

Process automation and closed-loop control technology

FESTO



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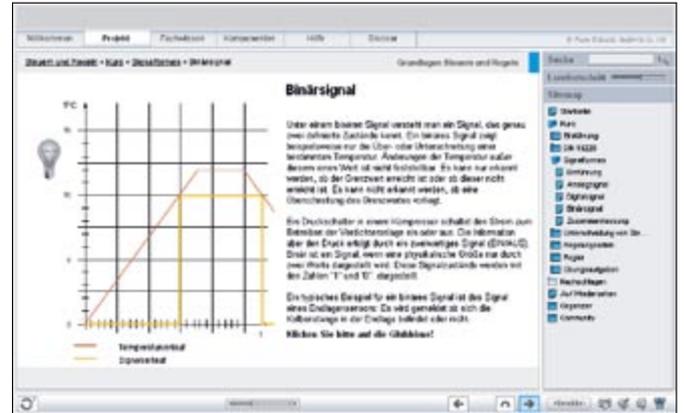
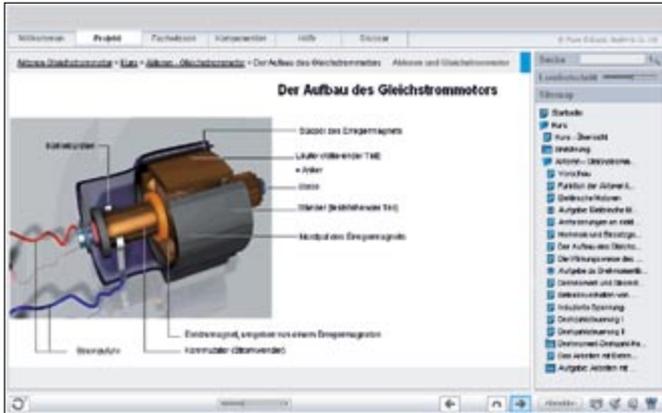




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Actuators – DC motor

Open- and closed-loop control



Using the everyday example of a car park access control system, the trainee learns the basics of a mechatronic system.

Building on this, the training program determines what function the actuators have in the controller. A DC motor is then studied in more detail as an example of a typical actuator, e.g. its structure and the laws which govern its operation. Further chapters cover speed control and the use of data sheets as well as the transmission ratios which can be achieved by using a gearbox.

- From the contents:
- The function of actuators in mechatronic systems
 - Electric motors
 - DC motor
 - Torque and current
 - Behaviour of DC motors
 - Induced voltage and speed control
 - Characteristic torque/speed curve
 - Working with data sheets
 - Determining the transmission ratio

Training time: approx. 2 hours

E.g. single licence on CD-ROM with online activation DE/EN/ES/FR
 Order no. 540953
 with network licence connector DE/EN/ES/FR
 Order no. 540955

The training program uses practical examples to show the difference between open- and closed-loop control in automation. Easy-to-understand tasks are used first to examine the overall process of a simple functioning system. Later sections then look at different types of controllers, the different ways in which signals are represented and processed and the ways in which programs are implemented.

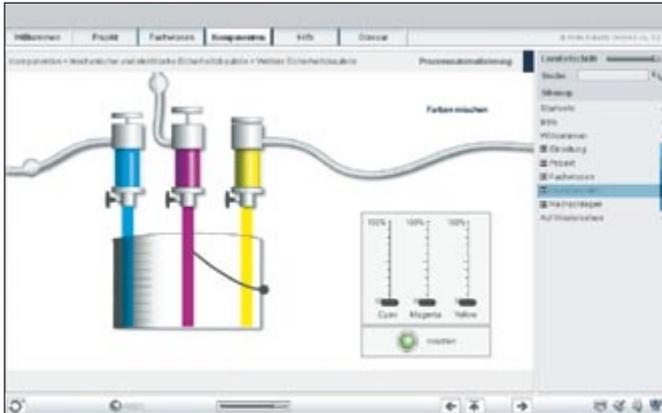
- From the contents:
- Differences between open- and closed-loop control (characteristics of controllers, characteristics of regulators
 - DIN 19226
 - Signal types
 - Differences between types of control
 - Signal processing (synchronous control, controlling links, asynchronous control, process control)
 - Types of control (regulating to fixed values, tracking values)
 - Regulators (P, I and D controllers, combined controllers such as PI or PID controllers)

Training time: approx. 2 hours

E.g. single licence on CD-ROM with online activation DE/EN/ES/FR
 Order no. 540947
 with network licence connector DE/EN/ES/FR
 Order no. 540949

Process automation

New!



Basic principles of process automation

The training programme deals with the broad spectrum of technical process automation in a concise way. The characteristics and special features of process automation are conveyed in a simple manner via images from actual real-life situations, graphic representations of physical-technical processes and animated processes which you yourself can manage and control.

Content topics:

The three chapters „Handling substances“, „System planning“ and „Practical processes for process engineering“, guide you step-by-step to a complete on-screen system. The content of these chapters is reflected in the MPS® PA stations, which you will use during the practical part of the training.

– Handling substances

Product manufacturing is, for the most part, subject to defined physical and chemical characteristics. Students' awareness should be heightened so that they can assess production conditions and are able to deal with them correctly.

– System planning

This guides students through a planning office, providing an insight into the planning and development of a system. Students can examine all the fundamental activities of the planning phase, from the basic principles of project management to drawing a circuit diagram, until the system can finally be built.

– Practical processes for process engineering

The vast number of engineering processes can be reduced to four typical ones: filtration, tempering, mixing and filling. Design and function are analysed using the four MPS® PA stations and the modular product systems from Festo Didactic and any questions that arise while learning about process engineering are answered.

Training time: about 4 hours

E.g. single licence on CD-ROM
with online activation DE/EN/ES/FR

Order no. 567705

with network licence connector DE/EN/ES/FR

Order no. 567706

The fascination of technology



This exciting journey through the history of technology shows how inventions have changed the world. New forms of work have been created: from the hunter to the engineer. „The fascination of technology“ is an interactive journey through the world of automation. The program contains many different multimedia components to help you on your journey. Experience the excitement of discovery and learning – this is pure edutainment! The programme consists of 4 modules:

Technology and automation

Every day we come across technology and automated processes. This introduction illustrates, with practical examples, just how much life is affected by technology, in earlier times too but particularly today.

