Quotation/Proforma Invoice

121.454

Date

2019

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Content

Festo Didactic – Technical Education Solutions

Festo Didactic is the world-leading provider of equipment and solutions for industrial education. We design and implement learning centers and laboratories, educational equipment and programs that train people to perform in highly dynamic and complex industrial environments. Our goal is to maximize learning success in educational institutions and industrial companies around the globe.

Festo Didactic educational solutions directly evolve from technologies and innovations in automation and engineering. They place students in real-life situations and enable them to gain practical experience with high-tech industrial components and current systems. The product design focuses on excellence in usability and practice orientation: All functional components stand out from their complex industrial surroundings. They are easy to use and easy to remember. Their specific functions, positions and connections within the learning system intuitively show how technologies really work.

All learning environments, such as learning factories, laboratory equipment and e-learning products, are offered in conjunction with technical, organizational and people-oriented training programs – in 40 languages worldwide – and are associated with services like planning and operating complex learning centers, and with consultancy services for industrial companies.

www.festo-didactic.com

Description CP Lab

CP Lab – Industry 4.0 right from the start

CP Lab – The compact Industry 4.0 learning system

The Cyber-Physical Lab is the professional and compact industry 4.0 learning system from Festo Didactic. It contains the relevant technologies and components to provide comprehensive industry 4.0 knowledge.

The modular and flexible design allows working in different learning scenarios: from the individual pallet transfer system with integrated control to the networked production facility with cloud services.

CP Lab – A versatile system

The modularity of the factory layout is one of the most important features of Industry 4.0. The CP Lab modules can be combined and expanded in a variety of ways.

In sequence

By simple combinations of the individual modules, different system configurations can be realised.

In circulation system

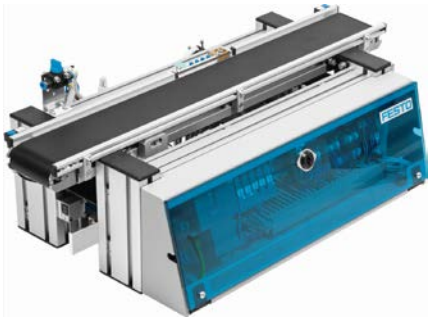
The individual modules can be easily combined "over corner". This means that complete circulation systems can already be implemented with four, six, eight or ten modules.

In combination with mobile robot

The CP Bridge (Branch) is used, as a supplementary module for CP Lab transfer system, to transport workpiece carriers to the next working position. The CP Bridge is the main interface which enables the handover of workpieces from CP Lab to the mobile robot system Robotino® and to CP Factory modules.

The system at a glance

Main components:

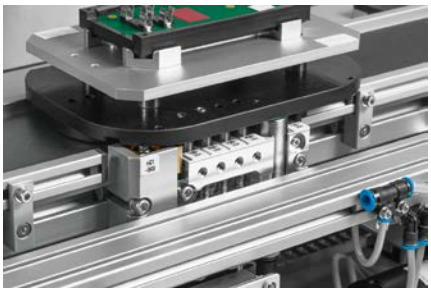


- Integrated control
- Mono-belt transfer system
- Pallet stopper
- 3/2-way valve
- Inductive sensors
- Capacitive sensors at the beginning and end of the conveyor
- RFID-read/write sensor
- Identification system, binary
- Optical transmitters and receivers
- DC or AC motor

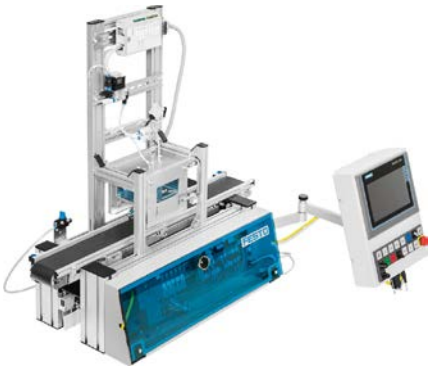
- Motor controller, bidirectional with 2 speed levels
- Incremental encoder
- IO-Link Master
- IO-Link Device
- Analogue I/O via IO-Link
- Control panel

RFID process control

In CP Lab the workpiece takes over the process control. Every carrier is equipped with a RFID-tag on which workpiece parameters are stored.



Following application modules are available:



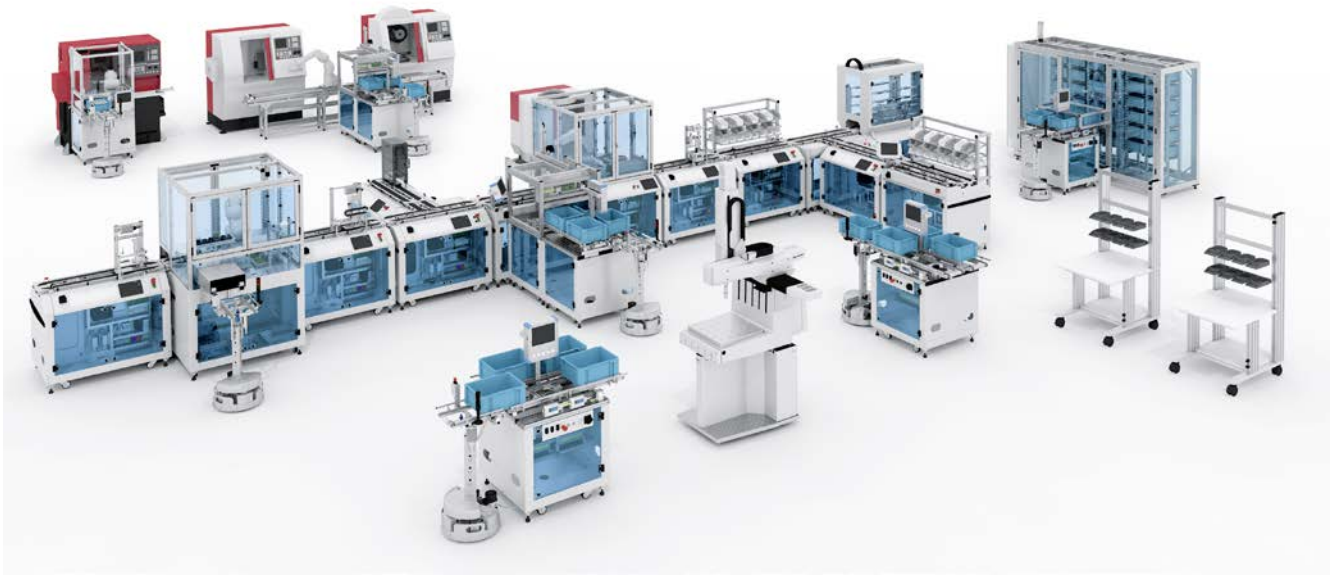
- Magazine
- Turning
- Camera inspection
- Tunnel oven
- Drilling
- Press
- Measure analogue
- Workpiece output
- Labelling
- Pick-by-Light
- Dosing

Further application modules on request.

