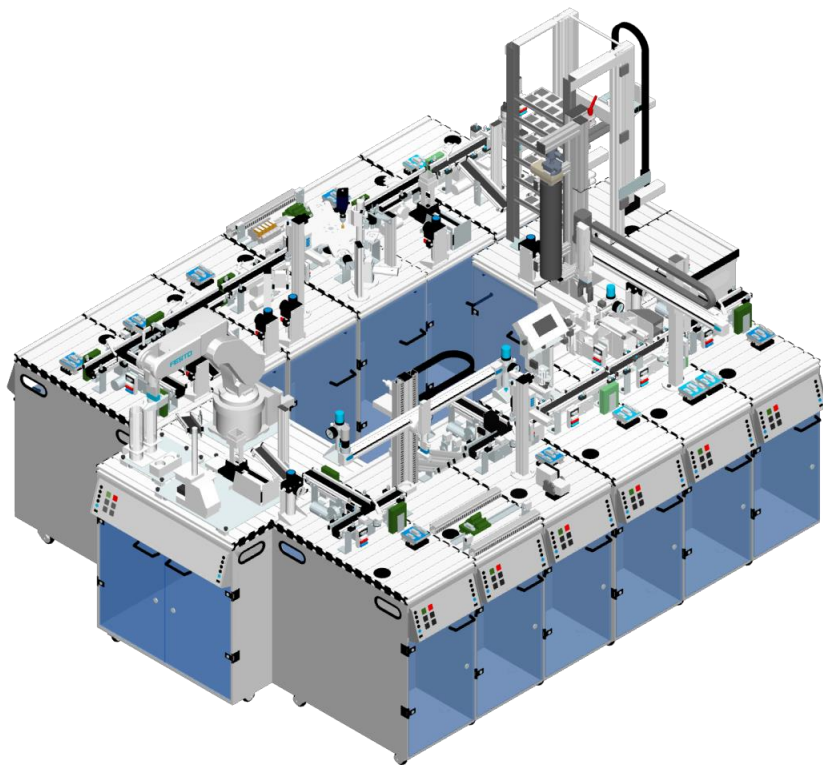


Flexible Manufacturing System

Official sporting equipment at Mechatronics Championship



THE TRAINING AIMS

The multitude of stations and the technologies contained in them permit an investigation of almost all relevant areas of control and automation technology.

- Construction of pneumatic and electropneumatic circuits
- Learning about sensors and actuators
- Application and programming of PLCs
- Digitalisation, Smart maintenance, and Energy consumption
- Smart sensors and RFID
- Monitoring and control via HMI and SCADA
- Application of various handling devices and grippers
- Application of vacuum technology
- Application of various electrical drives (DC, AC)
- Application of frequency converters
- Networking of sensors and actuators via IO-Link
- Application of industrial robots for assembly tasks
- Programming and simulation of robots
- Set-up and mode of operation of transport systems
- Mode of operation and purpose of pallet identification
- IT: Local Area Network and WLAN

