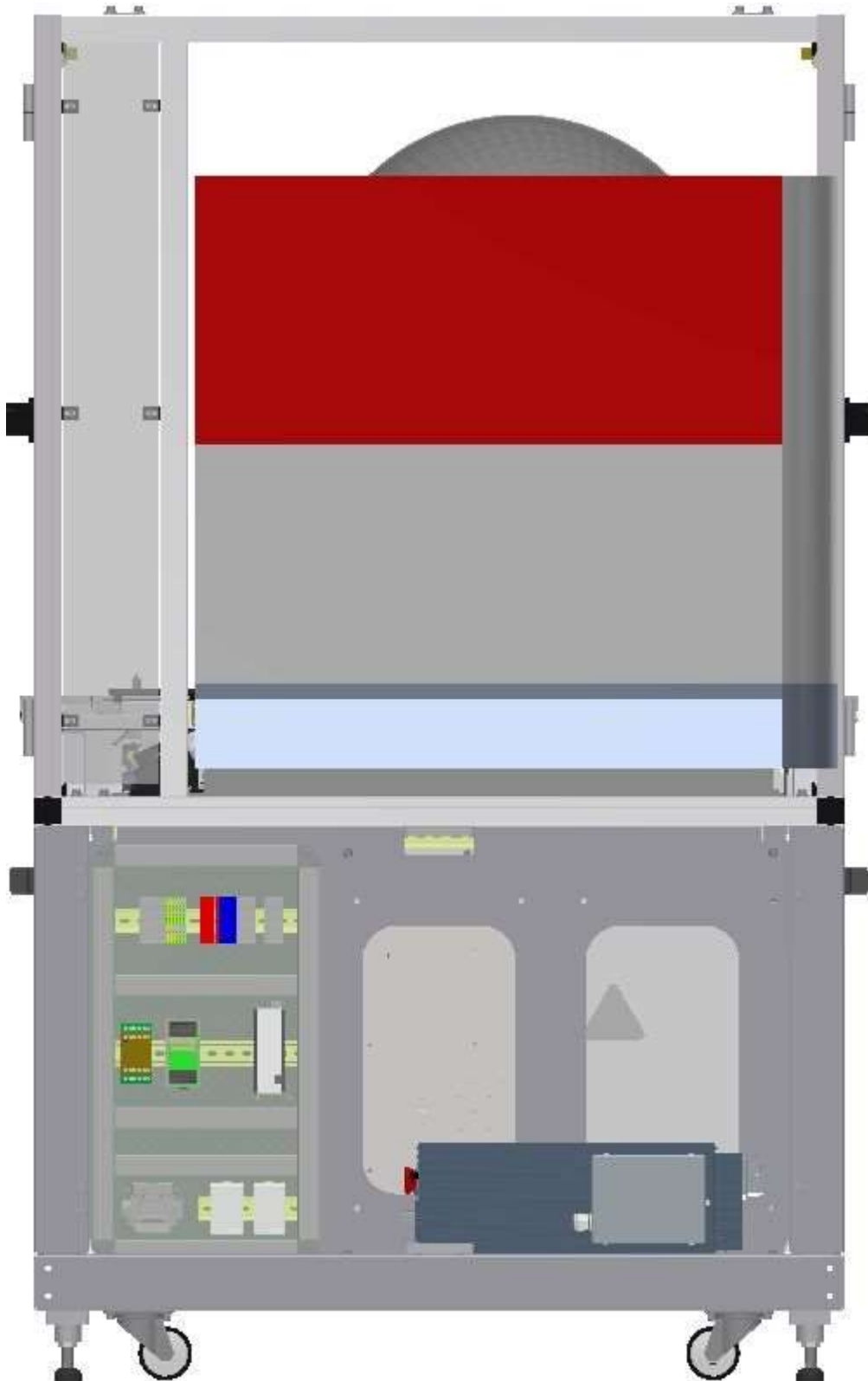
| Position | Description |
|----------|-------------------------|
| 1 | Emergency chain linking |
| 2 | Pressure |
| 3 | Network |
| 4 | 400 V |

6.5 Electrical set up

The robot feeding for mill has two electric boards. The main electric board is mounted on the front of the base frame and is responsible for the conveyor belt with the bypass. The electric board for the feeding is mounted on the back. The drive unit for the robot is also located on the back of the base frame.

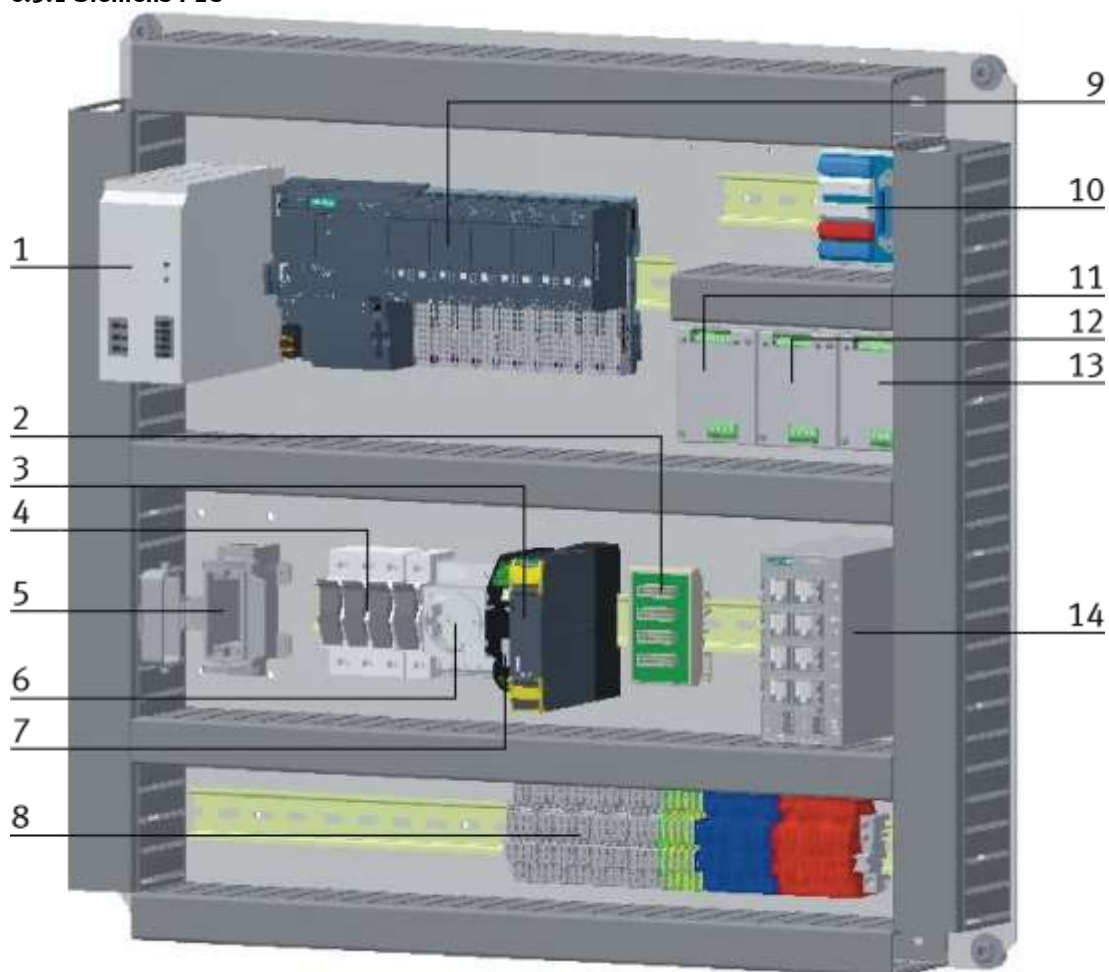


E- Board robot feeding for mill front side / illustration similar



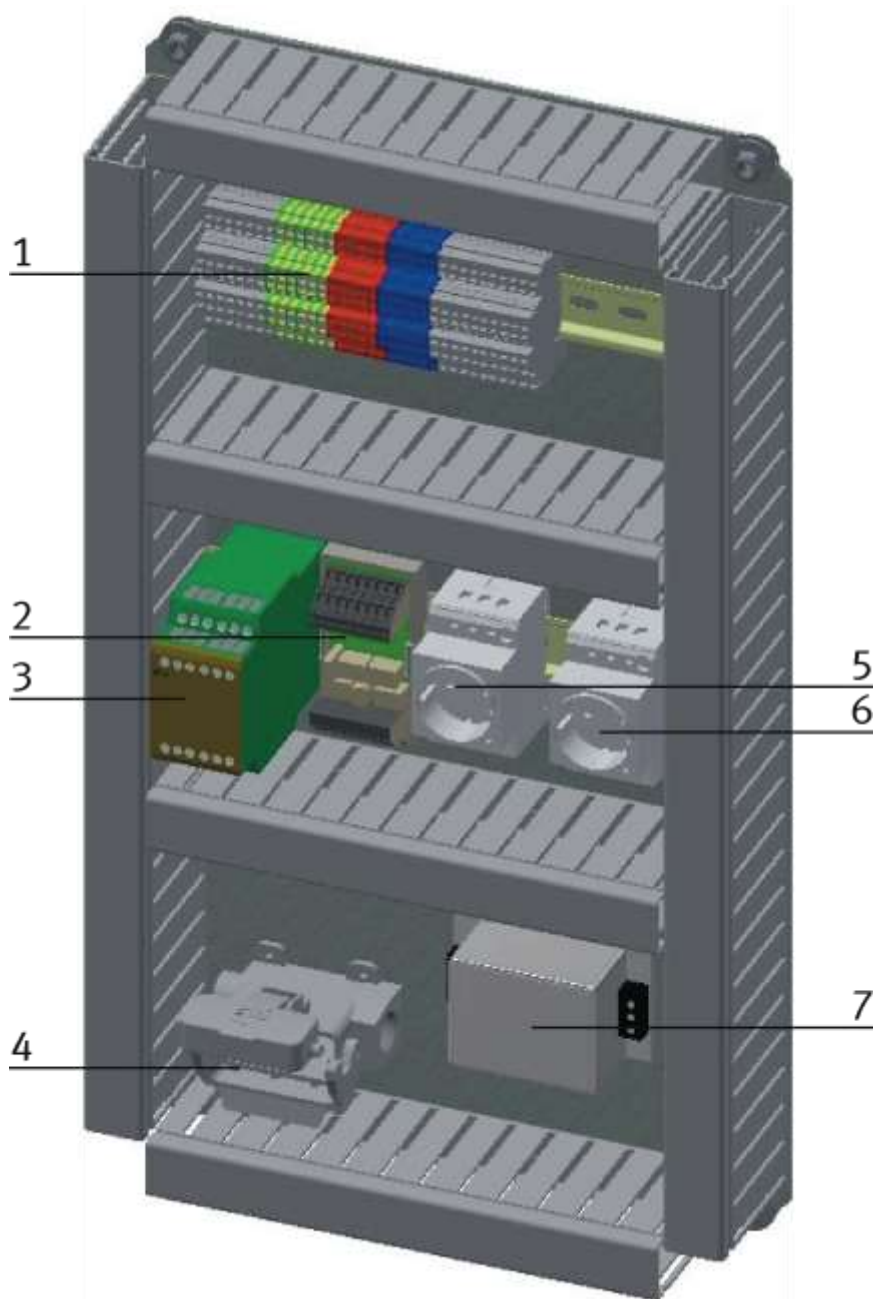
E-Board robot feeding for mill back side / illustration similar

6.5.1 Siemens PLC



E-Board front side conveyor with bypass / illustration similar

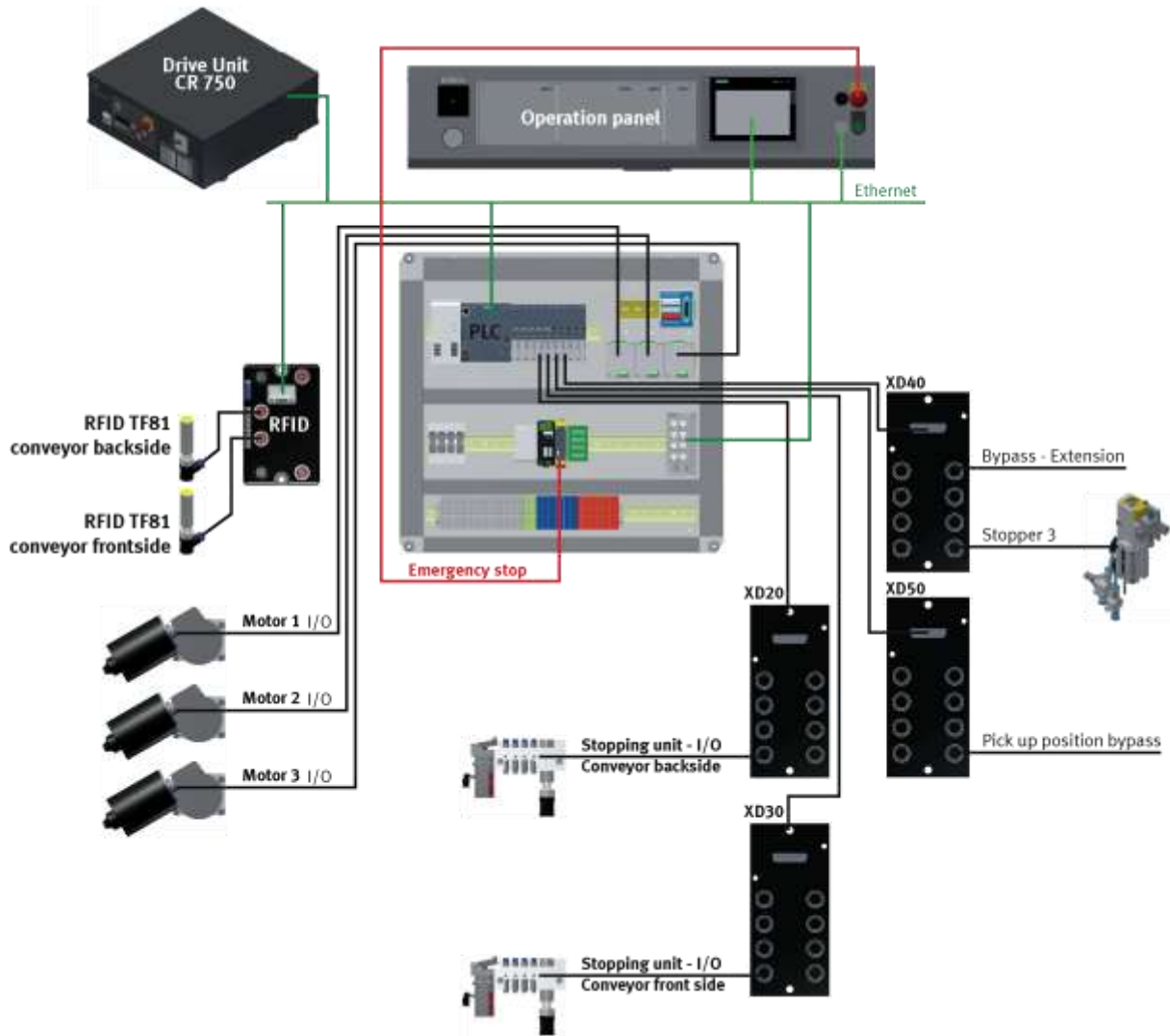
| Position | Description | BMK | Description / Ordernumber |
|----------|---------------------------------|-----------------|---|
| 1 | Power supply 24 V | K1-TB1 | Festo CACN-3A-1-10 / 2247682 |
| 2 | Emergency stop distributor | K1-F2-XZ2 | |
| 3 | Emergency stop unit | K1-F2-KF1 | Siemens / 3SK1111-2AB30 |
| 4 | Fuses | | Han 10A-asg2-LB-M20 |
| 5 | Harting plug | K1-FC1 + K1-FC2 | |
| 6 | protective contact socket 230 V | K1-XJ4 | |
| 7 | ELEC AUX CIRCUIT | K1-FC4 | Murr Elektronik / 9000-41042-0100600 |
| 8 | Clamps | K1 XD0-K1-XD13 | |
| 9 | PLC | K5-KF1 | ET 200 SP CPU 1512SP F-1 P |
| 10 | I/O terminal | K1-XD15 | |
| 11 | Start-up current limiters | K1-QA1 | Kaleja M-MZS-4-30 / 06.05.020 |
| 12 | Start-up current limiters | K1-QA2 | Kaleja M-MZS-4-30 / 06.05.020 |
| 13 | Start-up current limiters | K1-QA3 | Kaleja M-MZS-4-30 / 06.05.020 |
| 14 | Ethernet Switch | K1-XF1 | Siemens Scalance XB008 / 6GK5008-OBA00-1AB2 |



E-Board back side robot feeding for mill / illustration similar

| Position | Description | BMK |
|----------|---------------------------------|------------|
| 1 | Clamps for power distribution | XD1 / XD10 |
| 2 | Pilz PSEN iX1 | F2-KF3 |
| 3 | Emergency stop unit PNOZ X8P | F2-KF2 |
| 4 | Harting plug | XJ4 |
| 5 | protective contact socket 230 V | XD3 |
| 6 | protective contact socket 230 V | K6-XD6 |
| 7 | MIT-SUP-EL20-ER-6 | K6-KF2 |

6.5.2 Cabling chart



Overview cabling chart Mitsubishi - Siemens / illustration similar

6.5.3 Emergency stop structure

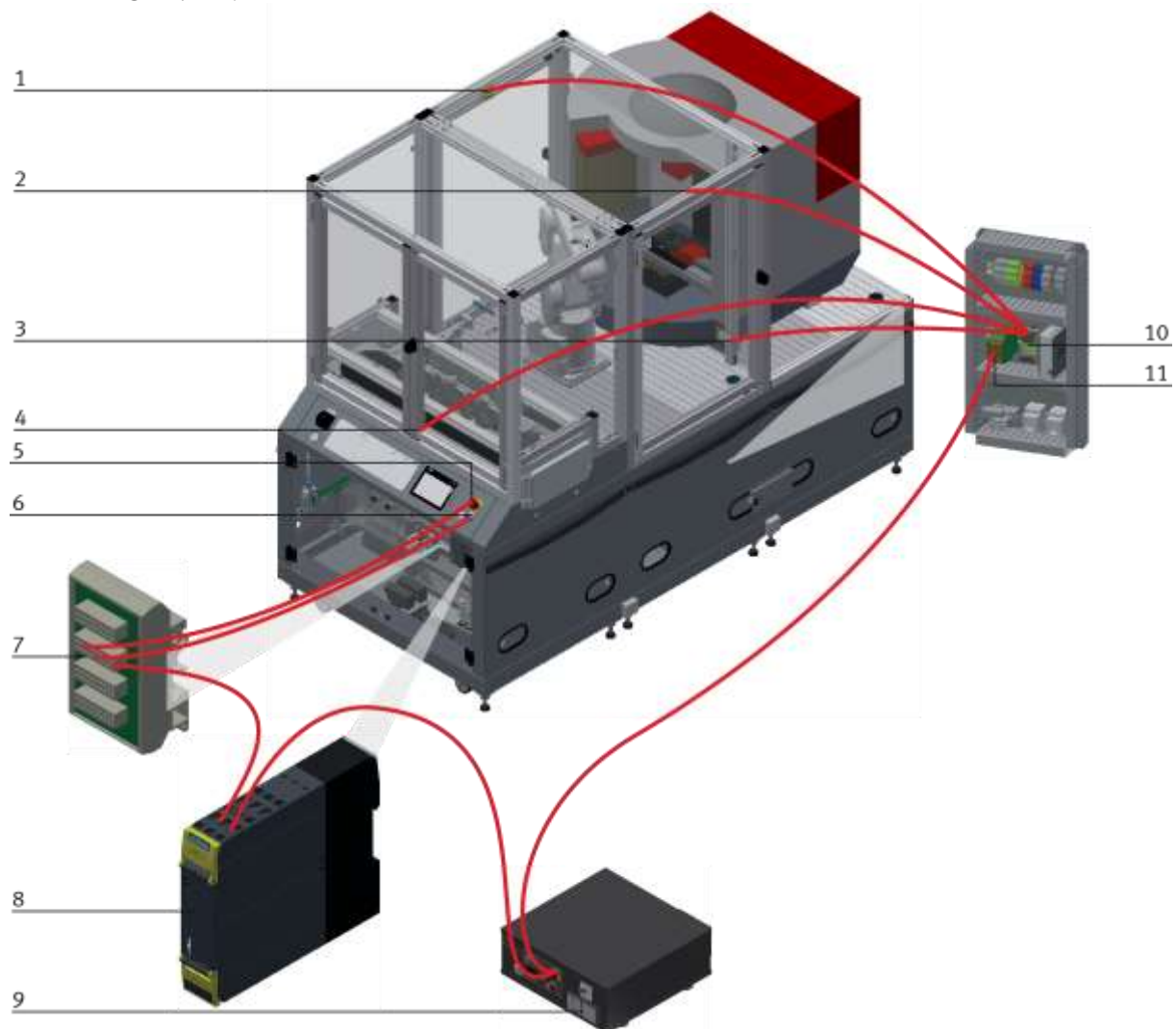
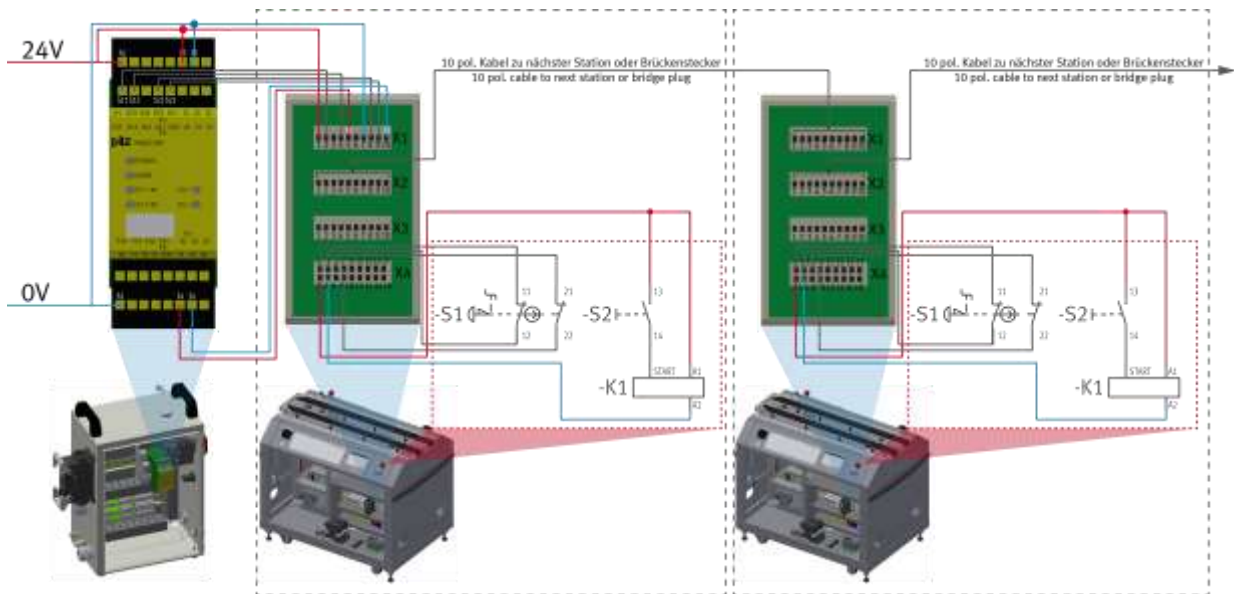


Illustration similar

The emergency stop components on the back side are firmly wired to the front. The type of control does not matter.

| Position | Name |
|----------|---|
| 1 | Safety door / -H1-F2-FQ3 |
| 2 | Safety door / -H1-F2-FQ2 |
| 3 | Safety door / -H1-F2-FQ4 |
| 4 | Safety door / -H1-F2-FQ1 |
| 5 | Emergency stop switch F2-FQ1 / to emergency stop board X4:1; X4:3; X4:5; X4:7 |
| 6 | Reset button SF2 / to PNOZ S33+S34; lamp clamp 24VNA/0V+ |
| 7 | Emergency stop board for emergency stop linking / F2-XZ2 |
| 8 | Emergency stop unit / F2-KF1 |
| 9 | Drive Unit / K6-KF1 |
| 10 | PSEN iX1 / F2-KF3 |
| 11 | PNOZ X8P / F2-KF2 |



Setup emergency stop system / illustration similar

The emergency stop system affects the whole line, so if an emergency stop is pressed, all stations in the line stop.

The emergency stop boards which are used in each station are used to connect one station to the next. These are connected with 10-pin cables and route all emergency stop information from one station to the next.

Starting at the power cabinet, a 10-pin cable is plugged into the X1 interface of the emergency stop board at the first station, from there it goes from the X2 of the emergency stop board to the X1 interface of the Emergency stop board from the next station. If no other station is connected, a jumper plug must be plugged into X2 of the emergency stop board at the last station.

The information is processed internally by X4 on the emergency stop board.

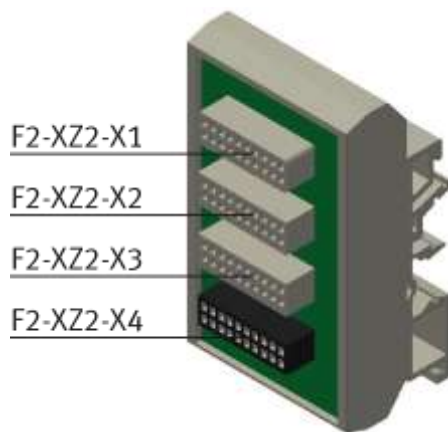


Illustration similar

Circuit board emergency stop circuit

- F2 XZ2-X1
Emergency stop coupling input / If no predecessor station is present, a bridge plug is to be installed here or at the system plug.
- F2 XZ2-X2
Emergency stop coupling Output 1 / If there is no following module, a bridge plug is to be installed here or at the system plug.
- F2 XZ2-X3
Emergency stop coupling output 2 / for the connection of a further module or an external machine (for example for basic module branch - here a further module can be installed at the branch or a CNC processing machine can be provided at a bypass) otherwise a bridge plug is to be provided.
- F2 XZ2-X4
Connection terminals for control panel, power supply, emergency stop relay

6.6 Commissioning

The robot feeding for mill has got several components which have to be attached when starting up. The procedure will be described on the following pages.

6.6.1 Pneumatic commissioning

The mechanic mounting must be finished and completed. At first you have to connect the robot feeding for mill to the pneumatic system of the room. The corresponding service unit has to be provided by the customer and should be placed right next to it. The quick coupling plug has got a nominal size of 5 mm. If the local system has got a nominal size of 7.9 mm, it is possible to exchange the quick coupling plug of the service unit for a bigger one (adapter 1/8 to 1/4 necessary).

Now the station can be supplied by 6 Bar and the pneumatic commissioning is completed.

6.6.2 Electrical commissioning

Now the robot feeding for mill has to be supplied with electric voltage (400 V). The voltage has to be provided by the customer. Professional installation must be guaranteed as well.

6.7 Visual inspection

The visual inspection must be carried out before each start-up!

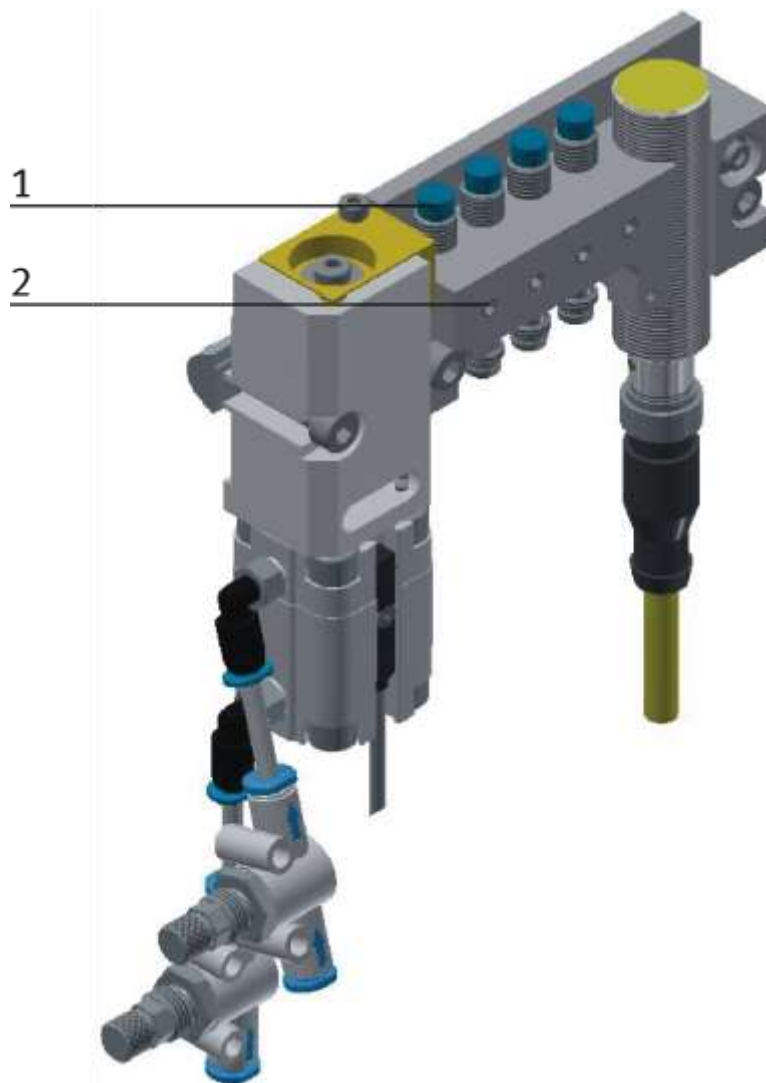
Before starting the station, check:

- the electrical connections
- the correct fit and the condition of the compressed air connections
- the mechanical components for visible defects
(Cracks, loose connections, etc.)
- the emergency stop devices are working

Eliminate any damage found before starting the station!

6.8 Adjusting the sensors

6.8.1 Proximity switch (stopper Identsensor)



| Position | Description |
|----------|--|
| 1 | Sensor stopper identify sensor / 150395 (SIEN-M8NB-PS-S-L) 1 position (BG21/BG31/BG41) 2 position (BG22/BG32/BG42) 3 position (BG23/BG33/BG43) 4 position (BG24/BG34/BG44) |
| 2 | Screw to clamp the sensor |

The proximity switches are used for controlling the pallet.

Requirements

- Stopper unit is attached to the conveyor.
- Electrical connection of the proximity switches is set up.
- Power supply is available.

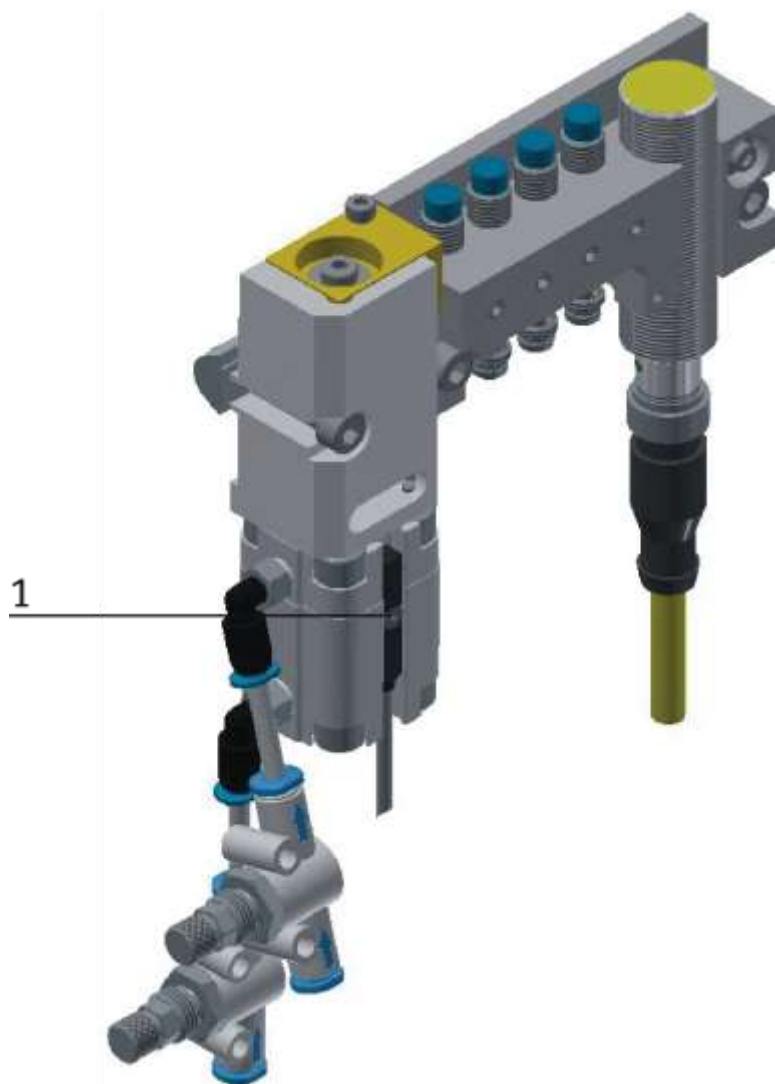
Procedure

1. The stopper is in upper position, a pallet is stopped at the stopper.
2. Shift the switch as long as the switching status display (LED) appears.
3. Shift the proximity switch into the same direction by a few millimetres as long as the switching status display disappears.
4. Shift the proximity switch halfway between the start-up and end position.
5. Tighten the locking screw of the proximity switch with an Allen key SW 1,3.
6. Check the position of the proximity switch by repeated removing the pallet.

Documents

- Data sheets / operating instructions
Proximity Switch 150395 (SIEN-M8NB-PS-S-L)

6.8.2 Proximity switch (stopper cylinder)



| Position | Description |
|----------|--|
| 1 | Sensor stopper down/ 574334 (SMT-8M-A-PS-24V-E-0,3-M8D) (BG20) / (BG30) / (BG30) / (BG40) |

The proximity switches are used for controlling the end position of the cylinder for the stopper. The proximity switches react to a permanent magnet on the piston of the cylinder.

Requirements

- Cylinder stopper is attached to the conveyor.
- Pneumatic port of the cylinder is set up.
- Compressed air supply is switched on.
- Electrical connection of the proximity switches is set up.
- Power supply is available.

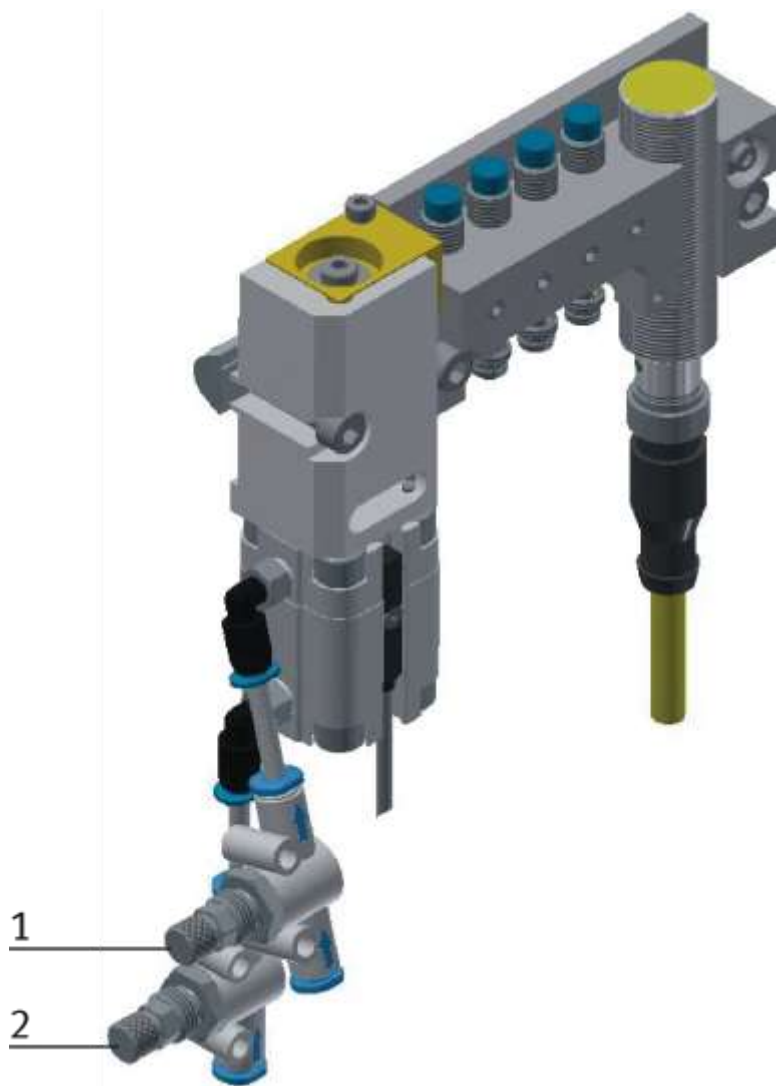
Procedure

1. The cylinder is in its end position to be queried.
2. Shift the proximity switch as long as the switching status display (LED) appears.
3. Shift the proximity switch into the same direction by a few millimetres as long as the switching status display disappears.
4. Shift the proximity switch halfway between the start-up and end position.
5. Tighten the locking screw of the proximity switch with an Allen key SW 1,3.
6. Check the position of the proximity switch by repeated test runs of the cylinder.