The history of automation technology

Mankind has always tried to make work easier through mechanisation and automation. Fascinating examples show how hard this development has sometimes been and how impressive the results can be.

Fundamentals of automation technology

This training module goes more deeply into practical examples. A manufacturing process previously carried out manually is automated: you learn about the parts (sensors, actuators) and processes (material flow, energy flow, signal flow) involved in an automated process.

Technology and ...

Technology and society have always been closely interwoven. This training module uses easy-to-understand examples to show how technology and society influence each other. The module also covers the limitations of technology – and possible negative impacts on society.

Training time: approx. 6 hours

E.g. single licence on CD-ROM
with online activation DE/EN/ES/FR

Order no. 540899

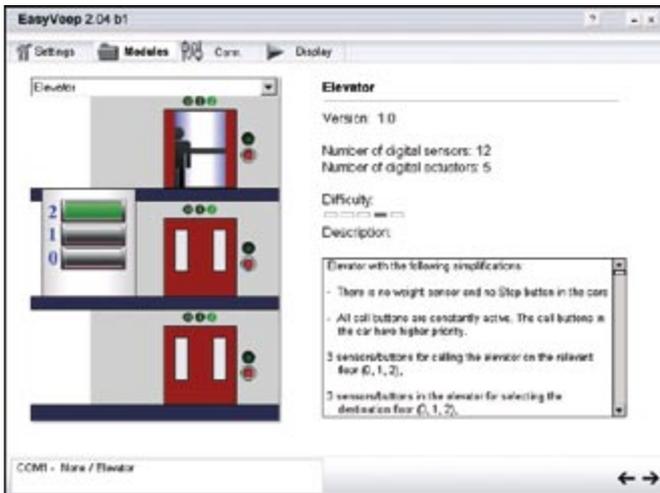
with network licence connector DE/EN/ES/FR

Order no. 540901

Further languages on request.

EasyPort USB – An interface for measuring, open-loop control, closed-loop control.

New!



Connection of software/simulation with actual training equipment/all PLCs

The principle is simple: the USB interface is connected to the PC. The connection to the automation equipment is via standard SysLink connectors. Input and output signals can thus be read into and output from a PC. So that EasyPort can adapt to different situations, we have developed software for the device drivers with a graphical user interface, via which connections can be made.

Control of numerous practical process model

Numerous practical process models can be controlled using any PLC using EasyPort and the EasyVeep® simulation software included in scope of delivery. The models are documented and meet a broad range of requirements.

The topics covered include the following:

- Level crossings
- Multi-storey car parks
- Sorting systems
- Sluice chambers
- Lifts
- Washing machines
- 7-segment display
- Garage doors

Technical data

- 24 V power supply via separate screw terminals or via SysLink connectors
- Interface to PC (galvanically isolated): USB 2.0, RS 232. Up to 4 modules can be connected via a USB hub. Transmission speed: 115 kbaud
- Analogue interface: sub-D 15-pin socket, 12 bit resolution, 4 analogue inputs, 2 analogue outputs, sample frequency 0.5 kHz
- Digital interface: 16 digital inputs, 16 digital outputs on 2 x 24-pin Centronics sockets with 8 digital inputs each (24 V), 8 digital outputs (24 V). 24 V power supply. Digital signals represented by LEDs
- Large LCD display, display of channel, unit, trend and measured value (4 digits). Selection of the channel to be displayed and the units via keys.
- Controllable via Activ-X control from Labview, C++ or Visual Basic

EasyPort USB	548687
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Also order:

For EasyPort with a real process or SimuBox:

I/O data cable with IEEE 488 SysLink connectors at both ends	34031
Analogue cable, parallel	529141

For EasyPort with a real PLC:

I/O data cable with IEEE 488 SysLink connectors at both ends	167106
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For EasyPort, freely wirable, with any PLC:

I/O data cable with one IEEE 488 SysLink connector and open cable end sleeves	167122
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For EasyPort with a PLC board:

I/O data crossover cable, with terminal socket	167197
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For EasyPort with a real PLC or SimuBox:

Analogue crossover cable	533039
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PLC starter kit	543081
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Universal connection unit, digital (SysLink)	162231
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EasyPort adapter for slotted profile plate	549806
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Connects the simulation to the real world

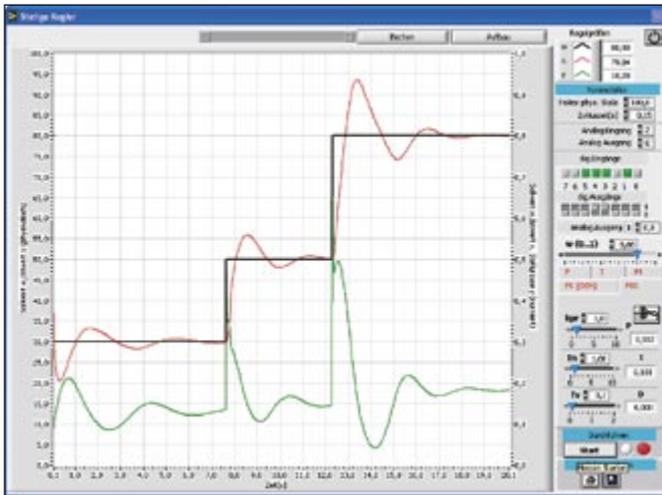
Example applications	Measuring	Control (open loop)	Closed-loop control	Controlling a simulation
PC: Software and simulations	<ul style="list-style-type: none"> – Fluid Lab®-PA – Fluid Lab®-P – Fluid Lab®-H – Labview – C++ – Visual Basic 	<ul style="list-style-type: none"> – FluidSIM® (only digital) – S7-PLCSIM – CoDeSys Soft-SPS – Labview – C++ – Visual Basic 	<ul style="list-style-type: none"> – Fluid Lab®-PA – Fluid Lab®-P from version 2.0 – Labview – C++ – Visual Basic 	<ul style="list-style-type: none"> – EasyVeep® – FluidSIM® – CIROS® – Labview – C++ – Visual Basic
Interface: EasyPort USB	Interface: USB  Interface: digital/analogue	Interface: USB  Interface: digital/analogue	Interface: USB  Interface: digital/analogue	Interface: USB  Interface: digital
Real training equipment	<ul style="list-style-type: none"> – Simulation box, digital/analogue – MPS® PA – TP 210 – TP 610 <p>EasyPort USB is the PC interface for receiving analogue measurements and digital signals.</p> <p>Measurement data logged via:</p> <ul style="list-style-type: none"> – Fluid Lab®-PA – Fluid Lab®-P – Fluid Lab®-H 	<ul style="list-style-type: none"> – Simulation box, digital/analogue – MPS® PA – MPS® – TP 301 <p>EasyPort USB is the PC interface to control actual processes or simulations on a PC via an actual PLC.</p> <p>Actual process, controlled via:</p> <ul style="list-style-type: none"> – S7-PLCSIM – FluidSIM® – CoDeSys 	<ul style="list-style-type: none"> – Simulation box, digital/analogue – MPS® PA – TP 210 – TP 610 <p>EasyPort USB is the PC interface to control an actual closed-loop controlled system.</p> <p>Closed-loop controlled system, controlled via:</p> <ul style="list-style-type: none"> – Fluid Lab®-PA – Fluid Lab®-P from version 2.0 	<ul style="list-style-type: none"> – Any PLC – Simulation box, digital – EduTrainer® – PLC Board <p>Recommendation: the PLC starter kit contains everything that is needed to start on the subject of control. See Training packages Electronics/PLCs.</p> <p>Simulated process, displayed via:</p> <ul style="list-style-type: none"> – CIROS® – FluidSIM® – EasyVeep®