Position	Quantity	Description

Description CP Factory

CP Factory – The Cyber-Physical Factory



CP Factory – The universal Industry 4.0 training factory

CP Factory reflects the new developments of the networked production of industrial 4.0 and provides a "Smart Factory" kit for training and research.

The training system does not only include assembly lines but also other areas such as production, lean production, logistics and quality assurance.

System versatility

The exceptional flexibility of a CP Factory system is based on the basic design of its cells, which is always identical: dimensions, track rollers, control cabinet, conveyor, control console, system cable.

All CP Factory cells are equipped with rollers. This enables them to be freely positioned in the laboratory without tools or lifting trucks.

Optimum connection

The cells are supplied by a special system cable. Rewiring, fitting new tubing or additional installations are not required when changing the layout. this saves valuable training time and the laboratory remains free of additional supply ducts and trip hazards.

Patented material flow

The passive deflection is a patented development by our engineers. The unique option of using the CP Factory cells individually or in a network with no additional work is based on this development:

- Workpiece carriers can circulate within the cell.
- Comissioning the sybsystems is no problem.
- Subprocesses can be isolated without modifying the software.

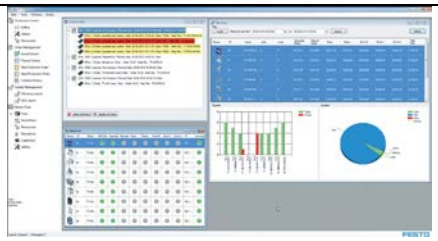
RFID process control

In CP Factory the workpiece takes over the process control. Every carrier is equipped with a RFID-tag on which workpiece parameters are stored.

Mobile Robotics

The mobile robot system is used for transporting workpiece carriers. Robotino® is the mobile robot system for research and education. Upgraded with a laser scanner and a transportation unit makes it an automated guided vehicle (AGV) in the mobile robotics.

Manufacturing Execution System (MES)



MES4 is a didactic structured Manufacturing Execution System (MES), which is designed for Industry 4.0 learning platforms. Special importance is placed on the topics of production control and management.

The MES4 can directly communicate with the PLC via open communication interfaces. As a result, the communication architecture can easily be understood without any interconnection to the main computer. Work instructions for manual workplaces can be created or adapted at any time.The individual controllers communicate with the MES4 via TCP/IP.

The learning content is inside the application module

The individually, variably connectable application modules determine the learning content on the station.

The application modules can be exchanged within few minutes thanks to standardized interfaces. This allows a quick conversion for different learning situations and content.

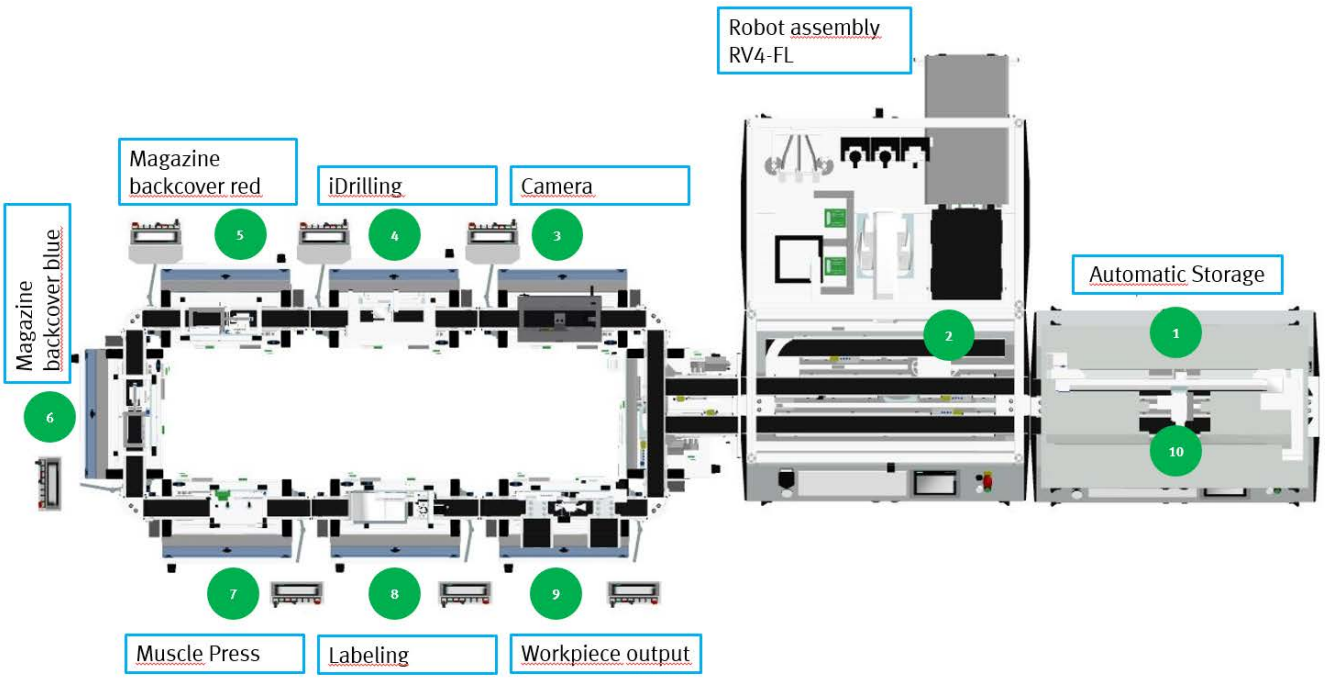
Following application modules are available:

- Magazine
- Turning
- Camera inspection
- Tunnel oven
- Drilling
- Press
- Measure analogue
- Workpiece output
- Labelling
- Pick-by-Light
- Dosing

Further application modules on request.