Documents

- Data sheets / operating instructions
Proximity Switch 574334 (SMT-8M-A-PS-24V-E-0,3-M8D)

6.9 Adjusting the one-way flow control valves



One-way flow control valves

| Pos | Description |
|-----|---|
| 1 | One-way flow control valves GRLA for stopper cylinder |
| 2 | One-way flow control valves GRLA for stopper cylinder |

One-way flow control valves are used for the regulation of the exhaust air volume of double-acting drive units. In the opposite direction the air flows through the flow control valve having a full cross-sectional flow. The piston is clamped between air cushions by free supply air and throttled exhaust air (improvement of the operating behaviour even if the load changes).

Requirements

- Pneumatic port of the cylinders is set up.
- Compressed air supply is switched on.

Procedure

1. At first, turn off both one-way control valves completely. Then turn them on by about one rotation.
1. Start a test run.
2. Turn on the one-way flow control valves slowly as long as the required piston speed has been reached.

Documents

- Data sheets
One-way flow control valve (193138)

7 Operation

The chapter Operation describes the control units required for the operation, as well as start-up and close-down of the system.

7.1 General notes on operation

The stations demand strict adherence to certain rules of operation. Negligence in observing these rules may cause errors in the stations' processes. Also, damage to physical health cannot be excluded.

Strict observance of the following rules is demanded.

7.1.1 Handling regulations

- Manual interference during the stations' operation is prohibited.
- In case of larger audience, a mechanical barrier of the station is required.
- It is prohibited to pull off any cables while voltage supply is not deactivated.
- Any kind of liquid is to be kept from the installation, at all times.

7.1.2 Operating regulations

The stations are to be operated only from trained personnel. Operation is to ensue according to operating instructions.

Uncontrolled pressing of the various switches/push-buttons of the control units is to be omitted / prevented.

No work-piece carriers should to be removed from the system.

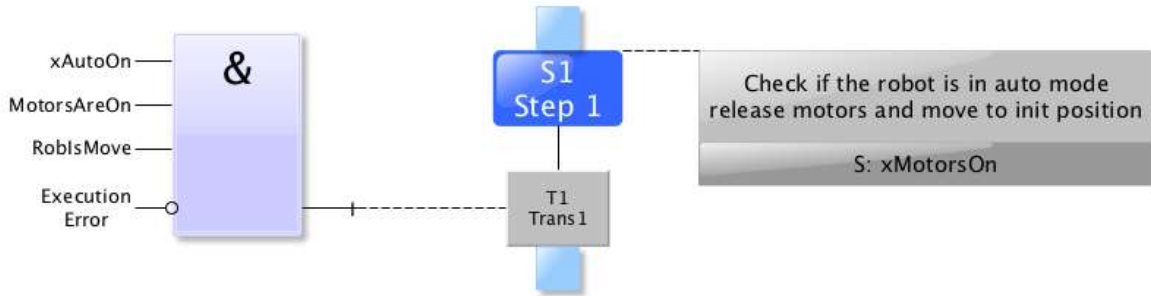
7.2 The control units of the robot feeding for mill



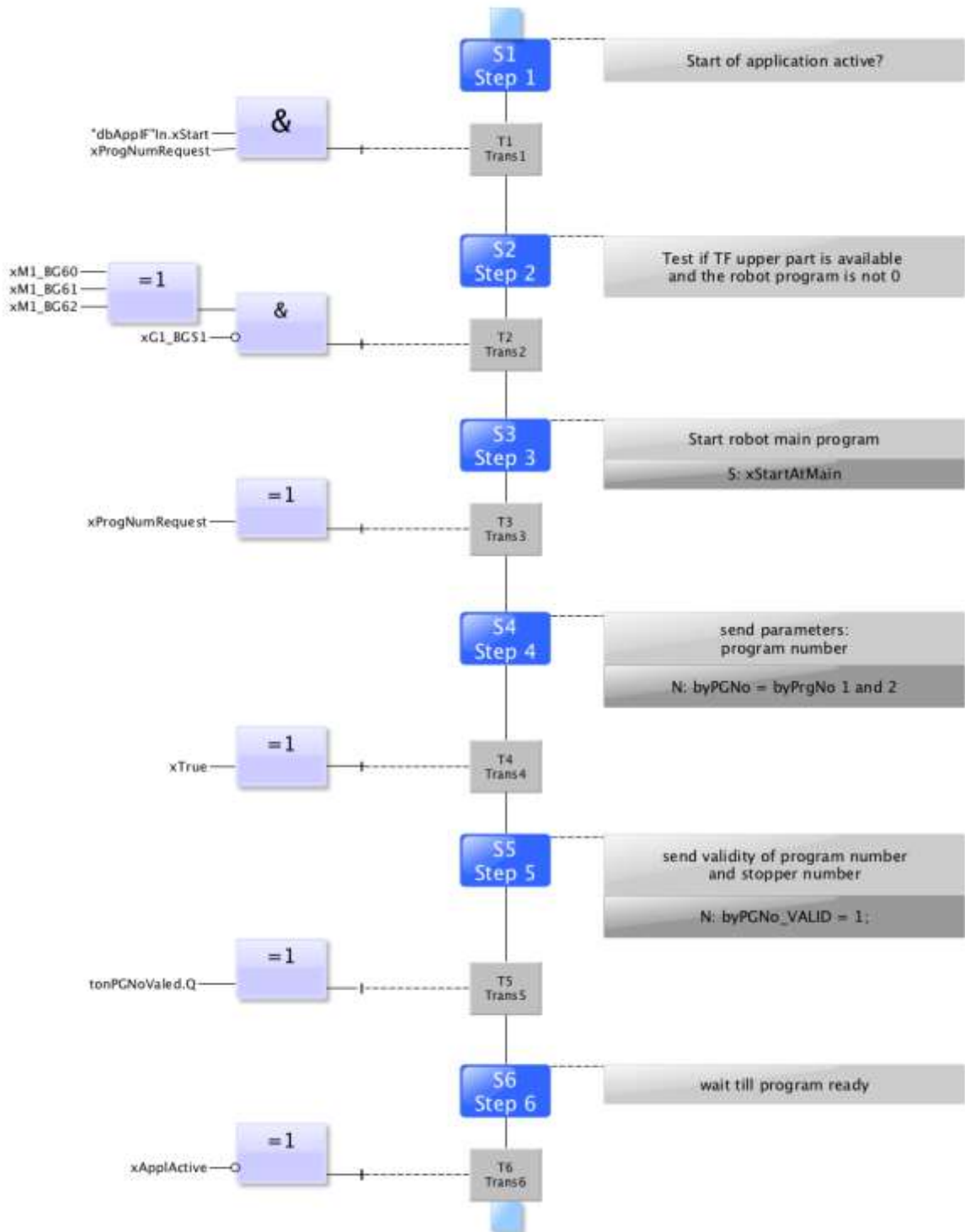
CP Factory control panel / illustration similar

| Position | Description |
|----------|---|
| 1 | Main switch - QB1 |
| 2 | Manometer |
| 3 | Touch Panel – PH1 / Festo panel or Siemens panel possible |
| 4 | Network socket- XPN3 |
| 5 | Emergency- stop switch – F2-FQ1 |
| 6 | Reset pushbutton – F2-SF1 |
| 7 | Switch operation mode (option) |

7.3 Sequence description of robot feeding for mill



Reset sequence



Automatic sequence

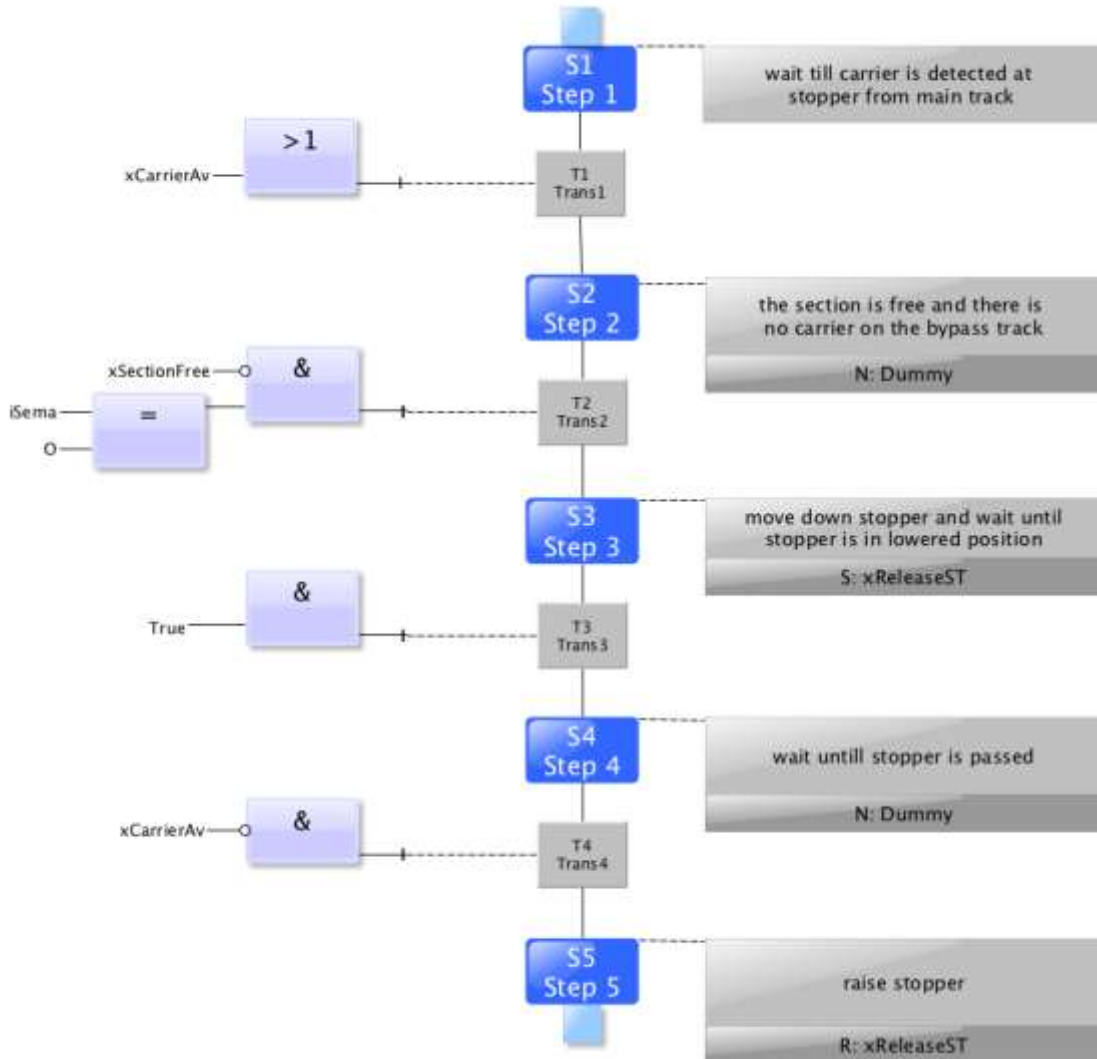
7.4 Sequence description of the Basic Module ByPass



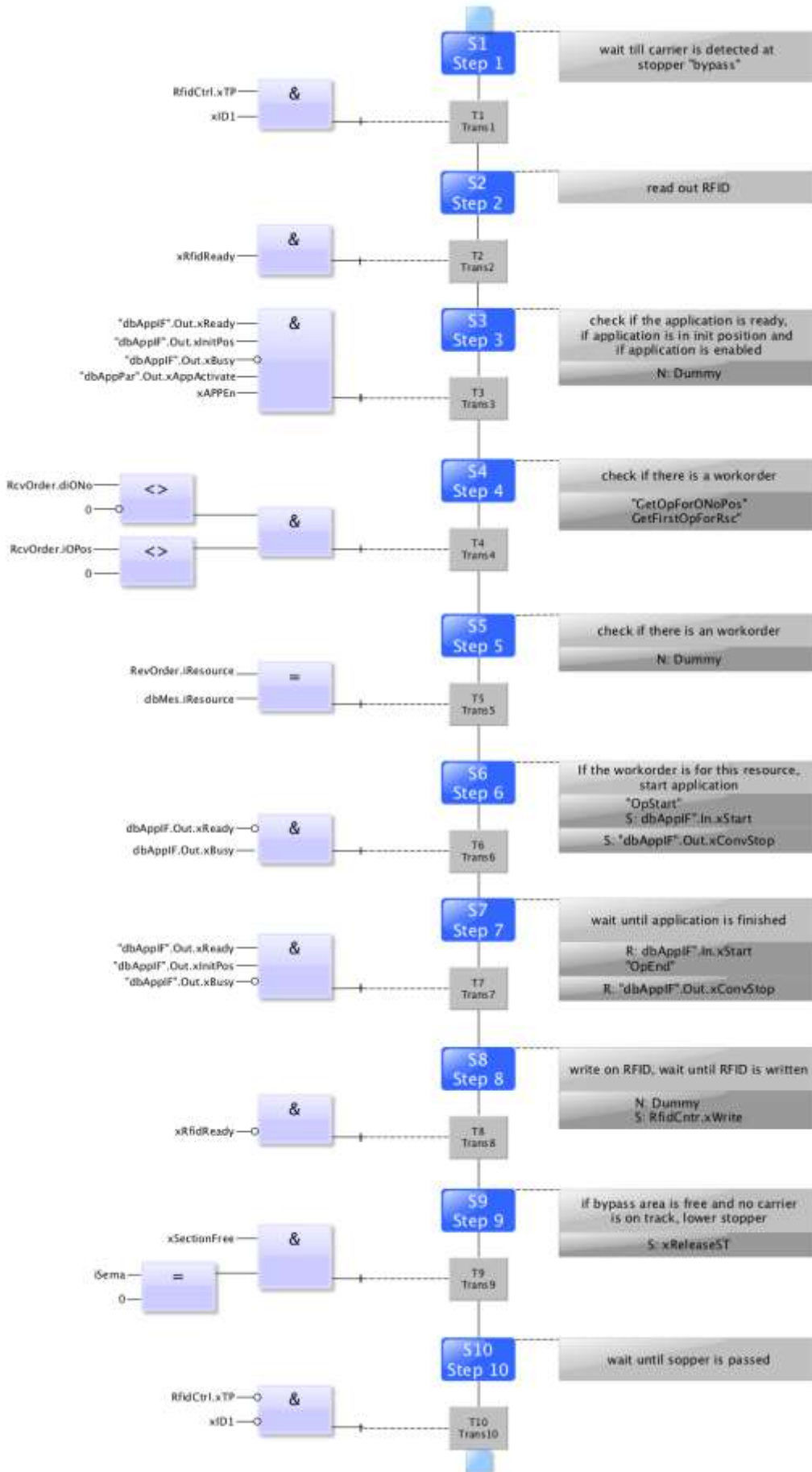
Illustration similar

| Position | Description |
|----------|-----------------------|
| 1 | Stopper in bypass |
| 2 | Stopper without RFID |
| 3 | Branch |
| 6 | Stopper branch bypass |

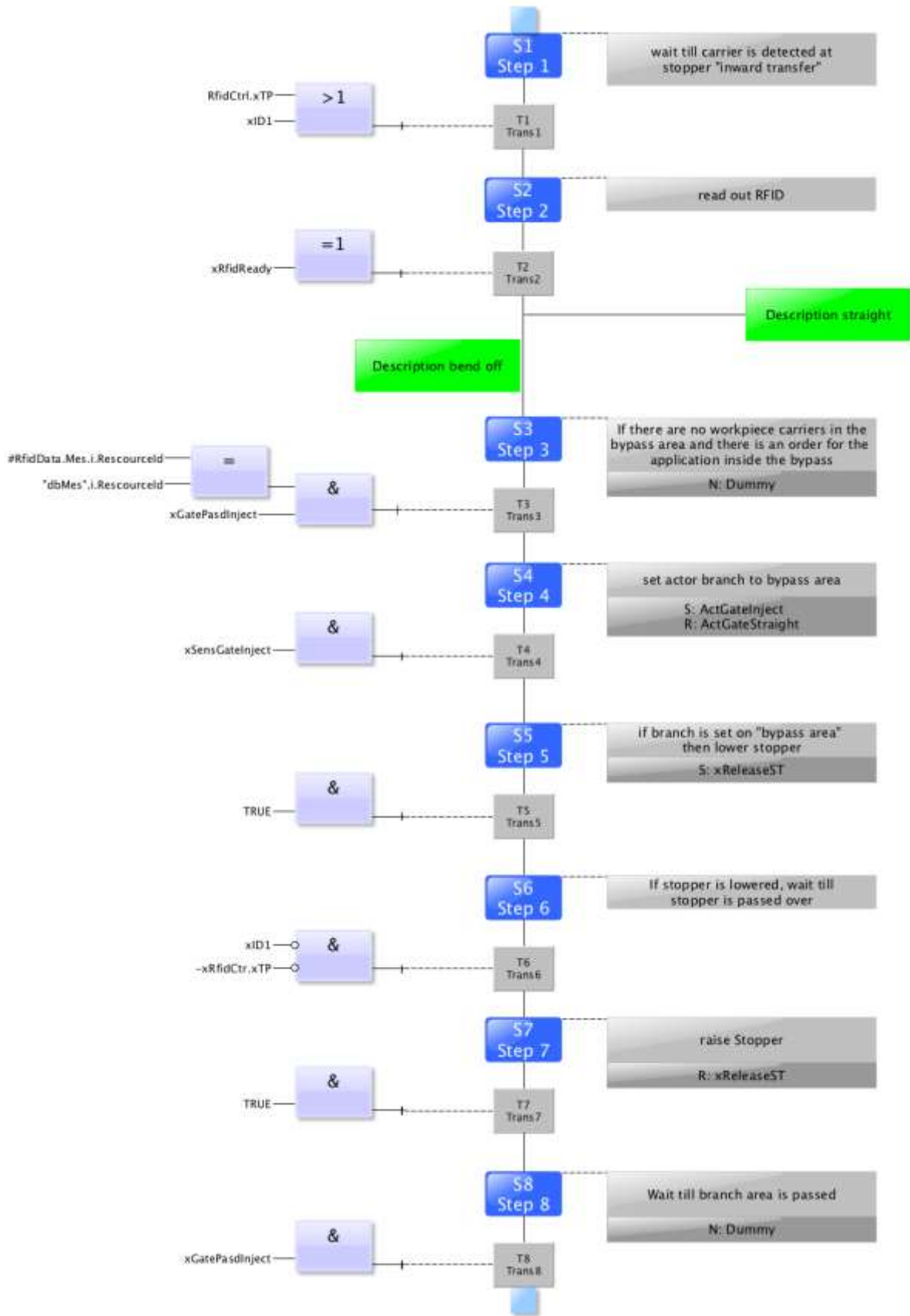
Sequence description bypass



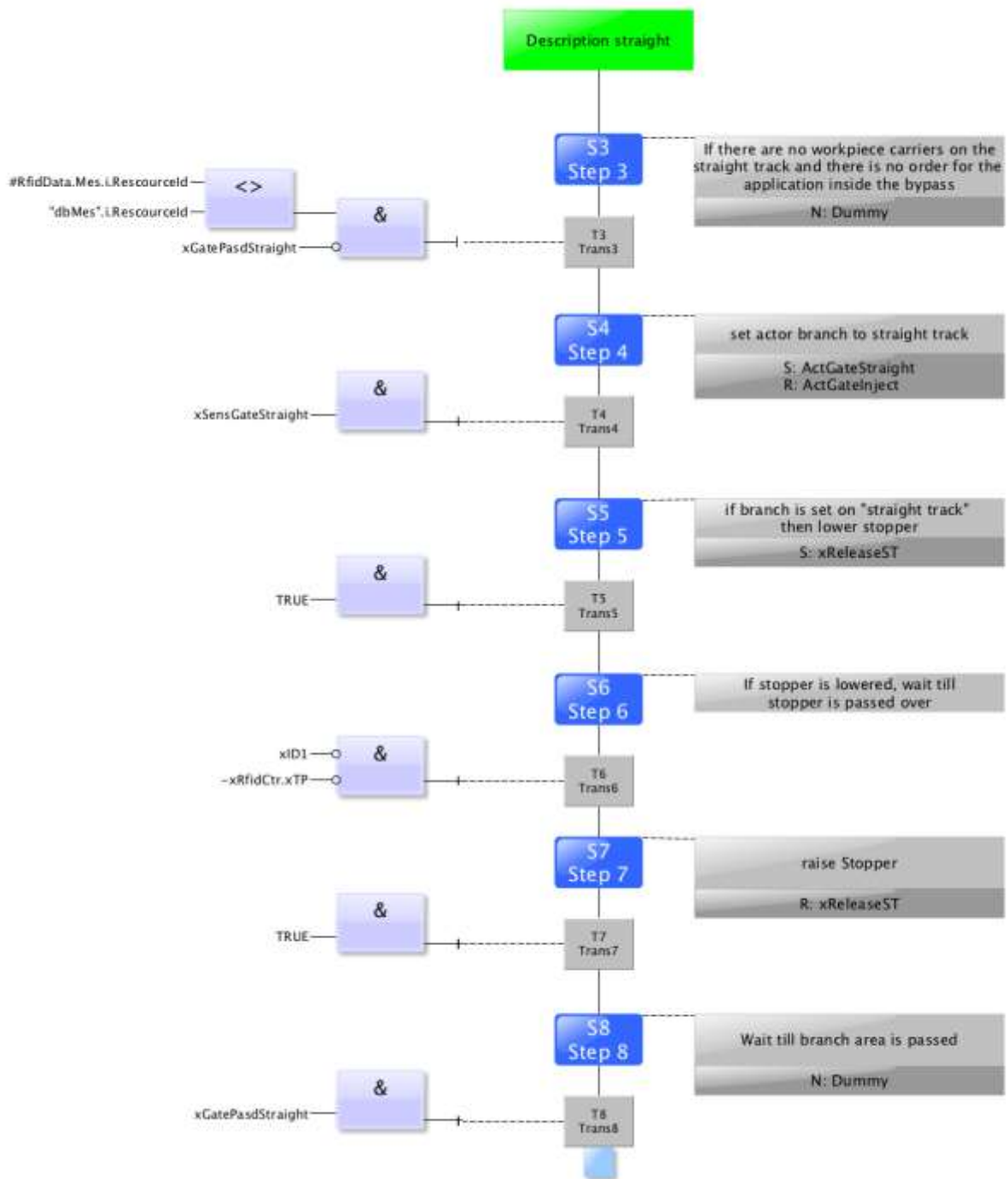
stopper without RFID



Automatic stopper in bypass area

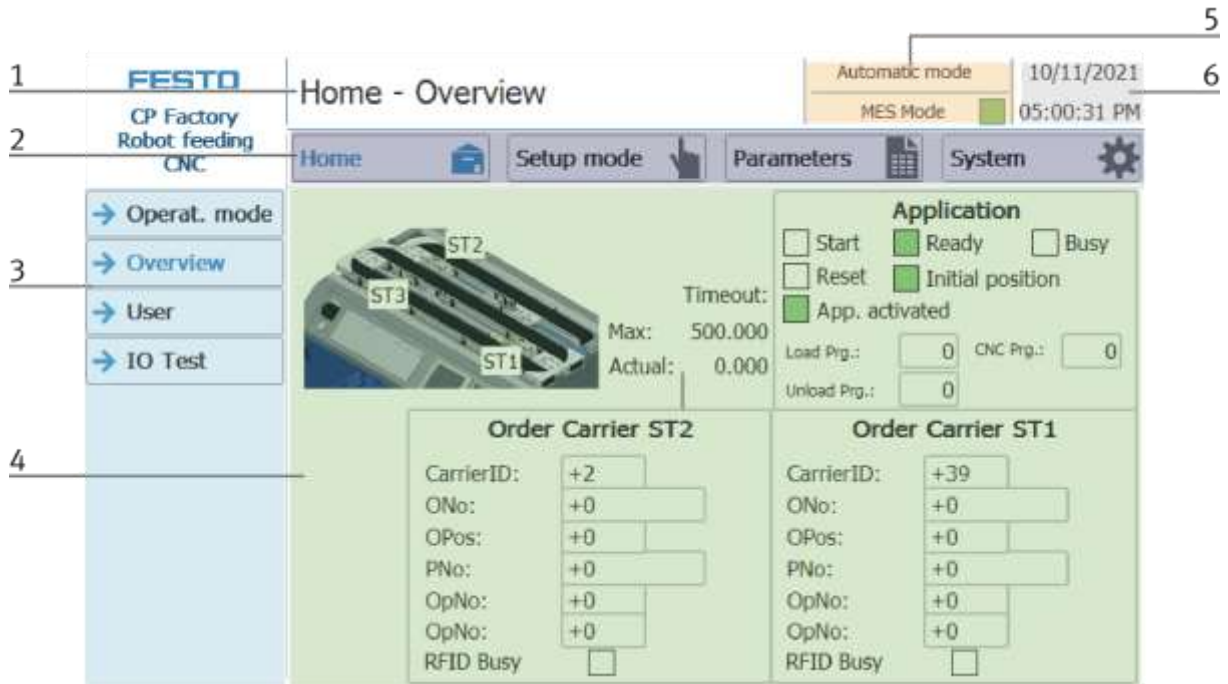


Bypass bend off



Bypass straight

7.5 Menu architecture from operation panel



| Position | Description |
|----------|--|
| 1 | Description of menu (main or submenu) OR in case of an active Error or an error message, this field is also for announcement |
| 2 | Main menu (always shown the same) Home: Here the module can be controlled, the mode (default / MES) can be selected, the automatic or the set-up mode can also be operated. Setup: Here, the application can be operated manually in setup mode Parameter: The parameters of the application are set here, a simulation can be started, the transitions can be defined, or the tape can be set System: Here the system parameters such as language, time, etc. are set |
| 3 | Submenu Changing content, depending on the main menu |
| 4 | Changing content, depending on the main or submenu |
| 5 | Announcement of operation mode and mode (MES or default) |
| 6 | Announcement of actual date and time |

Log in as an administrator

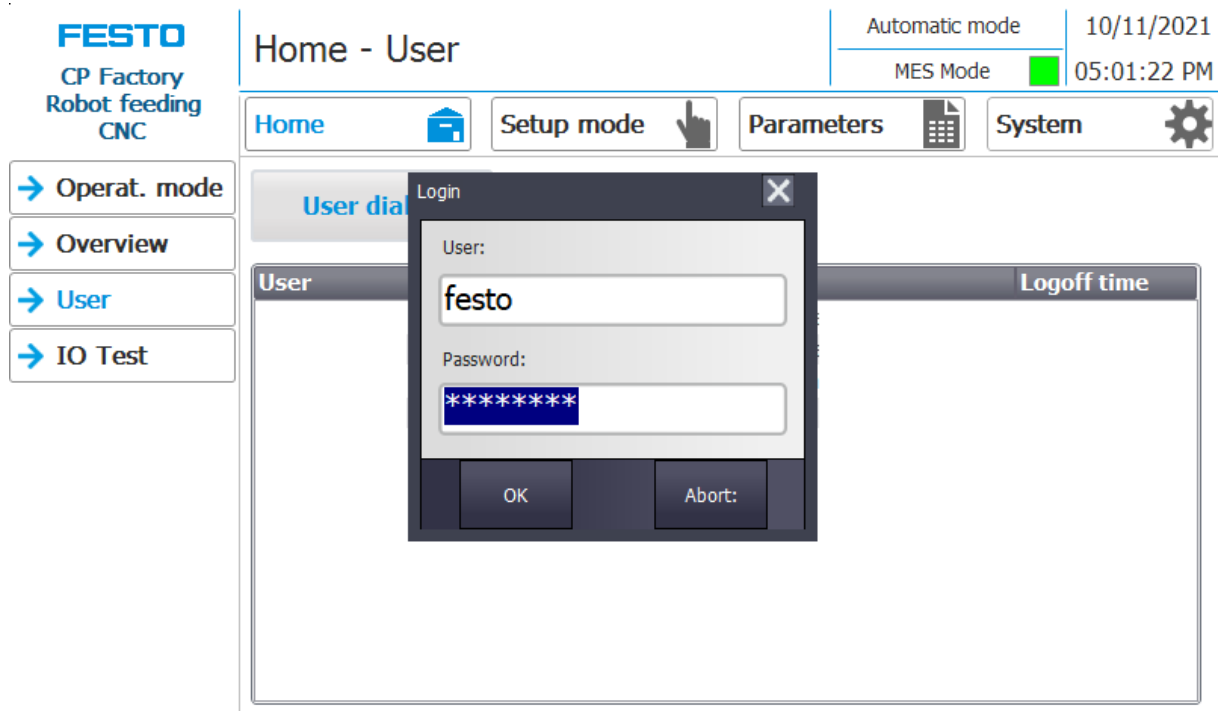
There are 2 functions in the operation of the HMI that are only available when the operator logs on to the HMI. These functions are the I/O test in the setup mode and the user area.

If one of the functions has been logged in, the other function is also available without the user having to log in again.

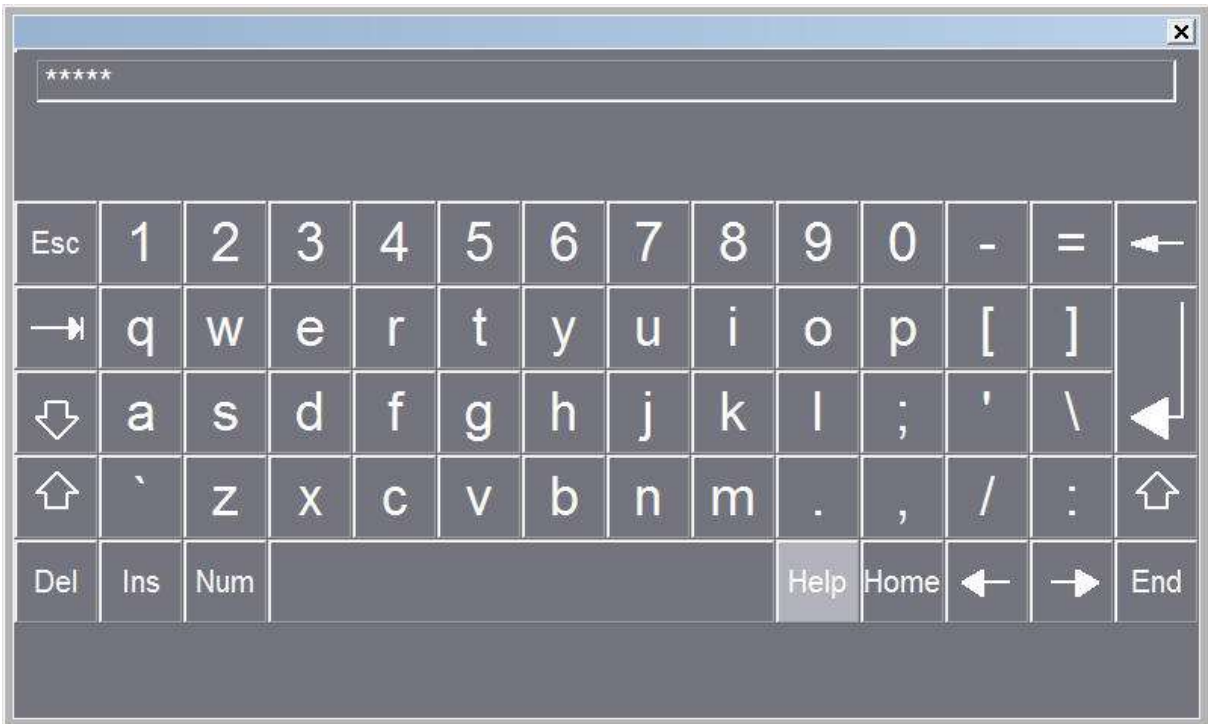
The process is explained using the user function as an example.



1. With a click on the User Dialog button the following window is opened.



2. If you click in the User or Password fields, the input window opens and the user data can be entered.



3. The user data can be entered here. The entry is confirmed with the Return key.

User: festo
 Password: festo

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Automatic mode | 10/11/2021
 MES Mode ■ | 05:01:22 PM

Home

Setup mode

Parameters

System

User dialog

| User | Password | Group | Logoff time |
|---------------|----------|----------|-------------|
| Administrator | ***** | Bedienen | 5 |
| festo | ***** | Bedienen | 5 |
| PLC User | ***** | | 5 |

→ Operat. mode

→ Overview

→ User

→ IO Test

4. The user is now logged in as "Administrator" and the functions User and I / O test are available.

7.6 Operation modes

The following operation modes are available

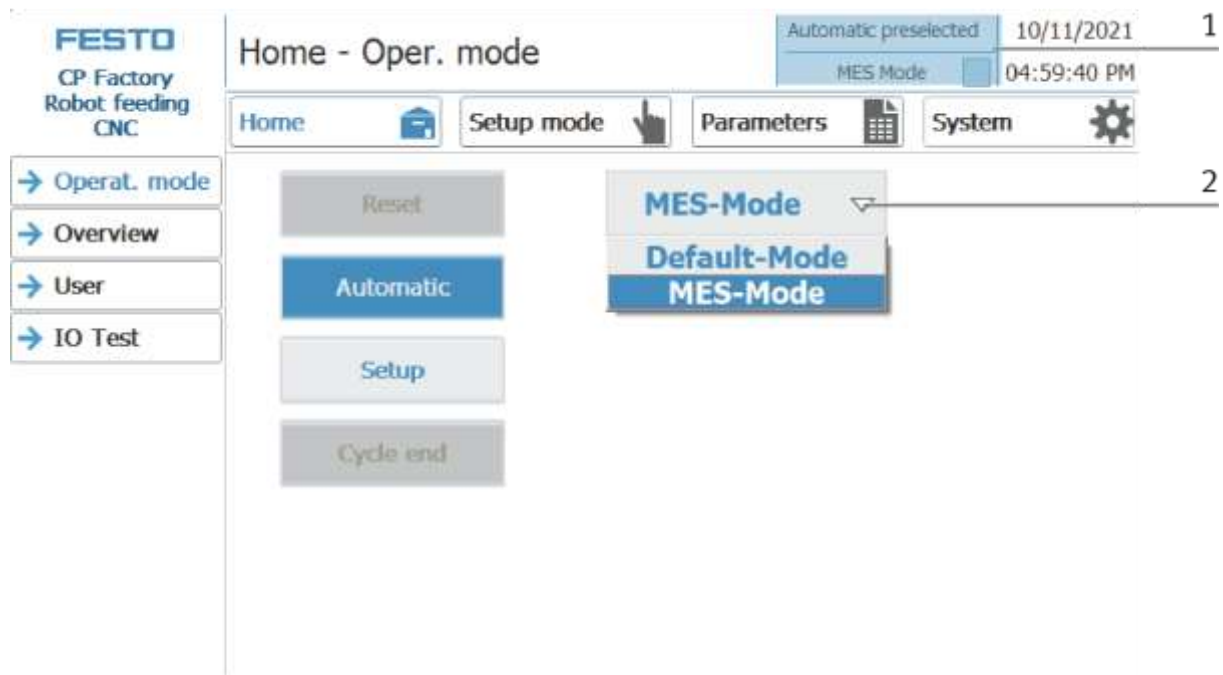
- Reset
The station is moved to its home position
- Setup
The station runs in set-up mode, actuators can be controlled and monitored
- Automatic
The station runs in automatic mode, all processes run automatically, no actuators can be controlled.
There are two modes in the automatic mode: the default mode and the MES mode.

7.6.1 Mode

The mode can be set between MES and default, there are two ways to set it.

1. Clicking on the blue marked area opens a pop-up window in which the operating mode can be selected.
Other functions are also integrated in the pop-up.

The mode can also be set on the Home / Operating mode page.

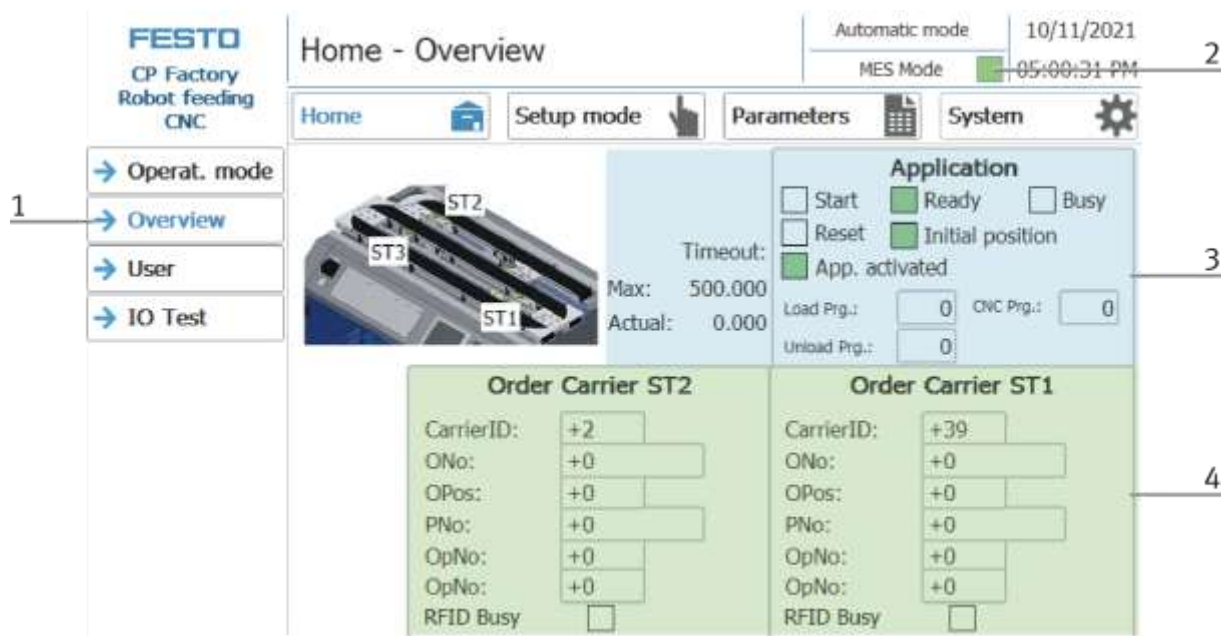


Possibilities of mode

- MES mode
In the MES mode, all processes are centrally started, executed and monitored by the MES software. All stations must be set to MES mode and automatic start.
- Default Mode
The automatic sequence is not centrally controlled in the default mode, all information from the transition tables (see chapter "Schematic process flow") is read and processed separately at each station.