Scope of delivery

- EasyPort USB
- 24 V connecting cable on 4 mm safety plugs
- USB cable
- CD-ROM: EasyVeep®, EasyOPC driver, datasheet, Activ-X control, examples of control using Labview



Fluid Lab®-PA



Fluid Lab®-PA can be used to teach and demonstrate the fundamentals of control technology. The main components required for actuating the MPS® PA stations using a PC are the EasyPort and the Fluid Lab®-PA software.

Fluid Lab®-PA can be easily installed on any Microsoft Windows operating system.

Key features

Three main functions are integrated in Fluid Lab®-PA in combination with the EasyPort:

M as in measurement

For detection and evaluation of measured variables from 8 digital/4 analogue input signals.

C as in open-loop control

For binary or continuous control of 8 digital/2 analogue outputs.

R as in closed-loop (regulated) control

For freely selectable closed-loop control functions such as 2-point, P, I, PI and PID.

Actual process or simulation

All exercises and experiments can be performed online on the actual process in conjunction with the station or offline using the pre-integrated simulation.

„Settings“ menu item

The following parameters can be set here for the four analogue input channels and the sensors connected to them:

- Factor
- Offset
- Filter
- Inversion

The analogue and binary output signals can also be switched and the signal states of the inputs read off. General PC system settings can also be made here.

„Process Sequence“ menu item

The process sequence of each station can be easily started from Fluid Lab®-PA. All of the process steps are visualised and can be monitored on the flow chart.

„Measuring and Control“ menu item

All the functions of the MPS® PA station can be clearly and directly controlled. The states of the process valves, pumps and sensors are graphically recorded, which means they can be directly evaluated. The following functions are provided for recording the sensor characteristics and determining the step response:

- Selection of measuring channels
- Factor for physical scale
- Adaptation of the time scale
- Display of the input signals
- Setting of output signals, switching on/off of the manipulated variable
- Printing of the measured value display or saving as a .jpg file

„Analysis“ menu item

Analyses of a wide range of process components can be directly performed using predefined exercises, for example:

- Recording of sensor characteristics
- Recording of pump characteristics
- Recording of heating characteristics

This permits a fast and thorough understanding of the typical process components.

„2-Point Controller“ and „Continuous Controller“ menu item

For easy parameterisation of the required controller with an immediate effect on the process. One click of the mouse starts various controller functions for the selected control system. Documentation of the controller parameters is also straightforward. The measured values and characteristic curve profiles can be easily printed out.

Mechatronics/Handling technology/Process automation



Communication-oriented approach to system malfunctions

The importance of maintenance and servicing, in particular with respect to malfunction management, cannot be underestimated in production.

The purpose of this textbook is to teach students how to reduce downtimes. Identifying failure modes, diagnosing malfunctions and fixing faults requires both specialist knowledge and interpersonal communication skills. This practical textbook addresses the situation using the case example of a medium-sized drinks bottling company: training scenarios portray realistic situations, that provide instruction in a range of faults from the simple to the cross-linked.

Includes a CD-ROM with presentations on the topic of communication and troubleshooting, circuit diagrams and function charts for the MPS® distributing and sorting stations plus the textbook.

Walter E. Theuerkauf, Sarah Funke,
Gabriele Graube
Edition 2006, 144 pages, in binder incl.
CD-ROM

DE 543068



Training document Process optimisation

With the basics of

- Analysis of existing systems
- Project plan
- Planning and optimisation of automated systems
- Value creation and wastage
- KANBAN
- SMED
- TPM
- Poka-Yoke
- FMEA

The detailed project task, with seven subsidiary tasks based on the example of the MPS Distribution, Inspection, Processing, Handling and Sorting stations, enables practical optimisation of a production process, with material flow analysis, devising and appraising suggestions for improvement, procurement and production of components, programming and commissioning the optimised system.

Includes a CD-ROM with circuit diagrams, symbols and sample programs for the Siemens PLC S7-300.

M. Bellenberg, T. Mehwald, H. Regber,
G. Schmidt
Edition 2006, 310 pages, in binder incl.
CD-ROM

DE 539934



MPS® PA workbook

Workbook including solutions, for training in process automation.

This workbook includes tables that allocate training aims with exercises and components with exercises, together with the fundamentals of closed-loop control technology, exercises with all necessary worksheets and didactic instructions about analysing and inspecting a system, measuring, open and closed-loop control, as well as the solutions for the instructors. The workbook provides detailed descriptions of the problem definition and parameters. The worksheets support the students through the required steps of planning, execution and function testing.

The exercises refer to the filtering, mixing, temperature maintenance and bottling processes. The trainees acquire the ability to inspect systems, to describe components and functions as well as the operation of systems.

The workbook includes a CD-ROM with the worksheets and the solutions.

J. Helmich, H. Kaufmann
Edition 2007, workbook 270 pages, with
CD-ROM, in folder, solutions 160 pages,
bound

DE	548590
EN	548591
ES	548592
FR	548593



Workbook for EduKit PA

New!
Workbook with solutions for training in closed-loop control/process technology with EduKit PA.