Incoming/ Outgoing goods

Storing (AS/RS), Distributing, and Sorting stations



Processing

Processing, Joining, and programming stations



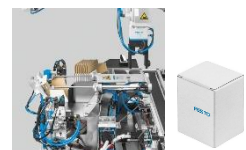
Assembly

Robot assembly and pick & place stations



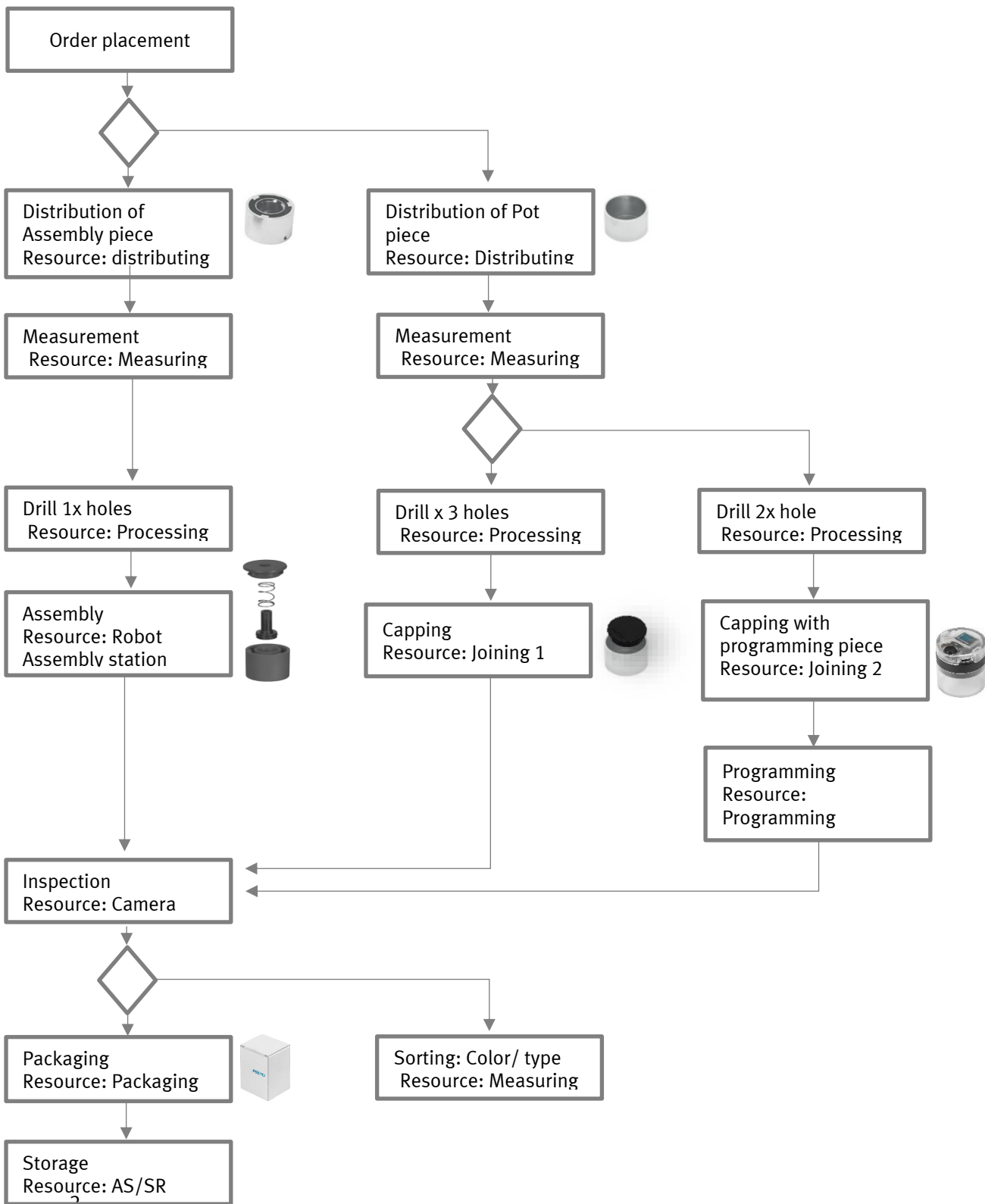
Packaging

Packaging station