Display MES Mode

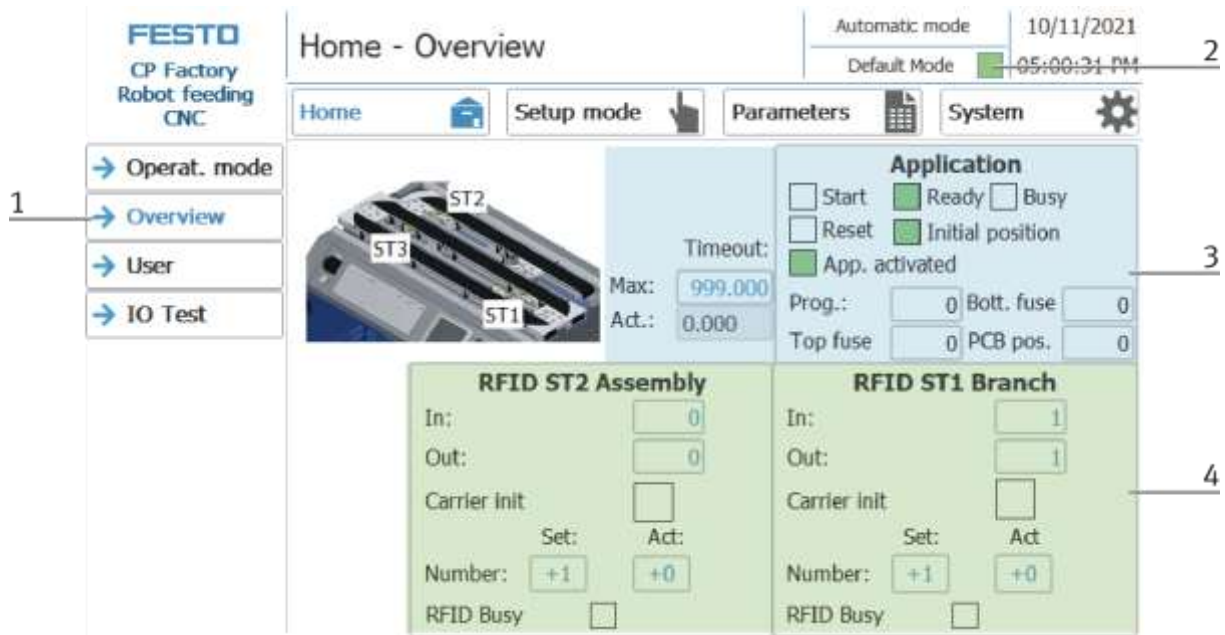
Various states are displayed in the Home operating mode on the Overview page.



| Position | Description |
|----------|--|
| 1 | Change to sub menu Overview |
| 2 | Display operation state MES is active |
| 3 | Display of various functions (marked green if active) Display of various information about the station and its parameters |
| 4 | Display of the order data of the current carrier at stopper 1 and stopper 2 |

Display Default mode

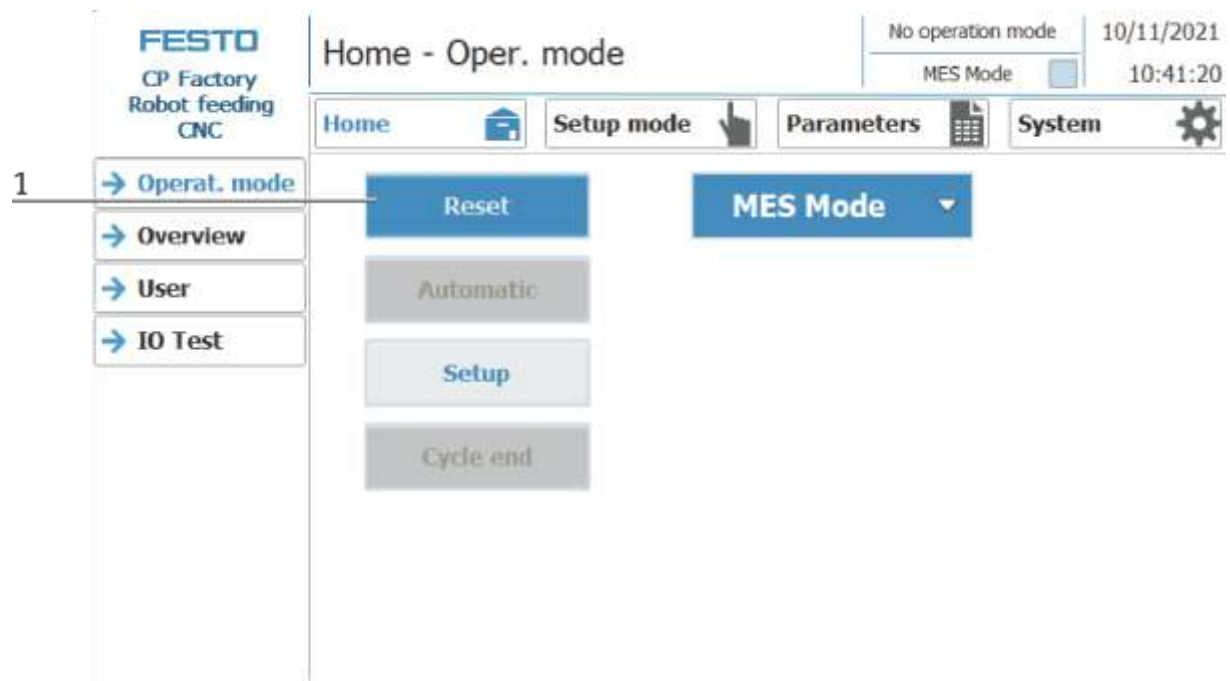
Various states are displayed in the Home operating mode on the Overview page.



| Position | Description |
|----------|--|
| 1 | Change to sub menu Overview |
| 2 | Display default mode is active |
| 3 | Display of various functions (marked green if active) Display of various information about the station and its parameters |
| 4 | Display of RFID state code at stopper 1 and stopper 2 |

7.6.2 Operation mode Reset

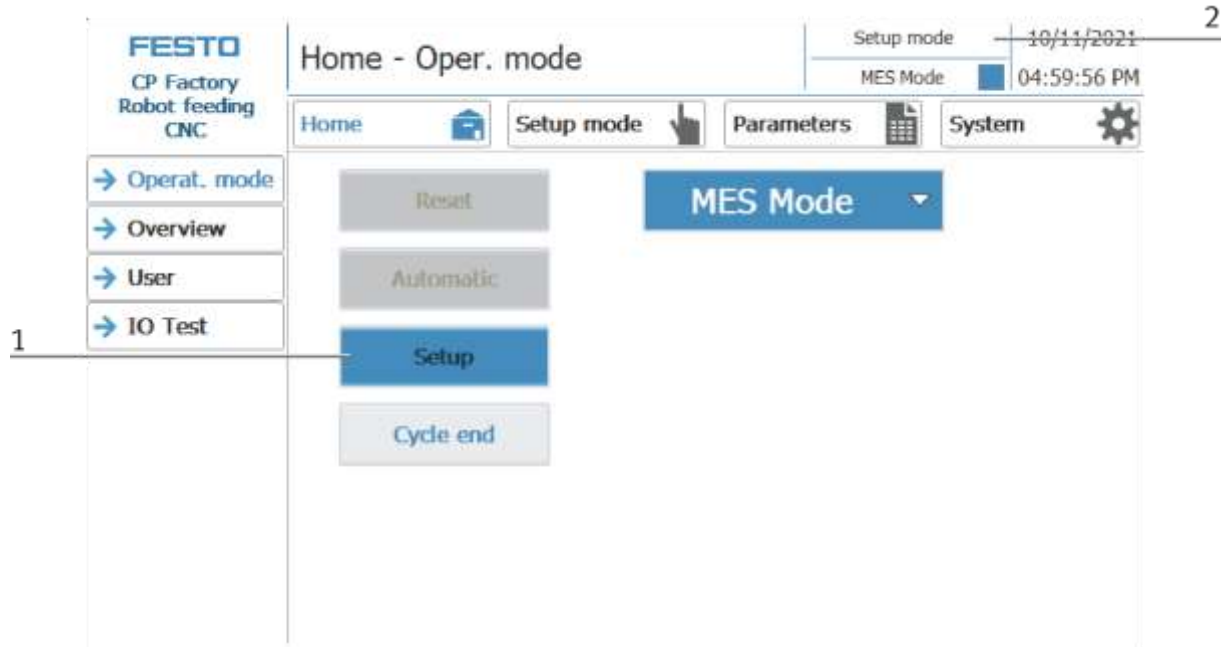
In the operation mode Reset, the station is moved to its home position.



2. After switching on the station, the Reset button flashes, press this to move the station into its home position.
3. The operating mode Reset is displayed here during the process.

7.6.3 Operation mode Setup

In operation mode Setup, all sensors can be displayed and actuators can be controlled from the HMI. This is used for troubleshooting or during commissioning.

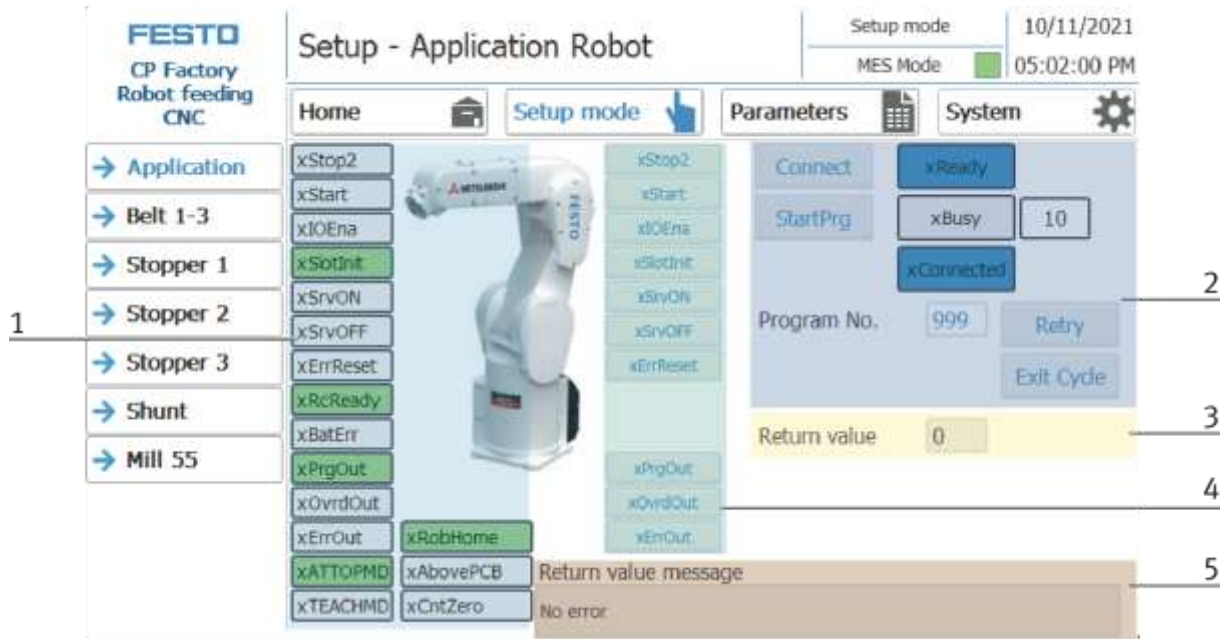


1. Automatic mode is not active and the Setup button is not greyed out - press the Setup button to activate the Setup mode.
2. The current operation mode is displayed here

Set up application

1. Click the Setup mode button
2. Select application

The screenshot displays the 'Setup - Application Robot' interface. At the top right, it shows 'Setup mode' as 10/11/2021 and 'MES Mode' as 05:02:00 PM. The main navigation bar includes 'Home', 'Setup mode' (highlighted with a hand cursor), 'Parameters', and 'System'. A left sidebar lists applications: 'Application', 'Belt 1-3', 'Stopper 1', 'Stopper 2', 'Stopper 3', 'Shunt', and 'Mill 55'. The 'Application' item is selected. The central area features a robot image and two columns of control buttons: 'xStop2', 'xStart', 'xIOEna', 'xSlotInt', 'xSrvON', 'xSrvOFF', 'xErrReset', 'xRCReady', 'xBatErr', 'xPrgOut', 'xOvrdOut', 'xErrOut', 'xRobHome', 'xAbovePCB', and 'xCritZero'. The right side contains status indicators: 'xReady', 'xBusy' (with a value of 10), 'xConnected', 'Program No.' (999), and 'Return value' (0). Buttons for 'Connect', 'StartPrg', 'Retry', and 'Exit Cycle' are also present. A 'Return value message' field at the bottom shows 'No error'.



The functions can be activated in the Setup menu under Application by clicking the buttons.

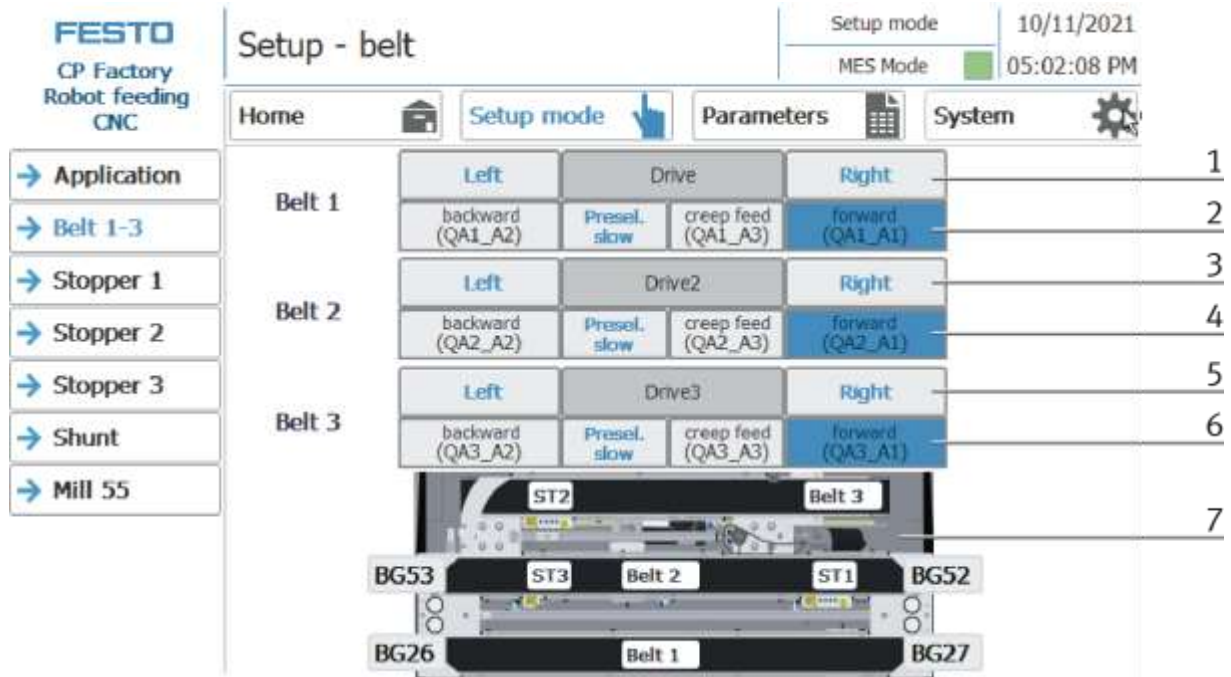
| Position number | description |
|-----------------|--|
| 1 | <p>Display robot inputs (green if active)</p> <p>xStop2 - movement stopped</p> <p>xStart - motion started</p> <p>xIOEna - the robot is controlled by an external controller</p> <p>xSlotInit - Slot 1 of the robot is initialized</p> <p>xSrvON - Servo mode switched on</p> <p>xSrvOFF - Servo mode switched off</p> <p>xErrReset - Reset error</p> <p>xRcReady - Drive Unit of the robot is ready</p> <p>xBatErr - the battery of the robot is empty</p> <p>xPrgOut - Program area outputs is selected</p> <p>xOvrOut - Override range Outputs is selected</p> <p>xErrOut - the robot has an error</p> <p>xATTOMPD - The robot is in automatic mode</p> <p>XTEACHMID - the robot is in manual mode</p> <p>XRobHome - the robot is in the home position</p> <p>xAbovePCB - the robot is above the board</p> <p>XCntZero - reset counter to zero</p> |
| 2 | <p>Control robot (blue if active)</p> <p>Connect - connect to the Drive Unit</p> <p>Start Prog. - start the robot program</p> <p>xReady - the robot is ready</p> <p>xBusy - the robot is busy (display current step)</p> <p>xConnected - connection drive unit made</p> <p>Position in the box. - Position of the board inside the box</p> <p>Program number - Program number as in the drive unit</p> <p>Retry – try again</p> <p>Exit Cycle – stop actual cycle</p> |
| 3 | <p>Return value - Return value of the robot program</p> |
| 4 | <p>Display robot outputs (blue if active)</p> <p>xStop2 – stop movement</p> <p>xStart – start motion</p> <p>xIOEna – control the robot by an external controller</p> <p>xSlotInit – initialize Slot 1 of the robot</p> <p>xSrvON – switch on Servo mode</p> <p>xSrvOFF – switch off Servo mode</p> <p>xErrReset - Reset error</p> <p>xPrgOut – select program area outputs</p> <p>xOvrOut – select override range outputs</p> <p>xErrOut - the robot has an error</p> |
| 5 | <p>Textual description of the return value</p> |

Setup belt 1-3

1. Click the Setup mode button
2. Select belt 1-2; the functions of the conveyor belts are displayed and / or controlled here.

The screenshot shows the 'Setup - belt' interface. On the left, a navigation menu lists: Application, Belt 1-3 (selected), Stopper 1, Stopper 2, Stopper 3, Shunt, and Mill 55. The top right corner displays 'Setup mode' (active) and 'MES Mode' (active) with a date of 10/11/2021 and time of 05:02:08 PM. The main area is divided into three sections for Belt 1, Belt 2, and Belt 3. Each section has a 'Left' and 'Right' control panel. The 'Left' panel includes 'backward (QA1_A2)' and 'Presele. slow'. The 'Right' panel includes 'creep feed (QA1_A3)' and 'forward (QA1_A1)'. Below the controls is a schematic diagram of the belt system with components labeled ST2, Belt 3, BG53, ST3, Belt 2, ST1, BG52, BG26, Belt 1, and BG27.

Setup – belt 1-3



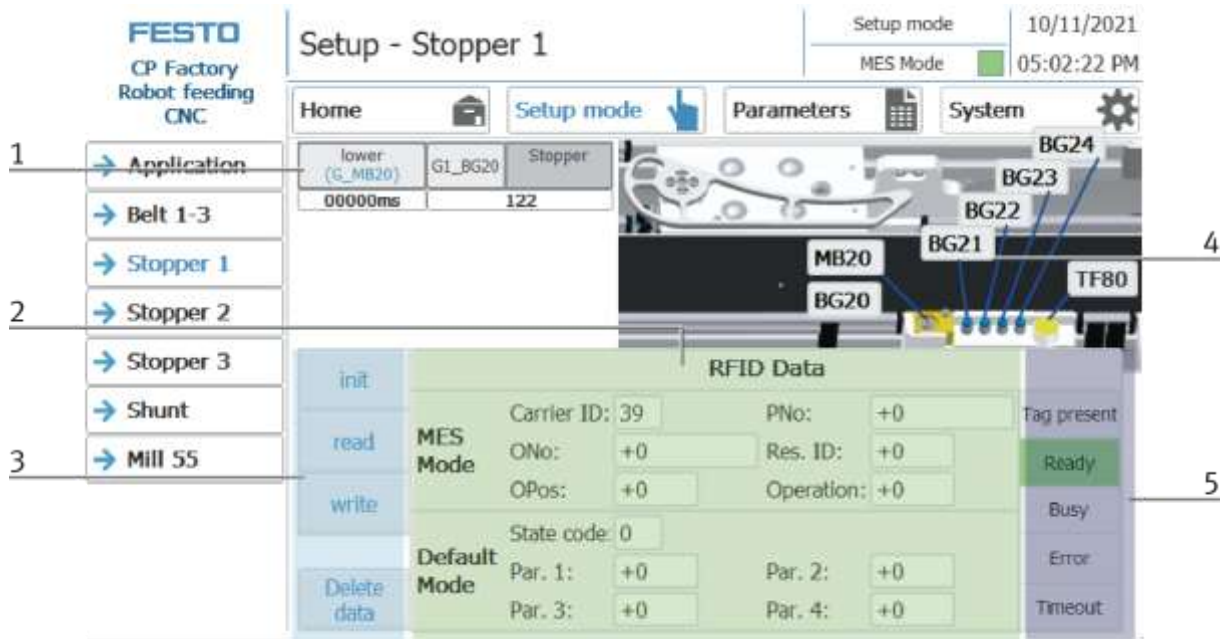
| Position number | description |
|-----------------|--|
| 1 | Drive conveyor 1 right / left Left: Conveyor moves counterclockwise to the left Drive 1: Display conveyor belt 1 Right: conveyor moves clockwise to the right |
| 2 | To left: move conveyor to the left (actuator QA1_A2 is activated, lights up blue when active) Slow pre selection: set the conveyor speed slowly Slow: move the conveyor slowly (actuator QA1_A3 is activated, lights up blue when active) To right: move conveyor to the right (actuator QA1_A1 is activated, lights up blue when active) |
| 3 | Drive conveyor 2 right / left Left: Conveyor moves counterclockwise to the left Drive 2: Display conveyor belt 2 Right: conveyor moves clockwise to the right |
| 4 | To left: move conveyor to the left (actuator QA2_A2 is activated, lights up blue when active) Slow pre selection: set the conveyor speed slowly Slow: move the conveyor slowly (actuator QA2_A3 is activated, lights up blue when active) To right: move conveyor to the right (actuator QA2_A1 is activated, lights up blue when active) |
| 5 | Drive conveyor 3 right / left Left: Conveyor moves counterclockwise to the left Drive 3: Display conveyor belt 3 Right: conveyor moves clockwise to the right |
| 6 | To left: move conveyor to the left (actuator QA3_A2 is activated, lights up blue when active) Slow pre selection: set the conveyor speed slowly Slow: move the conveyor slowly (actuator QA3_A3 is activated, lights up blue when active) To right: move conveyor to the right (actuator QA3_A1 is activated, lights up blue when active) |
| 7 | Display conveyors and stoppers (light up green when active) |

Setup Stopper 1

1. Click the Setup mode button
2. Select stopper - the functions of the stopper position are displayed and / or controlled here.

The screenshot shows the 'Setup - Stopper 1' configuration screen in the FESTO CP Factory Robot feeding CNC software. The interface includes a navigation menu on the left with options like 'Application', 'Belt 1-3', 'Stopper 1', 'Stopper 2', 'Stopper 3', 'Shunt', and 'Mill 55'. The top status bar shows 'Setup mode' and 'MES Mode' indicators. The central area displays a 3D model of the robot with various components labeled (e.g., BG20, BG21, BG22, BG23, BG24, MB20, TF80). Below the model is a 'RFID Data' table with fields for Carrier ID, PNo, ONo, Res. ID, OPos, Operation, State code, Par. 1-4, and Tag present status.

| | | RFID Data | | | | Tag present |
|-------------|--------------|----------------|---------------|---------------|-------------|-------------|
| init | MES Mode | Carrier ID: 39 | PNo: +0 | ONo: +0 | Res. ID: +0 | Ready |
| read | | OPos: +0 | Operation: +0 | State code: 0 | | Busy |
| write | Default Mode | Par. 1: +0 | Par. 2: +0 | Par. 3: +0 | Par. 4: +0 | Error |
| Delete data | | | | | | Timeout |



| Position number | description |
|-----------------|---|
| 1 | Move down the stopper Lower: Move stopper down (actuator G1_MB20 is activated, lights up blue when active) G1_BG20: Sensor G1_BG20 Stopper lowered (lit green when active) Stopper: Indicator stopper |
| 2 | RFID area MES Mode: Displays the job data Default Mode: Displays the RFID status |
| 3 | Write and read RFID area Initialize: Set RFID data to zero read: Read RFID data write: Write current data on RFID Delete data: all data in the input mask are deleted - not directly on the RFID (for easier entry) |
| 4 | Range Display of the active sensors (lit green when active) and actuators (lit orange when active) at the stopper |
| 5 | Display of RFID reading status |

Setup Stopper 2

1. Click the Setup mode button
2. Select stopper - the functions of the stopper position are displayed and / or controlled here.

The screenshot shows the 'Setup - Stopper 2' configuration screen in the FESTO CP Factory Robot feeding CNC software. The interface includes a navigation menu on the left with options like 'Application', 'Belt 1-3', 'Stopper 1', 'Stopper 2', 'Stopper 3', 'Shunt', and 'Mill 55'. The main area displays a 3D model of the robot with various components labeled (BG45, MB30, BG30, TF81, BG31, BG32, BG33, BG34, BG50, BG51). Below the model is a table of RFID data with fields for Carrier ID, PNo, ONo, Res. ID, OPos, Operation, State code, Par. 1-4, and Tag present status.

| | | RFID Data | | | | | |
|-------------|--------------|-------------|----|------------|----|-------------|--|
| init | | Carrier ID: | 2 | PNo: | +0 | Tag present | |
| read | MES Mode | ONo: | +0 | Res. ID: | +0 | Ready | |
| write | | OPos: | +0 | Operation: | +0 | Busy | |
| | Default Mode | State code: | 0 | | | Error | |
| Delete data | | Par. 1: | +0 | Par. 2: | +0 | Timeout | |
| | | Par. 3: | +0 | Par. 4: | +0 | | |



| Position number | description |
|-----------------|---|
| 1 | Shut down stopper down: Move stopper downwards (actuator G1_MB30 is activated, lights up blue when active) G1_BG30: Sensor G1_BG30 stopper down (lit green when active) Stopper: display stopper |
| 2 | Area RFID MES Mode: Display of order data Default Mode: Display of the RFID state |
| 3 | Describe and read the RFID area initialize: set RFID data to zero read: Read out RFID data write: write current data on RFID Delete data: all data in the input mask is deleted - not directly on the RFID (for easier entry) |
| 4 | Area Display of the active sensors (lit green when active) and actuators (lit orange if active) on the stopper |
| 5 | Display of the RFID read status |

Setup - Stopper 3

1. Click the Setup mode button
2. Select stopper - the functions of the stopper position are displayed and / or controlled here.

1

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Setup - Stopper 3

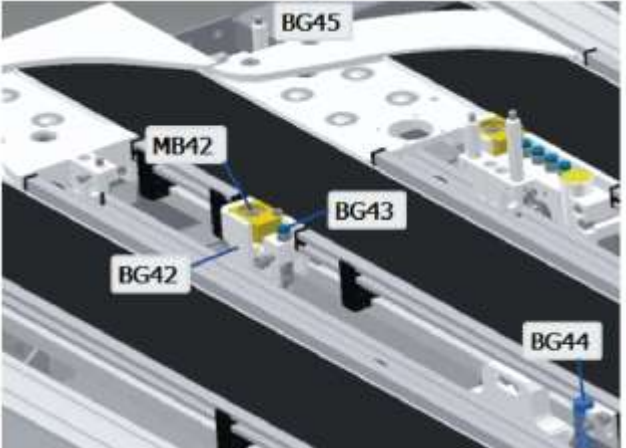
Setup mode 10/11/2021
MES Mode 05:03:03 PM

Home Setup mode Parameters System

| | | |
|-------------------|---------|---------|
| lower (G_MB42) | G1_BG42 | Stopper |
| 00000ms | | 102 |

2

- Application
- Belt 1-3
- Stopper 1
- Stopper 2
- Stopper 3
- Shunt
- Mill 55



The image shows a 3D CAD model of a mechanical assembly. The assembly consists of a white metal frame with various components. A yellow component labeled MB42 is mounted on a rail. A black component labeled BG42 is also mounted on the rail. Other components labeled BG43, BG44, and BG45 are visible in the background. The model is shown from a perspective view.

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Setup - Stopper 3

Setup mode 10/11/2021
MES Mode ■ 05:03:03 PM

1 → Application

→ Belt 1-3

→ Stopper 1

→ Stopper 2

→ Stopper 3

2 → Shunt

→ Mill 55

| | | |
|-------------------|---------|---------|
| lower (G_MB42) | G1_BG42 | Stopper |
| 00000ms | | 102 |



| Position number | description |
|-----------------|---|
| 1 | Shut down stopper down: Move stopper downwards (actuator G1_MB42 is activated, lights up blue when active) G1_BG42: Sensor G1_BG42 stopper down (lit green when active) Stopper: display stopper |
| 2 | Area Display of the active sensors (lit green when active) and actuators (lit orange if active) on the stopper |

Setup – Shunt

1. Click the Setup mode button
2. Select shunt - the functions of the shunt are displayed and / or controlled here.

The screenshot shows the 'Setup - Shunt' interface. At the top right, it displays 'Setup mode' as 10/11/2021 and 'MES Mode' as 05:03:12 PM. The navigation bar includes 'Home', 'Setup mode' (highlighted), 'Parameters', and 'System'. The main control area contains buttons for 'close (G_MB40)', 'G1_BG40', 'Bypass', 'G1_BG41' (highlighted in green), and 'open (G_MB41)'. Below this is a 3D model of the shunt mechanism with labels BG35, MB40, BG40, BG44, MB41, and BG41. A left-hand menu lists 'Application', 'Belt 1-3', 'Stopper 1', 'Stopper 2', 'Stopper 3', 'Shunt' (highlighted), and 'Mill 55'. A '1' is placed next to the 'Setup mode' button, and a '2' is placed next to the 'Shunt' menu item.

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Setup - Shunt

Setup mode 10/11/2021
MES Mode ■ 05:03:12 PM

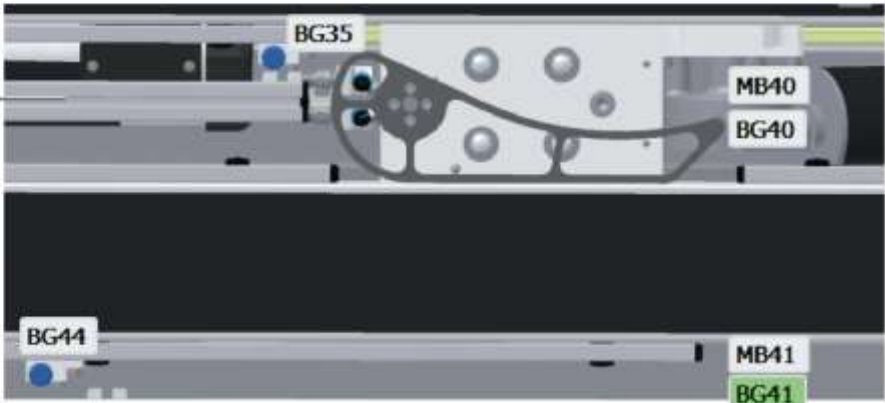
Home

Setup mode

Parameters

System

| | | | | |
|----------------------------------|---------|--------|---------|---------------------------------|
| close <small>(G_MB40)</small> | G1_BG40 | Bypass | G1_BG41 | open <small>(G_MB41)</small> |
| 00000ms | | 34 | | 00683ms |



1 → Application

→ Belt 1-3

→ Stopper 1

2 → Stopper 2

→ Stopper 3

→ Shunt

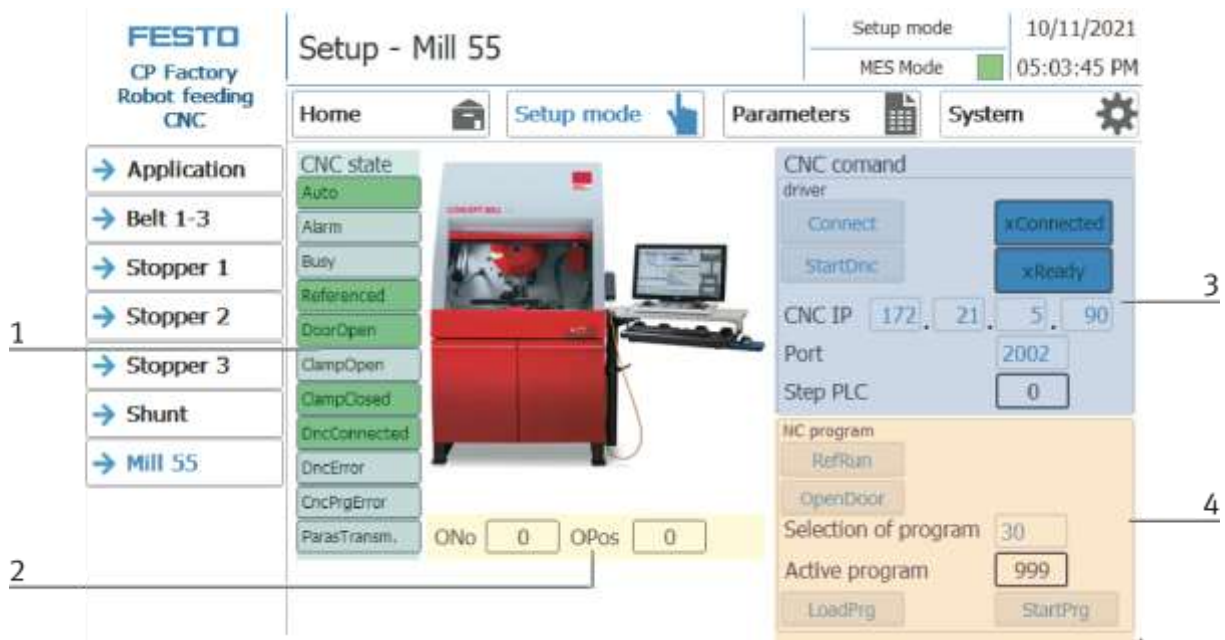
→ Mill 55

| Position number | description |
|-----------------|--|
| 1 | <p>operate shunt</p> <p>Close: set the shunt to close position (Actuator G1_MB40 is activated, lights blue when active)</p> <p>G1_BG40: Sensor G1_BG40 shunt closed into position (lights up green when active)</p> <p>Gate: Display bypass</p> <p>G1_BG41: Sensor G1_BG41 set shunt to open position (lit green when active)</p> <p>Open: set shunt to open position (Actuator G1_MB41 is activated, lights blue if active)</p> |
| 2 | Area Display of the active sensors (lit green when active) and actuators (lit orange if active) on the stopper |

Setup - Mill 55

1. Click the Setup mode button
2. Select shunt - the functions of the shunt are displayed and / or controlled here.

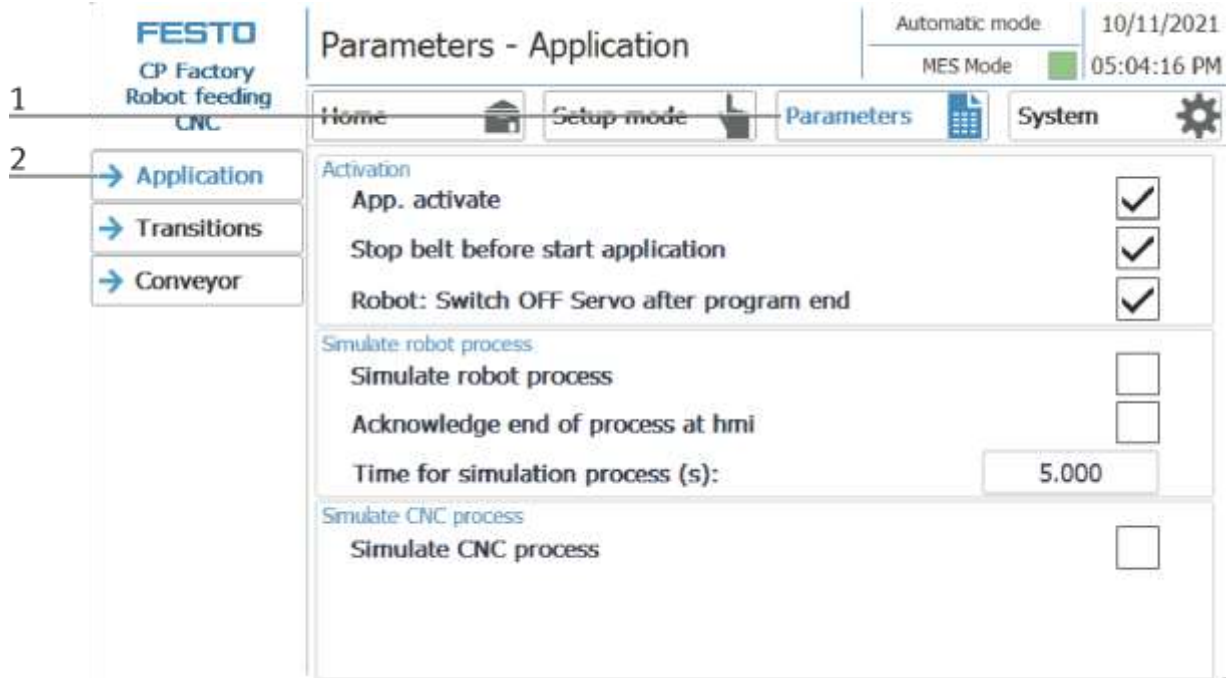
The screenshot shows the 'Setup - Mill 55' interface. At the top right, it displays 'Setup mode' and 'MES Mode' with a date and time of 10/11/2021 05:03:45 PM. The main navigation bar includes 'Home', 'Setup mode' (highlighted with a hand icon), 'Parameters', and 'System'. On the left, a sidebar menu lists various components: Application, Belt 1-3, Stopper 1, Stopper 2, Stopper 3, Shunt, and Mill 55. The central panel shows the 'CNC state' with buttons for Auto, Alarm, Busy, Referenced, DoorOpen, ClampOpen, ClampClosed, DncConnected, DncError, CncPrgError, and ParasTransm. Below these are 'ONo' and 'OPos' indicators, both set to 0. A central image shows the red Mill 55 machine. To the right, the 'CNC comand' section includes a 'driver' section with 'Connect' and 'xConnected' buttons, and 'StartDnc' and 'xReady' buttons. Below this are input fields for 'CNC IP' (172.21.5.90), 'Port' (2002), and 'Step PLC' (0). The 'NC program' section includes 'RefRun' and 'OpenDoor' buttons, and input fields for 'Selection of program' (30) and 'Active program' (999), with 'LoadPrg' and 'StartPrg' buttons at the bottom.

