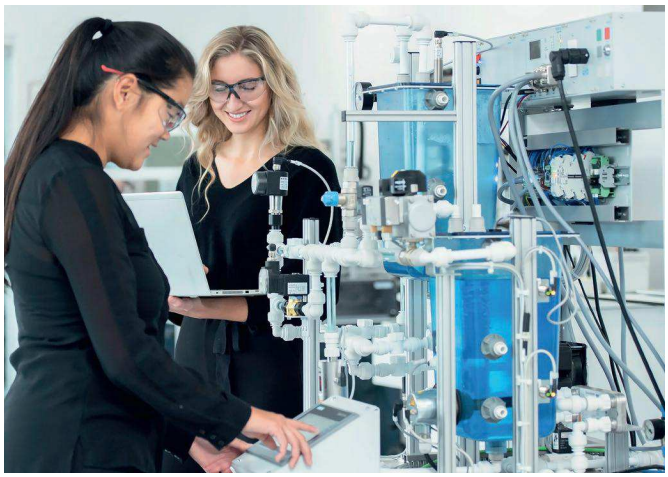
MPS PA Compact Workstation

→ Video







Function
The four controlled systems can be operated individually. By using a corresponding controller, the level and flow rate controlled system can be configured into a cascade control system (FluidLab-PA Multi-Loop required).

The sensors and valve actuators support various types of controllers, including continuous ones like P, I, PI, PID, and discontinuous ones like two-point controllers. The pumps can be controlled through direct actuation or speed adjustment.

In the flow rate and pressure controlled systems, the manipulated variable of the controller can also operate a proportional directional control valve. A two-way ball valve with a pneumatic quarter-turn actuator is installed in the return between the elevated tank and the lower reservoir. This valve simulates a “load” for disturbance variable compensation in the level controlled system.

The workstation features IO-Link components (level, temperature, and magnetic flow sensors) to address digital communication between devices.

Learning Outcomes
- Introduction to process automation
- Learn the fundamentals of closed-loop control
- Read and design technical drawings for process engineering
- Learn the different methods used for control loop tuning
- Operate, identify, and analyze different control systems for pressure, flow, level, and temperature
- Operate, identify, and analyze different control systems for pressure, flow, level, and temperature with industrial instrumentation (Process instrumentation workstation)
- Operate, identify, and analyze a control system for energy management (Energy workstation)

Note: When ordering a complete compact workstation, it is delivered preassembled and preprogrammed. Individual components can be ordered separately to create a custom solution, but the system will not come preassembled nor preprogrammed.



MPS PA Compact Workstation – Basic

The basic workstation contains the mechanical and electrical components, sensors, and actuators that form the process system. The corresponding workbook is entitled “Fundamentals of Closed-Loop Control”, sold separately ➔ page 155.

	120 V	220 – 240 V
Without an additional controller and operator unit	**8164437**	**8164438**
With Festo controller and operator unit	**8162573**	**8162574**
With Siemens controller and operator unit	**8162582**	**8162583**
With Rockwell Automation controller and operator unit	**8162589**	**8162590**

Scope of delivery:

1x MPS PA Compact Workstation, basic (120 V, 60 Hz) **or**	8162603
1x MPS PA Compact Workstation, basic (220 – 240 V, 50/60 Hz)	8162604

Main components at a glance:

Mechanical components: 2 tanks, stainless steel pressure tank, plug-in tube system, filter regulating valve, mounting frame, aluminum profile plate

Sensors: 2 capacitive sensors, 2 float switches, IO-Link ultrasound level sensor (0 – 10V), IO-Link magnetic flow sensor with display (0,1...25 l/min), pressure sensor with display (0...400 mbar), IO-Link temperature sensor PT100 (-50...+150°C/-58...+302°F)

Actuators: pump with a separate motor controller for varying the pump speed with analog signals, proportional directional control valve, 2-way ball valve with pneumatic quarter turn actuator and end-position sensing, double-acting, heating

Electrical components: I/O connection board with measuring transducer, motor controller, I/O terminal, SysLink, 8I/8O, analog terminal, SysLink, 15-pin, power supply 24 V DC

And:

1x Trolley	8106686
1x EasyPort USB 19”	8021637
1x Control panel	195766
1x FluidLab-PA Closed-Loop (perpetual license, 1 user)	8208217
1x Water-air cooler	8080632
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Analog cable, parallel, 2 m	529141
1x Safety laboratory cable, 3 m	571817
1x Ethernet/USB Interface	8079873

Note: The control components are added to this scope of delivery, depending on the selected workstation variant. A compressor (order no. 91030/565440) is also required.