Content

Layout (exemplary):



Position	Quantity	Description

Process description

Start of process: Module magazine (1)	Outsourcing front cover (black, red, blue)
Robot assembly RV4-FL (2)	Order specific production of a circuit board and/or 1-2 fuses
Camera (3)	It is checked whether there is a fuse, and whether front, back or both It is checked whether there is a hole in the front cover If there is a label on the front cover it is checked whether it is visible or not and whether it is the correct way round or not Module can detect errors, these are stored in the MES. If this happens, there are the following options: Rework at the manual workplace (empty conveyor) or e.g. milling Separate out (Module Workpiece output, Module Storage or manual workplace (empty conveyor)
iDrilling (4)	Simulation drilling left, right or both Sensors will give error report if front cover is wrong way round Web Interface is linked via the MES: - Evaluation travel time of X-Axis - Commissioning Surface to adjust axes individually (without belt possible)
Magazine backcover red (5)	Order-related discharge of the back cover (red) on pallet with front cover
Magazine backcover blue (6)	Order-related discharge of the back cover (red) on pallet with front cover
Muscle Press (6)	Front-/ Back cover will be pressed (only one time) MES indicates how long it will be pressed Pressing force in Newton comes from MES, if the value is too low then the covers will not be pressed properly Force curve is recorded and can be evaluated Control parameters can be set by customer

Position	Quantity	Description

Labeling (8)	Existing templates for QR-Codes - Reference to the order in the mobile MES (by order number and position) - Separate Tablet required for mobile MES or customer has already a tablet Customer can define own print templates with variables
Possible end of process: Output (9)	Part output via slide (order related) After that it can be dismantled
Possible end of process: Storage (10)	Part will be stocked in magazine (order related)

CP Lab Pallet Transfer System stations

Pos. 1 | 7,00

CP LAB CONVEYOR DC-1512SP

D12501

Picture similar

Function

The conveyor is the main component of the CP Lab and is used to transport workpiece carriers to the next working position. The identification of workpieces is done via capacitive sensors at the beginning and at the end of the conveyor. Every carrier is equipped with a RFID-tag on which workpiece parameters are stored. A RFID read- and write-system exchanges data with the workpiece that communicates through an IO-link-interface with the main Controller. The CP Lab Conveyor is equipped with a PLC and all necessary interfaces in order to be complemented by an application module and to communicate with the MES. Conveyors that are placed in-line communicate through an optical 2-bit communication system.

Highlights:

- A compact Industry 4.0 Learning System – The CP Lab Conveyor is "ready for Industry 4.0" because of its clearly defined mechanical and electrical interfaces as well as the use of open standards.
- A modular and flexible layout – The modular and flexible design makes working in various learning scenarios possible: from a single transfer system with an integrated controller up to a cross-linked production system with cloud services.
- Modern industry supervision – The embedded modular controller S7 1512SP makes the system a self-intelligent industry 4.0 component.
- The learning content is part of the application module – The application modules are mounted on the conveyor and are controlled via I/O, Profinet, TCP/IP, OPC UA or Plug & Produce - depending on the type of the module.

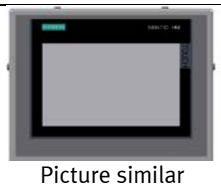
Learning content for project work:

- Installation and structure of manufacturing plants
- Capture of information using intelligent sensors
- PLC programming
- Control via embedded controllers*
- Communication based on open standards
- Industrial communication and IT-security*
- Fieldbus technology
- Identification systems
- Plug & Produce: Quick modification*
- Cyber-physical systems*

Position	Quantity	Description
		• Production management with MES*: Creation, management, controlling and visualization of customer orders • Use of the cloud technology* (* These topics require additional products) Main components: • Mono-belt transfer system length 700 mm, width 80 mm • Pallet stopper with sensors and valve • Pallet identification BCD with 4 inductive sensors • Pallet identification RFID on I/O-Link • Capacitive sensor at the beginning and the end of the conveyor • Communication sensors to previous and following stations • PLC Siemens S7-1500 CPU 1512SP • 16 inputs/16 outputs digital 24 V • Siemens I/O-Link Master • Festo I/O-Link Device 8 inputs/8 outputs digital, 4 inputs/2 outputs analogue • Incremental position measuring via optical sensor • Conveyor drive 24 VDC • DC motor controller bi-directional and creep speed • I/O interface for application module Syslink 8 inputs/8 outputs • Interface for control panel with 4 inputs/4 outputs and Emergency Stop Note: The optional touch panel and the application modules are not included in this item.
Pos. 2	1,00	**CP LAB BRANCH** D12520  Picture similar Function The CP Lab Branch is used, as a supplementary module for CP Lab Conveyor, to transport workpiece carriers to the next working position. Two rectangular branch-off conveyors allow the diversion of workpiece carriers. Every carrier is equipped with a RFID-tag on which workpiece parameters are stored . According to workpiece parameters the diversion of carriers will be executed. The CP Lab Branch is the main interface which enables the handover of workpieces from CP Lab Conveyors to the mobile robot system Robotino® and to CP Factory modules. Highlights: • Ideal combination with Robotino® – By using the CP Lab Branch, the mobile transport system Robotino® can be perfectly combined with

Position	Quantity	Description
		CP Lab Conveyors. According to the order, carriers can be transported from one place to the other by a Robotino®. • Seamless transition to CP Factory – By means of CP Lab Branch, it is possible to integrate the CP Factory robot cells, manufacturing machines and warehouse systems into the overall concept (CP Lab and CP Factory). • Modern compact industrial controller – The integrated Festo CECC Controller with I/O-Link Master and I/O-Link Device interface enables the programming with CODESYS according to IEC 61131-3. Learning content for project work: • Installation and structure of manufacturing plants • Capture of information using intelligent sensors • PLC programming • Communication based on open standards • Fieldbus technology • Identification systems • Production management with MES*: Creation, management, controlling and visualization of customer orders • Use of the cloud technology* (* These topics require additional products) Main components: • Mono-belt transfer system length 700 mm, width 80 mm • Two rectangular branch-off conveyors length 300 mm, width 80 mm • Pallet stopper with sensors and valve • Docking-kit • Pallet identification BCD with 4 inductive sensors • Pallet identification RFID on I/O-Link • Capacitive sensor at the beginning and the end of the conveyor • Communication sensors to previous and following stations • Festo CECC Controller with 14 inputs/8 outputs digital 24 V • Festo I/O-Link Master • Festo I/O-Link Device • Incremental position measuring via optical sensor • Conveyor drive 24 VDC • DC motor controller bi-directional and creep speed

Position	Quantity	Description
Pos. 3	7,00	**CP LAB HMI CASE** D12601 Description The Human Machine Interface (HMI) consists of a case and a console with classical buttons and lamps. It is plugged to the CP Lab Conveyor by means of I/O cable and is used as control panel for signal entry and monitoring unit. The HMI case is mounted on the profile frame of the conveyor. In the basic configuration, the HMI case is equipped with 4 electrical actuators and 4 light indicators. If required, the HMI case can be equipped with additional 8 electrical actuators/indicators and up to 8 potential-free switching contacts for safety circuits. Main components: • Metal case • Circuit board • Electrical actuators • Light indicators • Emergency stop • VESA mounting plate • Carrying arm • Connector for Profinet • Connector for safety circuits • Connector for control panel (basic configuration) • Connector for control panel (extended configuration) • Cable set Note: The optional touch panel (D12602) for CP Lab HMI case in not included in this position.  Picture similar