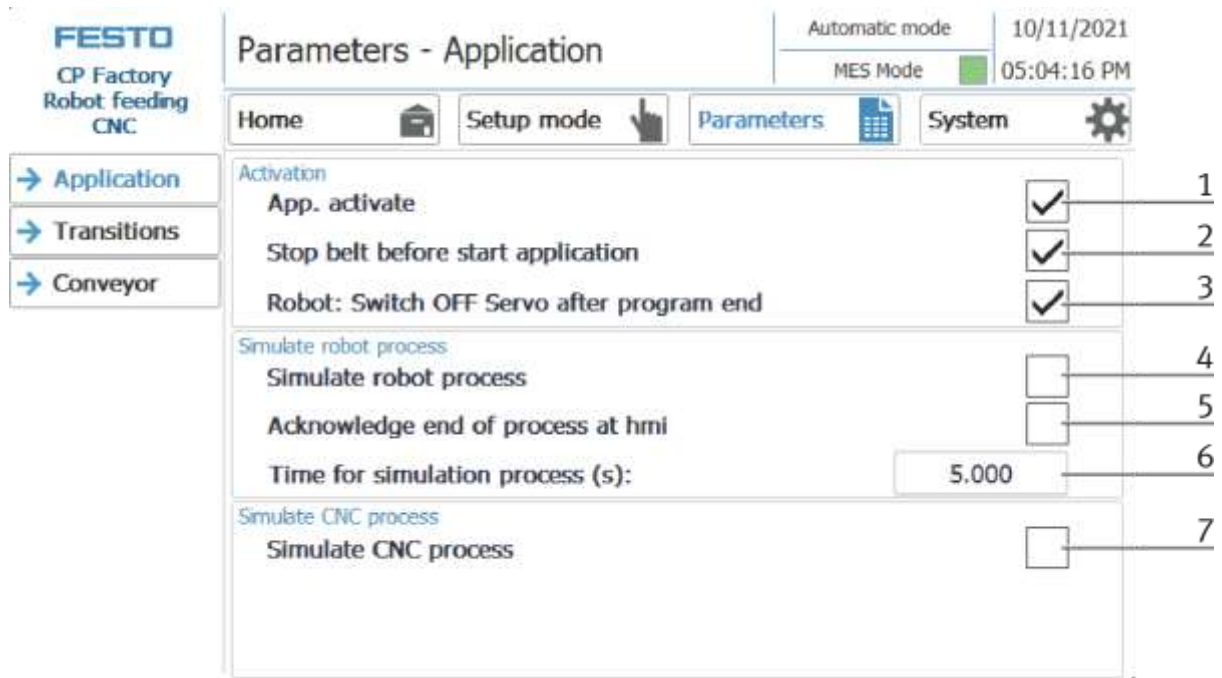


| Position number | Description |
|-----------------|--|
| 1 | Display input milling machine (green when active) Auto – milling machine in automatic mode Alarm – error at milling machine alarm active Busy – milling machine busy Referenced – milling machine has made the reference move DoorOpen – door at milling machine is opened ClampOpen – vice at milling machine is opened ClampClosed – vice at milling machine is closed DncConnected – connection to DNC controller is established DncError – connection to DNC controller is faulty CncPrgError – CNC program is faulty ParasTransm. – parameters are transmitted |
| 2 | Ono: order number OPos: order position |
| 3 | Status display of milling machine / CNC comand (blue when active) Connect - connect driver StartDnc –connect to DNC controller xReady – milling machine is ready xConnected – connection to milling machine is established xReady - the robot is ready CNC-IP: display of CNC IP address Port: display of CNC Port step PLC – Announce the actual step in the PLC |
| 4 | NC program RefRun – Reference CNC machine OpenDoor – button to open the door Selection of program – choose next program number Active program: display actual program number LoadPrg – load program at milling machine StartPrg – execute program milling machine |

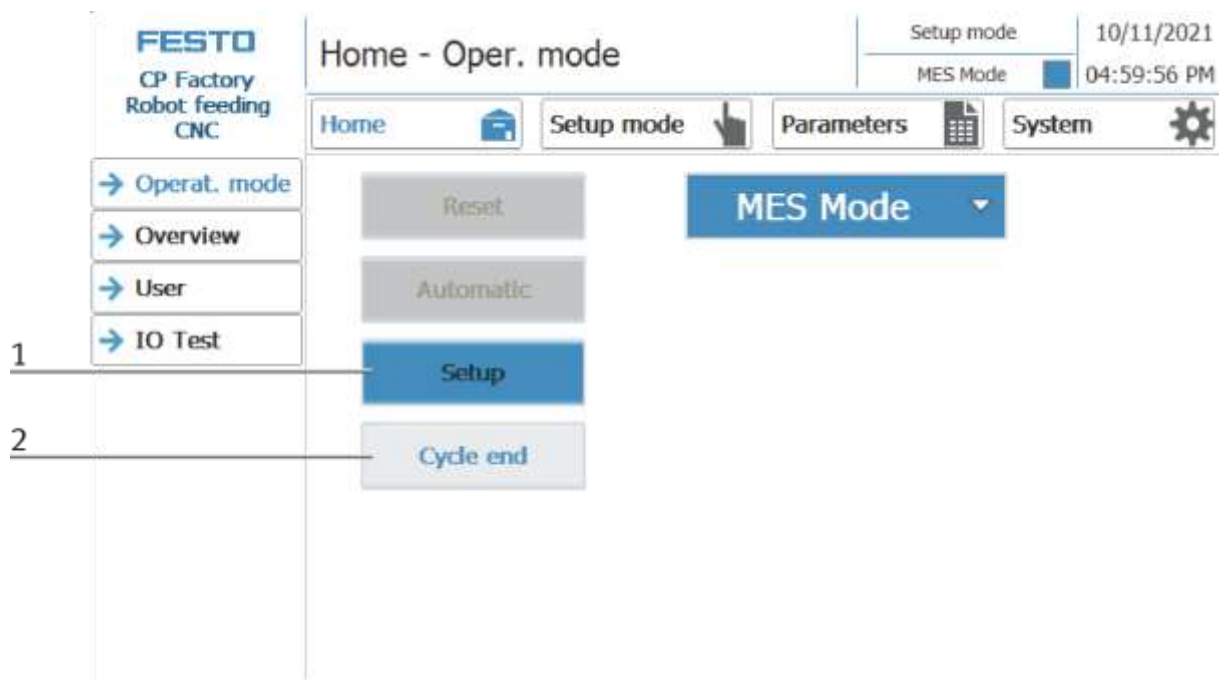
Set up application parameters

1. Click on the Parameter button
2. Select application - the parameters of the application can now be set up here.





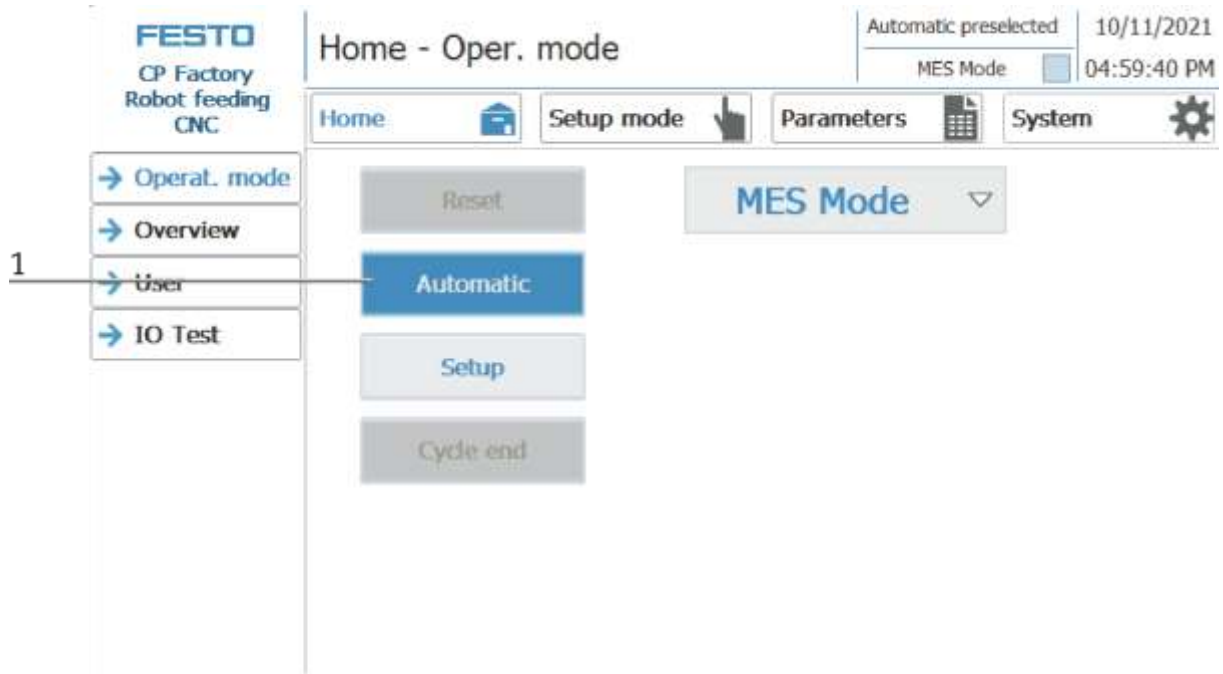
| Position number | Description |
|-----------------|---|
| 1 | App. activate: Here, a check is set to activate the application |
| 2 | Stop belt before start application: The conveyor is stopped before the application starts to work - set the check for this |
| 3 | Robot: Switch off the servo after the end of the program: If a check is made here, the servo motors are switched off after the program has ended, thus saving energy. |
| 4 | Simulate robot process: if the robot process is to be simulated, a check must be made here so that a process can be run even without a robot. If the function is activated, an indicator appears at the bottom left (2) |
| 5 | Acknowledge end of process at HMI: If a check is made here, the process end of the robot process must be actively confirmed on the HMI. |
| 6 | Time for simulation process (s): the time which the simulation process should take is entered / displayed here |
| 7 | Simulate CNC process: if the CNC process is to be simulated, a check must be made here so that a process can be run even without a CNC machine. If the function is activated, an indicator appears at the bottom left (1) |

Exit operation mode setup

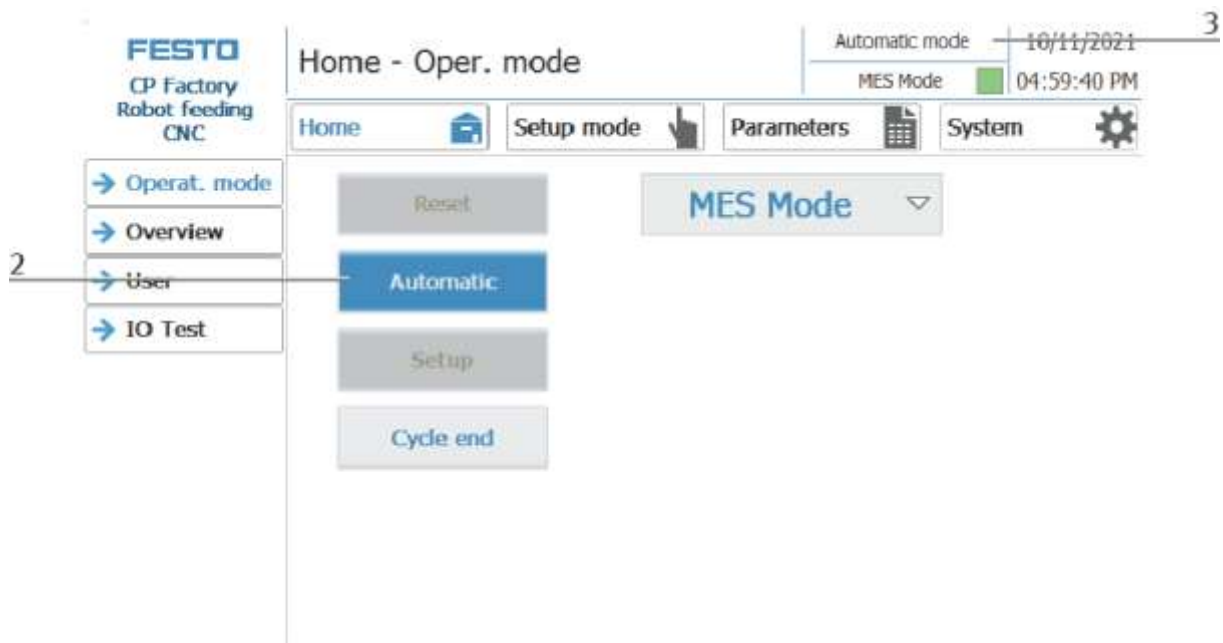
1. Setup mode is active, button lights up blue
2. Press the cycle end button to end the operation mode setup.

7.6.4 Operation mode automatic

In automatic mode, the chosen automatic processes can be processed at the station. Depending on the selection of the mode, the processes are controlled via the transition tables (default) or via MES.



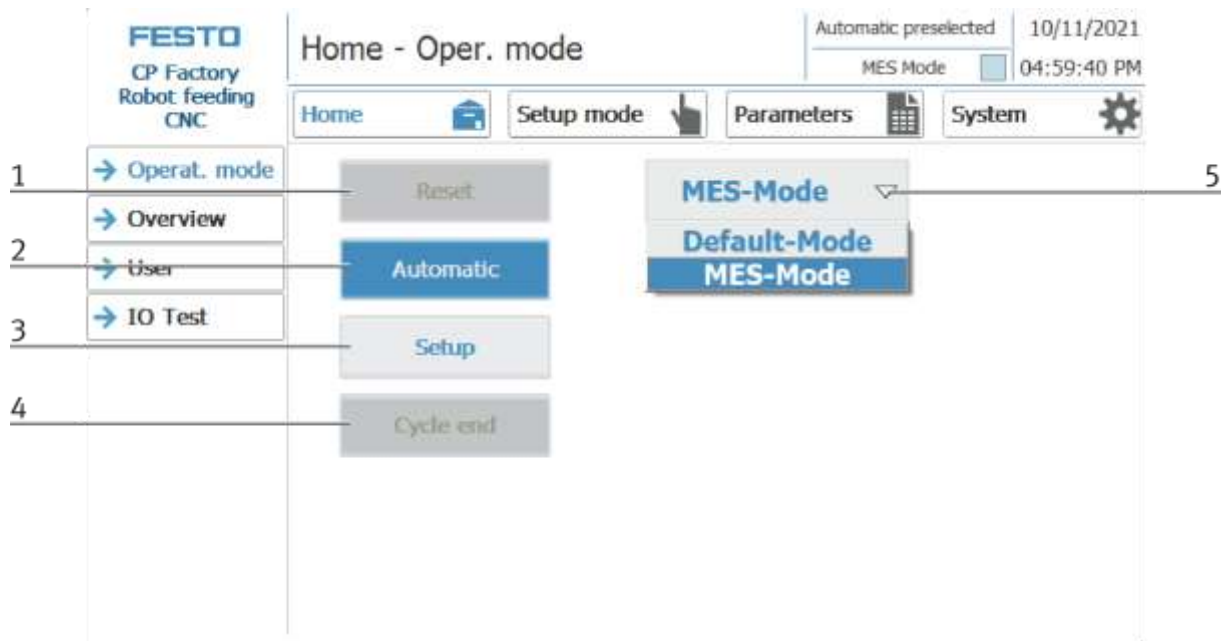
1. Automatic button flashing blue – Press Button to activate operation mode automatic



2. Operation mode automatic is active, button lights up blue

3. Announcement of active operation mode automatic

7.6.5 Main menu - Home
Sub menu operation mode

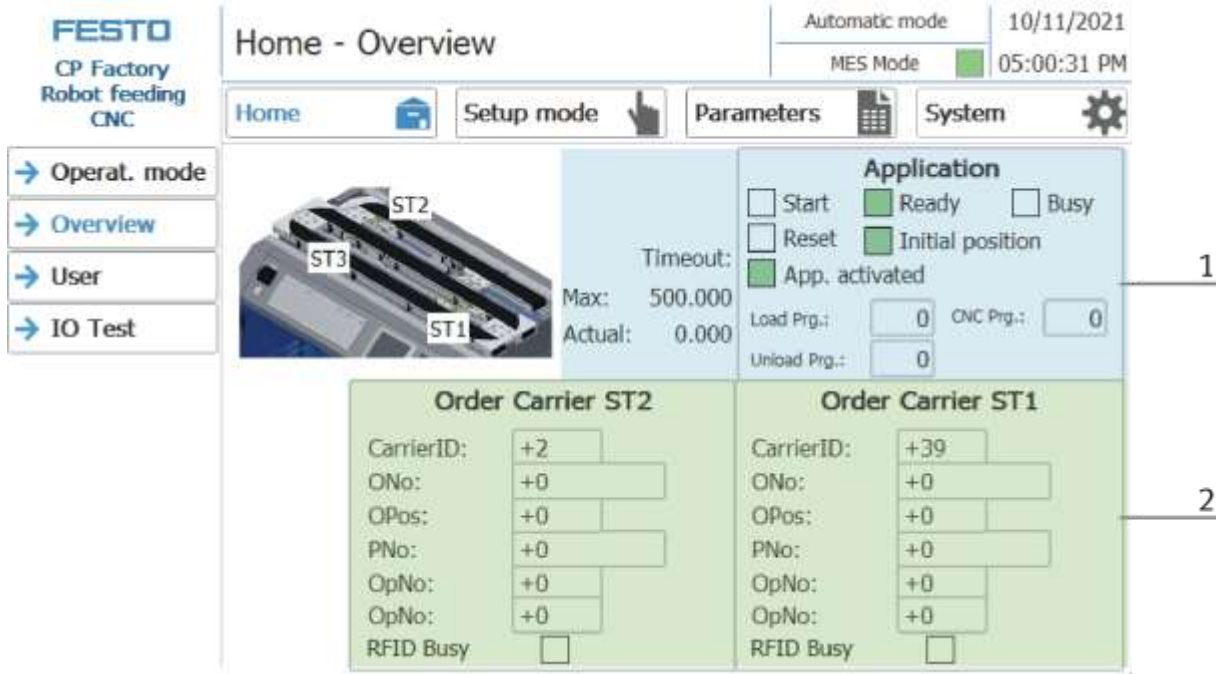


In the operation mode Home, the operating mode and the mode (MES or default) can be selected and started.

| Position | Description |
|----------|---|
| 1 | Reset button: Start reset sequence |
| 2 | Automatic button: the automatic sequence in dependent from the mode (Default/MES) is started here |
| 3 | Setup button: Here the application module can be controlled manually and sensors can be displayed. Suitable for commissioning an application module or for troubleshooting. There is no difference in mode - setup mode is independent of default or MES mode. |
| 4 | Cycle end button: The currently active operating mode is stopped here. |
| 5 | Selection of the mode: Default - automatic sequence is processed with the stored transitions MES - automatic process is completely controlled by MES software |

Submenu overview

Various states are displayed in the operation mode home on the Overview page.
(changing content depending on the selected operating mode)



| Position | Description |
|----------|---|
| 1 | <p>Application area: here the status of the station is displayed</p> <p>Start: Green when started</p> <p>Ready: Green when ready</p> <p>Init Pos.: Green when the basic setting is reached</p> <p>Reset: Green when the application is directed</p> <p>Busy: Green when the application processes an order</p> <p>RFID Busy: green when an RFID code is read or written</p> <p>Application active: green when the application is logged on to the basic module</p> <p>Timeout: The max. timeout and the actual timeout are announced here</p> |
| 2 | <p>Area Order Carrier ST1- here the information provided by MES on the carrier</p> <p>Carrier ID: Carrier number</p> <p>ONo: Order number</p> <p>OPos: Order position</p> <p>PNo: Part number</p> <p>OpNo: Operation Number</p> <p>Resc ID: Resource</p> <p>Area Order Carrier ST2- here the information provided by MES on the carrier</p> <p>Carrier ID: Carrier number</p> <p>ONo: Order number</p> <p>OPos: Order position</p> <p>PNo: Part number</p> <p>OpNo: Operation Number</p> <p>Resc ID: Resource</p> |

FESTO
CP Factory
Robot feeding
CNC

Conveyor Stop by Sensor / Energy-Mode: conveyor belt instance Drive1 is stopped!

Automatic mode 29/04/2021
MES Mode ■ 10:42:04

Home Setup mode Parameters System

→ Operat. mode
→ Overview
→ User
→ IO Test

| Time | Date | Status | Text |
|----------|------------|--------|--|
| 09:29:13 | 22/02/2021 | K | Conveyor Stop by Sensor / Energy-Mode: conveyor belt instance Drive1 is stopped! |

Error messages are also displayed in the overview window.

Sub menu user

Different users can be created here. The function is independent of the selected mode (MES - or default)

| User | Password | Group | Logoff time |
|---------------|----------|----------|-------------|
| Administrator | ***** | Bedienen | 5 |
| festo | ***** | Bedienen | 5 |
| PLC User | ***** | | 5 |

Display / editing of all users, a login as "Administrator" is required.

Sub menu I/O Test

The inputs / outputs are displayed here. The outputs can also be activated in setup mode.

FESTO
CP Factory
Robot feeding
CNC

Home - IO test

Automatic mode 10/11/2021
MES Mode ■ 05:01:34 PM

Home

Setup mode

Parameters

System

→ Operat. mode

→ Overview

→ User

→ IO Test

Eingänge

| Byte | | | | |
|------|-----|-----|-----|-----|
| 0 | 1 | 2 | 3 | 4 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |

Ausgänge

| Byte | | | | |
|------|-----|-----|-----|-----|
| 0 | 1 | 2 | 3 | 4 |
| 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |

**Enable
Outputs
CAUTION
Program
return
of OB1
No cyclic
program
call**

© Festo Didactic 8063660 en

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7.6.6 Main menu - Setup


See chapter operation mode setup.

7.6.7 Main menu – Parameter

Submenu application





See chapter operation mode setup.

Sub menu transitions



Parameters - Transitions

Automatic mode 10/11/2021
MES Mode ■ 05:04:25 PM

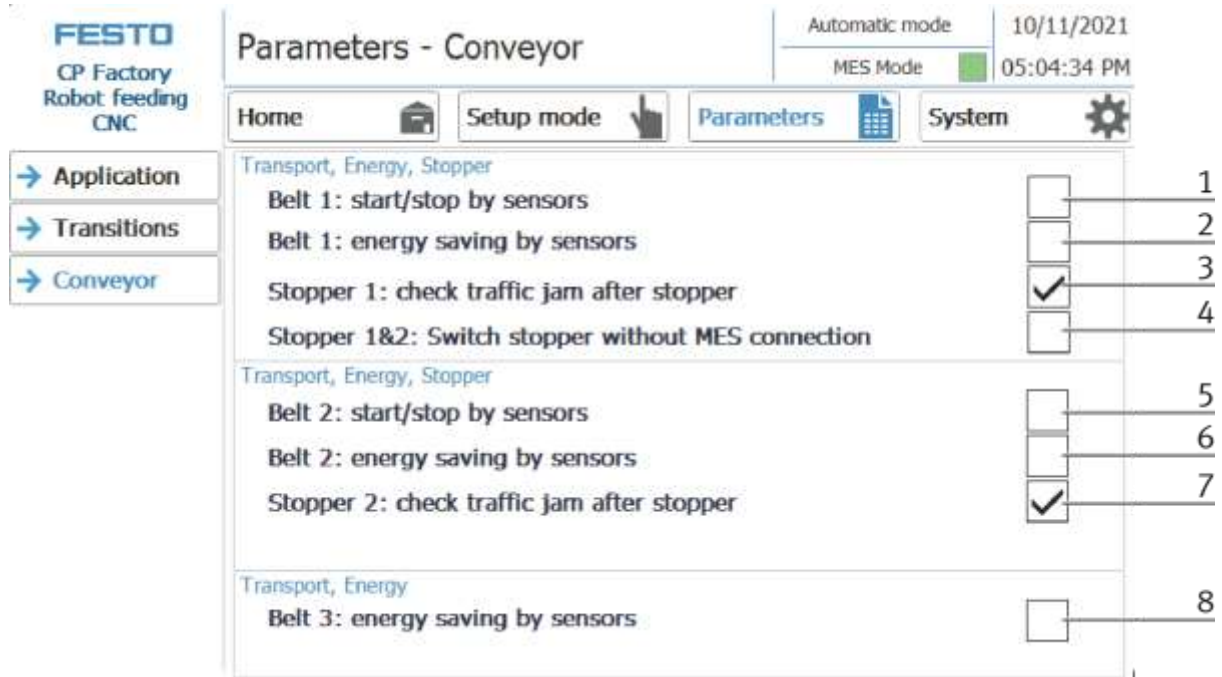
Home 
Setup mode 
Parameters 
System 

→ Application
→ Transitions
→ Conveyor

| No. | Start condition | Application execute | Parameter | | | | End condition | |
|------|-----------------|-------------------------------------|----------------|--------------|----------------|-------------|---------------|-----|
| | | | rob. prg. load | prog.no. CNC | pb. prg. unloa | Parameter 4 | OK | NOK |
| Init | none | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 1 | 0 |
| 1 | 1 | <input checked="" type="checkbox"/> | 0 | 0 | 0 | 0 | 2 | 0 |
| 2 | 2 | <input checked="" type="checkbox"/> | 0 | 0 | 0 | 0 | 1 | 0 |
| 3 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |
| 5 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |
| 7 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 | 0 | <input type="checkbox"/> | 0 | 0 | 0 | 0 | 0 | 0 |

If the sub menu transitions is selected, the transitions of the installed application module are displayed. The transitions of all other application modules can be found in the associated manuals for the application modules.

Sub menu belt, stopper



| Position number | description |
|-----------------|---|
| 1 | Belt 1 Start / Stop by sensors: Hook set when the belt should be switched automatically with the sensors. Switch on when Sensor at belt beginning signals a carrier, switch off when the sensor at the end of the belt signals the carrier passing by |
| 2 | Belt 1 energy saving by sensors: If no workpiece is detected on the belt via the sensors, the belt is switched off |
| 3 | Stopper 1: Check the jam after stopper: The carrier is only released from the stopper if the belt is not occupied at the belt outlet. |
| 4 | Stopper 1 & 2: Switch stopper without MES connection Function active MES in – workpiece carriers run through / MES out - workpiece carriers run through constantly Function not active MES in - workpiece carriers run continuously / MES out - workpiece carriers stop |
| 5 | Belt 2 Start / Stop by sensors: Hook set when the belt should be switched automatically with the sensors. Switch on when Sensor at belt beginning signals a carrier, switch off when the sensor at the end of the belt signals the carrier passing by |
| 6 | Belt 2 energy saving by sensors: If no workpiece is detected on the belt via the sensors, the belt is switched off |
| 7 | Stopper 2: Check the jam after stopper: The carrier is only released from the stopper if the belt is not occupied at the belt outlet. |
| 8 | Belt 3 energy saving by sensors: If no workpiece is detected on the belt via the sensors, the belt is switched off |

FESTO
CP Factory
Robot feeding
CNC

Conveyor Stop by Sensor / Energy-Mode: conveyor belt instance Drive2 is stopped!

Automatic mode 10/11/2021
MES Mode ■ 05:04:34 PM

Home

Setup mode

Parameters

System

→ Application

→ Transitions

→ Conveyor

| |
|---|
| <p style="color: blue; margin: 0;">Transport, Energy, Stopper</p> <p>Belt 1: start/stop by sensors <input type="checkbox"/></p> <p>Belt 1: energy saving by sensors <input type="checkbox"/></p> <p>Stopper 1: check traffic jam after stopper <input checked="" type="checkbox"/></p> <p>Stopper 1&2: Switch stopper without MES connection <input type="checkbox"/></p> |
| <p style="color: blue; margin: 0;">Transport, Energy, Stopper</p> <p>Belt 2: start/stop by sensors <input type="checkbox"/></p> <p>Belt 2: energy saving by sensors <input checked="" type="checkbox"/></p> <p>Stopper 2: check traffic jam after stopper <input checked="" type="checkbox"/></p> |
| <p style="color: blue; margin: 0;">Transport, Energy</p> <p>Belt 3: energy saving by sensors <input type="checkbox"/></p> |

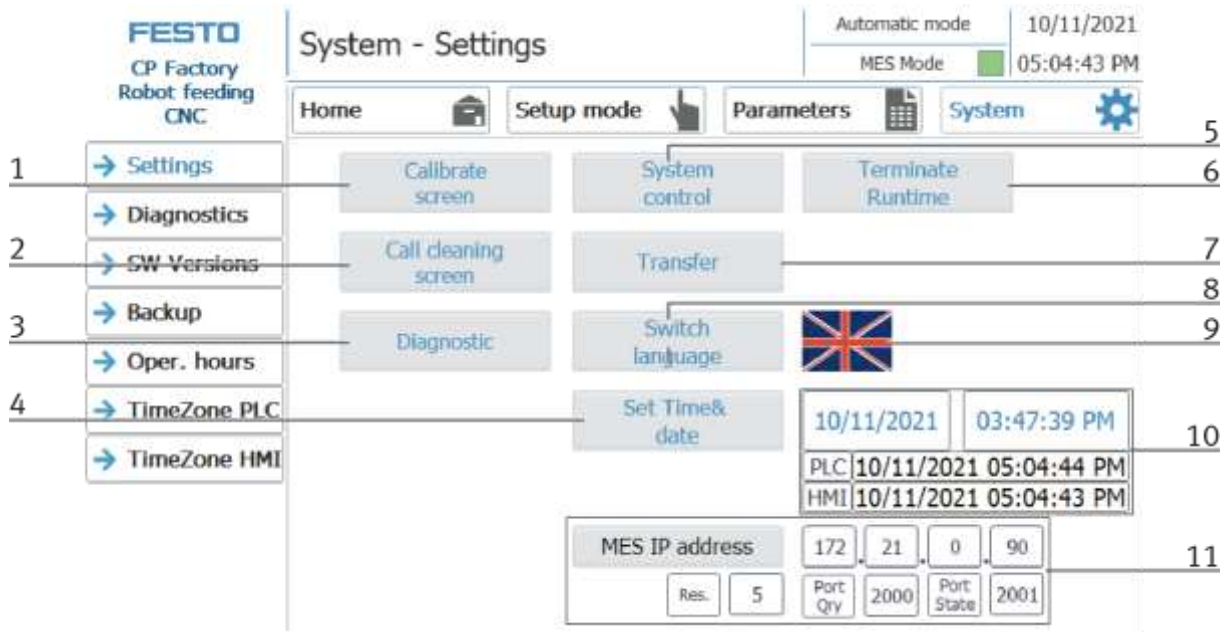
If the belt energy saving by sensors function is activated and the belts stop when there are no workpiece carriers on the belt, this is displayed in the upper message window.

7.6.8 Main menu – System

Sub menu - Settings

The screenshot shows the 'System - Settings' interface. At the top right, it displays 'Automatic mode' as '10/11/2021' and 'MES Mode' as '05:04:43 PM'. The navigation bar includes 'Home', 'Setup mode', 'Parameters', and 'System' (indicated by a gear icon and a '1' label). The left sidebar (indicated by a '2' label) lists 'Settings', 'Diagnostics', 'SW Versions', 'Backup', 'Oper. hours', 'TimeZone PLC', and 'TimeZone HMI'. The main content area contains several buttons: 'Calibrate screen', 'System control', 'Terminate Runtime', 'Call cleaning screen', 'Transfer', 'Diagnostic', 'Switch language' (with a UK flag), 'Set Time & date' (with date '10/11/2021' and time '03:47:39 PM'), 'MES IP address' (with fields for 172, 21, 0, 90), and 'Res.' (with field '5'). Below the IP address, there are fields for 'Port Qty' (2000) and 'Port State' (2001). At the bottom right, it shows 'PLC 10/11/2021 05:04:44 PM' and 'HMI 10/11/2021 05:04:43 PM'.