This workbook explains the basic principles of process technology and provides an introduction to the subject. It covers manual and automated measurement, open and closed-loop control and system design topics such as planning, installation, commissioning, marketing and sales. You will be provided with exercises including all necessary worksheets as well as didactic information and solutions as support for trainers. The workbook contains detailed descriptions of the problems and parameters. The worksheets guide students through the required steps of planning, execution and function testing.

The measurement/open and closed-loop control exercises relate to flow, level and pressure technology.

The workbook includes a CD-ROM with the worksheets, data sheets and solutions.

J. Helmich, H. Kaufmann
Edition 2009, workbook 270 pages, with
CD-ROM, in folder, solutions 160 pages,
bound

DE	563969
EN	563971
ES	563973
FR	563975

MPS® PA – The Modular Production System

With MPS® PA, you determine the degree of complexity:

- Task-based projects with the EduKit PA project kit
- Complex problem definitions with MPS® PA stations or the MPS® PA Compact Workstation
- Multi-layered projects with the PA 204 complete MPS® system or the hybrid AFB training factory

Filtering, mixing, tempering and bottling as in industry



Modular

The modularity of the learning system enables you to realise a diverse range of configurations for typical production processes from very different industries in a safe learning environment.

Training for many areas of application and careers

- Electronic engineers
- Mechatronics engineers
- Systems engineers
- Microtechnologists
- Process technicians for plastic and rubber technology, glass and coating technology
- Experts in food, confectionery and fruit juice technology
- Experts in water supply, sewage technology, pipe, canal and industrial services
- Chemical engineers
- Pharmaceutical engineers
- Biotechnicians
- Paper technicians
- Systems engineers for sanitary, heating and air conditioning technology

Train efficiently



Festo – The partner to the process industry

Festo is fast becoming a key partner to the process industry. It is only logical that the process automation learning system benefits from this know-how and is tailored to the requirements of different industries through its consistent modularisation:

- Water supply and disposal industry
- Food industry
- Bulk goods industry
- Chemical and petrochemical industries
- Biotechnology/pharmaceutical industries
- Paper industry

Why stop production to facilitate training?

It is prohibitively expensive to shut down an industrial system to facilitate training. Comprehensive training in the individual areas of process automation requires industry-oriented model systems or training installations. „Learning by doing“ and „process orientation“ are two principles that are central to the successful imparting of the many detailed training aims in process technology. Simulation of a process engineering system on a PC provides the opportunity of using a simulation as an actual training system.

From the kit to the training factory

Application and process-oriented learning systems

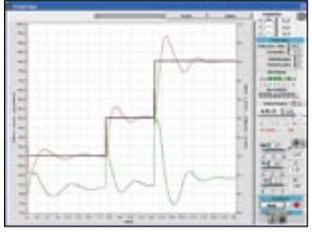


Industry-oriented basic and further training

As practical training on actual production and industrial systems is seldom possible, project kits, stations, systems and training factories from Festo Didactic prepare trainees for the demands of their profession in the best possible way.



Measuring and controlling as in industry

<p>The closest thing to reality The MPS® PA learning system is based on industrial standards. The MPS® PA concept is based on a market leaders' automation solutions and trends.</p>	<p>Components</p>	<p>Operation and configuration</p>	<p>Advantages</p>
<p>SimuBox</p>			<ul style="list-style-type: none"> – Simple commissioning of an MPS® PA station – Testing and commissioning of process components or system components of a station
<p>Fluid Lab®-PA</p>			<ul style="list-style-type: none"> – Commissioning and testing of an MPS® PA station – Analysis of process components and control processes of an MPS® PA station – Monitoring and analysis of the process sequences of a station – Testing, configuration and optimisation of control processes (2-point, P, PI or PID controllers) – Analysis of the control response
<p>PLC</p>			<ul style="list-style-type: none"> – Programming of process sequences and recipe controllers – Analogue signal processing – Operation and monitoring using the touch panel – Programming of PID controllers – Configuration and parameterisation of P, PI or PID controllers
<p>PLC with external industrial controller</p>			<p>Same as PLC, plus:</p> <ul style="list-style-type: none"> – Operation of an industrial controller (manual operation, automatic operation) – Parameterisation of industrial controllers (P, PI or PID control algorithm) – Configuration of measuring ranges, setpoint value limits and alarm limits – Self-optimisation with oscillation or step response method

Understanding process automation – Through seminars and workshops



Further training, with the objective of supporting people in companies to deal with current as well as future problems and provide them with new answers – that is the purpose of Festo Didactic.

Festo is developing itself to become an important partner to the process industry. The close coordination with our parent company, Festo AG & Co. KG, ensures that state-of-the-art devices and systems are used in our learning systems. And our trainers have first-hand expert knowledge.

Our orientation and methods set us apart. Our trainers and consultants are practitioners. They are familiar with the tasks of their participants, even those that go beyond technical requirements.

We have high standards. In our courses you will realise the difference between us and other providers: we provide new answers to old questions – answers that help you get that critical step ahead with your operational plans.

Give us a call; we'll be happy to help.

Valves and fittings – Process control valves

This course provides detailed insights into valve and fitting technology and shows how they are used in the process industry. Participants gain basic knowledge of the individual valve and fitting types and components. In addition, selecting materials and operating conditions/limitations are described in detail. The various types of actuators are also explained with regard to the individual fitting and valve types and all relevant standards are discussed.

Basic principles and mode of operation of industrial measuring technology and instrumentation

This course provides detailed and sound insights into process engineering. The various measuring types, as well as the different principles, such as pressure, flow rate, temperature and filling level control are treated in detail. Furthermore, control engineering is taught in-depth based on P, I and PID controllers, along with their advantages and disadvantages.

Closed-loop control circuits

Participants gain detailed and sound insights into process control technology based on P, I and PID controllers and their advantages and disadvantages. Practical exercises with the PA EduKit and the Fluid Lab®-PA software ensure that the knowledge acquired is transferred into practice.