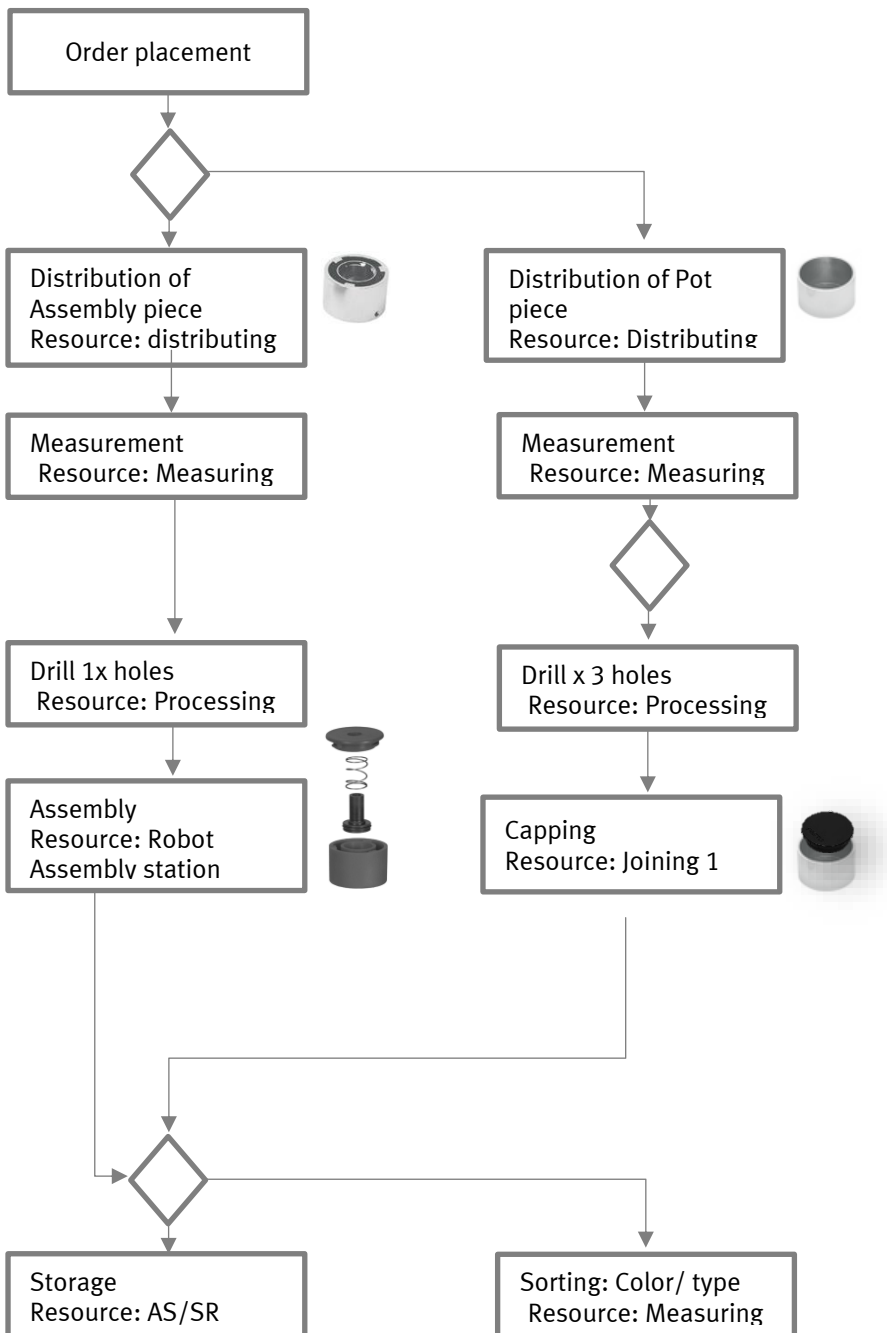
Example Workplan – FMS-D variant 3-15 (Large)

Resources: 3x separating, Distributing, Measuring, processing, Robot assembly, Handling, 2x Joining, Programming, Camera, Packaging, sorting, and Storing



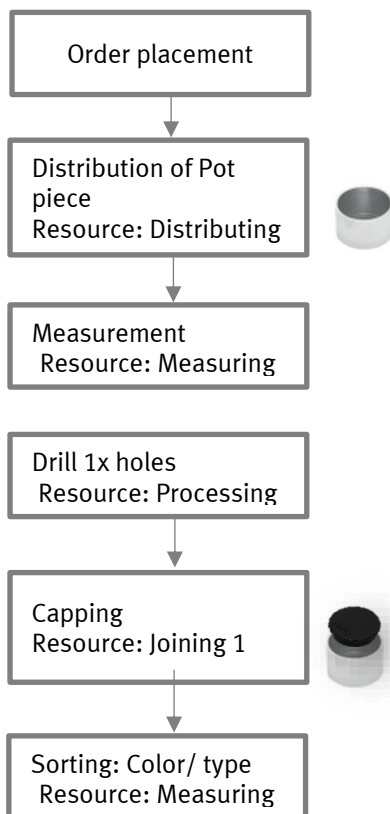
Example Workplan – FMS-D variant 2-12 (Medium)