Position	Quantity	Description
Pos. 4	7,00	**CP LAB TOUCH PANEL SIEMENS TP700 COMFORT** D12602 Description The CP Lab Touch Panel TP700 Comfort is used, in combination with CP Lab HMI Case (D12601), for operator control and monitoring. Thus, the control panel includes in addition to the classical actuators and lamps also a Siemens Touch Panel TP700 Comfort with high-end functionality. The touch panel is complete integrated, wired and tested. Features: • Widescreen-Display with 16 Mio. colours and LED backlighting • High-end functionality: Archiving, VB-script and various viewers for showing plant documentation (i.e. as PDF) or as web-browser • Data backup • Different interfaces for process communication • Integrated PROFINET-Switch • Programming from WinCC Comfort V11 (TIA Portal) Technical data: • 7,0” Widescreen TFT-Display • Resolution: 800 Pixel x 480 Pixel • Number of colours: 16 Mio. • Touch screen • 2 Ethernet interfaces • 1 Profibus interface • 2 USB interfaces with integrated switch • Dimensions (B x H x T): 214 x 158 x 70 mm • Supply voltage: 24 V DC • Current consumption: 0,5 A Process coupling: • S7-1200, S7-1500 • S7-200, S7-300/400 • LOGO! • WinAC • Allen Bradley (EtherNet/IP) • Allen Bradley (DF1) • Mitsubishi (MC TCP/IP) • Mitsubishi (FX) • OMRON (Host Link)  Picture similar

Position	Quantity	Description
		• Modicon (Modbus TCP/IP) • Modicon (Modbus RTU) • OPC UA Client System requirements: • 64 Bit: Windows 7 Professional, Enterprise, Ultimate SP1, Windows 8.1 Professional, Enterprise • 32 Bit: Windows 7 Professional, Enterprise, Ultimate SP1 Scope of delivery: • Siemens Touch Panel TP700 Comfort • Ethernet cable (CAT 6, crossover, 6 m) • Engineering-, Options- and Runtime software and license WinCC Advanced (TIA-Portal) Note: This product requires a license for the end user to be used exclusively for educational purposes. Festo provides the declaration text on a form. If Festo does not provide this declaration or does not deliver it on time, Festo is not obliged to deliver this product.
Pos. 5	8,00	**Switch XB008** D12725 SCALANCE XB008 unmanaged Industrial Ethernet Switch for 10/100 Mbit / s; LED diagnostics, IP20, DC 24V power supply, with 8x 10/100 Mbit / s twisted pair ports with RJ45 sockets; Note: this unmanaged switch is not for advanced network scenarios such as ring high availability, VLAN operation, and others. suitable. We are happy to advise you on further variants for the implementation of these topics.  Picture similar

Position	Quantity	Description
Pos. 6	8,00	**TABLETOP SUPPLY UNIT** E13000 Description The Tabletop Power Supply Unit is used to supply the CP Lab Conveyor with a supply voltage of 24 VDC. For each CP Lab Conveyor, a Tabletop Supply Unit is required. Technical data: • Input voltage: 85 – 265 V AC (47 – 63 Hz) • Output voltage: 24 V DC, short-circuit-proof • Output current: max. 4.5 A • Dimensions: 75 x 155 x 235 mm Scope of delivery: • Tabletop Supply Unit • IEC cable

Picture similar

Position	Quantity	Description

CP Factory stations

Pos. 7 | 1,00

CP FACTORY ASRS FOR PALLETS

D12002

Picture similar

Function

The Automatic Storage and Retrieval System (ASRS) is equipped with a Cartesian robot for automatic storage and retrieval of pallets. Up to 32 pallets can be stored and retrieved. Two parallel conveyors move in 2 different directions and transport carriers to the next working position. Every carrier is equipped with a RFID-tag on which workpiece parameters are stored. Using a passive deflection, a circulating system can be realized.

Highlights:

- Cell on wheels – The cell is equipped with caster wheels and can be freely positioned in the laboratory without tools or lifting trucks.
- Double-sided storing and retrieving – Using the pneumatic swivel arm, both sides of the high-bay rack can easily be reached.
- Superior safety – The doors of the ASRS are equipped with magnetic safety switches.

Learning content for project work:

- Mechanical and electrical set-up of the CP Factory ASRS for Pallets: Sensors/ Actuators - Conveyors - Wiring
- Capture of information using intelligent sensors
- Warehouse management using MES
- Positioning and servo drives
- PLC programming
- Communication based on Fieldbus technology
- Binary pallet detection
- Identification using RFID
- Communication with superordinate controls and MES

Consisting of:

- 1x Base frame made from steel and aluminium profile
- 1x Integrated control cabinet with a control panel
- 2x Conveyor
- 2x Stop unit, pneumatic with RFID-sensor
- 1x Control panel with key panel, Siemens touch panel and emergency stop
- 1x High-bay rack on a aluminium profile with 32 storage shelves

Position	Quantity	Description
		• 1x Cartesian robot consisting of: o 2x servo linear axes o 1x pneumatic linear axis o 1x pneumatic rotary axis o 1x pneumatic gripper • 2x Passive deflection Note: Pallets are not included in the scope of delivery.

Technical data

Design	Base frame made from steel; aluminium profile
Doors	Transparent, lockable
Positioning	4x Levelling feet; 4x Caster wheels
Dimensions (H x W x D)	1800 mm x 1200 mm x 800 mm
Power supply	230/400 VAC
Pressure	6 bar
PLC board	1x Siemens S7 CPU1512 ET200SP
Touch Panel	1x Siemens TP700 Comfort
Drives for conveyors	2x 24 VDC motor
Stopper	2x Stopper with RFID
Switch	8-port
MES Interface	Integrated
Positioning of robot	Incremental encoder
Axis controller	2x Servo controller
Number of shelves	32

Position	Quantity	Description
Pos. 8	1,00	**CP FACTORY ROBOT ASSEMBLY CELL WITH MITSUBISHI RV-4FL**

Picture similar

D12006

Function

The Robot Assembly Cell is used for mounting of workpieces using a 6-axis industrial robot. The robot places the printed circuit boards (PCB) into the housing and equips them with fuses. Two parallel conveyors move in 2 different directions and transport carriers. An additional bypass-conveyor allows the diversion of the carriers to the robot working position. Every carrier is equipped with a RFID-tag on which workpiece parameters are stored. Using a passive deflection, a circulating system can be realized. The supply of workpieces (PCBs) happens manually or by means of a mobile robot.

Highlights:

- Cell on wheels – The cell is equipped with caster wheels and can be freely positioned in the laboratory without tools or lifting trucks.
- Additional lane – Due to the bypass-conveyor, the production process can be optimized. That way a congestion in material flow can be avoided even during longer production processes.
- Safe operation – The safety concept for the cell includes a complete housing of the cell with safety doors that are equipped with magnetic safety switches.
- Automatic gripper changing system – Depending on the workpiece feature, three different pneumatic grippers can automatically be exchanged and collated.
- Camera-supported assembly – The cell is equipped with an industrial Vision-Control-System for workpiece and position recognition.
- Ideal combination with Robotino® – The Robot Assembly Cell can be perfectly combined with the driverless transport system (AGV) Robotino®. Workpieces (PCBs) can be fed into the Robot Assembly Cell by a Robotino®.