Specific customer training, e.g. the basic principles of control engineering

Customised training for employees from the areas of maintenance, service and operational support. With the professional training equipment from Festo Didactic, the following course topics are covered by the training systems on the basis of „learning by doing“:

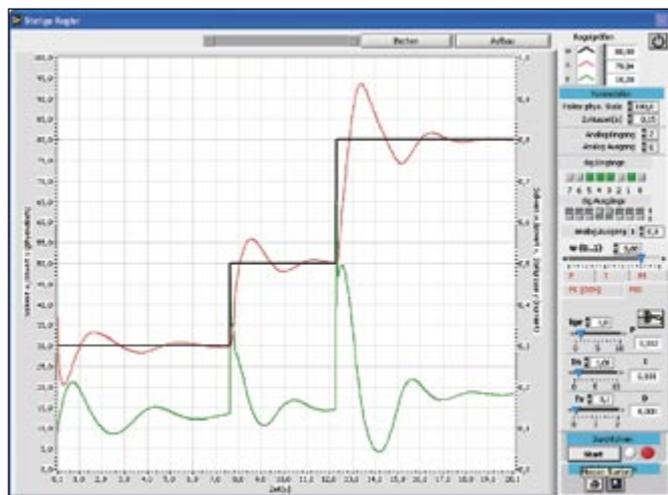
- Cross section of all controller types (P, I, D, PI, PD, PID)
- Control technologies (Fluid Lab®-PA, industrial controllers and modern PLCs)

Do you need anything else?

Workshop with more complex tasks for practical operational support and maintenance. For example:

- Exchange and new use of sensors and their integration in a controlled system
- Troubleshooting with control characteristic diagnostics
- Controlled system with reaction time (on request)

Fluid Lab®-PA



Fluid Lab®-PA can be used to teach and demonstrate the fundamentals of control technology. The main components required for actuating the MPS® PA stations using a PC are the EasyPort and the Fluid Lab®-PA software.

Fluid Lab®-PA can be easily installed on any Microsoft Windows operating system.

Key features

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C as in open-loop control

For binary or continuous control of 8 digital/2 analogue outputs.

R as in closed-loop (regulated) control

For freely selectable closed-loop control functions such as 2-point, P, I, PI and PID.

Actual process or simulation

All exercises and experiments can be performed online on the actual process in conjunction with the station or offline using the pre-integrated simulation.

„Settings“ menu item

The following parameters can be set here for the four analogue input channels and the sensors connected to them:

- Factor
- Offset
- Filter
- Inversion

The analogue and binary output signals can also be switched and the signal states of the inputs read off. General PC system settings can also be made here.

„Process Sequence“ menu item

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„Measuring and Control“ menu item

All the functions of the MPS® PA station can be clearly and directly controlled. The states of the process valves, pumps and sensors are graphically recorded, which means they can be directly evaluated. The following functions are provided for recording the sensor characteristics and determining the step response:

- Selection of measuring channels
- Factor for physical scale
- Adaptation of the time scale
- Display of the input signals
- Setting of output signals, switching on/off of the manipulated variable
- Printing of the measured value display or saving as a .jpg file

„Analysis“ menu item

Analyses of a wide range of process components can be directly performed using predefined exercises, for example:

- Recording of sensor characteristics
- Recording of pump characteristics
- Recording of heating characteristics

This permits a fast and thorough understanding of the typical process components.

„2-Point Controller“ and „Continuous Controller“ menu item

For easy parameterisation of the required controller with an immediate effect on the process. One click of the mouse starts various controller functions for the selected control system. Documentation of the controller parameters is also straightforward. The measured values and characteristic curve profiles can be easily printed out.

DE/EN/ES/FR

544304

Project kits for task-based training

The significance of control technology is increasing constantly in all areas as energy and resources can be saved using this technology. To achieve efficient production, individual steps must be planned, sequences understood and double-checked.

With the EduKit PA project kit, the introduction to process and control technology is easy and safe.

EduKit PA

The new project kits for process and control technology

New!



The inexpensive introduction to process and control technology

The project kits are modular, can be expanded flexibly and are therefore ideally suited for exciting and practical lessons in technology. Links can be made with industrial project work, filling level control, flow rate control and pressure control.

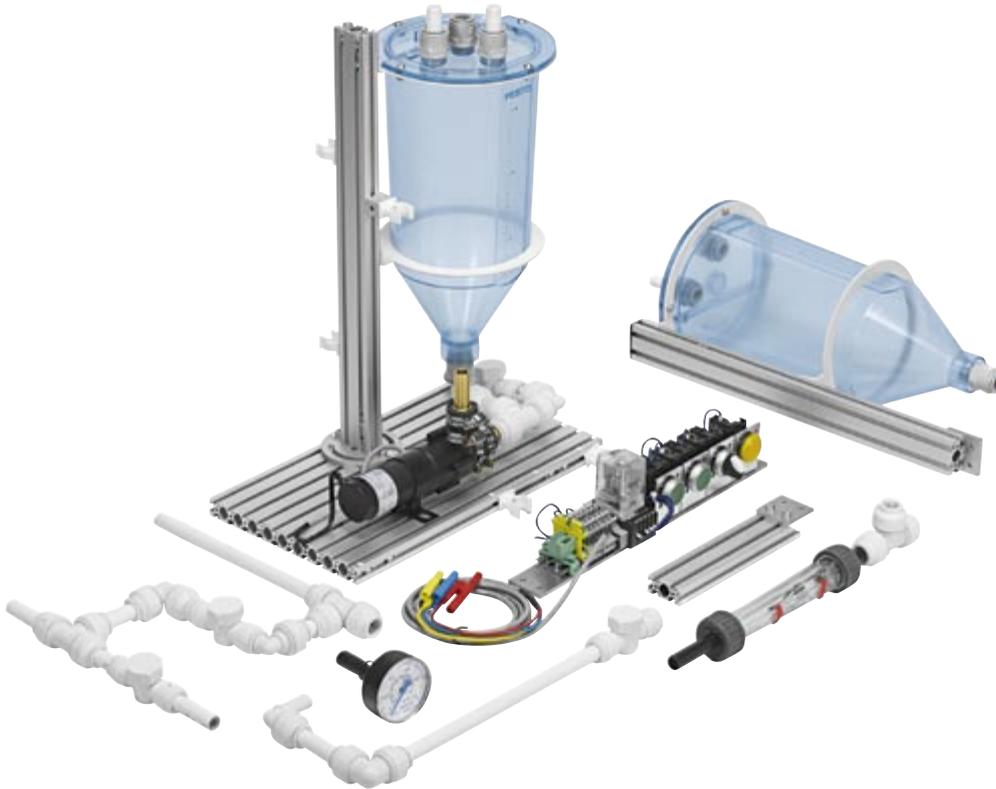
The didactic concept of EduKit PA both supports experimental learning as well as a structured procedure, thanks to extensive optional training materials with project exercises and a lot of additional documentation on CD ROM. EduKit PA is therefore the inexpensive way to become familiar with process and control technology, both in vocation-oriented lessons as well as for use at colleges and universities.