Resources: 3x separating, Distributing, Measuring, processing, Robot assembly, Handling, Joining, Packaging, sorting, and Storing



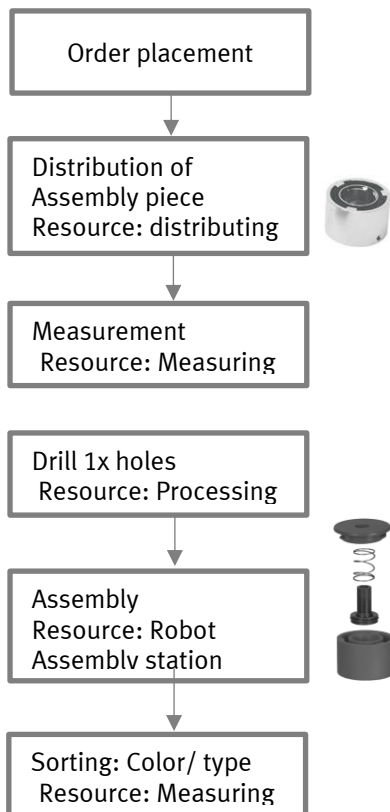
Example Workplan – FMS-D variant 1-9 (Small- Assembly line)

Resources: 3x separating, Distributing, Measuring, processing, Joining, Handling, and sorting



Example Workplan – FMS-D variant 1-9 (Small-PA line)

Resources: 3x separating, Distributing, Measuring, processing, Robot assembly, Handling, Joining, Packaging, sorting, and Storing



Stations of FMS



Separating x3

The MPS separating station D tackles a number of topics, including the use of digital sensors and actuators. The station controls a distribution process based on workpiece properties. The workpiece dimensions measured by the sensors are used to determine the subsequent process. 8038802

Important items:

- MP Trolley P/N: 8033590
- MPS Operator panel P/N: 8127608
- PLC - CECC-LK P/N: 8043320
- Syslink cable P/N: 34031 x3

Packaging

The MPS Packaging station D deals with the pneumatic control of a complex packaging process, and the control of stepper motors by micro controllers. The station also introduces the use of digital sensors. 8062644

Important items:

- MP Trolley P/N: 8033590
- MPS Operator panel P/N: 8127608
- PLC-S7-1512C-1PN P/N: 8095754
- Syslink cable P/N: 34031 x3
- Analog cable P/N: 529141
- Boxes x50 P/N: 8064301
- RFID Module P/N: 8063388

Programming

The MPS Programming station D deals with the programming of micro controllers and the detection and alignment of workpieces. The station also provides some insight into the use of proximity sensors. 8059892

Important items:

- MP Trolley P/N: 8033590
- MPS Operator panel P/N: 8127608
- PLC-S7-1512C-1PN P/N: 8065452
- Syslink cable P/N: 34031
- Analog cable P/N: 529141
- EasyKit P/N: 8049530 x6
- RFID Module P/N: 8063388

Camera

The MPS camera station is used as an intelligent and universal sensor in the process for quality assurance via visual inspection. D13003

Important items:

- MP Trolley P/N: 8033590
- MPS Operator panel P/N: 8127608
- PLC - CECC-LK P/N: 8043320
- Syslink cable P/N: 34031 x2
- Conveyor module P/N: 8037644
- Misc. 170395, 8025740, 8025738, 8033582 x2
- RFID Module P/N: 8063388

Handling

The MPS handling station C covers a number of topics, including sensing and handling of workpieces for bridging height differences in the production process. It focuses mainly on electric linear axes and how to control them. 567203

Important items:

- MP Trolley P/N: 8033590
- MPS Operator panel P/N: 8127608
- PLC - CECC-LK P/N: 8043320
- Syslink cable P/N: 34031 x2

Stations of FMS



Measuring	Distributing	Processing	Joining x2	Sorting
<p>The MPS measuring station D tackles a number of topics, including how to record and process analog and digital signals. The station also provides insight into how pneumatic actuators work and are used, and how actuators are calibrated.</p> <p>8038623</p> <p>Important items:</p> <ul style="list-style-type: none"> MP Trolley P/N: 8033590 MPS Operator panel P/N: 8127608 PLC-S7-1512C-1PN P/N: 8065452 Syslink cable P/N: 34031 x2 Analog cable P/N: 529141 RFID Module P/N: 8063388 	<p>The MPS distributing station D tackles a number of topics, including the basic principles of PLC programming and sensor technology. In addition to this, the station provides an introduction to conveyor control using micro controllers and the associated transport of materials.</p> <p>8034566</p> <p>Important items:</p> <ul style="list-style-type: none"> MP Trolley P/N: 8033590 MPS Operator panel P/N: 8127608 PLC - CECC-LK P/N: 8043320 Syslink cable P/N: 34031 x2 RFID Module P/N: 8063388 	<p>The MPS processing station covers a range of topics, including how to program two parallel processes on one rotary indexing table, includes a range of different actuators: a DC drill, an AC motor on the rotary indexing table.</p> <p>195782</p> <p>Important items:</p> <ul style="list-style-type: none"> MP Trolley P/N: 8033590 MPS Operator panel P/N: 8127608 PLC-S7-1512C-1PN P/N: 8065452 Syslink cable P/N: 34031 x2 AC motor P/N: 550524 G120 VSD P/N: 8105137 A4 mounting frame P/N: 8033592 	<p>The MPS joining station D covers a number of topics, including checking the orientation of workpieces using sensors, automated assembly and monitoring downstream transport.</p> <p>8063910</p> <p>Important items:</p> <ul style="list-style-type: none"> MP Trolley P/N: 8033590 MPS Operator panel P/N: 8127608 PLC - CECC-LK P/N: 8043320 Syslink cable P/N: 34031 x2 Conveyor module P/N: 8037644 RFID Module P/N: 8063388 Misc. 554301 and 8063850 	<p>The MPS sorting station D tackles a number of topics, including combining different types of sensors to detect materials. The station controls a sorting process based on workpiece properties.</p> <p>8046325</p> <p>Important items:</p> <ul style="list-style-type: none"> MP Trolley P/N: 8106687 MPS Operator panel P/N: 8127609 PLC - CECC-LK P/N: 8043320 Syslink cable P/N: 34031 x2 RFID Module P/N: 8063388 The MPS IoT Kit Machine Learning P/N: 8158958



Storing

The MPS storing station addresses, the topics of parameterization and commissioning of multi-axis controllers and advanced PLC programming. Workpieces can be stored on several high rack storage levels using a combination of sensors and actuators.

8082795

Important items:

- MP Trolley P/N: 8033590
- MPS Operator panel P/N: 8127608
- PLC-S7-1512C-1PN P/N: 8095754
- Syslink cable P/N: 34031 x3
- Analog cable P/N: 529141
- Energy measurement box P/N: 8129208



Robot assembly

This equipment level is created based on the basic design of the MPS robot station and the two robot handling and robot assembly modules as a introduction to industrial robotics.

8039313

Important items:

- MP Trolley P/N: 8106687
- MPS Operator panel P/N: 8127609
- PLC - CECC-LK P/N: 8043320
- Syslink cable P/N: 34031
- Misc. 162239, 8039314, 8038620, 8038740, 8046131, 3396765, 573859, 540691, 8140772

Essential accessories



Custom Computer for SCADA

The Custom Computer for SCADA is designed to ensure full compatibility with the SCADA system as well as long-term reliability and efficiency. The computer model includes a 23-inch Touch-Screen Computer that is a compact solution for saving space in the classroom. It can be installed on a full-motion mount on the workstation to maximize desk space.