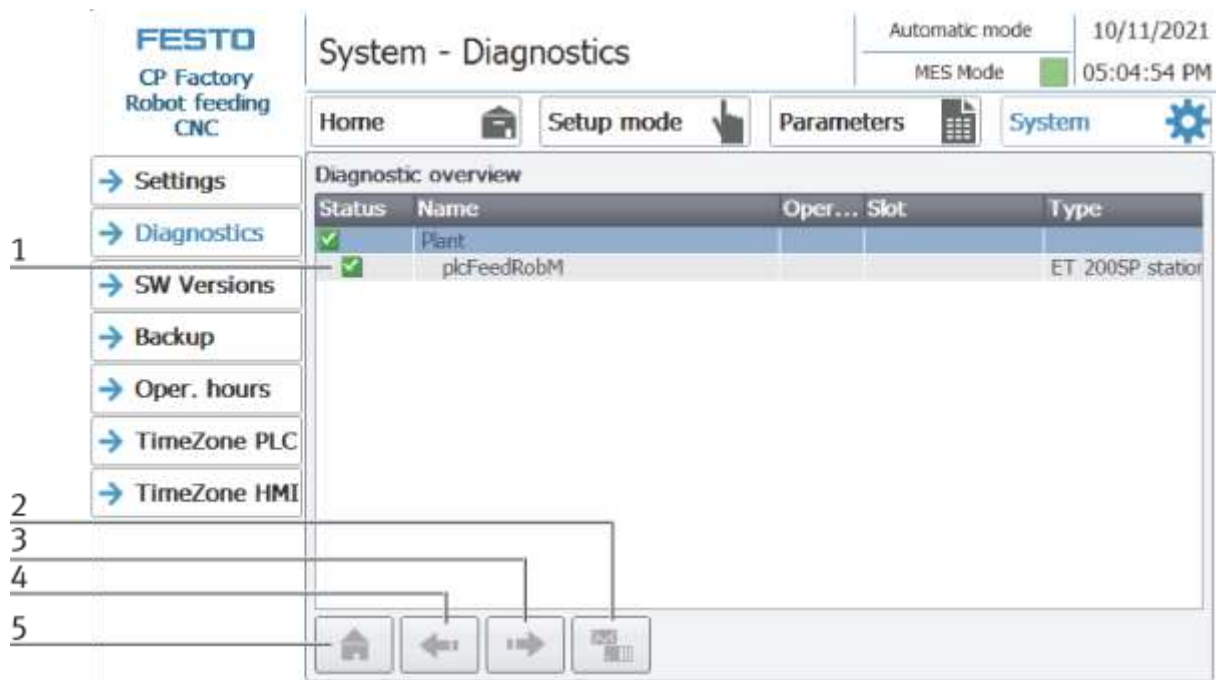
1. To get to the system settings, the System button must be selected
2. Click on Settings



The system can be set in this operating mode.

| Position number | Description |
|-----------------|---|
| 1 | Button Calibrate Screen - If buttons react inaccurately, calibration of the touch screen can be restored |
| 2 | Button call cleaning screen - the screen can be cleaned here. The touch function is interrupted and unintentional operation is excluded |
| 3 | Button Diagnsotic |
| 4 | Button set time & date: The time and date of the HMI touch panel can be set here. |
| 5 | Button system control: Windows system control is opened |
| 6 | Button Terminate Runtime: The runtime is terminated and returned to Windows. |
| 7 | Button Transfer: Runtime is closed and the transfer mode of the HMI is called |
| 8 | Button switch language: here the language can be changed |
| 9 | Flag displays only current language. By clicking on button next to the flag language can be switched |
| 10 | Input field for date / time. Click on the "Set time & date" button to accept date / time Display date and time of the PLC Display date and time of the HMI touch panel |
| 11 | Display of the MES IP address additionally the IP of the MES can be set here. (Password protected) User: festo, PW: festo) Input fields for your own resource number, query port and status port of the MES connection |

Sub menu diagnostics



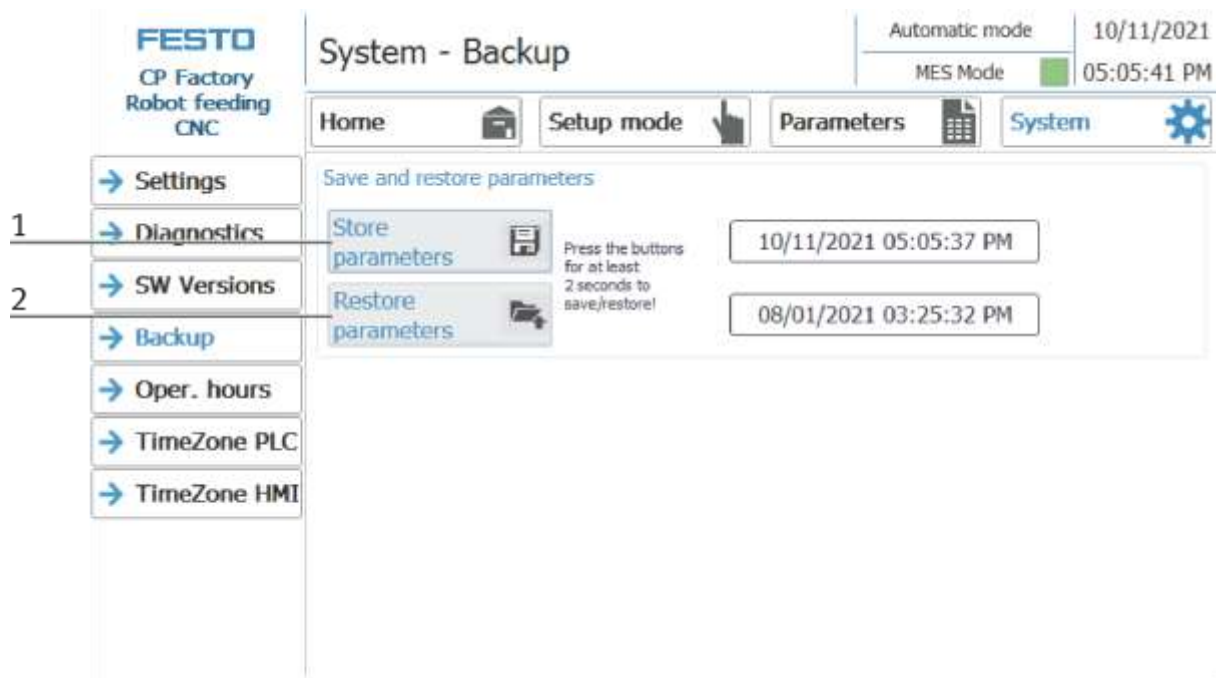
| Position number | Description |
|-----------------|----------------------------------|
| 1 | Announcement overview plant |
| 2 | Send diagnostic message via mail |
| 3 | Next diagnostic message |
| 4 | Previous diagnostic message |
| 5 | Home Button |

Sub menu software versions

The screenshot shows the 'System - Version' interface. On the left is the FESTO logo and a vertical menu with options: Settings, Diagnostics, SW Versions, Backup, Oper. hours, TimeZone PLC, and TimeZone HMI. The top right corner displays 'Automatic mode' with the date '10/11/2021' and 'MES Mode' with a green indicator and the time '05:05:25 PM'. Below this is a navigation bar with 'Home', 'Setup mode', 'Parameters', and 'System' (selected). The main content area shows 'actual library version:' followed by a box containing 'V4.06'.

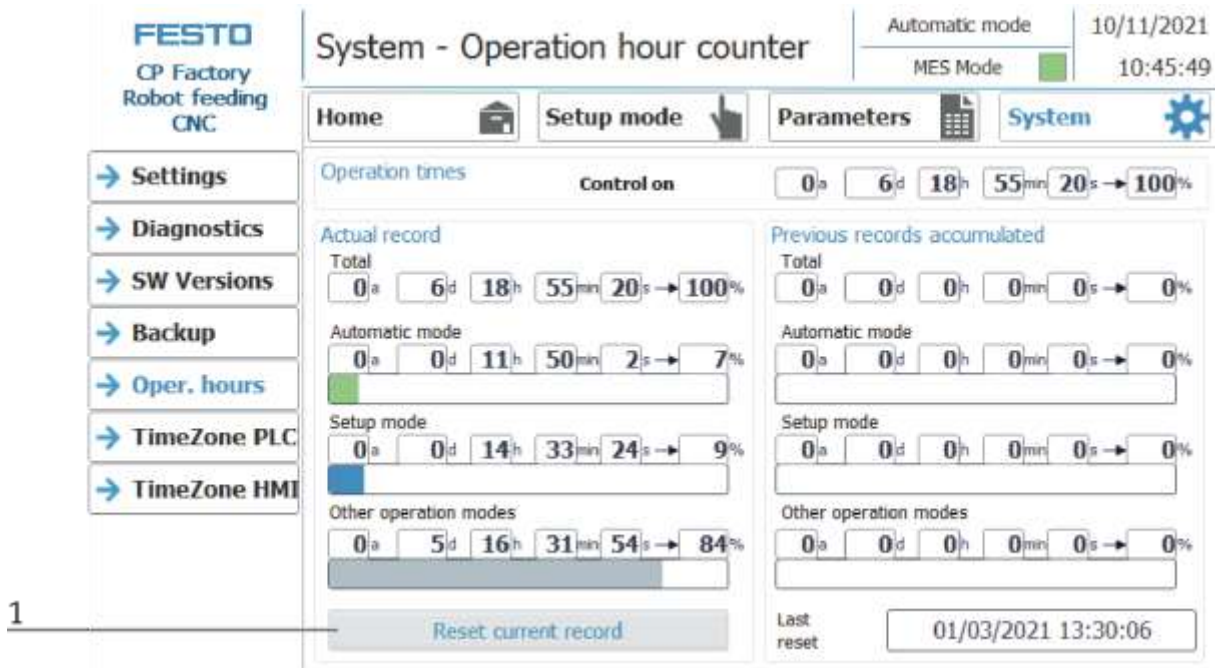
Display of the current library version.

Sub menu Backup



| Position number | Description |
|-----------------|---|
| 1 | Save parameters button: all parameters are saved, for this it is necessary to press the button for at least 2 seconds. The display shows the date of the last storage. |
| 2 | Restore parameters button: all parameters are loaded, for this it is necessary to press the button for at least 2 seconds The display shows the date on which the parameters were last loaded. |

Submenu operating hours counter



Display of the operating times with allocation to the respective operating mode.

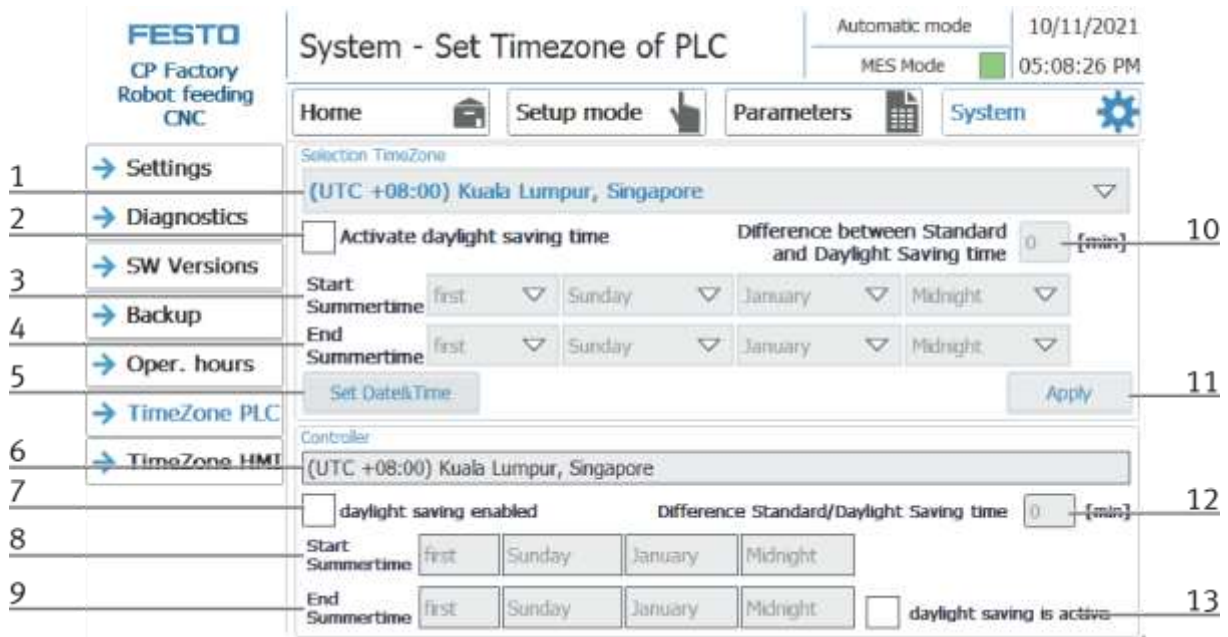
In the "Operation times" area, the time since the control was switched on is counted.

In the "Actual record" area, the time until the next time the "Reset current record" button is pressed is counted. The times are divided into the categories "Total", "Automatic mode", Setup mode and "Other operating modes". The times are counted under the heading "Other operating modes" while the station is in the operating mode "Automatic preselection", "Setup" and "No operating mode". The value in the "Total" line represents the total of the operating times differentiated according to the operating mode. The percentage refers to the proportion of the operating mode in the total time.

With the button (1) "Reset current record", the current recording is set to 0 and the operating times contained therein are added to the "Previous recordings accumulated" area. The current recording can thus be used, for example, for daily recordings.

All counter values are saved in a retentive data block. These are lost when the controller is booted. If they are to be retained, the values must be saved beforehand.

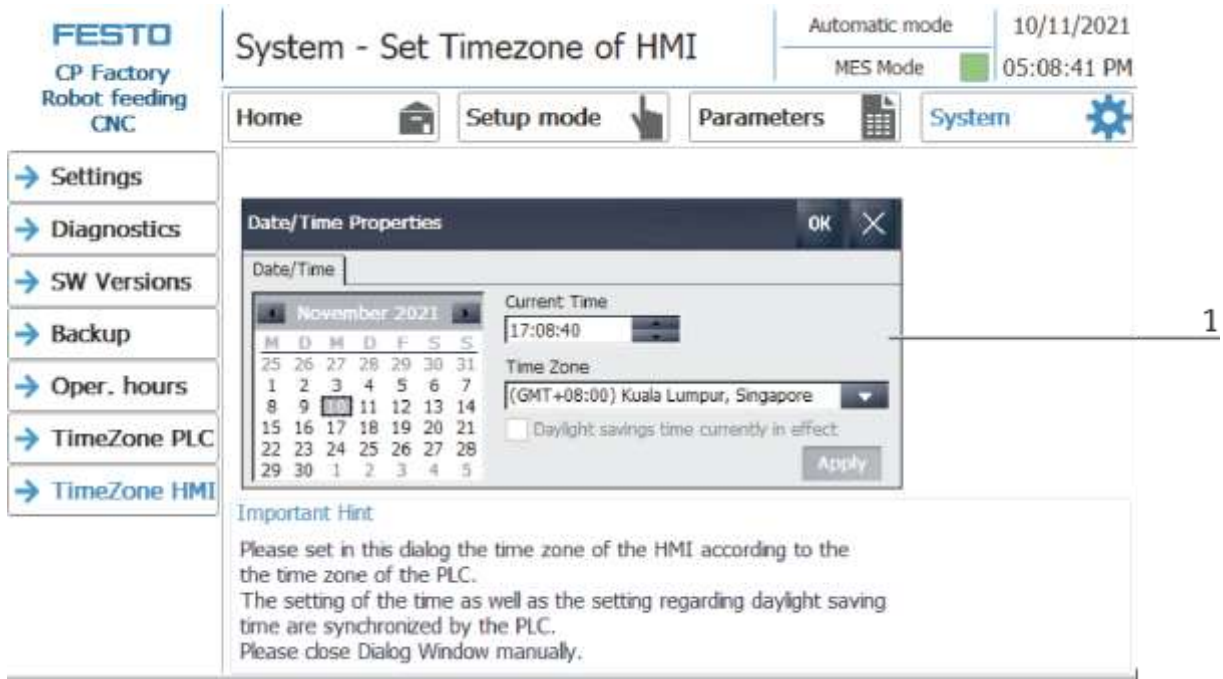
Time zone submenu in the PLC



The time and time zone of the PLC can be set in this menu. The default settings of the PLC are overwritten when you click the "Apply" button.

| Position number | Description |
|-----------------|--|
| 1 | Select TimeZone |
| 2 | Checkmark set - the daylight saving time changeover is automatically changed at the times "Beginning of daylight saving time" and "End of daylight saving time" Checkmark not set - there is no daylight saving time changeover |
| 3 | Setting the start of daylight saving time |
| 4 | Setting the end of summer time |
| 5 | Set time & date: When this button is pressed, a pop-up window opens for setting the time of the PLC |
| 6 | Display of the current time zone of the controller <i>(Only valid if the time zone of the PLC has been set once using the "Apply" button)</i> |
| 7 | Display of whether daylight saving time changeover is active in the PLC. <i>(Only valid if the time zone of the PLC has been set once using the "Apply" button)</i> |
| 8 | Display of the current start of daylight saving time in the control <i>(Only valid if the time zone of the PLC has been set once using the "Apply" button)</i> |
| 9 | Display of the current end of daylight saving time in the control <i>(Only valid if the time zone of the PLC has been set once using the "Apply" button)</i> |
| 10 | Enter the time difference between summer and winter time in minutes. |
| 11 | Accept the selected settings for the time zone and time change by pressing the button. |
| 12 | Display of the time difference between summer and winter time in minutes. <i>(Only valid if the time zone of the PLC has been set once using the "Apply" button)</i> |
| 13 | Display of whether daylight saving time is currently active. <i>(Only valid if the time zone of the PLC has been set once using the "Apply" button)</i> |



Time zone submenu in the HMI



The time and time zone of the HMI can be set in this menu. The default settings of the HMI are overwritten. It is important to set the time zone in the HMI the same as it is set in the PLC, otherwise certain functions will get a different time stamp. (e.g. sending emails)

| Position number | Description |
|-----------------|--|
| 1 | System pop-up window of the HMI for selecting the time zone. The selected time zone in the Time Zone drop-down field is transferred to the HMI by pressing the "Apply" button. Before exiting the menu item, close the system pop-up window by pressing the X at the top right. |

7.6.9 Start sequence Mill 55

| | |
|---|---|
|  | <div style="text-align: center; background-color: #c85130; color: white; padding: 5px;">  WARNING </div> <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. |
|---|---|

1. All EMERGENCY STOP signal transmitters (push buttons, door contact, light barriers, etc.) are not activated and unlocked.
2. Switch on compressor
3. Switch on the main switch



4. RESET button lights up blue, HMI is started and starts up



5. Commission the robot: follow the start up process of the corresponding robot **
6. Make sure the CNC Digital input -output and emergency is connected to the CP Factory and it is turned to external mode (FMS position 1)



7. Turn on CNC machine



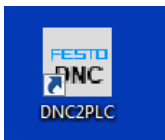
8. Switch on and start the PC of the CNC machine

9. Wait until WinNC starts automatically and select “HMloperate Mill”

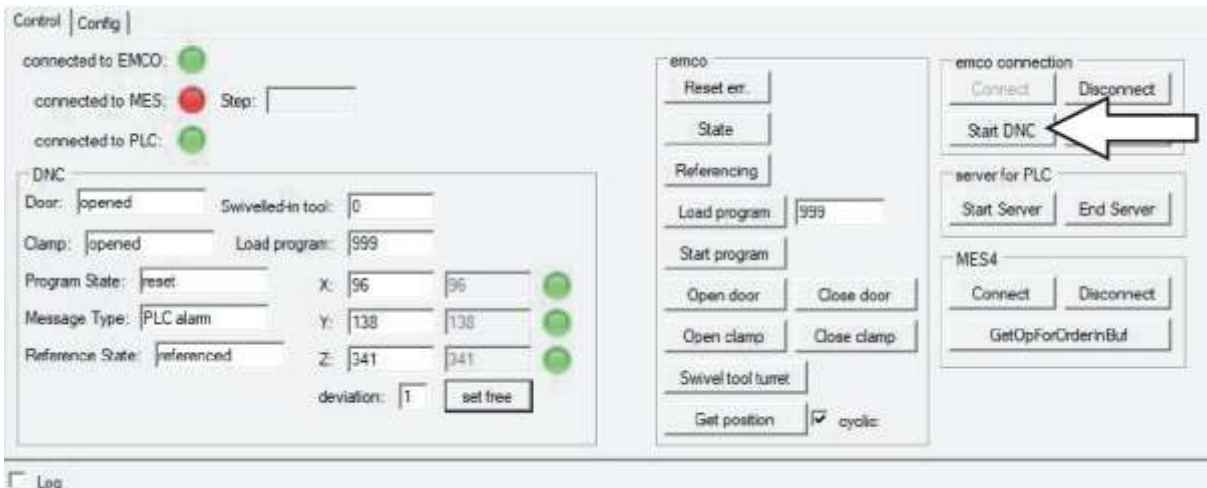


10. Wait until the WinNC software is connected to the CNC: Machine data is available

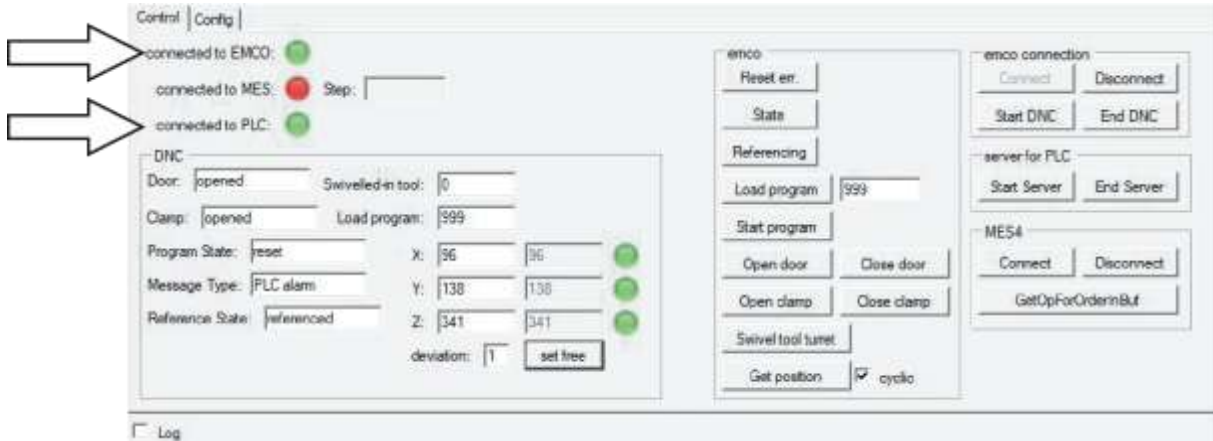
11. Start DNC2MES if not started automatically



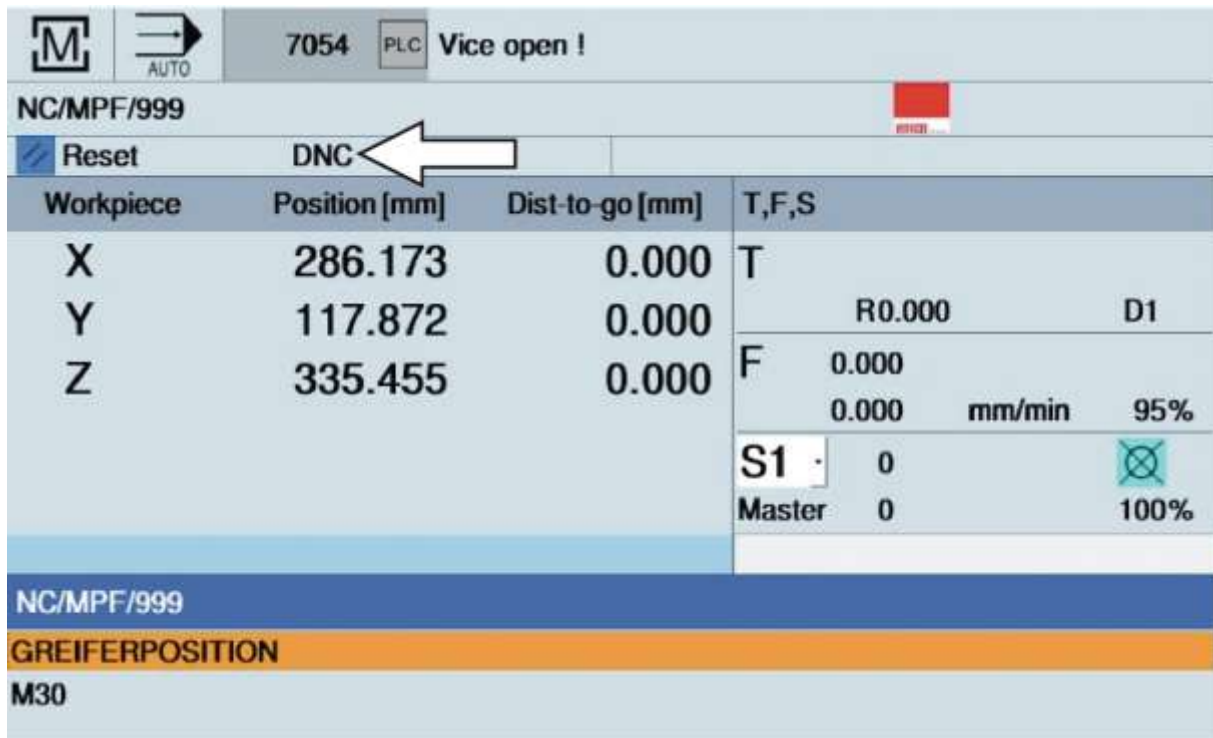
12. Start DNC



13. Make sure the DNC2MES is connected to the WinNC software and to the PLC as well



14. The WinNC should show also the DNC connection



15. Reference and move the axes of the CNC machine to its home position

16. This can happen in 2 ways:

with the WinNC software

with the DNC2MES software

*steps continued after referencing and homing

7.6.10 Referencing with WinNC software

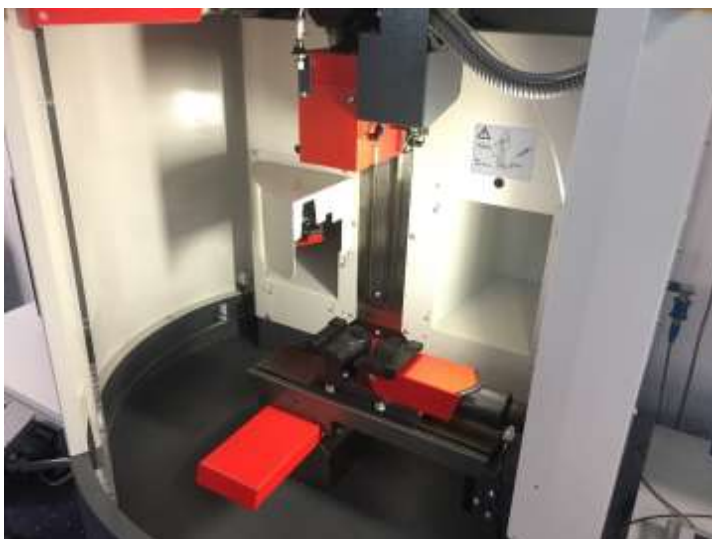
1. If there is an error by the CNC machine reset it with the reset button on the keyboard



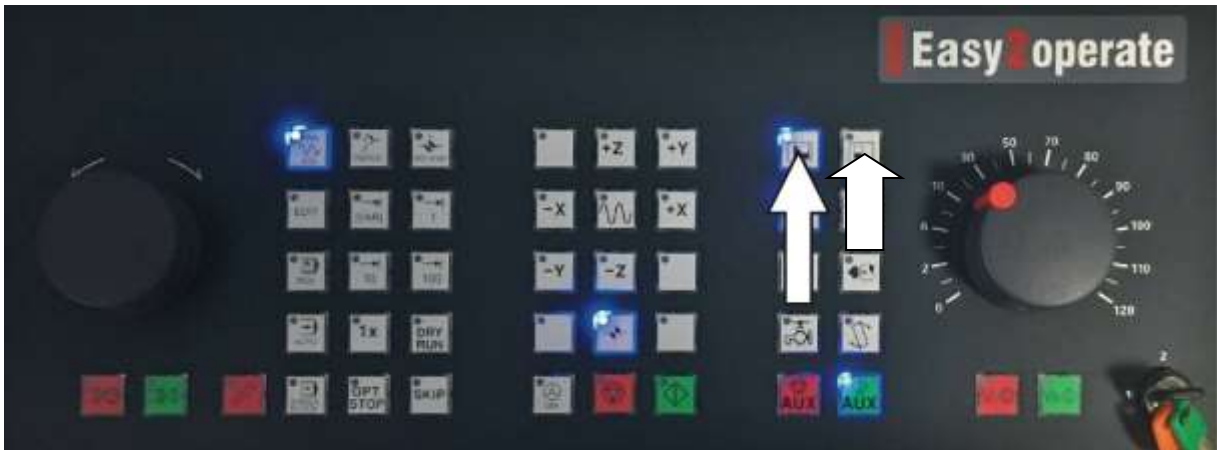
2. Open the clamps



3. Remove workpiece from the CNC machine if there is any



4. Close the door of the CNC machine while pressing the button continuously



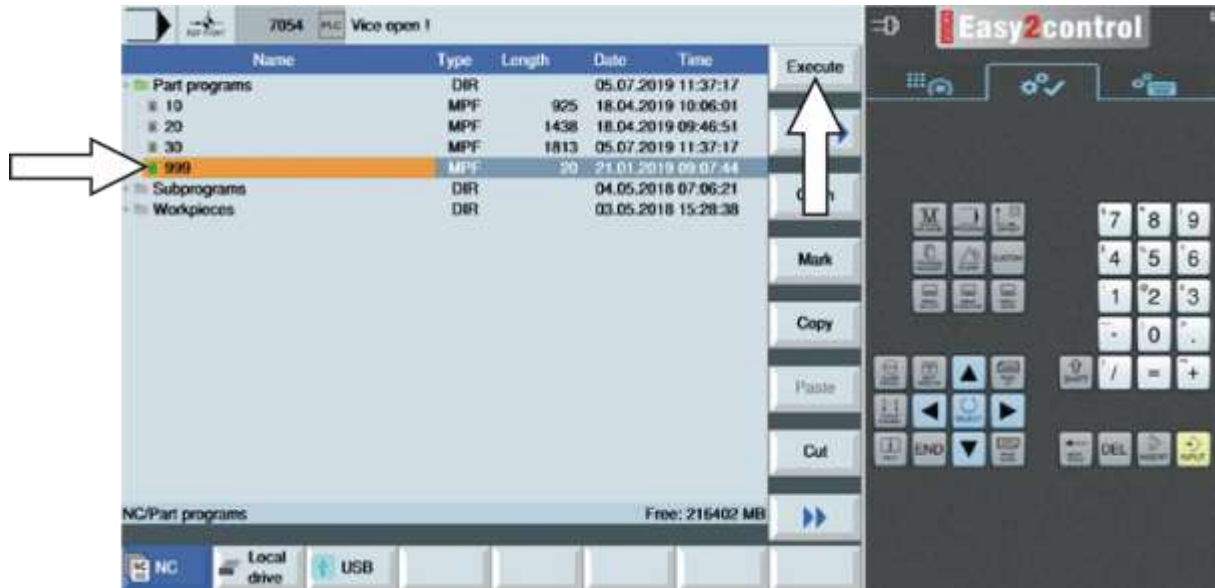
5. Press Reference button on the CNC keyboard



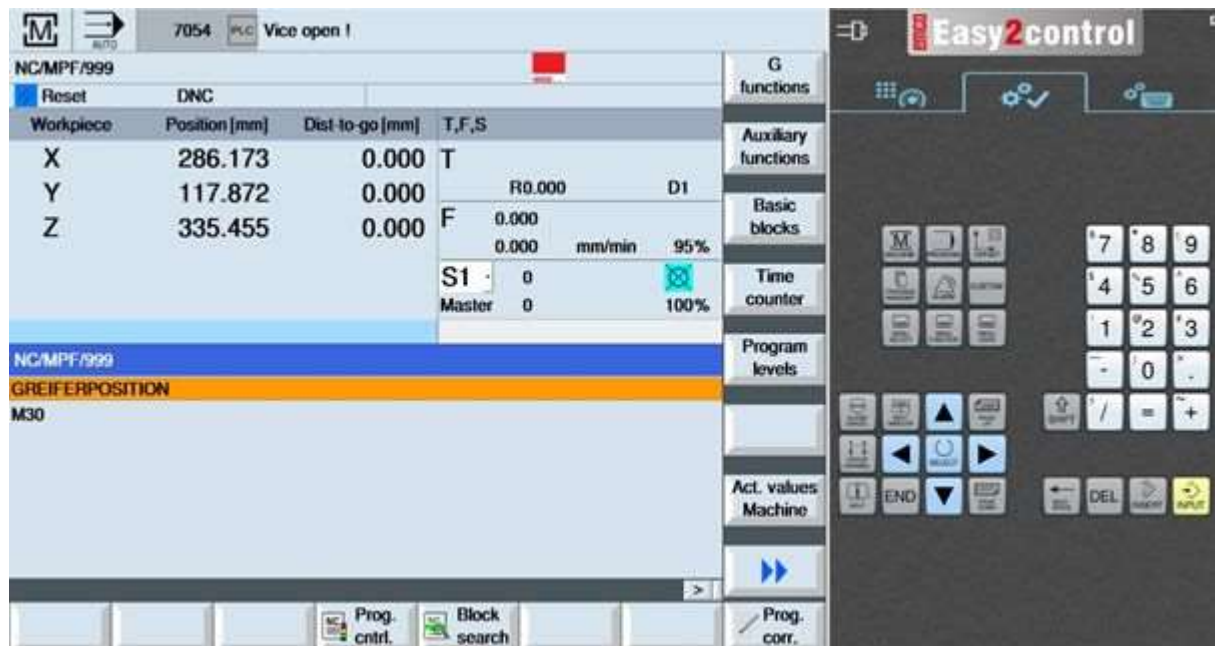
6. After the referencing finished the program number 999 has to be called to move the axes to the home position. Click on “Program manager” in the WinNC software



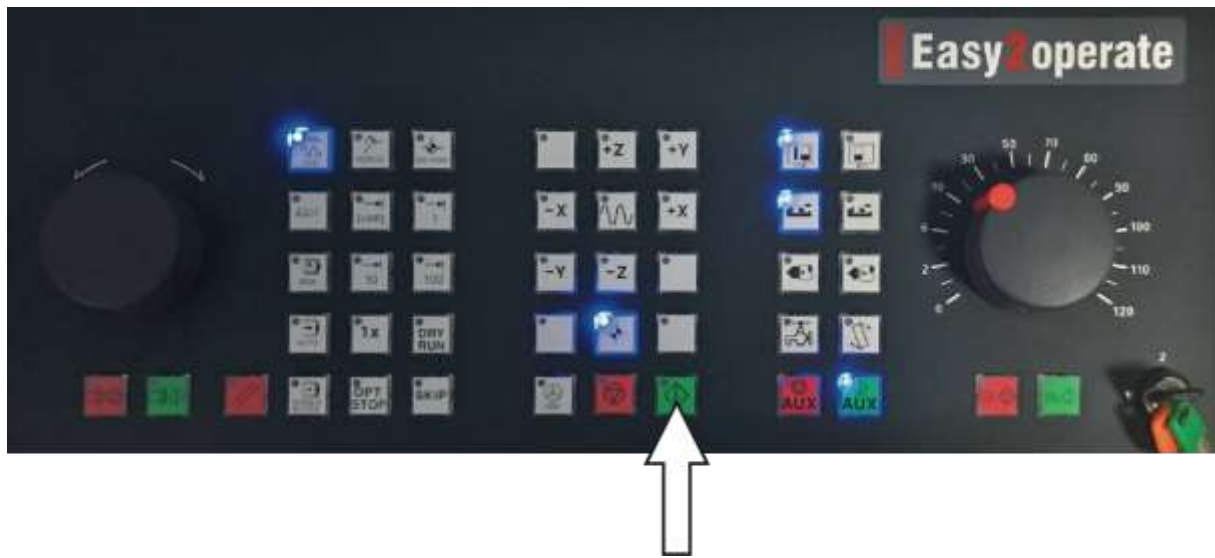
7. Select program 999 and click on Execute