Recommended extensions:

Simulation box	526863
IoT kit for MPS PA	8162599
Air Control System AirCS equipment set ➔ page 14	8023858
Cooling unit with heat exchanger ➔ page 13	
FluidLab-PA Multi-Loop ➔ page 171	
FluidLab-PA Process ➔ page 170	



MPS PA Compact Workstation – Process Instrumentation

The process instrumentation workstation is equipped with parameterizable sensors to allow a deep-dive into typical control devices and the HART communication protocol. The corresponding workbook is entitled “Fundamentals of Closed-Loop Control”, sold separately ➔ page 155.

	120 V	220 – 240 V
Without an additional controller	**8164439**	**8164440**
With Festo controller (CDPX and Codsys incl. I/O)	**8162575**	**8162577**
With Siemens controller (PLC S7-1512 and MTP700)	**8162584**	**8162585**
With Rockwell Automation controller (L24 and PanelView 7)	**8162591**	**8162592**

Scope of delivery:

1x MPS PA Compact Workstation, instrumentation (120 V, 60 Hz) **or**	8162605
1x MPS PA Compact Workstation, instrumentation (220 – 240 V, 50/60 Hz)	8162606

Main components at a glance (different than the basic station):

Sensors: capacitive level measurement, two-rod probe for continuous level measurement, magnetic-inductive flow meter with evaluation unit, on-site indicator and HART interface, pressure sensor, configurable with on-site indicator, temperature sensor PT100, configurable with on-site indicator, level vibration limit switch for fluids

Electrical engineering: signal conversion with parameterizable measured-value transducers, includes parameterization software and programming cable

And:

1x Trolley	8106686
1x EasyPort USB 19”	8021637
1x Control panel	195766
1x FluidLab-PA Closed-Loop (perpetual license, 1 user)	8208217
1x Water-air cooler	8080632
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Analog cable, parallel, 2 m	529141
1x Safety laboratory cable, 3 m	571817
1x Ethernet/USB Interface	8079873

Note: The control components are added to this scope of delivery, depending on the selected workstation variant. A compressor (order no. 91030/565440) is also required.

Recommended extensions:

Simulation box	526863
IoT kit for MPS PA	8162599
Air Control System AirCS equipment set ➔ page 14	8023858
Cooling unit with heat exchanger ➔ page 13	
FluidLab-PA Multi-Loop ➔ page 171	
FluidLab-PA Process ➔ page 170	

MPS PA Compact Workstation



MPS PA Compact Workstation – Energy
The energy workstation is equipped with current and power meters to study energy consumption and efficiency. The corresponding workbook is entitled "Fundamentals of Closed-Loop Control", sold separately ➔ page 155.

	120 V	220 – 240 V
Without an additional controller	**8164441**	**8164442**
With Festo controller (CDPX and Codsys incl. I/O)	**8162578**	**8162579**
With Siemens controller (PLC S7-1512 and MTP700)	**8162587**	**8162588**
With Rockwell Automation controller (L24 and PanelView 7)	**8162593**	**8162594**

Scope of delivery:

1x MPS PA Compact Workstation, energy (120 V, 60 Hz) **or**	8162607
1x MPS PA Compact Workstation, energy (220 – 240 V, 50/60 Hz)	8162608

Main components at a glance (different than the basic station):
Electrical engineering: DC Wattmeter, power meter up to 5 A/24 V DC, incl. Ethernet interface, mounted on mounting bracket, AC multi-function meter PAC 3200 for measuring total output incl. Ethernet interface, built into 19" front panel
Software: FluidLab-PA Energy

And:

1x Trolley	8106686
1x EasyPort USB 19"	8021637
1x Control panel	195766
1x FluidLab-PA Closed-Loop (perpetual license, 1 user)	8208217
1x Water-air cooler	8080632
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Analog cable, parallel, 2 m	529141
1x Safety laboratory cable, 3 m	571817
1x Ethernet/USB Interface	8079873

Notes: The control components are added to this scope of delivery, depending on the selected workstation variant. A compressor (order no. 91030/565440) is also required.