588441

Important items:

- Monitor holder P/N: 8069039
- WinCC flexible/WinCC P/N: 556239



Touch Panel TP700

Comprehensive high-end functionality: archive, VB scripts and various viewers for displaying system documentation (e.g. as PDF files) or in the form of Internet pages Multiple interfaces for process communication Integrated PROFINET switch Programming from WinCC Comfort V11 (TIA portal) D12605

Important items:

- Monitor holder P/N: 8069045
- STEP 7 Professional TIA-Portal V15 for Students for 20 users P/N: 548576



Touch panel CDPX-X-A-W-7

Features of the CDPX panels:
Open for web and multimedia applications
Incorporation of standard documents
Multiple interfaces for process communication
Integrated Ethernet switch
Programming with Designer Studio
Supported PLC protocols: CODESYS 2.3 and 3.5, Modbus TCP client, TCP server, RTU client, RTU server
574411

Important items:

- Enclosure bracket P/N: 11955302
- Monitor holder P/N: 8069045



Ethernet switch XB005 Qty: 15

Training device for an ER mounting frame (pneumatics/hydraulics). The universal Ethernet switch Siemens Scalance XB005 allows you to set up small star and linear structures and provides a simple way of showing how PLCs, touch panels (HMI) and other components are networked.

8041755

Important items:

- Ethernet cable P/N: 567280



Access Point

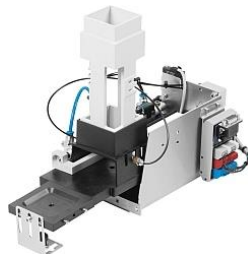
The MPS handling station C covers a number of topics, including sensing and handling of workpieces for bridging height differences in the production process. It focuses mainly on electric linear axes and how to control them.

8086515

Important items:

- Ethernet cable P/N: 567280

Essential accessories



Air compressor and power cables

Oil-lubricated, very quiet (45 dB (A)) compressor. This makes it ideal for use in classrooms. With pressure reducer and water separator.
91030

Important items:

- 5-fold plug socket strip P/N: 380707 x5
- IEC power cable P/N: 549860 x 18
- Plastic tubing-6mm P/N: 152963 x2
- T- Piece QST-6 P/N: 153129
- Tool set P/N: 539767

Simulation box

The digital/analog simulation box additionally allows the simulation and display of analog signals (0 – 10 V). The simulation box is supplied without connection cables
526863

Important items:

- Analog cross-over cable P/N: 533039
- Syslink cross-Over cable P/N: 167197

Stacking magazine module

The Stacking magazine module separates workpieces or end caps. A double-acting cylinder pushes the workpiece at the bottom out of the gravity-feed magazine. The cylinder position is detected electrically by inductive, three-wire sensors. The speed with which the cylinder extends and retracts can be infinitely adjusted via one-way flow control valves. Through-beam sensors or diffuse sensors can be attached to the magazine.
8032171

Important items:

- Adapter P/N: 8032173
- 15-pin D-sub cable P/N: 8033586

A4 Assembly board and smart sensors

The assembly board is used to mount the various terminals or other components that can be mounted on the H-rail. The board can be installed in any A4 mounting frame in the MPS trolley or in the lab table.
8035612

Important items:

- Mounting profile P/N: 8033594
- Digital IO terminal P/N: 8025736
- DC Wattmeter P/N: 573261 x3 *plug-in Adapter* P/N: 185692 x3
- Flow sensor with IO-Link® P/N: 8115026 x3 *Connecting cable* P/N: 541342 x3
- Pressure sensor with IO-Link® P/N: 8115027 *Connecting cable* P/N: 572576

Workbooks

The attachment for MPS stations is for vertically mounting the Tec2Screen® bracket to an MPS station. It can be mounted directly on a profile plate.
8069039

Important items:

- Robot programming instruction P/N: 8039315
- Robot teaching manual P/N: 8039316
- frequency converters training documentation P/N: 8114399
- Fundamentals of stepper motor drive technology: Workbook P/N: 571861
- More books are available on request