8. When the program is selected the machine data and below the program itself is available

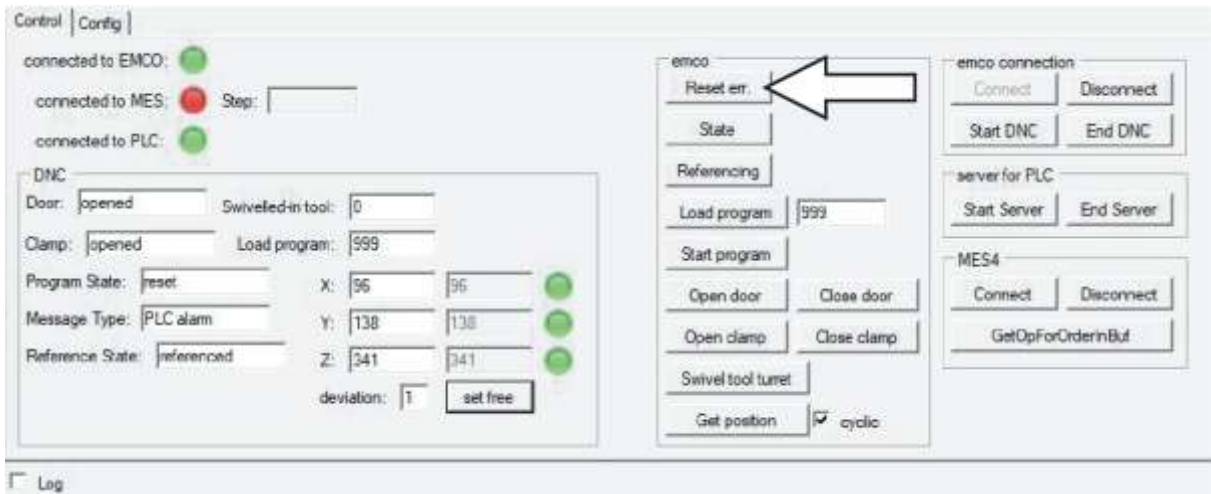


9. Press the start button on the CNC keyboard

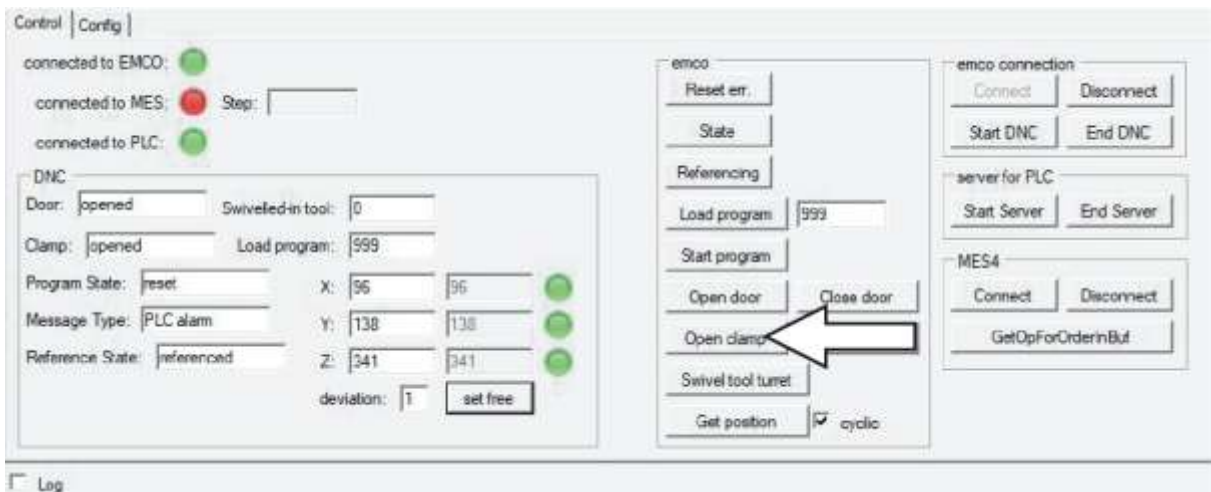


7.6.11 Referencing with DNC2MES software

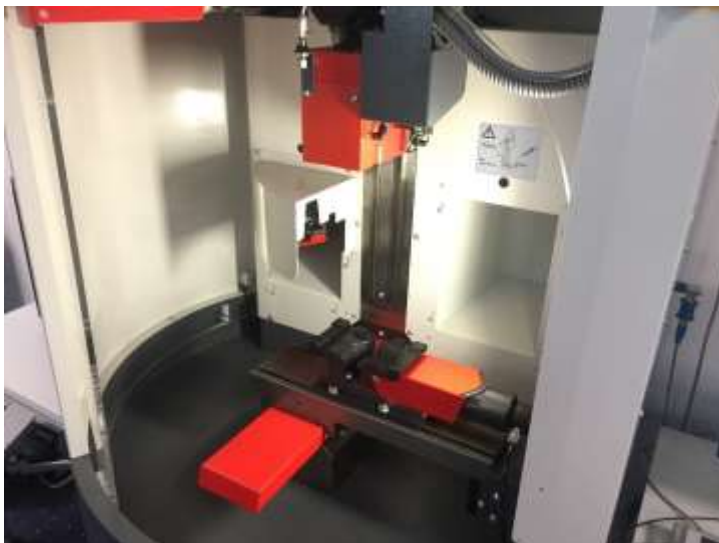
1. Reset error if there is any



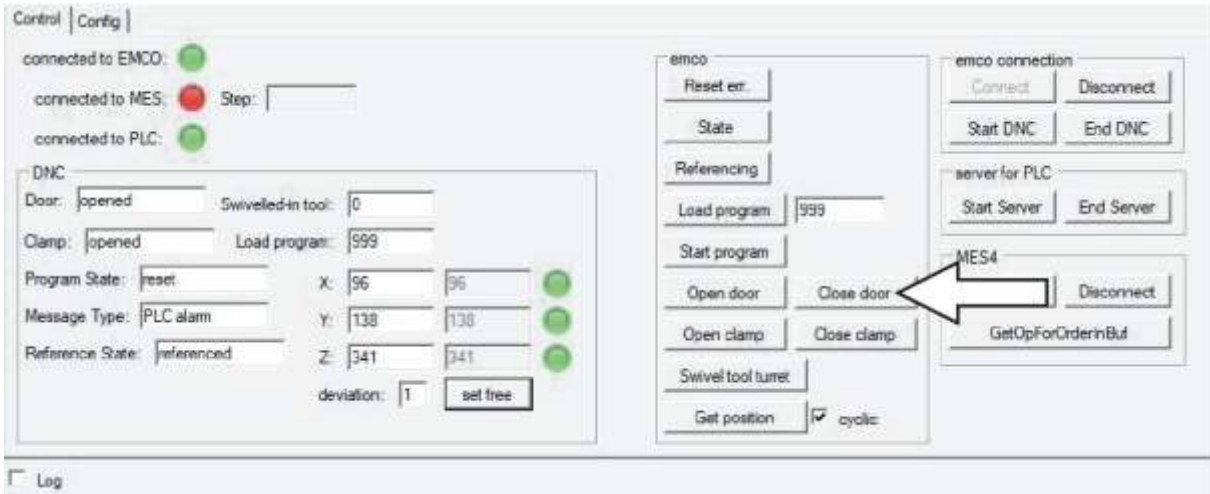
2. Open the clamps



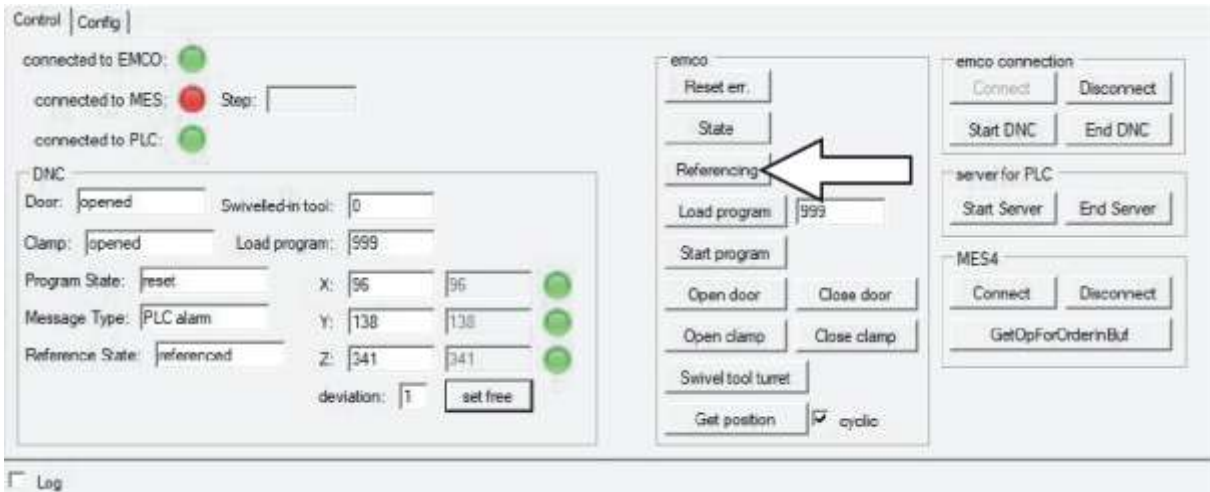
3. Remove workpiece from the CNC machine if there is any



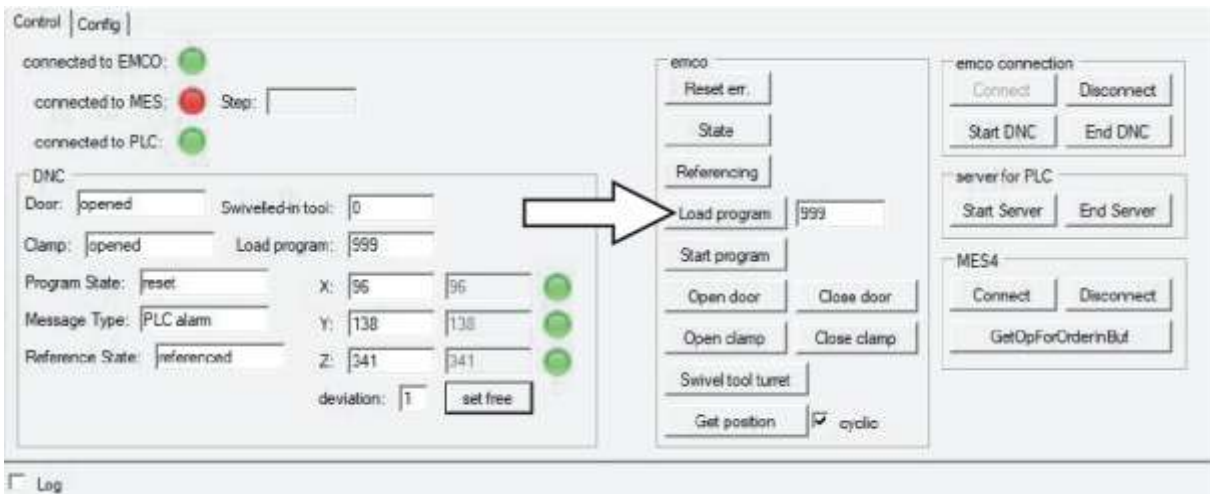
4. Close the door of the CNC machine



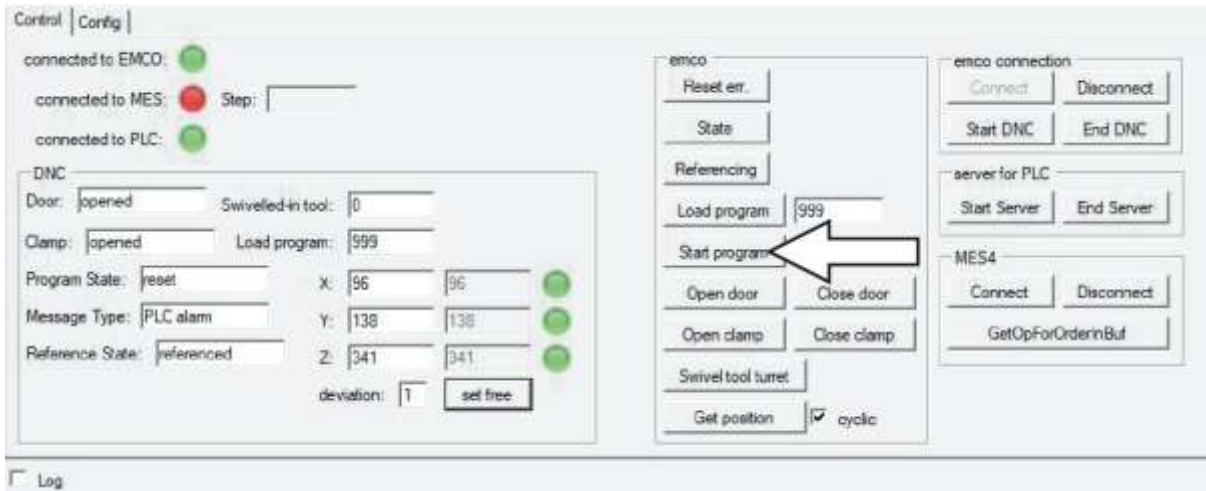
5. Click on "Referencing"



6. Type program 999 and click on "Load program"

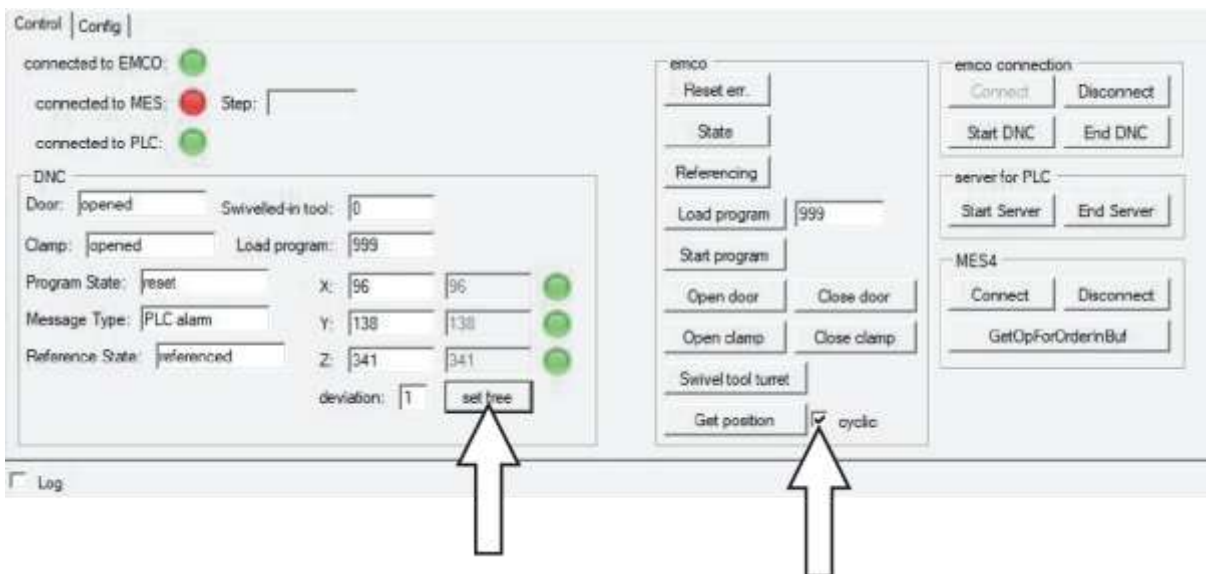


7. Finally click on “Start program”



8. *after referencing and homing

9. While the DNC2MES “cyclic” checkbox is enabled the software is cyclically gets the position of the CNC axes. This is required for safety reason, that the robot only moves into the CNC machine while it is at home position. By clicking on the “set free” button the actual CNC position is activated as a home position



10. Accept errors on the HMI

11. The HMI shows no error and CNC is connected

7.6.12 ** Mitsubishi Robot homing

1. Reset error if there is any



2. Select Manual mode with the key switch on the robot controller



3. Enable the robot Teachpendant



4. Press half-way and hold the deadman switch during the complete operation



5. Turn on the servo



6. Open the Jog window



- Take care to choose the right tool (TOOL1) and press continuously the Home button until the robot moves to its home position



- After the robot has finished its movement disable the Teachpendant



- Finally turn the key switch on the robot controller back to Automatic mode



7.6.13 Automatic description

1. Press the automatic button
2. Stoppers are retracted
3. Workpiece is transported in circuit mode
4. The automatic button is announced in blue
5. If a carrier is coming into the application, the station is executing the automatic sequence. The sequence is only started if the operation is set for this resource in MES and the resource can carry out the operation.
6. The busy signal is getting active.
7. During this time, the automatic sequence is done in the application.
8. The next resource and the next operation are written on the RFID Chip
9. If the application is ready, the busy signal is going out and the stopper is retracted
10. The carrier is leaving the operation position and is provided for other applications.

7.6.14 Cycle end sequence

1. An automatic sequence is active
2. Press cycle end button
3. The application is doing the sequence till cycle is ready, during this time the cycle end button is red
4. The stoppers are extended
5. The conveyors are stopping

7.7 Writing on the RFID tag manually

7.7.1 Pallet carriers

In order to describe a pallet carrier with a specific ID, or to get information on which data is stored on the pallet carrier, it is possible to read this data or to describe the tag.

For this, it is necessary that a pallet carrier with a functioning tag is at one of the stopper positions and the station is switched on.

The following example is guilty for all read out positions where pallet carriers can be read out.

The screenshot shows the FESTO Setup - Stopper interface. At the top, it displays 'Setup mode' and the date '04/05/2017'. Below this, there are navigation buttons: 'Home', 'Setup mode' (selected), 'Parameters', and 'System'. On the left, there is a menu with 'Application', 'Belt', and 'Stopper' (selected). The main display area shows a 3D model of the stopper with various components labeled: BG1, BG21, MB20, BG22, BG23, BG24, TF80, and BG20. Below the 3D model, there is a table for 'RFID (TF1)' data. The table has two modes: 'MES Mode' and 'Default Mode'. The 'MES Mode' data is as follows:

| Field | Value |
|------------|---------|
| Carrier ID | 10 |
| PNo | +65546 |
| ONo | +655361 |
| Resource | +1 |
| OPos | +10 |
| Operation | +10 |

The 'Default Mode' data is as follows:

| Field | Value |
|------------|-------|
| State Code | 1 |
| Par. 1 | +10 |
| Par. 2 | +1 |
| Par. 3 | +10 |
| Par. 4 | +1 |

On the right side of the data table, there are status indicators: 'tag present' (green), 'ready' (green), 'busy', 'error', and 'timeout'. The 'tag present' indicator is highlighted in green, indicating that an RFID tag is detected.

1. Select the Setup mode
2. Select the stopper from the setup menu on the left
3. If an RFID is detected, this is indicated by "tag present". (TF80 and button "tag present" are green)
4. The data of the RFID tag can be read out and displayed by pressing the "read" button.
5. Press the Delete Data button

For easier input, all data is only deleted in the input mask, the data remains on the tag itself.

6. Enter the desired data in the field (all fields which are white in background can be edited)

MES Mode

Carrier ID - displays or enter the carrier number

ONo - the order number is displayed or entered here

OPos - the order position is displayed or entered here

PNo - the part number is displayed or entered here

Resource - here the resource is displayed or entered

Operation - the number of the operation is displayed or entered here

DefaultMode

State code - here the state code for the start condition is entered, if these match the transition tables, the parameters are read out and the automatic sequence of the application is started.

Parameter 1 = Input of parameter value (e.g., 1 / left side drilling)

Input of parameter value (e.g., 2 / right side drilling)

Input of parameter value (e.g., 3 / both sides drilling)

Parameters 2 - 4 - not used in this example

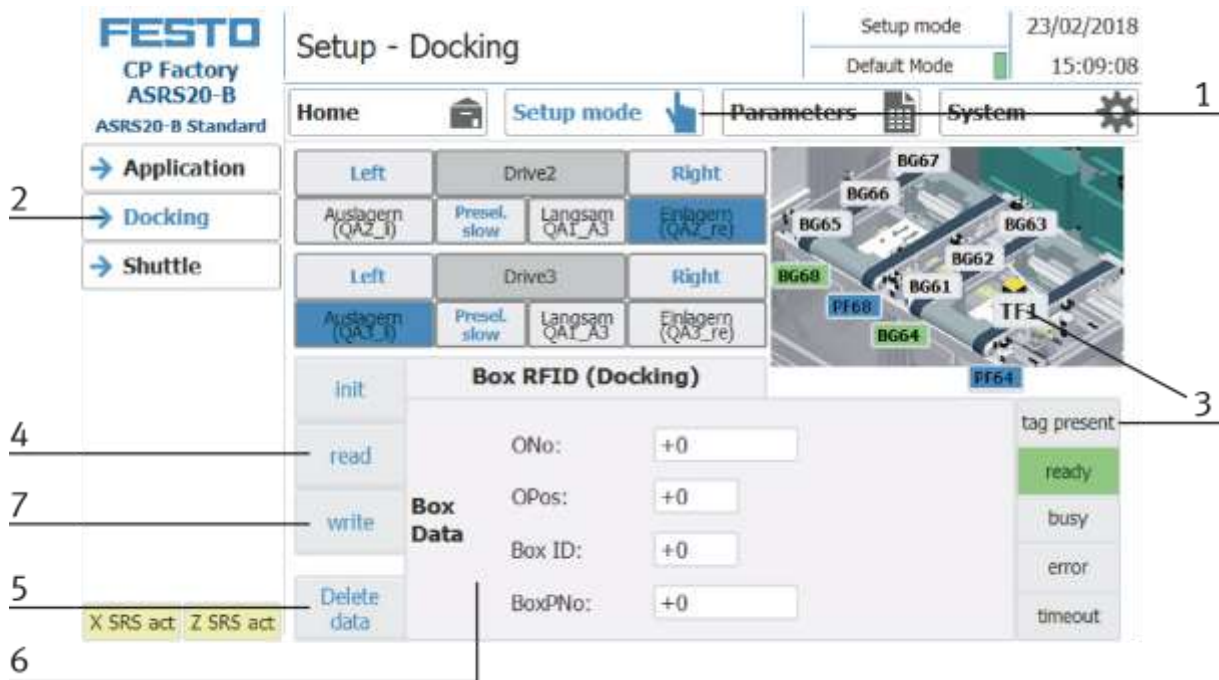
7. Press the "Write" button to write the changes made to the tag.

7.7.2 Boxes

In order to describe a box with a certain ID, or to get information about what data is on the box, it is possible to read this data or to describe the tag.

For this it is necessary that a box with a working tag is located at one of the readout positions and the station is switched on.

The following example applies to all readout positions that can read an ID of boxes.



1. Select the Setup mode
2. Select the module with the read out position from the menu on the left
3. If an RFID is detected, this is indicated by "tag present". (TFxx and button "tag present" are green)
4. The data of the RFID tag can be read out and displayed by pressing the "read" button.
5. Press the Delete Data button
For easier input, all data is only deleted in the input mask, the data remains on the tag itself.
6. Entry of the desired data in the field (all fields with a white background can be edited)
MES Mode and default mode are identically
ONo – without function
OPos – without function
BoxID – here the IB number of the box is displayed or entered
BoxPNo – Here, the part number of the box and the retainer for the workpieces to be picked up are displayed or entered.
7. Press the „write“ button in order to write the performed modifications on the tag.

7.7.3 Parameter (FEEDROBM)

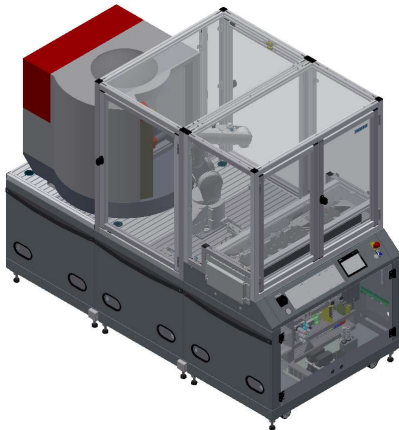


Illustration similar

Default:

| Parameter-No. | Description |
|---------------|--|
| 1 | Program number load 1: Load CNC with workpiece (robot) Limit: no limit of value in the transition table |
| 2 | CNC program number 1: process workpiece (CNC) Limit: no limit of value in the transition table |
| 3 | Program number unload 2: Unload workpiece from CNC (robot) Limit: no limit of value in the transition table |
| 4 | Not used |

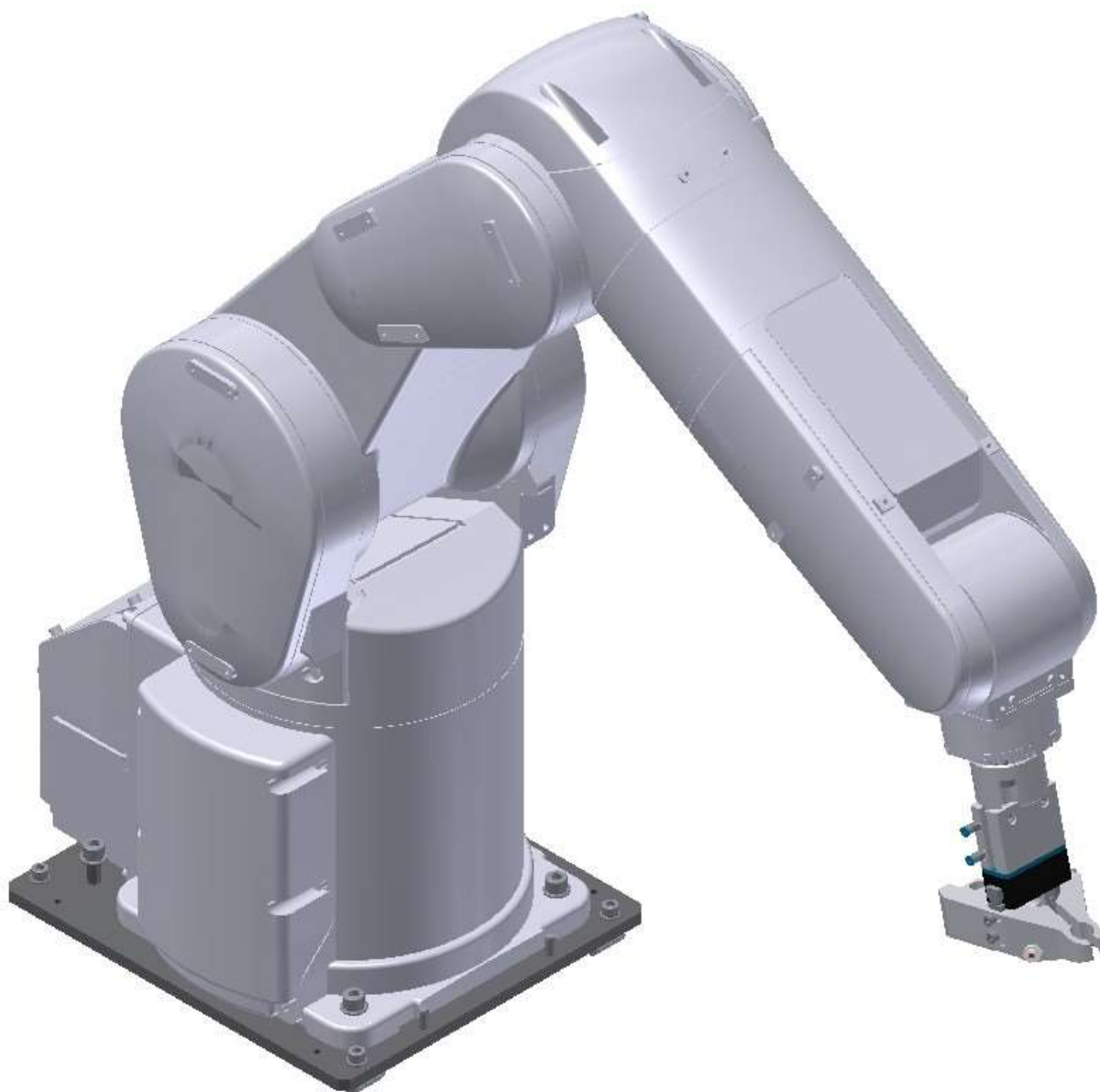
MES:

| Operation | Parameter | Description |
|---------------|-----------|--|
| 193 Robot CNC | 1 | Robot program load Value: 1 Type: changeable |
| | 2 | CNC Program Value: 1 Type: changeable |
| | 3 | Robot program unload Value: 2 Type: changeable |
| | 4 | Working time (Ciros) Value: 15 Type: changeable |

8 Components

8.1 Mitsubishi Robot RV-4FL

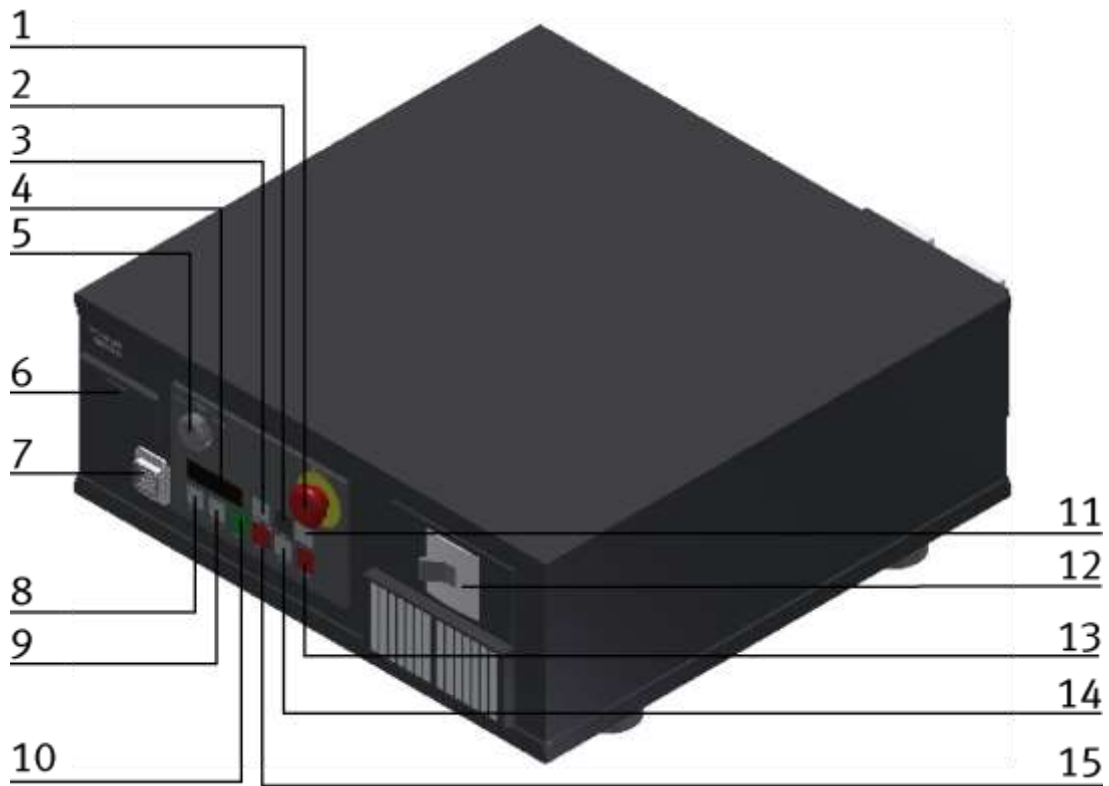
For the transport of the workpieces, a vertical- articulated arm robot is used. This is an industrial robot with 6 axis. The repetition accuracy of the robot positioning is $\pm 0.02\text{mm}$. Its maximum speed amounts to 9900 mm/s. There is an end position and overload monitoring program integrated. The maximum reach of the robot arm is 648,7 mm.



RV-4FL

| Performance | |
|------------------|------------------------------|
| Inputs | 32 Inputs for communication |
| Outputs | 32 Outputs for communication |
| Max. reservation | 1 work piece/pallet |

8.1.1 Drive Unit CR750-D



The Drive Unit is the controller for the robot / illustration similar

| Position | Description |
|----------|-------------------------------------|
| 1 | Emergency stop |
| 2 | Down button |
| 3 | CHNG button |
| 4 | Display |
| 5 | Key switch for teach or auto modes |
| 6 | Interface cover for USB and battery |
| 7 | Plug for teach pendant |
| 8 | Servo on button |
| 9 | Servo off button |
| 10 | Start button |
| 11 | Up button |
| 12 | Main switch |
| 13 | END button |
| 14 | RESET button |
| 15 | Stop button |

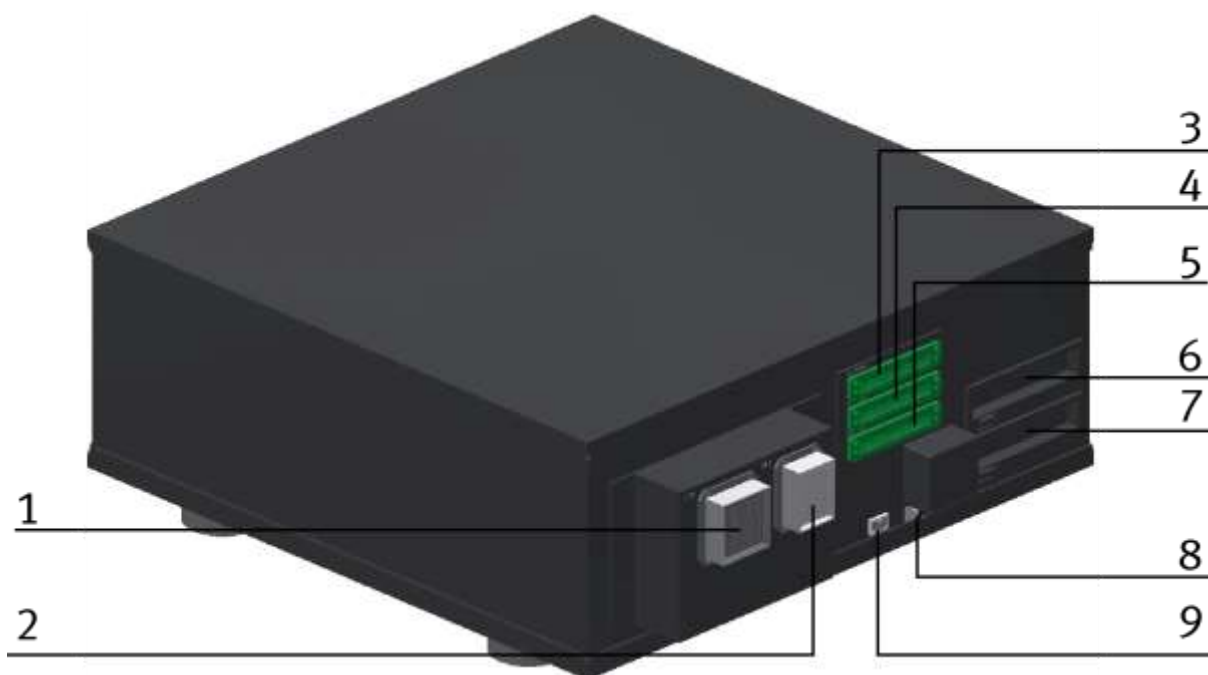


Illustration similar

On the backside of the drive unit, there are some more plugs and interfaces.

| Position | Description |
|----------|--|
| 1 | CN1 for robot communication |
| 2 | CN2 for robot communication |
| 3 | CNUSER 11 |
| 4 | CNUSER 12 |
| 5 | CNUSER 13 |
| 6 | Slot 1 / for connector 1 (in/output 0-15) |
| 7 | Slot 2 / for connector 2 (in/output 16-31) |
| 8 | CNUSER 2 |
| 9 | LAN1 for ethernet |

8.1.2 Teachpendant R56TB

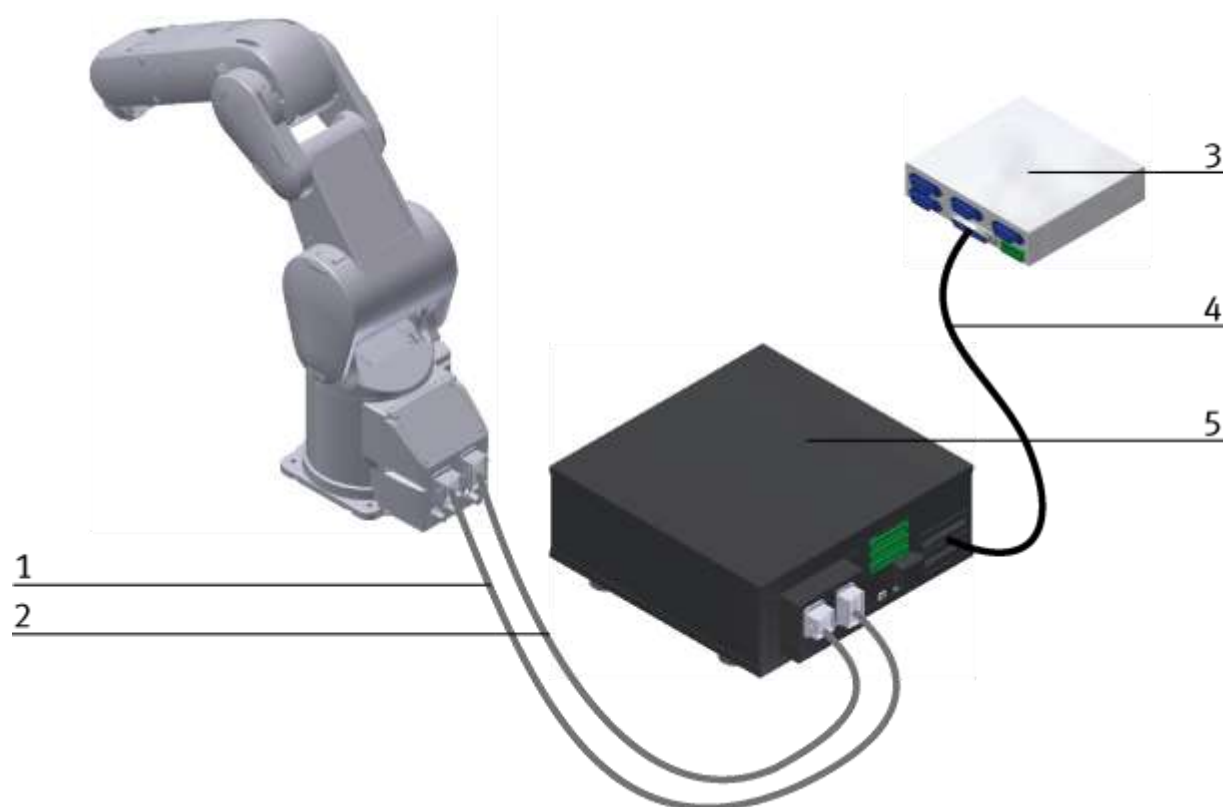
To operate the robot in standalone mode, the teach pendant is necessary. The buttons have different functions, depending on the different modes. With the key switch at the Drive unit, it is possible to choose the following three modes.

- Position Auto (OP) for standalone mode.
- Position Auto (EXT) for communication with other controller.
- Position Teach for teach mode.