Learning Content for Project Work:

- Mechanical and electrical set-up of the Robot Assembly Cell
- Functioning and application areas of optical and inductive sensors
- Capture of information using intelligent sensors
- Functioning and application areas of industrial camera systems
- Object recognition
- Position and orientation
- Application areas of gripper changing systems
- Application areas of industrial robots
- Teaching of robots in various coordinate systems
- Individual and flexible assembly (batch size 1)
- Communication based on Fieldbus technology
- Binary pallet detection

Position	Quantity	Description

- Identification using RFID
- Communication with superordinate controls and MES

Consisting of:

- 2x Base frame made from steel and aluminium profile
- 1x Mitsubishi 6-axis industrial robot type RV-4FL
- 1x Mitsubishi robot controller type CR750-D
- 1x Mitsubishi robot teach box type R56TB
- 1x Integrated control cabinet with a control panel
- 3x Conveyor
- 1x Material feeder for PCB
- 3x Magazine for fuses
- 1x Workpiece fixing unit
- 3x Stop unit, pneumatic with RFID-sensor
- 1x Control panel with key panel, Siemens touch panel and emergency stop
- 1x Camera with transmitted light unit
- 1x Changer magazine for 3 grippers
- 2x Passive deflection

Technical data

Base Frame	2x Base frame made from steel and aluminium profile; seperable
Doors	Transparent, lockable
Positioning/ Base Frame	4x Levelling feet; 4x Caster wheels
Dimensions/ Base Frame	1800 mm x 1200 mm x 800 mm
Power supply	230/400 VAC
Pressure	6 bar
PLC board	1x Siemens S7 CPU1512 ET200SP
Touch panel	1x Siemens TP700 Comfort
Drives for conveyors	3x 24 VDC Motors
Stopper	3x Stopper with RFID

Robot RV-4FL

Type	Articulated Robot
Number of Axes	6
Ultimate load	4 kg
Maximum reach radius	649 mm
Movement range	480 °/240°/164°/400°/240°/720°
Maximum composite speed	9048 mm/s
Cycle time	0,36 s
Position repeatability	± 0,02 mm
Weight	41 kg
Tool wiring	8 I/O
Protection rating	IP67

Position	Quantity	Description	
		Robot controller CR750-D	
		Programming language	MELFA-BASIC V
		Number of programs	512
		Positions/program	3900
		Programming	Teachbox/ PC
		Power supply	Single-phase 180 – 253 V AC 50/60 Hz
		Interface	RS422/ Ethernet USB/ digital I/O
		Dimensions (H x W x D)	430 mm x 425 mm x 174 mm
		Weight	16 kg
		Protection rating	Ground position/ IP20
		Teach box R56TB	
		Menu navigation (language)	German, English, French, Italian
		Features	Operating, programming and monitoring all robot features
		Programming and Monitoring	Reading out information even during the running system; Programming using a virtual key board; Display of up to 14 lines of programming code; I/O Monitoring of up to 256 inputs and 256 outputs; Maintenance display of service intervals; trouble indication of the last 128 alarms
		Display	Touchscreen with background lighting 6,5" TFT display (640 x 480 pixel), 65536 colours
		Interface	USB, combined RS422 and ethernet interface
		Connection	Direct connection to the robot controller, cable length 7m
		Protection rating	IP65
		Weight	1,25 kg

Position	Quantity	Description

Application Modules for CP System

Pos. 9 | 1,00

APPLICATION MODULE CAMERA INSPECTION

D13003

Picture similar

Function

The application module Camera Inspection can be mounted on CP Factory basic modules as well as on CP Lab pallet transfer systems. The camera is used as an intelligent and universal sensor with integrated controller for quality assurance by optical inspection.

The application module is completely assembled and tested.

Learning content:

- Mechanical and electrical design of the Module
- Image processing: Quality assurance/evaluation
- PLC programming
- Handling technology
- Communication with superior control and MES

Consisting of:

- 1x Module frame made from aluminium profiles
- 1x Intelligent camera with integrated controller
- 1x Signal interface
- 1x Software package

Technical data

Interface digital	SysLink IEEE488, 24 pin
Voltage	24 VDC
Lighting	integrated
Vision system	Intelligent camera Sensor: Colour sensor resolution: 752 x 480 Pixel Interfaces: Ethernet; CANopen Digital I/O: 2 I/3 O Integrated controller: CODESYS; IEC 61131-3 Frame rate: 150 pictures/sec. Protection class: IP65
Image processing Software	RIO tool: Pixel-based comparison, Range, Dimension,Position, Rotation Contour tool: Contour deviation, Rotation Measuring tool: Length, Distance, Diameter, Angle

Position	Quantity	Description
		Configuration tool: Signals, Frame rate, Amplification, Output functions Analysis tool: Statistics, Evaluations, Test programs Diagnostic display: Features, Errors Dimensions (H x W x D) 605 mm x 350 mm x 195 mm
Pos. 10	2,00	**APPLICATION MODULE MAGAZINE** D13007 Function The application module Magazine can be mounted on CP Factory basic modules as well as on CP Lab conveyors. It is designed for magazining and distributing of cubic workpieces. The workpieces are stored in a magazine shaft and can be distributed individually depending on the order information. All sensors and actuators are connected to an I/O terminal, which can optionally be exchanged by fieldbus nodes (Profinet I/O). The application module is completely assembled and tested. Learning content: • Mechanical and electrical design of the module • Electro pneumatic circuits • Pneumatic drive technology • Fieldbus technology • Sensor technology • PLC programming • Magazining and distributing of parts • Variable manufacturing • Communication with superior control and MES Consisting of: • 1x Module frame made from aluminium profiles • 1x Stacking magazine • 1x Pneumatic feed separator • 1x Valve block • 1x Signal interface