EduKit PA

Unpack and away you go

New!



EduKit PA Basic

Teaches the basic principles of project work and the fundamentals of closed-loop control – manual measurement, open and closed-loop control – without a PC and without sophisticated control technology.

The benefits to you

- Handy, easy to transport and simple to set up
- Step by step construction of a functional system: start with a small setup – a tank – and finish the project with a level control system
- Training documents available
- Easy to use and expandable for use with other topic areas
- Water acts as a non-hazardous teaching medium ideally suited for closed-loop control
- Consistent with existing Festo Didactic systems

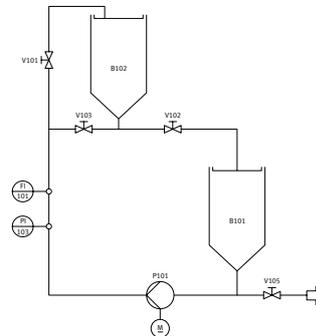
Learning content for project work

- Planning a project:
- Allocating tasks in teams
 - Creating a project plan with different steps
- Construction, assembly, connection:
- Creating sketches for the pipe connection system
 - Producing an assembly diagram
 - Mechanical assembly
 - Electrical connection of pump to 24 V supply
 - Checking activities
 - Creating test logs
- Commissioning and measured data acquisition:
- System start-up
 - Recording measured values with changed valve position, changed voltage on the pump or different fill heights
 - Observation of level, pressure and flow, as well as time response

Presentation and documentation:

- Creating assembly instructions
- Documenting measured values
- Graphical analysis
- Presenting project process

The EduKit PA Basic and EduKit PA Advanced modular product systems are each supplied in a Systainer.



As well as electrical pneumatic diagrams, you will also learn how to understand and describe a PI diagram.



EduKit PA Basic in the Systainer 549822

The most important components at a glance:

1x Pump	170712
2x Tank, round	On request
1x Flow meter	548604

Accessories, also order:

Tabletop power supply unit → Internet	
Tubing cutter	7658

Recommended learning media

Workbook with project tasks and solutions for EduKit PA Basic and Advanced on:

- Technological issues
- Mathematics
- Open-loop control
- Closed-loop control
- Work scheduling

Includes CD-ROM containing:

- Parts lists and data sheets
- RI flowcharts and circuit diagrams
- Assembly instructions for mechanical construction
- Checklists for commissioning
- Acceptance logs
- Worksheets for recording characteristic curves
- Process automation WBT



DE	563969
EN	563971
ES	563973
FR	563975

EduKit PA Advanced

Supplements the EduKit PA Basic modular product system with the topics of automated measurement, open and closed-loop control, sensors and electrical interfaces. The EduKit PA Basic is required when using the components of the EduKit PA Advanced.

EduKit PA Advanced in the Systainer 564631

The most important components at a glance:

1	1x I/O board for EduKit PA	549823
2	2x Sensor, capacitive	549824
3	1x Sensor, ultrasound	548689
4	1x Flow sensor for EduKit PA incl. transducer	549825
5	1x Pressure sensor 0 – 400 mbar	549826
6	1x 2/2-way solenoid valve	549827

Recommended accessories for control

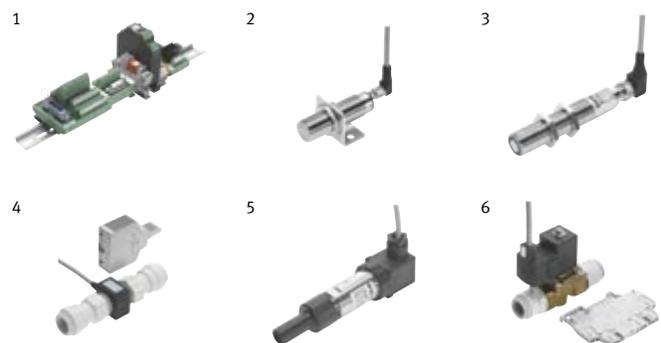
EasyPort USB	548687
Fluid Lab-PA DE/EN/ES/FR	544304
I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
Analogue cable, parallel, 2 m	529141

The open interface provides various actuation options, e.g. controllers from Siemens, Festo, Allen Bradley and Mitsubishi.

Extension options:

- Two-way ball valve for EduKit PA with quarter-turn actuator DAPS, double acting (order no. 549828)
- Float switch sensor, top (order no. 548597)

Additional components → Internet



Compact Workstation

Optimisation relative to your space requirement

Maybe you're restricted in the amount of space you have available but you want each of your training workstations to offer a high level of complexity.

If so then the Compact Workstation with four integrated closed-loop control systems is the solution for you. As shown in the flow chart, the individual control systems can be activated by simply repositioning the ball valves. The flexible piping system enables you to change the flow scheme or integrate other components quickly and easily.

Compact Workstation

Level, flow rate, pressure and temperature closed-loop control systems

Function

The four control systems in the Compact Workstation can be operated individually.

The level and flow rate control systems can be structured as a cascade control system through the addition of an appropriate controller.

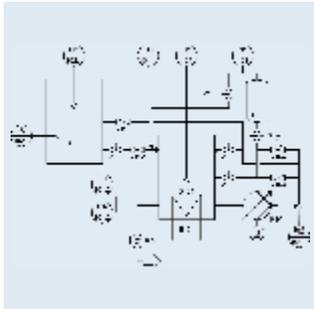
The layout of the sensors and servo drives permits experimentation with both continuous (e.g. P, I, PI, PID) and discontinuous action controller types (e.g. 2-point controllers). The pump can either be controlled directly or operated in controlled-speed mode.

The manipulated variable of the controller in the flow rate and pressure control systems can alternatively act upon a proportional directional control valve. A ball valve with pneumatic drive is built into the return between the high-level container and the lower reservoir. The pneumatic drive can be used to simulate a "load" for switching on a disturbance in the level control system or as an on-off valve for emergency switch-off.