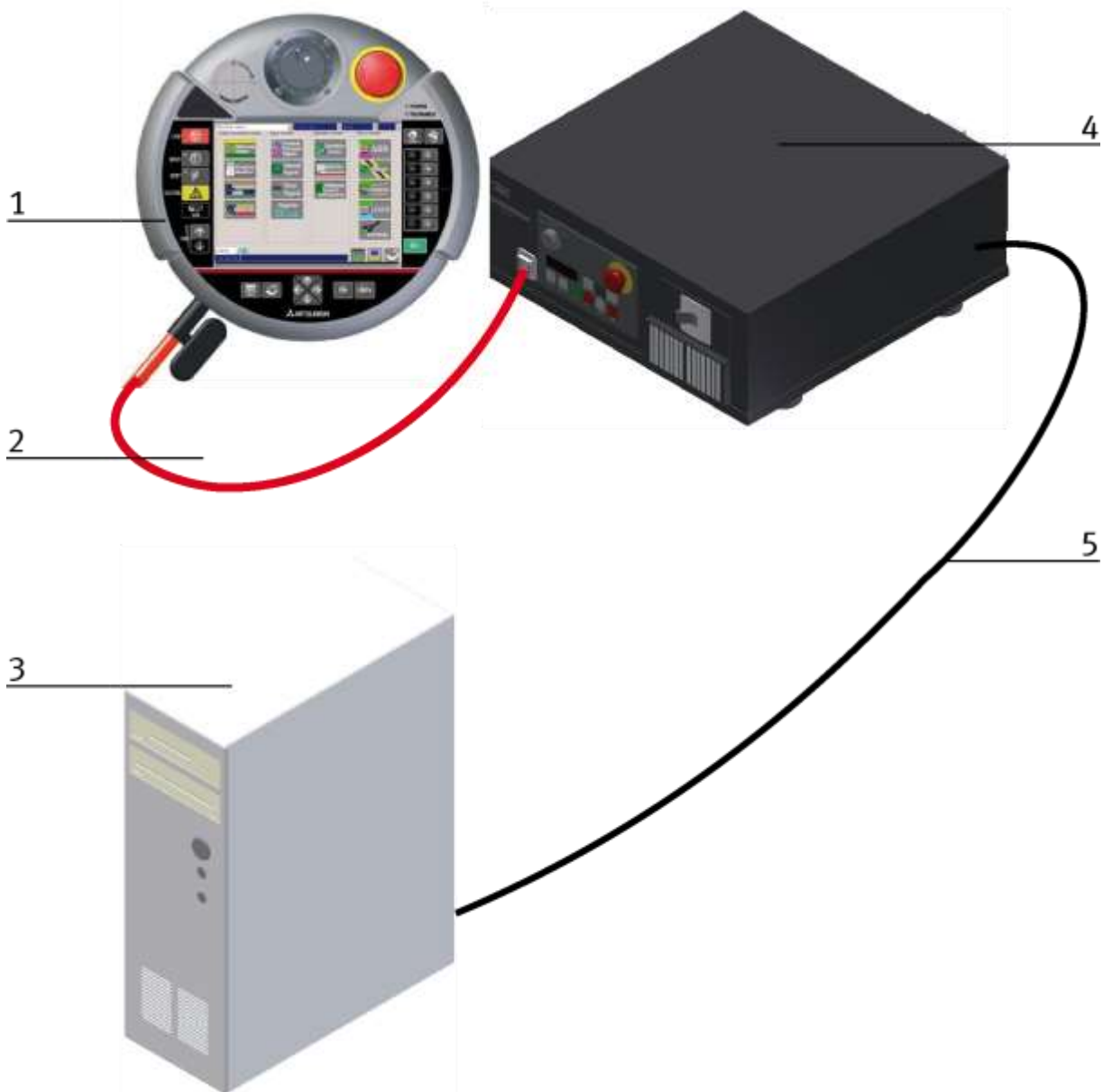
Teachpendant

8.1.3 Set up



Robot RV4-FL set up example for standalone mode / illustration similar

| Position | Description |
|----------|--|
| 1 | CN1 cabel |
| 2 | CN 2 cabel |
| 3 | Drive Unit CR750-D |
| 4 | 50 Pin cable from Ria-Box to slot 1 / there is a special cable necessary, this cable is plugged at the Drive Unit and then connected to the 50 PIN cable |
| 5 | RIA Box |



Robot RV4-FL set up example for standalone mode / illustration similar

| Position | Description |
|----------|-----------------------------|
| 1 | TB |
| 2 | Cable to Drive Unit |
| 3 | Programming PC |
| 4 | Drive Unit CR750D |
| 5 | Cable to Ethernet interface |

8.1.4 Interface Drive Unit

| Sensor Name | | RV-4FL Robot | | | | | SIEMENS PLC |
|----------------------------|-----------------------|------------------|------------------|------------------|------------------------|---------------------------------------|----------------|
| | | Variable Name | Input/ Output | Robot address | Data Type | Comment | PLC Address |
| connected to robot IO card | CNC | DoorOpened | Input | 16 | Bit | Milling machine door opened | |
| | CNC | DoorClosed | Input | 17 | Bit | Milling machine door closed | |
| | CNC | ViceOpened | Input | 18 | Bit | Milling machine vice opened | |
| | CNC | ViceClosed | Input | 19 | Bit | Milling machine vice closed | |
| | CNC | CNCRefPose | Input | 20 | Bit | Milling machine in reference position | |
| | CNC | CNCStopped | Input | 21 | Bit | Milling machine program is stopped | |
| | CNC | CNCInError | Input | 22 | Bit | Milling machine error in status | |
| Robot status Info region | | #STOP2 | Input | 2000 | Bit | Stop | 100.0 |
| | | #START | Input | 2001 | Bit | Program started | 100.1 |
| | | #IOENA | Input | 2002 | Bit | Set operation rights enable | 100.2 |
| | | #SLOTINIT | Input | 2003 | Bit | Reset program | 100.3 |
| | | #SRVON | Input | 2004 | Bit | Servo power supply on | 100.4 |
| | | #SRVOFF | Input | 2005 | Bit | Servo power supply off | 100.5 |
| | | #ERRRESET | Input | 2006 | Bit | Reset error input signal | 100.6 |
| | | #PRGSEL | Input | 2007 | Bit | Choose program input signal | 100.7 |
| | | #OVRDSEL | Input | 2008 | Bit | Choose override input signal | 101.0 |
| | | #PRGOUT | Input | 2009 | Bit | Program number output request | 101.1 |
| | | #OVRDOUT | Input | 2010 | Bit | Override value request | 101.2 |
| | | #ERROUT | Input | 2011 | Bit | Error number output request | 101.3 |
| | | #Reserved | Input | 2012 - 2015 | | Reserved | |
| | | #IODATA | Input | 2016 - 2031 | Word | Numeric value input | 102 - 103 |
| | | DI_RetryLastStep | Input | 2032 | Bit | Retry last step | 104,0 |
| | | DI_ExitCurrCycle | Input | 2033 | Bit | Exit current program cycle | 104,1 |
| | Reserve_RobS tate1 | Input | 2034 - 2039 | | Reserved for extension | | |
| | Reserve_RobS tate2 | Input | 2040 - 2047 | Byte | Reserved for extension | 105 | |

| Sensor Name | | RV-4FL Robot | | | | | SIEMENS PLC |
|-------------------------------|------|-------------------|--------|-------------|------|-------------------------------|-------------|
| Robot Variable Info Region | | ReservedWord1 | Input | 2048 - 2063 | Word | Reserved Word 1 | 106 - 107 |
| | | ReserveByte1 | Input | 2064 - 2071 | Byte | Reserved Byte 1 | 108 |
| | | ReserveByte2 | Input | 2072 - 2079 | Byte | Reserved Byte 2 | 109 |
| | | ReserveByte3 | Input | 2080 - 2087 | Byte | Reserved Byte 3 | 110 |
| | | ReserveByte4 | Input | 2088 - 2095 | Byte | Reserved Byte 4 | 111 |
| | | ReserveByte5 | Input | 2096 - 2103 | Byte | Reserved Byte 5 | 112 |
| | | ReserveByte6 | Input | 2104 - 2111 | Byte | Reserved Byte 6 | 113 |
| | | ReserveByte7 | Input | 2112 - 2119 | Byte | Reserved Byte 7 | 114 |
| | | ReserveByte8 | Input | 2120 - 2127 | Byte | Reserved Byte 8 | 115 |
| | | ReserveByte9 | Input | 2128 - 2135 | Byte | Reserved Byte 9 | 116 |
| | | ReserveByte10 | Input | 2136 - 2143 | Byte | Reserved Byte 10 | 117 |
| Connected PLC card | BG50 | DI_WPPalAvail | Input | 2144 | Bit | Workpiece pallet is available | 118,0 |
| | BG51 | DI_WPAAtStopAvail | Input | 2145 | Bit | Workpiece at stopper position | 118,1 |
| | | ReserveSensor1 | Input | 2146 - 2151 | Bit | Reserved for sensor group 1 | |
| | | ReserveSensor2 | Input | 2152 - 2159 | Byte | Reserved for sensor group 2 | 119 |
| | | ReserveSensor3 | Input | 2160 - 2167 | Byte | Reserved for sensor group 3 | 110 |
| | | ReserveSensor4 | Input | 2168 - 2175 | Byte | Reserved for sensor group 4 | 111 |
| | | | | | | | |
| Connected with robot I/O card | CNC | StartNCPrg | Output | 24 | Bit | Start loaded CNC program | |
| | CNC | StopCNC | Output | 25 | Bit | Stop CNC program | |
| | CNC | OpenDoor | Output | 26 | Bit | Open door of CNC machine | |
| | CNC | CloseDoor | Output | 27 | Bit | Close door of CNC machine | |
| | CNC | OpenVice | Output | 28 | Bit | Open vice of CNC machine | |
| | CNC | CloseVice | Output | 29 | Bit | Close vice of CNC machine | |

| Sensor Name | RV-4FL Robot | | | | | SIEMENS PLC |
|----------------------------|-------------------|-------------|-------------|------------------------|----------------------------------|-------------|
| Robot Status Info Region | #STOP2 | Output | 2000 | Bit | Stop | 100.0 |
| | #START | Output | 2001 | Bit | Start program | 100.1 |
| | #IOENA | Output | 2002 | Bit | Set operation rights enable | 100.2 |
| | #SLOTINIT | Output | 2003 | Bit | Enable choose program | 100.3 |
| | #SRVON | Output | 2004 | Bit | Servo on | 100.4 |
| | #SRVOFF | Output | 2005 | Bit | Servo off | 100.5 |
| | #ERRRESET | Output | 2006 | Bit | Output signal for errors | 100.6 |
| | #RCREADY | Output | 2007 | Bit | Controller ready | 100.7 |
| | #BATERR | Output | 2008 | Bit | Power supply is missing | 101.0 |
| | #PRGOUT | Output | 2009 | Bit | Program number output signal | 101.1 |
| | #OVRDOUT | Output | 2010 | Bit | Override value output signal | 101.2 |
| | #ERROUT | Output | 2011 | Bit | Error number output signal | 101.3 |
| | #ATOPMD | Output | 2013 | Bit | Teachmode output | 101,5 |
| | #TEACHMD | Output | 2014 | Bit | Teachmode output | 101,6 |
| | #IODATA | Output | 2016 - 2031 | Word | Numeric value output | 102 - 103 |
| | IsRbtArmHome | Output | 2032 | Bit | Robot arm in basic position | 104,0 |
| | IsRbtArmInByPass | Output | 2033 | Bit | Robot arm over bypass | 104,1 |
| | IsRbtArmInMill | Output | 2034 | Bit | Robot arm inside milling machine | 104,2 |
| | Reserve_RobState1 | Output | 2035 - 2039 | | Reserved for robot status | |
| Reserve_RobState2 | Output | 2040 - 2047 | Byte | Reserved for extension | 105 | |
| Robot Variable Info Region | ReservedWord1 | Output | 2048 - 2063 | Word | Reserved Word 1 | 106 - 107 |
| | ReturnValue | Output | 2064 - 2071 | Byte | Return value robot | 108 |
| | ReserveByte1 | Output | 2072 - 2079 | Byte | Reserved Byte 1 | 109 |
| | ReserveByte2 | Output | 2080 - 2087 | Byte | Reserved Byte 2 | 110 |
| | ReserveByte3 | Output | 2088 - 2095 | Byte | Reserved Byte 3 | 111 |
| | ReserveByte4 | Output | 2096 - 2103 | Byte | Reserved Byte 4 | 112 |
| | ReserveByte5 | Output | 2104 - 2111 | Byte | Reserved Byte 5 | 113 |

| Sensor Name | | RV-4FL Robot | | | | SIEMENS PLC |
|-------------|------------------|--------------|-------------|------|-----------------------------------|-------------|
| | ReserveByte6 | Output | 2112 - 2119 | Byte | Reserved Byte 6 | 114 |
| | ReserveByte7 | Output | 2120 - 2127 | Byte | Reserved Byte 7 | 115 |
| | ReserveByte8 | Output | 2128 - 2135 | Byte | Reserved Byte 8 | 116 |
| | ReserveByte9 | Output | 2136 - 2143 | Byte | Reserved Byte 9 | 117 |
| CNC | DO_CNCAutoMode | Output | 2144 | Bit | CNC machine in automatic mode | 118,0 |
| CNC | DO_CNCPrgRunning | Output | 2145 | Bit | Program in CNC machine is running | 118,1 |
| CNC | DO_CNCDoorOpen | Output | 2146 | Bit | CNC door opened | 118,2 |
| CNC | DO_CNCViceOpen | Output | 2147 | Bit | CNC vice opened | 118,3 |
| | ReserveSensor 1 | Output | 2148 - 2151 | | Reserved for sensor group 1 | |
| | ReserveSensor 2 | Output | 2104 - 2011 | Byte | Reserved for sensor group 2 | 119 |
| | ReserveSensor 3 | Output | 2160 - 2167 | Byte | Reserved for sensor group 3 | 110 |
| | ReserveSensor 4 | Output | 2168 - 2175 | Byte | Reserved for sensor group 4 | 111 |

8.1.5 Parameter

For the configuration of a new Drive Unit, you have to adjust the following parameters. After the configuration, the Drive Unit has to be switched off and then switched on again.

Tool offsets:

- MEXTL1= 0,0,205,0,0,0
- MEXTL2= 0,0,170,0,0,0
- MEXTL3= 0,0,151.50,0,0,0
- MEXTL4= 0,0,0,0,0,0

Communication parameter DP

- PBNUM=10;
- STOP2=2000,2000;
- START=2001,2001;
- IOENA=2002,2002;
- SLOTINIT=2003,2003;
- SRVON=2004,2004;
- SRVOFF=2005,2005;
- ERRRESET=2006,2006;
- PRGSEL=2007;
- RCREADY=-1,2007;
- OVRDSEL=2008;
- BATERR=-1,2008;
- PRGOUT=2009,2009;
- OVRDOUT=2010,2010;
- ERROUT=2011,2011;
- ATTOPMD=-1,2013;
- TEACHMD=-1,2014;
- IODATA=2016,2031,2016,2031;

Communication parameter Ethernet Camera:

- COMDEV=Us, "", "OPT12", "OPT13", "", "", "", "", "";
- NETHSTIP=Us, "192.168.0.2", "192.168.0.3", "Camera_IP_Address", "192.168.0.5", "192.168.0.6", "192.168.0.7", "192.168.0.8", "192.168.0.9", "192.168.0.10";
- NETPORT=10000, 10001, 10002, Camera_Port, 10004, 10005, 10006, 10007, 10008, 10009
- NETMODE=Ud,1,1,0,1,1,1,1,1,1;

Slot Parameter:

- SLT1=Us, "3", "CYC", "START", "1";
- SLT2=Us, "MONITORHOME", "REP", "ALWAYS", "1";
- SLT3=Us, "ENRGSAVEVACU", "REP", "ALWAYS", "1";
- SLT4=Us, "PCBTRAYCNTRL", "REP", "ALWAYS", "1";
- SLT5=Us, "MONITORPALWS", "REP", "ALWAYS", "1";

8.1.6 Main tasks/Programs

The following programs have to be loaded into the Drive Unit and must be available there:

Sub programs

| Prg Number | Description |
|------------|-------------|
| 1 | Load CNC |
| 2 | Reload CNC |

8.1.7 Return message

| Return Code | Description |
|-------------|--|
| 1 | Robot gripper closed |
| 2 | Safety door opened (front / back) |
| 11 | Unknown tool type gripped |
| 21 | Undefined Stopper Number |
| 22 | Unknown Program number |
| 31 | Camera found no workpiece |
| 41 | Workpiece assembly position occupied |
| 42 | No workpiece placed at the assembly position |
| 43 | Workpiece upside down oriented |
| 44 | Workpiece orientation not correct |
| 45 | Workpiece not clamped at assembly position |
| 51 | PCB tray in wrong orientation |
| 52 | Unknown PCB pallet number |
| 53 | No PCB found at the ordered Pallet Number |
| 54 | PCB at pallet position available |
| 61 | All fuse magazines are empty |
| 62 | Unknown fuse magazine number |
| 63 | Fuse magazine is full |

8.1.8 Further information to robot

To operate and further information to robot, see Mitsubishi robot manual.

8.2 Robot positions

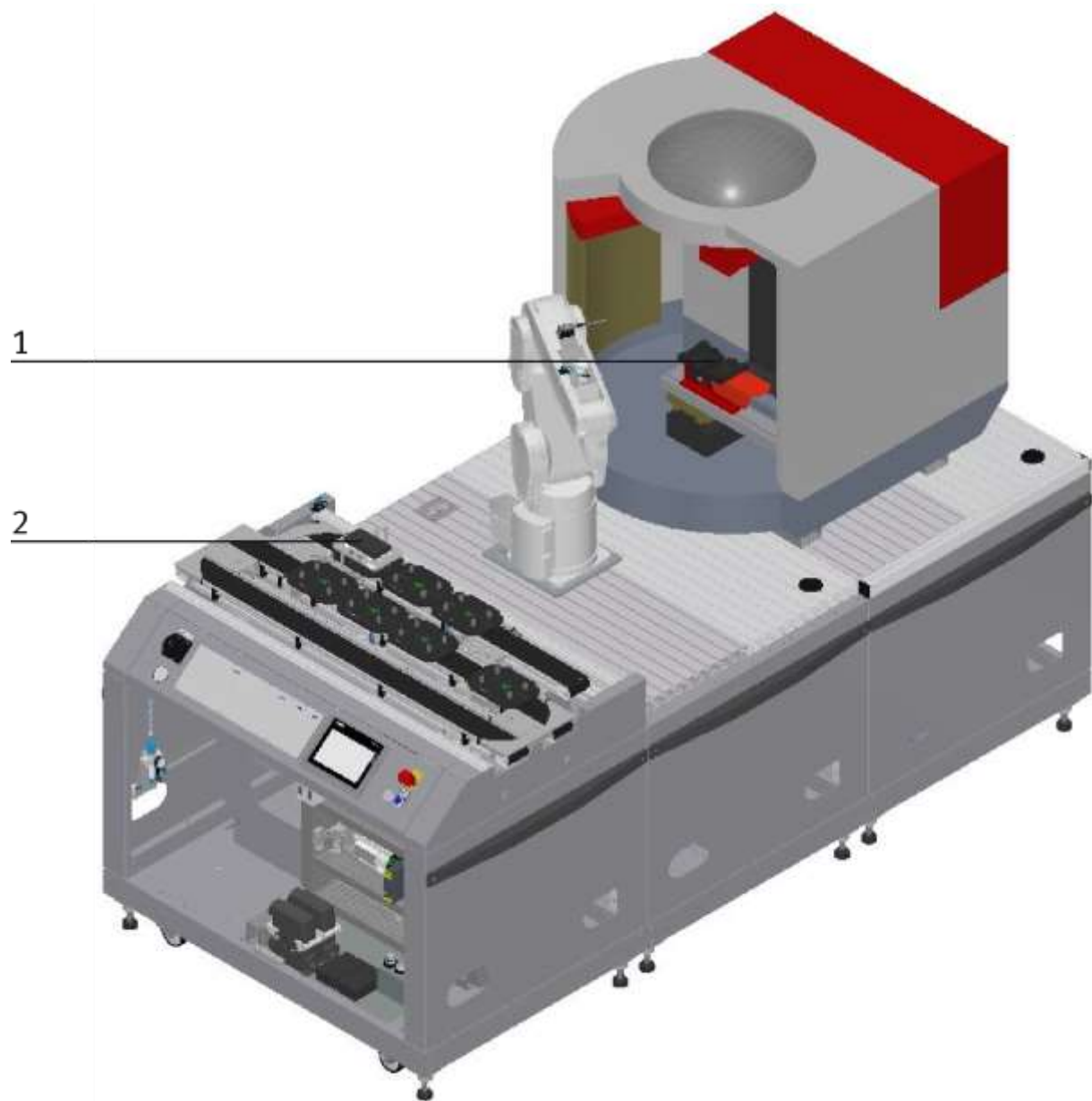


Illustration similar

| Position | Description |
|----------|---|
| 1 | P_ByPassPalPose = Tool 1 front cover pick up position at the bypass station |
| 2 | P_MillClampPose = Tool 1 product held at the vice of the Mill machine |

8.3 Electrical components

8.3.1 2 Quadrant Controller



Illustration similar

Description

Electronics for DC motors excited by magnet up to about 200 W

The module M-MZ-4-30 is a two-quadrant motor control for DC motors with anti-clockwise and clockwise rotation. It guarantees a safe starting and stopping as well as the control of the rotational direction of motors. In off-state, the load is short-circuited which results in a dynamic braking. By the inlet SLOW, you can switch over from slow speed (adjustment at Tr1) to high speed. At the inlet STOP a limit switch can be installed.

Use:

Motor controls for brushed motors

Electronic load relay for solenoid valves and various loads

Characteristics

- Anti-clockwise and clockwise rotation
- Switch-over from high speed to the speed adjusted at the TR.1
- Port for limit switch for stop
- Short-circuit proof and temperature protected
- Limitation for starting circuit

Technical Data

Type: M-MZS-4-30

Item No. 06.05.020

| Technical Data | | | | | |
|-----------------|--|---------------|--|---------|--|
| Control circuit | Input A1/A2 A1=Start clockwise A2=Start anticlockwise | Start wave | 8 | (V) | |
| | | Stop wave | 5 | (V) | |
| | | Allowed range | 0-35 | (V) | |
| | Input A3/A4 A3=slow drive A4=Stop | Shift wave | 8 | (V) | |
| | | Allowed range | 0-35 | (V) | |
| | Adjustment range for turning speed with trimmer at front plate (typical) | | 0 to max. turning speed | | |
| | Start delay at A1 and A2 to 24V | | < 2 | (ms) | |
| Load circle | Nominal voltage (power supply) U_b /range | | 24 (19-30) | (VDC) | |
| | Load current/constant load | | 3/5 depends on switching frequency | (A) | |
| | Input current at U_n /without load circle | | T 10 mA | (mA) | |
| | Loading current I_{max} . T=1 sec. | | 20 | (A) | |
| | Current detection at short | | 95 Typ. (45-140) | A | |
| | De-energize time at short | | 80-400 | μs | |
| Other data | Current entry at stop | | <20 | (mA) | |
| | Allowed surrounding temperature | | -20 to +40 | (C°) | |
| | DIN VDE-regulations | | 0110, 0160 in parts | | |
| | Any assembly position / DIN-rail assembly | | No / Yes | | |
| | Housing | | Plastic housing light grey | | |
| | Dimensions | | 59x77x50 | mm | |
| | Weight | | Approx. 100 | G | |
| | Temperature / short guard | | Yes / Yes | | |
| | Connection type screw connection | | 4mm ² , 2,5mm ² Yes | | |

Connection diagram

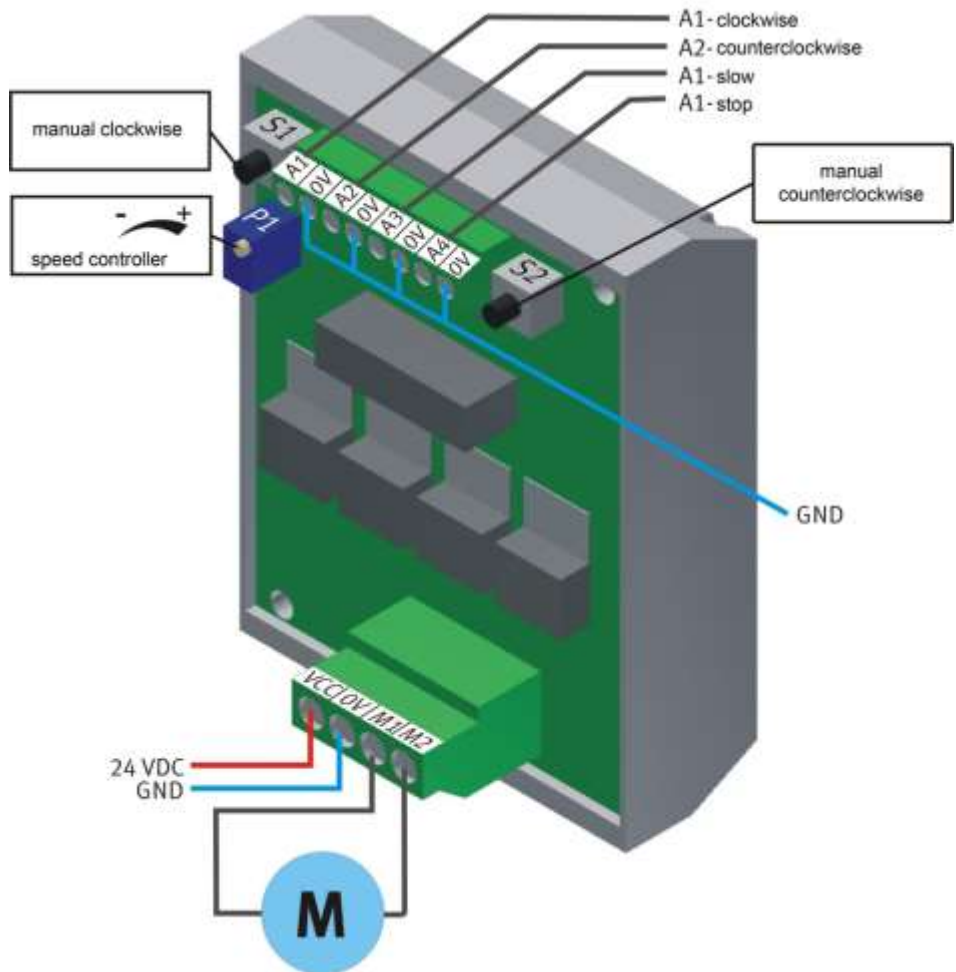


Illustration similar

| Input / Output | Starting Current Limiter | Description |
|-----------------------------|--------------------------|---|
| Control -5K2 / Q0.4:26 | X1:re | Conveyor drive unit clockwise rotation |
| Control -5K2 / Q0.5:27 | X1:li | Conveyor drive unit anti-clockwise rotation |
| Control -5K2 / Q0.5:28 | X1:sl | Conveyor drive unit creep speed |
| Control -5K2 / Q0.6:29 | X1:st | Conveyor drive unit Stop |
| Conveyor motor DC / -X3M1:4 | X2:M1 | Conveyor motor connection |
| Conveyor motor DC / -X3M2:3 | X2:M2 | Conveyor motor connection |

8.3.2 Controller Siemens

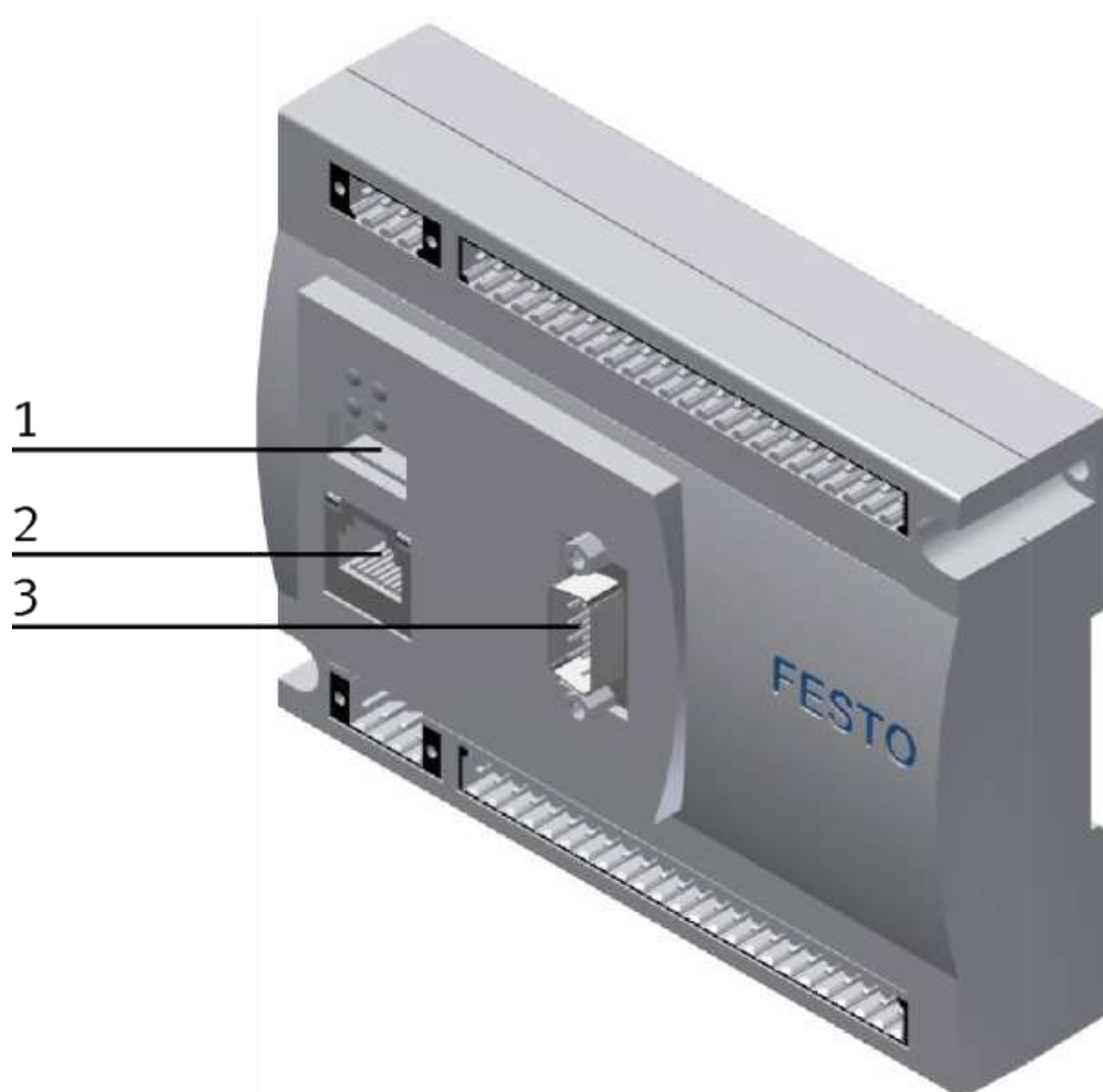


Siemens ET200 SP / CPU 1512SP F-1PN / Illustration similar

For detailed information see electrical circuit diagram.

8.3.3 Controller Festo CECC

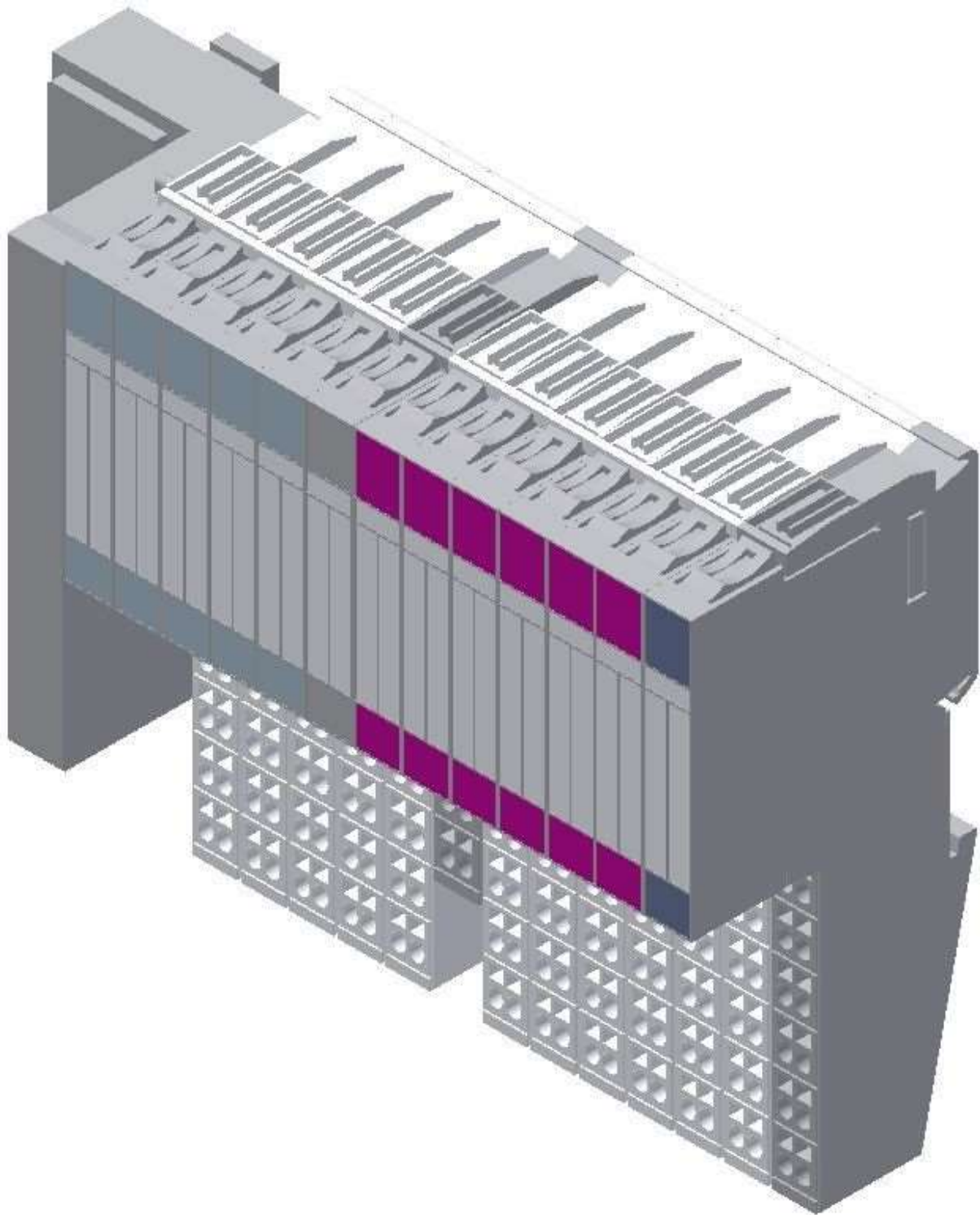
The controller is only one part (Order number; 574418-CECC-LK)



Festo CECC / illustration similar

| Position | Description | Comment |
|----------|--------------------------|--|
| 1 | USB interface | For external memory |
| 2 | Ethernet interface RJ 45 | For PC (for programming with CodeSys) or for external operation panel CDPX |
| 3 | CanOpen interface | To connect CanOpen slaves |

8.3.4 Turck Interface



Turck interface / illustration similar

For detailed information see electrical circuit diagram.

8.3.5 Touch Panel



Siemens TP 700 Comfort / illustration similar

Supply voltage

| | |
|-------------------------------------|--------|
| Type of supply voltage | DC |
| Rated value (DC) | 24 V |
| permissible range, lower limit (DC) | 19.2 V |
| permissible range, upper limit (DC) | 28.8 V |

Input current

| | |
|-----------------------------------|-----------------------|
| Current consumption (rated value) | 0.5 A |
| Starting current inrush I^2t | 0.5 A ² ·s |

Power

| | |
|-------------------------|------|
| Power consumption, typ. | 12 W |
|-------------------------|------|

Processor

| | |
|----------------|-----|
| Processor type | X86 |
|----------------|-----|

Memory

| | |
|--------------------------------|----------|
| Flash | Yes |
| RAM | Yes |
| Memory available for user data | 12 Mbyte |

8.3.6 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.

Product properties

SCALANCE X-208

Operating Instructions, 12/2011, A5E00349864-19

TP ports / Connector pinout

On the SCALANCE X208, the TP ports are implemented as RJ-45 jacks with MDI-X assignment (Medium Dependent Interface–Autocrossover) of a network component.

RJ-45 jack

Pin number

Assignment

Pin 8 n. c.

Pin 7 n. c.

Pin 6 TD-

Pin 5 n. c.

Pin 4 n. c.

Pin 3 TD+

Pin 2 RD-

Pin 1 RD+

NOTICE

TP cords or TP-XP cords with a maximum length of 10 m can be connected to the RJ-45

TP port. With the IE FC cables and IE FC RJ-45 plug 180, an overall cable length of up to 100 m is permitted between two devices depending on the cable type.

Autonegotiation

Autonegotiation means the automatic detection of the functionality of the port at the opposite end. Using autonegotiation, repeaters or end devices can detect the functionality available at the port of a partner device allowing automatic configuration of different types of device. With autonegotiation, two components connected to a link segment can exchange parameters and set themselves to match the supported communication functionality.

Note

If an IE switch port operating in autonegotiation mode is connected to a partner device that is not operating in autonegotiation mode, the partner device must be set permanently to half duplex mode. If an IE switch port is set permanently to full duplex, the connected partner device must also be set to full duplex. If the autonegotiation function is disabled, the MDI/MDI-X auto crossover function is also inactive. This means it may be necessary to use a crossover cable.

Note

The SCALANCE X208 is a plug-and-play device that does not require settings to be made for commissioning.

MDI / MDIX autocrossover function

The advantage of the MDI /MDIX autocrossover function is that straight-through cables can be used throughout and crossover Ethernet cables are unnecessary. This prevents malfunctions resulting from mismatching send and receive wires. This makes installation much easier for the user. IE Switches X-200 support the MDI / MDIX autocrossover function.

NOTICE

Please note that the direct connection of two ports on the switch or accidental connection over several switches causes an illegal loop. Such a loop can lead to network overload and network failures.

Auto polarity exchange

If the pair of receiving cables are incorrectly connected (RD+ and RD- swapped over), the polarity is reversed automatically.