Picture similar

Position	Quantity	Description
		Technical data Interface: SysLink IEEE488, 24 pin Number of I/O: 8 DI/8 DO Voltage: 24 VDC Pressure: 6 bar Dimensions (H x W x D): 525 mm x 340 mm x 185 mm Size of workpiece (L x W): 115 mm x 80 mm Magazine: Stacking magazine Capacity: 10 pieces Sensors: End position detection
Pos. 11	1,00	**APPLICATION MODULE iDRILLING** D13013 Function The application module iDrilling can be mounted on CP Factory basic modules as well as on CP Lab conveyors. It is designed for handling of cubic workpieces. Two drilling spindles, moving in Z-direction as well as in X-direction, simulate the drilling process of two pairs of drilling holes in the workpiece. All sensors and actuators are connected to an integrated PLC with web-interface. This makes the module an intelligent module with CPS functionality. The application module is completely assembled and tested. Highlights: • Controller with web interface for Cyber-Physical-System (CPS) – The integrated intelligent controller supervises the operating status of single actuators and is able to automatically generate order proposals, e. g. for spare materials, via web interface. • Compact and powerful Festo controller – With its industrial design, Festo CECC-S offers 12 digital inputs, 8 digital outputs and 2 high-speed digital inputs. Furthermore, a wide range of interfaces are available: 4x IO Link Master; 1x IO Link Device; 1x Ethernet; 1x USB; 1x CANopen. • Autonomous system – A comprehensive CoDeSys function library enables the autonomous control (stand-alone) and economical automation of the system. • Hybrid control – Direct control of electric and pneumatic drives using CANopen and IO Link Master. • Various communication: ProfiNet; Ethernet IP; Modbus TCP. Learning content: • Mechanical and electrical design of the module • Electro pneumatic circuits • Pneumatic drive technology • Electrical drive technology • Fieldbus technology

Picture similar

Position	Quantity	Description

- Sensor technology
- PLC programming
- Handling technology
- Cyber-Physical-System (CPS): local intelligence and self-diagnostics
- Variable manufacturing
- Communication with superior control and MES

Consisting of:

- 1x Module frame made from aluminium profiles
- 1x Pneumatically operated linear Z-axis
- 1x Pneumatically operated linear X-axis
- 1x Valve block
- 2x Drilling spindle
- 1x Integrated web controller

Technical data

Interface	Web-interface CANopen Ethernet/OPC UA USB/IO-Link
Controller	Festo CECC, integrated
Number of I/O	14 DI/8 DO
Voltage	24 VDC
Pressure	6 bar
Dimensions (H x W x D)	525 mm x 375 mm x 215 mm
Size of workpiece (L x W)	115 mm x 80 mm
X-Axis	Linear, pneumatic Stroke: 120 mm Position detection: 2 End position sensors
Z-Axis	Linear, pneumatic Stroke: 40 mm Position detection: 2 End position sensors
Drilling unit	Twin drill head Drive: 24 V Max. drilling diameter: 2 mm Current limiter: 3 A Drilling distance: 40 mm

Position	Quantity	Description
Pos. 12	1,00	**APPLICATION MODULE MUSCLE PRESS** D13015 Function The application module fluidic muscle press can be mounted on CP Factory basic modules as well as on CP Lab conveyors. It is designed for the pressing of cubic workpieces. The pressing process is carried out by means of a proportional pressure control. The generated force is measured precisely by means of a load cell. All sensors and actuators are connected to an I/O terminal, which can optionally be exchanged by fieldbus nodes (Profinet I/O). The application module is completely assembled and tested. Learning content: • Mechanical and electrical design of the module • Electro pneumatic circuits • Pneumatic drive technology • Control technology: Pressure/force • Fieldbus technology • Sensor technology • PLC programming • Variable manufacturing • Communication with superior control and MES Highlights: • Control technology with pressure and force control – The use of pneumatic muscle press, in combination with an industrial proportional pressure regulator, demonstrates the operating principle of pressure control in a simple way. Disturbance variables, e.g. pressure variations by pressing the pneumatic muscle, can be compensated immediately. • Powerful and precise pressing operation – The actual force is measured by means of an analogue force gauge. The press-in speed and depth can be varied manually, via throttle and pressure regulator, as well as electronically via the proportional pressure regulator. Consisting of: • 1x Module frame made from aluminium profiles • 1x Pneumatic muscle press • 1x Proportional pressure regulator • 1x Force gauge, analogue • 1x Signal interface  Picture similar

Position	Quantity	Description

Technical data

Interface digital	SysLink terminal IEEE488, 24 pin 8 I/8 O
Interface analogue	Analog Terminal 4 I/2 O
Voltage	24 VDC
Pressure	6 bar
Dimensions (H x W x D)	115 mm x 80 mm x 115 mm
Force measurement	0 - 10 V 0 - 200 N
Pressure control	Control range: 0,06 - 6 bar Input signal: 10 V equals 6 bar
Pressing force	Permitted value: 630 N for each muscle Practical value: 0 - 200 V for each muscle

Pos. 13 | 1,00

APPLICATION MODULE WORKPIECE OUTPUT

D13018

Picture similar

Function

The application module workpiece output can be mounted on CP Factory basic modules as well as on CP Lab conveyors. It is equipped with a two-axis handling system and is used to output cubic workpieces on two roller slides. All sensors and actuators are connected to an I/O terminal, which can optionally be exchanged by fieldbus nodes (Profinet I/O). The application module workpiece output can be used as a manual workplace for picking workpieces. The application module is completely assembled and tested.

Learning content:

- Mechanical and electrical design of the module
- Handling technology
- Electrical drives: stepper motor
- Fieldbus technology
- Sensor technology
- PLC programming
- Communication with superior control and MES

Consisting of:

- 1x Module frame made from aluminium profiles
- 1x Handling module
- 1x Parallel gripper, pneumatic
- 2x Roller slide

Position	Quantity	Description
		• 1x Valve block • 1x Signal interface
		Technical data Interface digital: Syslink IEEE 488, 24 pin Number of I/O: 8 DI/8 DO Voltage: 24 VDC Pressure: 6 bar X-axis: Stepper motor Z-axis: Pneumatic Gripper: Pneumatic Dimensions (H x W x D): 600 mm x 460 mm x 300 mm Size of workpiece (L x W): 115 mm x 80 mm
Pos. 14	1,00	**APPLICATION MODULE LABELING** D13024 The application module can used for beeing assembly on the offered pallet transfer system and on the CP Factory basic module. The module automatically applies a self-adhesive label that is freely printable to the offered model work piece. The print data are individually loaded into the printer in a job-controlled manner. The label is printed immediately before applying the lable on the workpiece. The scope of the Labeling module includes the corresponding control software in the form of program blocks. Program blocks are also provided, which ensure a loading of the print data from the offered MES. Characteristics: • Handling device with vacuum gripper • Vacuum sensor • End position sensors • Integrated control • Valve tray • Program blocks for module control • System connector IEEE 488 24Pin  Picture similar

Position	Quantity	Description
Pos. 15	1,00	**TRANSPORT BOX FOR PCB** D14019 Description Transport box with RFID chip for CP System printed circuit boards. Dimensions: • 400 mm x 300 mm x 170 mm

Accessories

Pos. 16 | 1,00

PASSIVE DEFLECTION

D12702

Picture similar

Description

The passive deflection makes it possible to connect two CP Lab pallet transfer systems at a 90 degree angle. Thus, individual modules can be easily combined with each other as "corner solution". A complete circulating system (e.g. with 4, 6, 8 or 10 CP Lab pallet transfer systems) can be realised. The passive deflections are connected to the conveyor profiles by means of T-Nuts. The workpiece carriers are "passively" transferred from a pallet transfer system to the following pallet transfer system, there is no electrical connection required.