Compact Workstation

Level, flow rate, pressure and temperature closed-loop control systems



1

Piping and instrument flow chart (1)

An important part of project work in process engineering is developing a piping and instrument flow chart. A piping and instrument flow chart explains the electrical, measuring and control technology functions using measuring points and final control elements. The measurement variable or another input variable, its processing, its direction of action and directional specifications and positions should follow from the chart.



2

Mounting frame (2)

Can be equipped with accessories for controllers, control unit and/or touchpanel. The activation and/or control devices can be replaced in just seconds.



3

Pneumatic drive (3)

With ball valve and signal box. Training aims: Design and application areas of various metering and shut-off devices when controlling the flow of liquids.



4

Intelligent in the field – closed-loop control with the CPX/FEC valve terminal and the FED 120 touchpanel (4)

The Festo Front End Controller with integrated web server and Ethernet interface is ideally suited to current communication tasks.

Scope of delivery of the Compact Workstation

Basic version including manual without actuation components

Mechanical components, fully assembled

- 2 containers
- Reservoir
- Plug-in piping system
- Aluminium profile benches
- Mounting frame
- Profile plate 700 x 700 x 32 mm

Sensors

- 2 capacitive sensors
- 2 float switches
- 1 process drive signal box
- Ultrasound sensor
- Flow sensor
- Pressure sensor
- PT100 temperature sensor

Actuation components

- Pump
- Proportional directional control valve
- Ball valve with pneumatic drive
- Heater

Electrical components

- I/O connection board with measuring transducer
- Motor controller with relay
- I/O terminal, SysLink, 8 I/8 O
- Analogue terminal, SysLink, 15-pin

Compact Workstation On request

Commissioning and training on-site upon request.

Accessories

- Trolley
- Power supply unit for the mounting frame
- Control kit

Recommended training media:

- Fluid Lab®-PA including EasyPort
- Web-based training program, Fundamentals of open and closed-loop control

Control variants of the Compact Workstation

Control kit S1:

Siemens SIMATIC EduTrainer® Compact with S7-313C/314C-2DP

- 1 x EduTrainer Compact S7-313C/314C-2DP
- 1 x control unit
- 2 x I/O data cable
- 1 x analogue cable

Note:

STEP 7 software and MPI cable must be ordered separately if required.

Control kit F2:

Festo CPX-FEC® valve terminal

- 1 x Festo CPX-FEC®
- 1 x control unit
- 1 x Ethernet cable, crossover
- 2 x I/O data cable
- 1 x analogue cable

Note:

FST software and programming cable must be ordered separately if required.

Control kit PC2:

Fluid Lab®-PA software licence with EasyPort

- 1 x Fluid Lab®-PA, individual licence
- 1 x EasyPort
- 1 x RS232 data cable
- 1 x mains cable
- 1 x I/O data cable
- 1 x analogue cable

Visualisation with WinCC or InTouch on request.

Control kit S2:

Siemens SIPART DR19 controller

- 1 x SIPART DR19 with serial interface integrated in ER frame
- 1 x PDM software for parameterisation and configuration of the DR19 controller
- 1 x serial data cable
- 1 x I/O data cable
- 1 x analogue cable

Control kit F3:

Festo CPX-FEC® with FED

- 1 x Festo CPX-FEC®
- 1 x Ethernet cable, crossover
- 1 x FED-120 touchpanel
- 1 x I/O data cable
- 1 x analogue cable

Note:

FST software and programming cable must be ordered separately if required.

I/O simulation box, digital/ analogue

- 1 x simulation box incl. mains cable
- 1 x I/O data cable, crossover
- 1 x analogue cable, crossover

Control Kit S1: EduTrainer Compact S7-313C	On request
Control Kit S1-DP: EduTrainer Compact S7-314C-2DP	On request
Control Kit S2: Siemens controller SIPART DR19	On request
Control Kit F2: Festo CPX-FEC	On request
Control Kit F3: Festo CPX-FEC + FED	On request

Control Kit PC2: Fluid Lab-PA + EasyPort	On request
I/O simulation box, digital/analogue	On request

MPS® PA Stations and Complete systems

Teaching today using the technology of tomorrow

MPS® PA, an innovative learning system equipped with the most modern technical features and products from market leaders.

The new learning system for process automation



Practical training

The exclusive use of industrial components underlines the necessary practicality and ensures a speedy transfer of knowledge from a training scenario to practical application.

Slide, flap or ball valve

The correct valve in use.

Sensors

Typical process engineering sensors assume control of temperature, level, flow rate and pressure in the MPS® PA.

Investment protection

A well thought-out modular design with clear-cut interfaces facilitates adaptation to future developments in components as well as open-loop and closed-loop control systems. This means that the system can be adapted to new requirements.

Boundless variety

It is only logical that the MPS® PA stations can be combined with stations from the greater MPS® family. After all, it is this possibility of combination with MPS® stations that makes the MPS® PA an interesting proposition for basic and further training in many industries which are dominated by process automation but still require elements from production automation.

Either: Simply build it yourself



Every MPS® PA station comes completely assembled and tested on the profile plate with MPS® PA trolley, touch panel and 24 V power pack.

A controller board with analogue inputs and outputs is required additionally.

For efficient operation in the lesson, we also recommend:

- EasyPort
- Fluid Lab®-PA
- PID industrial controller
- Workbook with tasks and solutions

Simply commission it ... and you're ready to go!

On request, we can also commission systems for you – particularly in the case of larger systems.

Or: MPS® PA commissioning service



To ensure that your training projects run smoothly right from the start, we offer:

1. Complete technical commissioning of your new system:

The range of applications of the system and the station programs and documentation are presented. Depending on the equipment, commissioning is performed for the following products:

- Station
- PID industrial controller
- EasyPort and Fluid Lab®-PA

2. Training:

You will learn how to operate stations and how to use them in your lesson. Depending on the equipment, training is provided on the following products:

- Station
- PID industrial controller
- Soft PID in the PLC
- EasyPort and Fluid Lab®-PA

The commissioning and training can thus be adapted to suit your needs.

And if you wish ...

3. Useful tips on how to get the most from the MPS® PA:

- Applications
- Enhancements
- Seminars

Are you planning a commissioning and training session?

We recommend:

Per Station: 1.5 days

Order no. 555647

Combining stations

The new interface concept offers many possibilities for direct combination of individual MPS® PA stations.