8.4 RFID with Ethernet



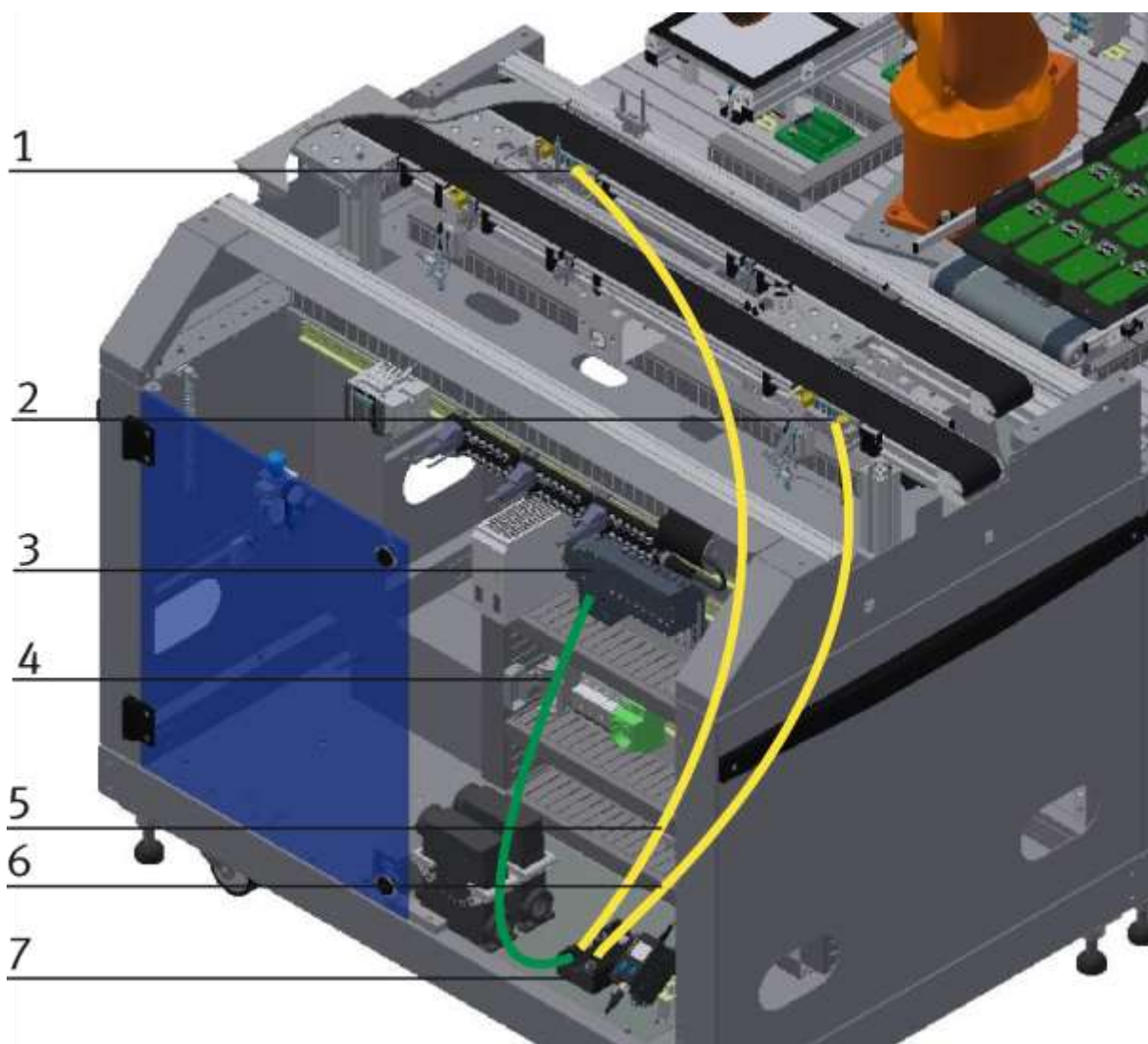
Turck – TBEN-S2-2RFID-4DXP / 6814029 / illustration similar

I/O data mapping

The BLident RFID-a interface modules cannot be controlled by the process data only. In any case, there is a software functional module required in the control. The functional module has been standardized for the RFID systems and is called Proxy Ident Block (PIB).

| Input | Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|----------|------|----------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Chanel 0 | 0 | Status word channel 0- low byte | | | | | | | |
| | 1 | Status word channel 0- high byte | | | | | | | |
| Chanel 1 | 2 | Status word channel 1- low byte | | | | | | | |
| | 3 | Status word channel 1- high byte | | | | | | | |

| Output | Byte | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|----------|------|-----------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Chanel 0 | 0 | Control word channel 0- low byte | | | | | | | |
| | 1 | Control word channel 0- high byte | | | | | | | |
| Chanel 1 | 2 | Control word channel 1- low byte | | | | | | | |
| | 3 | Control word channel 1- high byte | | | | | | | |



Wiring of the Ethernet module to the RFID interface / illustration similar

| Pos | Name |
|-----|--|
| 1 | Turck read-write head TB-M18-H1147 (equipment identifier G-TF80) |
| 2 | Turck read-write head TB-M18-H1147 (equipment identifier G-TF81) |
| 3 | Controller ET200SP / CPU 1512SP F-1PN (equipment identifier K5-KF1) |
| 4 | Ethernet cable from Turck module to controller (via Scalance) |
| 5 | Turck cable from Turck read-write head to Turck module |
| 6 | Turck cable from Turck read-write head to Turck module |
| 7 | Turck Ethernet module with RFID interface (equipment identifier K2-KF80) |



RFID read-write head / illustration similar

The Turck RFID read-write head is mounted on the stopper unit on the conveyor.
Its designation is TB-M18-H1147.

| Name | |
|----------------------------|--------------------|
| Operating voltage | 10...30 VDC |
| DC rated operating current | 0-80 mA |
| Operating voltage | DC |
| Data transfer | Inductive coupling |
| Working frequency | 13,56 MHz |
| Read-write distance | max. 30 mm |

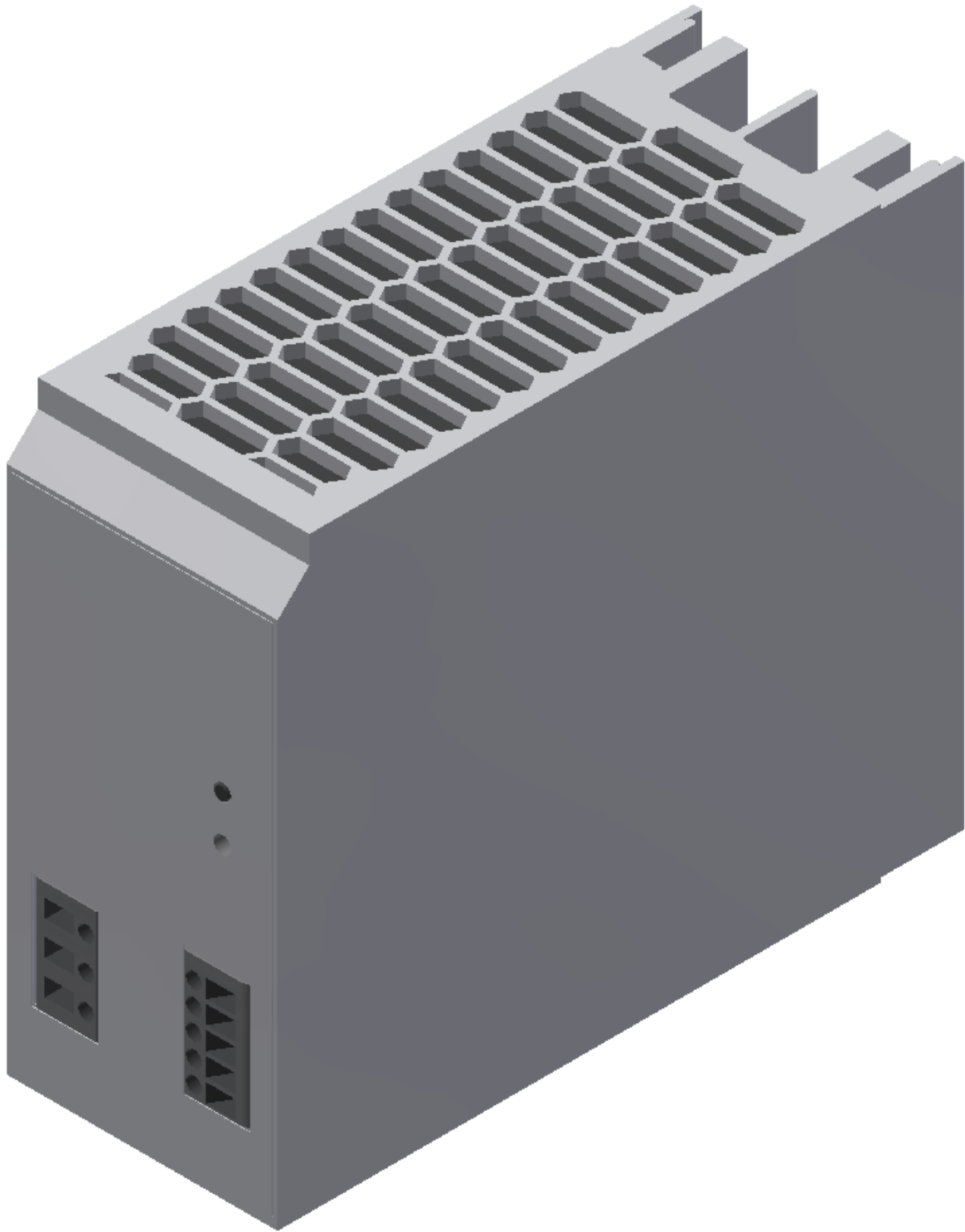
8.4.1 Electronic circuit protection



Murr Mico electronic circuit protection 2-channels / illustration similar

| Description | |
|------------------------|--|
| Input | |
| Operating voltage | 24 V DC (18...30 V DC) |
| Control inputs | |
| Input voltage (ON) | 10...30 V DC |
| Impulse length (ON) | min. 20 ms |
| Control outputs | |
| Group alarm output | Potential free 30 V AC/DC, 100 mA |
| General data | |
| Connection | Spring clamp terminals |
| Input terminals | 1 × 16 mm ² |
| Output terminals | Per output 1 × 4 mm ² |
| Alarm terminals | 2.5 mm ² |
| Bridging concept | Two sides, with spring clamp terminals or bridge set (max. 40 A) |
| Mounting method | DIN-rail mountable TH35 (EN 60715) |
| Dimensions H×B×T | 90×36×80 mm |
| Temperature range | 0...+55 °C (storage temperature -40...+80 °C) |
| Output | |
| Current adjustment | 1 A, 2 A, 4 A, 6 A, by counters inked rotary switch, sealed |
| Inrush capacity | max. 20 mF (per channel) |

8.4.2 Power supply unit



Power supply unit Festo CACN-3A-1-10 / illustration similar

| Description | Value |
|---|---|
| Width | 60 mm |
| Height | 130 mm |
| Length | 152,5 mm |
| Assembly position | Free convection |
| Primary supply | Single-phase |
| Input current | 1,5 - 3,0 A |
| Nominal output voltage DC | 24 V |
| Nominal output current | 10 A |
| Input voltage range AC | 100 ... 240 V |
| Power failure buffering | 24 ms |
| Line frequency | 45 ... 65 Hz |
| Authorisation | C-Tick /c UL us - Listed (OL) |
| CE mark (see declaration of conformity) | to EU directive for EMC to EU directive low-voltage devices |
| Storage temperature | -40 ... 85 °C |
| Relative air humidity | 95 % |
| Protection class | IP20 |
| Ambient temperature | -25 ... 70 °C |
| Product weight | 1.554 g |
| Mounting type | with top-hat rail |
| Materials note | PWIS substances/Conforms to RoHS |

8.4.3 SAFETY RELAY



Siemens Sirius safety relay / illustration similar

| Description | 24 V DC/AC |
|------------------|------------------|
| Mounting type | Span on mounting |
| Part number | 3SK1111-2AB30 |
| Type | SIRIUS 3SK11 |
| Depth | 121.6 mm |
| Height | 100 mm |
| Width | 22.5 mm |
| Current | 5 A |
| Power supply | 24 V/DC; 24 V/AC |
| Max. temperature | 60 °C |
| Min. temperature | -25 °C |
| Product-type | Safety relay |

8.4.4 Mini Terminal



Multi-pin plug distributor / illustration similar

The multi-pin plug distributor is designed for the inputs and outputs of the station. You can connect PNP sensors and two-pole actuators there. The connection is effected by three-pole M8x1 plugs, and the bus terminal by a 15pole sub-D plug connector. The operating status is displayed on yellow LEDs.

Pin allocation on the multi pin plug distributor

Pin allocation 15pole sub-D plug connector

- Signal lines Pin 1 to Pin 12
- DC 24V Pin 13
- 0V Pin 14 and Pin 15

Pin allocation M8 socket corresponding to IEC 947-5-2

- slots 0 to 11
- Signal line socket 4
- DC 24V socket 1
- 0V socket 3

XD20 – Multi pin distributor MPV1

| 15-pole D-Sub Pin | Bit | Name |
|-------------------|--------|--|
| 1 | Bit 0 | Stopper 1 down / -BG20 |
| 2 | Bit 1 | Stopper 1 lower / -MB20 |
| 3 | Bit 2 | Pallet available identity sensor 1 / -BG21 |
| 4 | Bit 3 | Reserve |
| 5 | Bit 4 | Identity sensor 2 / -BG22 |
| 6 | Bit 5 | Reserve |
| 7 | Bit 6 | Identity sensor 3 / -BG23 |
| 8 | Bit 7 | Reserve |
| 9 | Bit 8 | Identity sensor 4 / -BG24 |
| 10 | Bit 9 | Reserve |
| 11 | Bit 10 | Option / downstream station free 1 |
| 12 | Bit 11 | Reserve / Option station occupied 1 |
| 13 | +24 V | |
| 14 und 15 | 0V | |

XD30 – Multi pin distributor MPV2

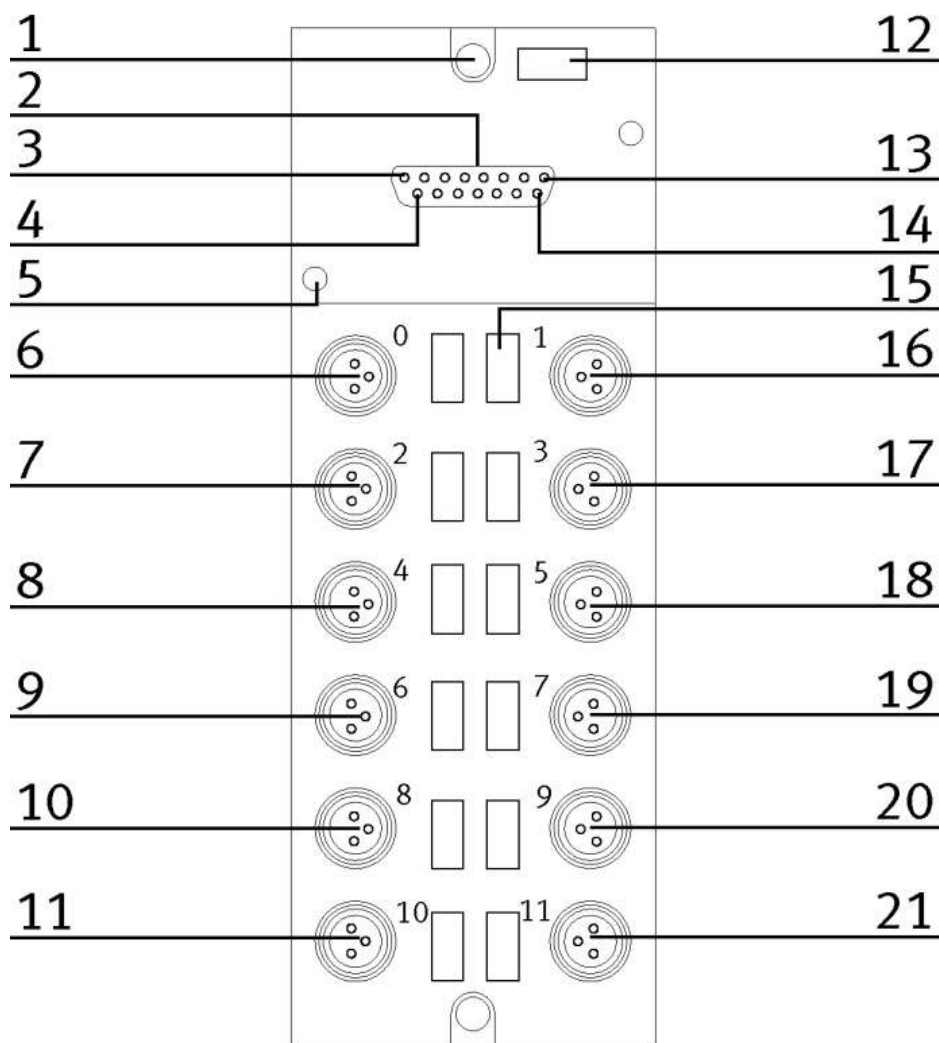
| 15-pole D-Sub Pin | Bit | Name |
|-------------------|--------|--|
| 1 | Bit 0 | Stopper 2 down / -BG30 |
| 2 | Bit 1 | Stopper 2 lower / -MB30 |
| 3 | Bit 2 | Pallet available identity sensor 1 / -BG31 |
| 4 | Bit 3 | Reserve |
| 5 | Bit 4 | Identity sensor 2 / -BG32 |
| 6 | Bit 5 | Reserve |
| 7 | Bit 6 | Identity sensor 3 / -BG33 |
| 8 | Bit 7 | Reserve |
| 9 | Bit 8 | Identity sensor 4 / -BG34 |
| 10 | Bit 9 | Reserve |
| 11 | Bit 10 | Congestion bypass / -BG35 |
| 12 | Bit 11 | Reserve / Option station occupied 1 |
| 13 | +24 V | |
| 14 und 15 | 0V | |

XD40 – Multi pin distributor MPV3

| 15-pole D-Sub Pin | Bit | Name |
|-------------------|--------|--|
| 1 | Bit 0 | Stopper 3 down / -BG40 |
| 2 | Bit 1 | Stopper 3 lower / -MB40 |
| 3 | Bit 2 | Pallet available identity sensor 1 / -BG41 |
| 4 | Bit 3 | Reserve |
| 5 | Bit 4 | Identity sensor 2 / -BG42 |
| 6 | Bit 5 | Reserve |
| 7 | Bit 6 | Identity sensor 3 / -BG43 |
| 8 | Bit 7 | Reserve |
| 9 | Bit 8 | Identity sensor 4 / -BG44 |
| 10 | Bit 9 | Reserve |
| 11 | Bit 10 | Inject WT from bypass / -BG45 |
| 12 | Bit 11 | Reserve / Option station occupied 1 |
| 13 | +24 V | |
| 14 and 15 | 0V | |

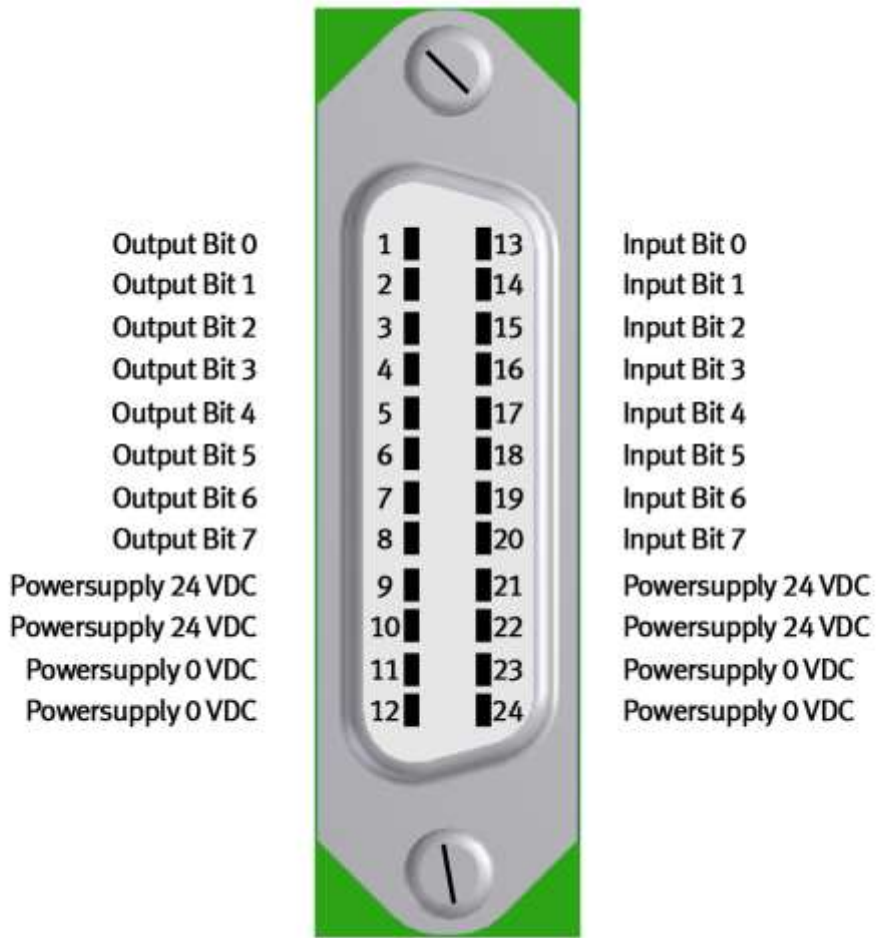
XD50 – Multi pin distributor MPV4

| 15-pole D-Sub Pin | Bit | Name |
|-------------------|--------|--|
| 1 | Bit 0 | Pick up position 1 pallet not available / -BG50 |
| 2 | Bit 1 | Pick up position 1 workpiece not available / -BG51 |
| 3 | Bit 2 | Reserve |
| 4 | Bit 3 | Reserve |
| 5 | Bit 4 | Reserve |
| 6 | Bit 5 | Reserve |
| 7 | Bit 6 | Reserve |
| 8 | Bit 7 | Reserve |
| 9 | Bit 8 | Reserve |
| 10 | Bit 9 | Reserve |
| 11 | Bit 10 | Reserve |
| 12 | Bit 11 | Reserve |
| 13 | +24 V | |
| 14 and 15 | 0V | |



| Pos | Designation | Pos | Designation |
|-----|--------------------|-----|-------------------|
| 1 | Mounting hole | 12 | Inscription label |
| 2 | 15 pole sub-D plug | 13 | PIN 8 |
| 3 | PIN 1 | 14 | PIN 15 |
| 4 | PIN 9 | 15 | Inscription label |
| 5 | Mounting hole M3 | 16 | OUT 0 |
| 6 | IN 0 | 17 | OUT 1 |
| 7 | IN 1 | 18 | OUT 2 |
| 8 | IN 2 | 19 | OUT 3 |
| 9 | IN 3 | 20 | OUT 4 |
| 10 | IN 4 | 21 | OUT 5 |
| 11 | IN 5 | | |

8.4.5 SYS link interface



Syslink allocation

| SYSlink PIN | Bit | Description | 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 | InputEX.4 |
| 06 | 5 | Output AX.5 | 18 | 5 | Input EX.5 |
| 07 | 6 | Output AX.6 | 19 | 6 | InputEX.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 |

8.5 Mechanic components

8.5.1 Motor of Conveyor

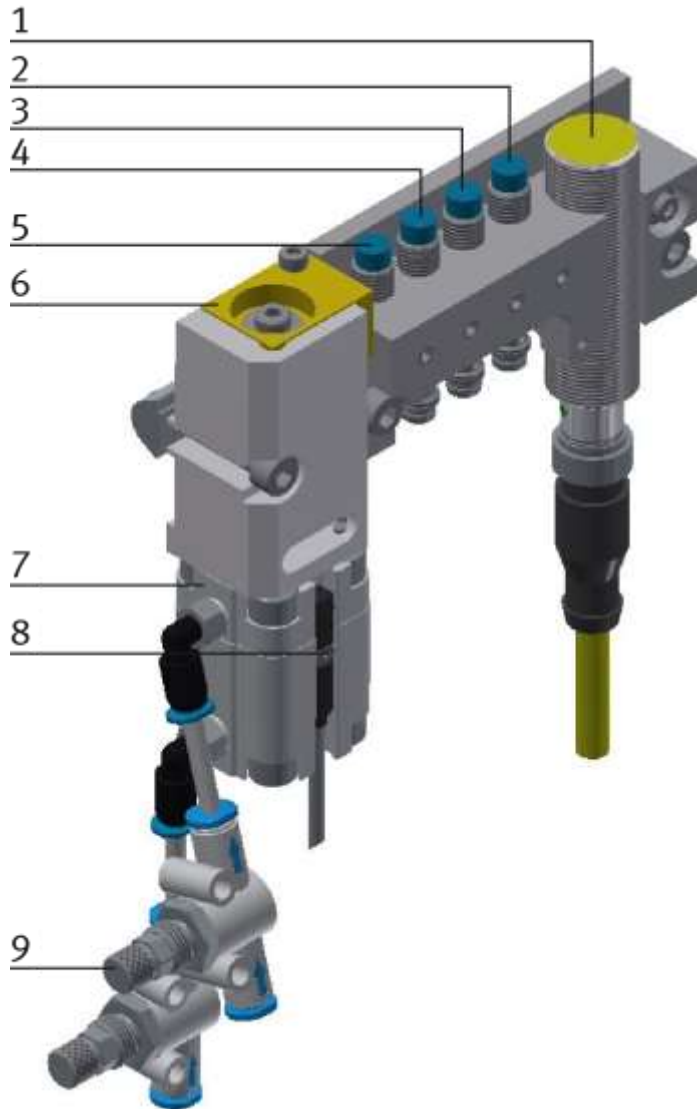


Motor type 403438 / illustration similar

The motor has got the equipment identifier / 3M1

| Name | |
|---|------|
| Nominal voltage UN /Volt | 36 |
| Idling speed n_0 [min ⁻¹] | 120 |
| Rated torque M_N [Nm] | 2 |
| Starting torque M_A [Nm] | 16 |
| Gear ratio i | 53/2 |
| Connection resistance 2 vanes R [m] | 3400 |
| Connection resistance 4 vanes R [m] | 3000 |
| Protection class IP 30 | 30 |
| Weight [kg] | 1 |

8.5.2 The stopper unit



CP Factory Stopper Unit / illustration similar

| Position | Description |
|----------|---|
| 1 | Turck TB-M18-H1147 RFID read-write head / IFM DTM424 RFID read write head |
| 2 | Pallet available Ident sensor 1 / Ordernumber 150395 / SIEN-M8NB-PS-S-L |
| 3 | Pallet available Ident sensor 2 / Ordernumber 150395 / SIEN-M8NB-PS-S-L |
| 4 | Pallet available Ident sensor 3 / Ordernumber 150395 / SIEN-M8NB-PS-S-L |
| 5 | Pallet available Ident sensor 4 / Ordernumber 150395 / SIEN-M8NB-PS-S- |
| 6 | Stopping unit |
| 7 | Stopper cylinder / Ordernumber 157211 / AEVUZ-16-5-P-A |
| 8 | Sensor Stopper lowered / Ordernumber 574334 / SMT-8M-A-PS-24V-E-0,3-M8D |
| 9 | one-way flow control valve / Ordernumber. 193967 / GR-QS-4 |

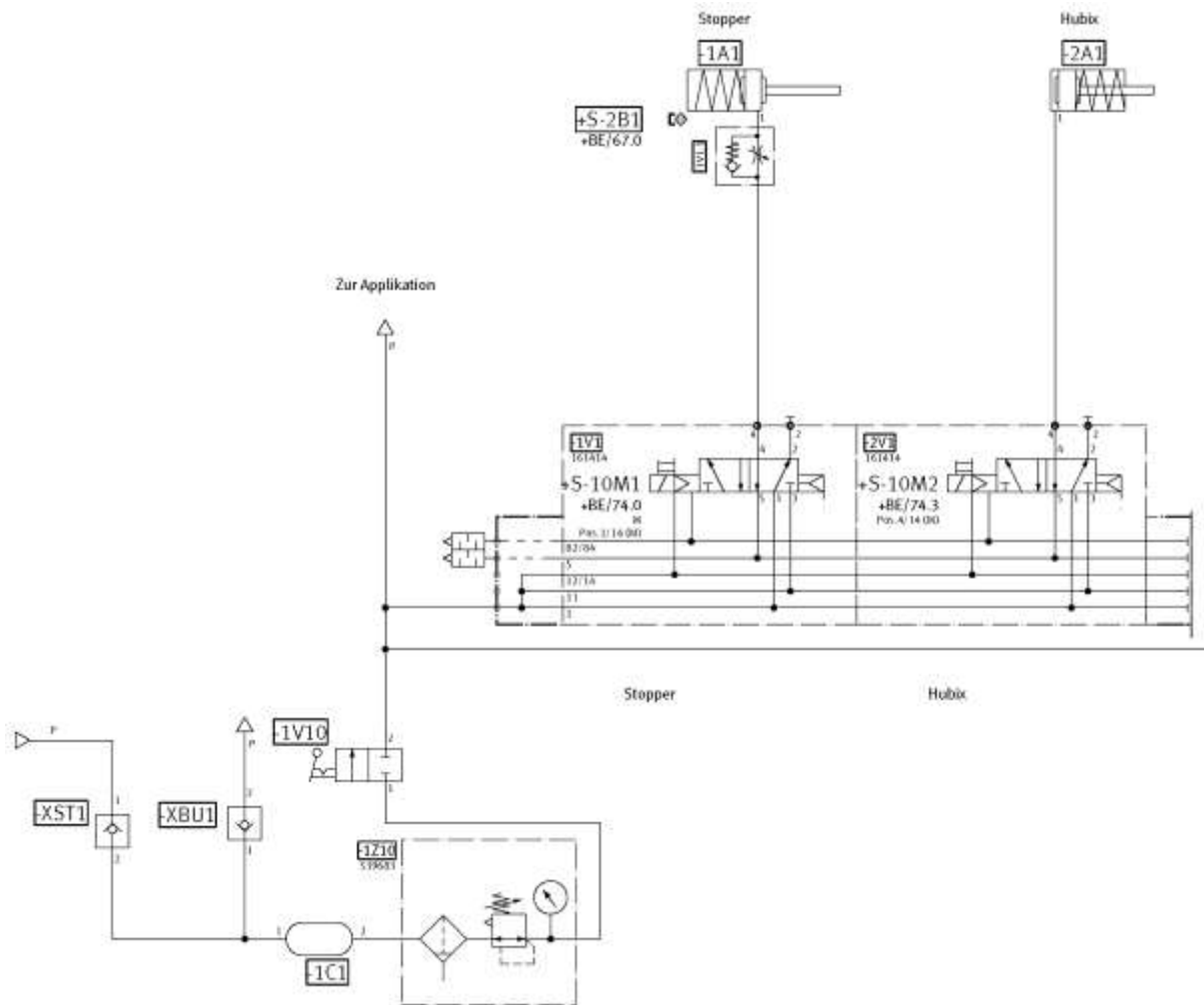
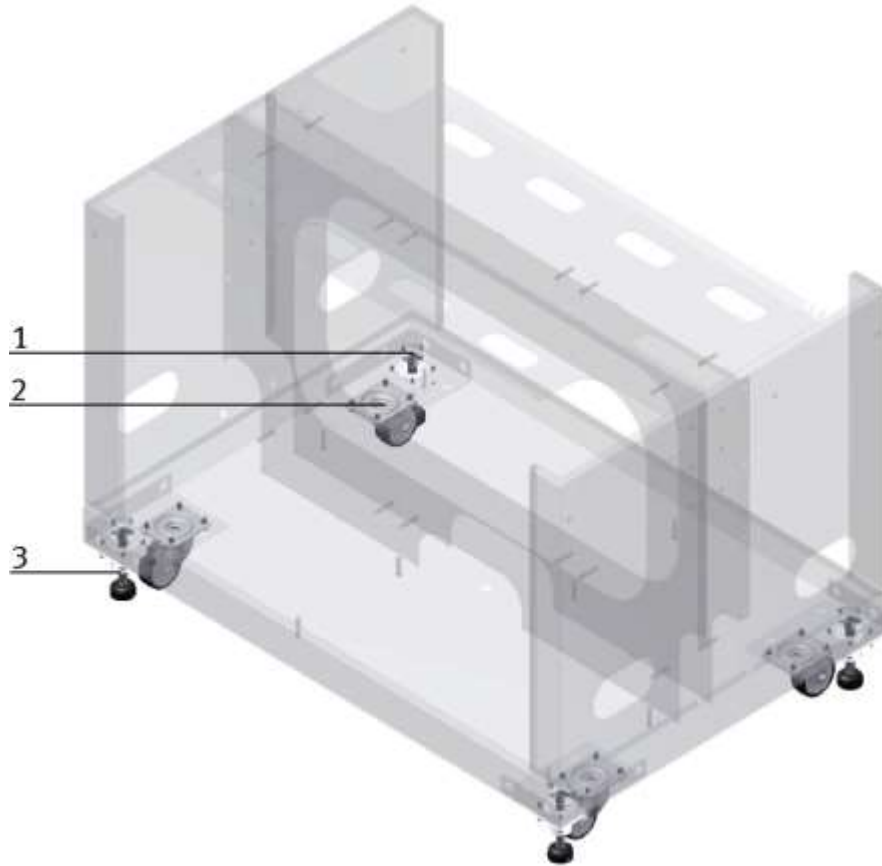


Diagram of pneumatics, Stopper Unit

8.5.3 Transportation of the station



CP Factory Transportation method / illustration similar

With the help of mechanically adjustable feet, you can lower the basic module and then put it on the rollers. In this way, an easy transport is possible. If you wind up the machine mounts, you can move the basic module easily to another place.



| Position | Description |
|----------|---|
| 1 | Star knob for adjusting the height of the machine mount |
| 2 | Roller |
| 3 | Lock nut for locking the machine mount in the position required |

| | |
|--|---|
| | 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. |

8.5.4 Operation panel working position

So that the components in the base frame of the module are more easily accessible, the entire control panel can be folded up.

The panel is gripped at the bottom and folded up. When the panel is completely raised, the springs stand vertically and support the panel against folding down.

| | |
|---|--|
|  |  WARNING |
| | <ul style="list-style-type: none"> • Risk of crushing <ul style="list-style-type: none"> - - Make sure that the springs are vertical and that the panel is secured against folding down. - - It is also important to ensure that no third person can fold the panel down. - - Failure to heed the information given can lead to injuries. |

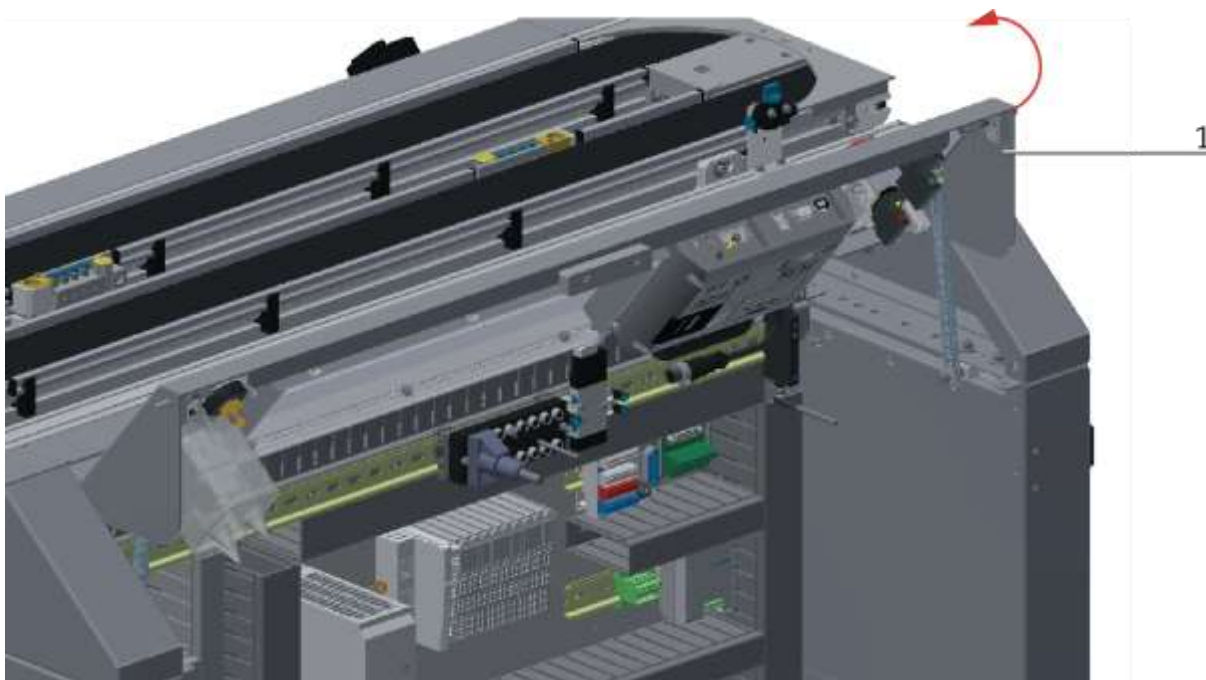


Illustration similar

1. Grip the panel at the bottom and fold it up



Illustration similar

2. Push the springs back in the middle and fold down the control panel


9 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.

| | |
|---|---|
|  | <p style="text-align: right;"><i>NOTE</i></p> <p>Do not use aggressive or abrasive cleaners.</p> |
|---|---|

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


10 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



11 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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