Scope of delivery:

- 4x Passive deflection

Note: The passive deflection is required for circulation system with carriage (D12720).

Pos. 17 | 8,00

CARRIAGE

D12720

Picture similar

Description

The carriage makes the CP Lab system into a compact and mobile unit. The CP Lab conveyor can be easily mounted on the carriage.

The carriage is designed for the use of CP Lab conveyor and is suitable for the combination with CP Factory.

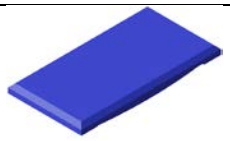
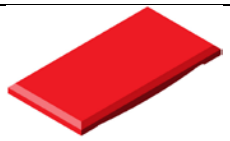
The carriage will be delivered including rollers and adjustable feet.

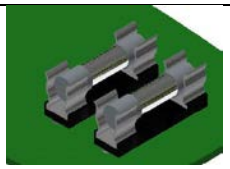
Technical data:

- Dimensions (H x W x D): 800 mm x 540 mm x 350 mm
- Frame: A4 in undercarriage

Position	Quantity	Description
Pos. 18	8,00	**Door for carriage D12720** D12724 Transperent Doors for carriage D12720.
Pos. 19	1,00	**SUPPLY CABLE** D14300  Picture similar Description Special power supply cable with a special system plug-in connector for the main power supply in CP Factory. Consisting of: • Plug-in connector, CEE plug 400V 16A • Hose for compressed air supply, Pun-8 • Network cable, RJ45 One end of the cable consists of the above-mentioned connections, which are connected to the main supply. The other end consists of a special system plug, which can be connected to the system.
Pos. 20	16,00	**WORKPIECE CARRIER** D12703  Picture similar Description The workpiece carrier is used to transport workpieces or pallets with workpieces on CP Lab or CP Factory pallet transfer systems. For identification, the workpiece carrier is equipped with a RFID-tag and 4 bit code. Technical data: • Design: Glass fiber reinforced plastic (GRP) • Dimensions: 100 mm x 160 mm x 15 mm • BCD Code: codeable, 4 screws • Track width: 80 mm • Transport weight: max. 3 kg

Position	Quantity	Description
Pos. 21	32,00	**PALLET** D12704  Picture similar Description The pallet is used to transport workpieces on CP Lab or CP Factory pallet transfer systems. The pallet, on which the workpiece is transported is placed on the workpiece carrier (D12703). Technical data: • Design: Aluminium • Dimensions: 100 mm x 160 mm x 5 mm • Workpiece holder: changeable, screwed
Pos. 22	16,00	**WORKPIECE FRONT COVER BLACK** D12705  Picture similar Description The workpiece set, consisting of a back cover, printed circuit board, electronic component and front cover, is used for the representation of many relevant process steps such as milling, drilling, marking, tempering, testing, turning, assembling, loading, pressing and more. The front cover is part of the workpiece set. Technical data: • Material: Plastic, black • Dimensions: 110 mm x 60 mm x 10 mm

Position	Quantity	Description
Pos. 23	8,00	**WORKPIECE BACK COVER BLUE** D12712 Description The workpiece set, consisting of a back cover, printed circuit board, electronic component and front cover, is used for the representation of many relevant process steps such as milling, drilling, marking, tempering, testing, turning, assembling, loading, pressing and more. The back cover is part of the workpiece set. Technical data: • Material: Plastic, blue • Dimensions: 110 mm x 60 mm x 10 mm  Picture similar
Pos. 24	8,00	**WORKPIECE BACK COVER RED** D12714 Description The workpiece set, consisting of a back cover, printed circuit board, electronic component and front cover, is used for the representation of many relevant process steps such as milling, drilling, marking, tempering, testing, turning, assembling, loading, pressing and more. The back cover is part of the workpiece set. Technical data: • Material: Plastic, red • Dimensions: 110 mm x 60 mm x 10 mm  Picture similar

Position	Quantity	Description
Pos. 25	16,00	**PRINTED CIRCUIT BOARD** D12707 **Description** The workpiece set, consisting of a back cover, printed circuit board, electronic component and front cover, is used for the representation of many relevant process steps such as milling, drilling, marking, tempering, testing, turning, assembling, loading, pressing and more. The printed circuit board is part of the workpiece set. **Technical data:** • Design: PCB • Dimensions: 100 mm x 55 mm  Picture similar
Pos. 26	4,00	**SET OF FUSES** D12708 Description The workpiece set, consisting of a back cover, printed circuit board, electronic component and front cover, is used for the representation of many relevant process steps such as milling, drilling, marking, tempering, testing, turning, assembling, loading, pressing and more. The set of fuses, consisting of 10 fuses, is part of the workpiece set. Technical data: • Design: Micro fuse  Picture similar

Position	Quantity	Description

MES production control and Visualization

Pos. 27 | 1,00

MES4 FOR CP SYSTEM

D15002

Picture similar

Description

MES4 is a didactic structured Manufacturing Execution System (MES), which is designed for Industry 4.0 learning platforms. Special importance is placed on the topics of production control and management. The MES4 can directly communicate with the PLC via open communication interfaces. As a result, the communication architecture can easily be understood without any interconnection to the main computer. Work instructions for manual workplaces can be created or adapted at any time. The individual controllers communicate with the MES4 via TCP/IP.

Highlights:

- No main PLC and data redundancy – Each PLC is able to communicate with the MES in real-time, and thereby, every station can receive data from the MES at any time.
- Order entry from ERP system – The open database of MES4 can be externally accessed via SQL commands (e.g. order entry from ERP system).
- Process monitoring and order traceability – The clear overview of each station in MES4 enables clearly structured process monitoring and order traceability by means of Ident based operation.