Recommended extensions:

Simulation box	526863
IoT kit for MPS PA	8162599
Air Control System AirCS equipment set ➔ page 14	8023858
Cooling unit with heat exchanger ➔ page 13	
FluidLab-PA Multi-Loop ➔ page 171	
FluidLab-PA Process ➔ page 170	
EiSLab Software	8050112

Controller Options for the MPS PA Compact Workstation

Notes: All options include a sample application with control functions for the level, flow, pressure, and temperature. For details about the components ➔ pages 112 – 113

Festo Controller/Operator Unit

Scope of delivery
– Touch Panel Operator unit CDPX 7'' (order no. 8162595)
– Integrated Soft PLC Codesys V3.5
– I/O module 16 DI/DO, 4 AI/2 AO, directly to 2x SysLink/1x analog cable
– Connecting cable 24 V dc
– Ethernet cable RJ45, length 5 m
– Software license Codesys V3 Runtime for CDPX
– Codesys V3.5 development environment
– Designer Studio V1.9x with HMI client

Siemens Controller/Operator Unit

Scope of delivery:
– EduTrainer Universal S7-1512C-1PN (order no. 8065600)
– SIMATIC HMI MTP700 Unified Comfort with mounting frame (order no. 8189570)
– IEC power cable 90°
– Connecting cable 24 V dc
– Ethernet cable RJ45, length 5 m
– Programming software STEP 7 TIA portal, single license

Rockwell Automation Controller/ Operator Unit

Scope of delivery:
– EduTrainer Universal A4 rack with Allen-Bradley 1769 L24 (order no. 8034583)
– 7-inch PanelView Operator unit with mounting frame (order no. 8162597)
– Connecting cable 24 V dc
– Ethernet cable RJ45, length 5 m

Note: RSLogix 5000 and FactoryTalk Studio ME software are not included
➔ pages 172 – 173

Recommended Learning Material

Workbook
➔ page 155



Campus licenses:

en/de	8190412

Note: The campus license includes the student and the instructor PDF versions of the workbook "Fundamentals of Closed-Loop Control" as well as other relevant documentation, such as user guides.

Courses on Festo LX
➔ Fundamentals of Closed-Loop Control



➔ Process Automation

1 **IoT Kit for MPS PA**
Create a learning scenario to introduce students to the Internet of Things. The IoT Kit provides a practical, all-in-one solution for networked processes in a compact tabletop size. Its use of open-source software and the availability of source data enable easy customization and do-it-yourself projects.

The different services run on the Raspberry PI such as an Apache Webserver / PHP Server (Website with shopping cart) and a MySQL-Server (Database). The components use a Siemens Scalance 5-port switch to communicate with each other's and a tablet preconfigured with the DC Wattmeter App.

Possible uses with:
– EduKit PA
– MPS PA Compact Workstation
– MPS PA Bottling Station
– EDS Water Management (Water Supply Station)

Scope of delivery
– Raspberry Pi 4 Wireless LAN
– Top-hat rail housing
– Power supply,
– SD Card with
– Raspbian operating system Services
– MySQL-Server (Database)
– Siemens Scalance 5-Port Switch
– Adapter for connecting Tablet to Ethernet via cable
– 7-inch tablet preconfigured with DC Wattmeter App
– Network cable set

Order no.	8162599

2 **Water-Air Cooler**
– Aluminum heat exchanger with copper line and flexible plug-in fittings
– 2x 24 V dc axial fans with 0 – 10 V adjustable speed input and encoder speed feedback
– Profile foot for mounting
– Connecting cable for I/O connection board
– 1x digital output, optional:
– 1x analog input 0 – 10 V

Order no.	8080632

3 **Cooling Unit with Heat Exchanger**
Hermetically sealed refrigerant circuit that is air-cooled with an axial fan that can be added to a MPS PA station for faster cooling. The heat exchanger is made of non-ferrous metal and has one 3/4" filling port as well as two 1/4" threaded female connections. Suitable for continuous operation and does not require any maintenance. The heat exchanger builds into the circulation pipe for tank-to-tank process with pump. Separated media circles: cooling and heating. Manual control of the cooling circuit by a temperature controller and a 2-way valve.

Technical data:
– Temperature range -10 °C to +40 °C
– Ambient temperature +12 °C to +30 °C
– Cooling capacity at +30 °C: 380 W
– Control accuracy +/- 1 K
– 4 liter/min 0,15 bar max. pressure
– Coolant tank volume: 4 Liter, filling port 3/4", inlet/outlet: 1/4"
– Refrigerant R134a
– Dimensions 260 x 370 x 405 mm (width x length x depth)

220 – 240 V, 50/60 Hz	8164444
120 V, 60 Hz	8162598

4 **Trolley**
Through-holes enable orderly routing of cables. The front side is equipped with mountings for panels.
– Height (including casters): 750 mm
– Width: 700 mm
– Depth: 700 mm

Order no.	8106686

5 **DC Wattmeter**
The DC wattmeter is a smart meter for training facilities with a 24 V DC power supply and up to 120 W power consumption. All measured values can be read out via data transmission with the integrated Ethernet port. Power consumption is read out as an analog signal within a range of either 0 to 10 V DC. Product picture for illustrative purposes only; actual product may vary.