Learning content for project works:

- Define order flows and process plans
- Read orders and update status
- Sort the order positions
- Assignment of the goods carrier to the order
- Create article master, including graphic representation of the workpieces
- Creation of machines, including costs and energy consumption
- Creating warehouse data and material buffers
- Creating and managing customer data
- Define plant layouts by Icons
- Automatic routing according to work plan and machine capabilities
- Report generation OEE, PLC and faults, including graphical representation
- Import or export of data as * .csv file
- Export of finished orders as * .xls file for further processing

Position	Quantity	Description
		Scope of delivery: • MES4 Software for CP Lab, single license • Dongle • PC with TFT-monitor
Pos. 28	12,00	**MES4 additional Network licence** D15007 Additional network licence for "MES4 for CP Lab" (D15005) or "MES4 for CP System" (D15002)
Pos. 29	1,00	**CIROS plant models CP Systems** D15009 4 fixed system models from CP Lab (4, 6, 8 and 10 systems) and 2 fixed plant models CP Factory (standard layouts) for operation with MES4. These 6 system models are tested and prepared for operation with MES4. They do not contain any robots, but only pallet circulation systems. To use the plant models as plant simulation, CIROS is required as well as MES4. The plant models behave like MES4 like the real plants, also the Interface between real plant and MES4 is identical to the simulated plant. Users of these plant models are entitled to exchange these for a free model library, as soon as it is available. (expected Q2 / 2019) This will then contain the standard CP Lab and CP Factory stations, as well as the mobile Robot system Robotino.

Position	Quantity	Description

Software

Pos. 30 | 1,00

Software

8038980

Picture similar

CIROS® - 1 License Ciros® Studio and 12 Licenses Ciros® Education

CIROS® is the industrially tested, extremely powerful platform for creating and applying 3D simulation models for automation technology. It combines the following functions in one common interface:

- 3D real-time simulation
- 3D modelling
- Import filters for STEP, IGES, STL, VRML
- Export filters for DXF, STEP, IGES, STL, VRML
- Plug-in for Autodesk Inventor and Autodesk 3DS MAX
- Model modifications can be saved and new models can be created
- System and production line design based on model libraries
- Robot programming in the following programming languages:
  - Industrial Robot Language (IRL)
  - Mitsubishi Movemaster Command Language (MRL)
  - Mitsubishi MELFA BASIC III, IV and V
  - Kuka Robot Language (KRL)
  - ABB Rapid
  - V+ (for Adept and Stäubli robots)
- Communication via OPC client/server
- Connection to the CIROS® Supervision control system
- Simulation of the Robotino® mobile robot platform
- Virtual human with 30 independent degrees of freedom
- Online connection to Mitsubishi robot control systems for upload and download of robot programs and position lists, and for diagnostics and optimisation of the robot application
- The complex model library contains 3D process models of selected MPS stations, various belt and warehouse systems.
- The models can be controlled by the integrated virtual S7 PLC, from STEP 7 by the simulated SIMATIC® controller S7-PLCSIM, via the EasyPort or the EzOPC server by an external hardware PLC.
- In manual mode, individual step movements can be made.
- High-performance error simulation with varied error scenarios for sensors. Setting errors is password-protected. Locating and eliminating errors can be logged and the results can be evaluated, thus allowing you to design an effective training for systematic commissioning and repair in the event of malfunctions within the simulation environment.

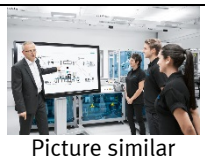
Position	Quantity	Description
		1 x CIROS® Studio is the program version for the trainer who creates new models, tests the virtual learning environments and releases programs for the connected robots and transfers them to the robot control system. 12 x CIROS® Education includes all functions of CIROS® Studio without the abilities of creating new models and connecting robot control systems.
Service		
Pos. 31	2,00	**INSTALLATION AND COMMISSIONING** D07000  Picture similar The installation and commissioning include the following scope of services: • Check the system • Placing stations in the room • Setup of mechanical and electrical connections of stations and/or modules of a system • Connecting the stations with each other, adjustment of all electrical, pneumatic and mechanical components • Configuration of controllers and download of programs • Starting and testing the system on site • Establish the operational readiness and handover to the customer Further topics can be agreed upon between customer and trainer before the training. The trainer defines the timeline for commissioning and training and he arranges the service date with the customer individually. Note: Diverse systems have different commissioning times. Therefore the commissioning service duration has to be selected accordingly to ensure proper completion of the installation. Furthermore, the customer has to ensure during installation: • that any construction work in the room for system are completed • that necessary energy supply (voltage and compressed air) is provided according to specification • that responsible personnel can be contacted in case the trainer has questions about the room or energy supply • that IT personnel is available for computer and software installation If one of the points mentioned above isn't fulfilled then the installation might delay . In such a case, there is no claim to extend the service time. The travel costs and expenditures of the trainer are included in the position. Note: We expressly reserve the right, especially in the case of an existing travel alert by the Federal Foreign Office at the time of departure, to cancel or postpone the training.

Position	Quantity	Description
Pos. 32	3,00	**TECHNICAL INSTRUCTION** D07001  Picture similar The technical instruction takes place after a successful commissioning of a system. The commissioning is performed by a trainer who can conduct a training afterwards. The training is complementary for the delivered system and usually has the following contents: Safety instruction ▪ General safety ▪ Emergency stop ▪ Safety equipment Process overview Startup/ shutdown of the system ▪ Power on ▪ Automatic mode Explanation of all stations (basic functionality) Operation of HMI* ▪ Setup mode ▪ Default mode ▪ Parameters ▪ Error and information message handling Restart of the system after emergency stop MES* ▪ General overview ▪ Buffers ▪ Orders ▪ Workplans PLC ▪ Backup/ Restore Robotics* ▪ Moving the robot ▪ Teaching the robot ▪ Backup/ Restore

Position	Quantity	Description
		▪ Basic Maintenance Vision* ▪ Calibration ▪ Backup/ Restore Robotino* ▪ Create a map ▪ Add positions ▪ Create a path ▪ Operation with Fleet Manager CNC* ▪ Referencing ▪ Jog/ automatic mode Troubleshooting * Depends on system configuration Further topics can be agreed upon between customer and trainer before the training. The trainer defines the timeline for commissioning and training and he arranges the service date with the customer individually. Note: Diverse systems have different commissioning times. Therefore the commissioning service duration has to be selected accordingly to ensure proper completion of the installation. The travel costs and expenditures of the trainer are included in the position.

Customer No.	Project	Document No.	Date	Page
654465	CP System Combination FL 2	121.454	2019	44 / 44

Position	Quantity	Description
Pos. 33	1,00	**Training for CP System Simulation** D17013 This training provides a basic introduction to CIROS® with a special focus on the simulation of CP Lab or Factory plants. The functionality of CIROS® is explained and the typical work steps in CIROS® model creation are explained. Numerous exercises enable the participants during the training to create and simulate their own CP Lab or Factory systems in CIROS®. In addition, the interaction of CIROS® with MES4 is discussed as well as i.a. SPS connection thematized. content • Structure CIROS®, menu structure, shortcut, help menu • Typical work steps in modeling / simulation • Difference between standard and MES mode • visualization and model options • Connection of CIROS® to MES4 competence objectives After the seminar the participants will be familiar with the basic functions of CIROS® and will be able to independently model and simulate a CP Lap or a CP Factory. You can connect CIROS to MES and embed both in your own training. duration 2 day


Picture similar