Order no.	8216170

1


3


4


2


5


Energy-Efficient Compressed Air Management
Equipment set AirCS



An Expansion Option for the MPS PA Compact Workstation or the MPS PA 204 Complete System

Compressed air energy monitoring and compressor control are taught in a practical and comprehensive manner.

As part of a continuous learning project, the tasks are divided into the areas of condition monitoring, load management, long-term monitoring, flow resistance and nominal flow measurement.

Results can be measured with measuring points, and the software also includes the entire collection of exercises as a PDF file.

A Look at the Overall System

Before compressed air can be used, it must be generated, processed and distributed through to the respective application. Compressed air is a valuable form of energy. The AirCS EduTrainer is integrated between the generation of compressed air (compressor) and the process. The integrated measurement technology, together with the FluidLab-AirCS software, enables innovative condition monitoring for measuring compressed air and power consumption.

Generation and Load Management

Different compressors can be compared and changes can be noticed at an early stage. A calculation aid supports the calculation of the total variable and fixed costs of compressed air generation. With load management, the energy consumption of the compressor and another consumer is visualized.

Distribution and Monitoring

With long-term monitoring, it is possible to visualize the consumption of individual applications. Elements of the compressed air distribution can be examined in the Flow resistance menu. A calculation aid is available to determine the ideal pipe crosssection.

Learning Goals

- Generation, preparation and distribution of compressed air
- Condition monitoring
- Flow measurement and flow resistance
- Effect of leakage
- Pressure losses in distribution networks

Benefits

- Efficient compressed air applications
- Recording pneumatic and electrical consumption values
- FluidLab-AirCS license included
- Industrial quality components
- Can be used in the A4 mounting frame or on the lab table

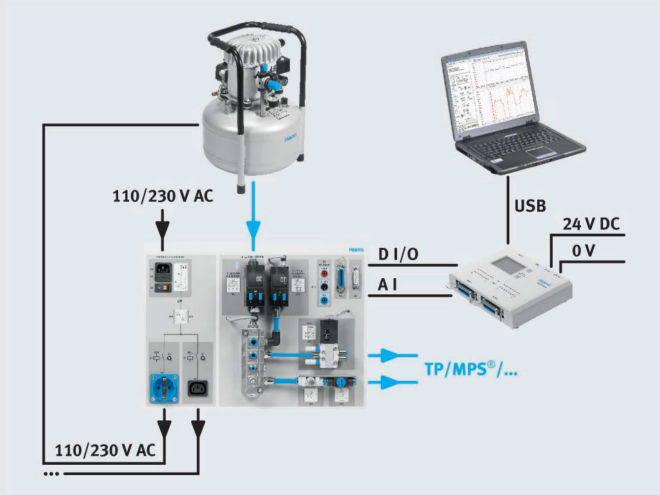
Complete equipment set AirCS	**8023858**

The most important components at a glance:

1x AirCS EduTrainer	8023859
1x AirCS accessory kit	8023860
1x FluidLab-AirCS 1.0 single license	8023861
1x EasyPort USB	548687
1x Analog cable, parallel, 2 m	529141
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Pressure sensor with display	572745

Necessary accessories, also order:

Compressor → Page 67
Tabletop power supply unit → Page 64
Power supply unit for mounting frame → festo.com/didactic
4 mm Safety laboratory cables → festo.com/didactic



FluidLab-AirCS and Training Documentation Included
The FluidLab-AirCS software is an important component of the AirCS equipment set. Just a few simple steps are needed to configure the interface and select the user language (German/English). Then the exercises can be started.

The measurement process is software-controlled. Results can be measured with measuring points, printed out, or exported to a spreadsheet program.

Exercises are supported by connection diagrams, descriptions, and sample solutions taken from the AirCS workbook in PDF format.

The workbook in German and English constitutes the accompanying documentation for the AirCS training project.

The workbook contains:
– Definition of task
– Sample solutions
– Training notes

Up to two electric consuming devices (e.g. compressor and power supply unit) are needed to perform the load management exercises.