Various aspects determine the decision as to which combination is required:

- Training aims
- Supplementation of existing stations
- Budget

The MPS® 204 Complete system section shows a fully configured system.

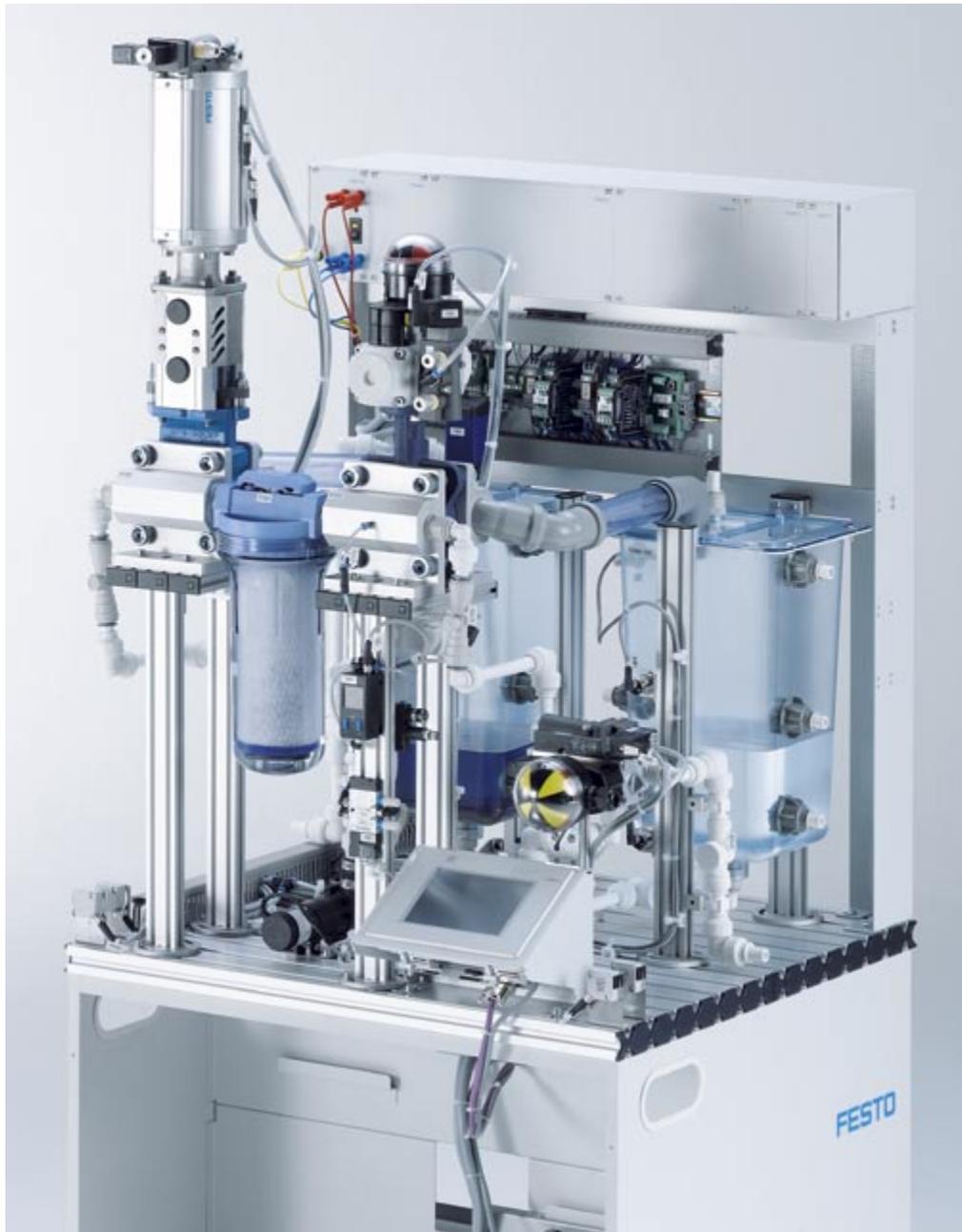


MPS® PA stations can be combined as follows:

Stations	Possible direct downstream station			
	Filtration	Mixing	Reactor	Bottling
Filtration		+	+	+
Mixing	+		+	+
Reactor	+	+		+



Filtration station



Function

The Filtration station filters liquids. The filtrate is pumped from the first tank into the second tank through the filter using a knife gate valve. The filtered liquid reaches the second tank via the flap with pneumatic semi-rotary drive. The filtered liquid can be pumped onwards to the next station using a separate pump. The filter can be rinsed using a rinse program. Regulated compressed air is additionally blown through the filter to loosen deposits.

Measurement and control

Sensors detect the filling level of the container in the Filtering station. This permits lessons on simple control exercises for monitoring the pumps right up to complete control projects involving complex processes. Pressure control ensures constantly high filter quality during flushing. The pressure sensor with LCD display, analogue output and switching output always supplies the correct measurement variable. The controller with P, PI or PID control algorithm ensures constantly high filter quality during rinsing via the proportional pressure regulator. Control technology is clearly and practically explained in this way.

Shutting off, opening, closing

The right selection of process valve, drive, drive accessories and control valve plays an important role in complex process sequences. The Filtering station uses an extremely wide range of process components. All the valve actuators are actuated via a directly connected NAMUR valve.

Knife gate valve with COPAC linear actuator.

Butterfly valve with sturdy rack and pinion COPAR rotary actuator and large visual display.

Three-way ball valve with SYPAR scotch yoke rotary actuator and large visual display.



Filtration station	544253
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(with trolley, colour touch panel, mounting frame and power supply unit)

Also order:

Open-loop and closed-loop control with PLC:

PLC board with SIMATIC S7-313C	533526
SIMATIC S7 connecting cable set	544296
PLC board with CPX-FEC	541187
Festo CPX connecting cable set	544297
PLC board with Allen Bradley MicroLogix 1500	544300
Allen Bradley MicroLogix connecting cable set	544298
PLC board with Mitsubishi MELSEC	544301
Mitsubishi MELSEC connecting cable set	544299

Or alternative:

SIMATIC S7 EduTrainer Compact 313C	533018
SIMATIC S7 connecting cable set	544296

For working with Fluid Lab®-PA:

Fluid Lab-PA DE/EN/ES/FR	544304
EasyPort USB	548687
PC data cable RS232 male-female	162305
RS232 USB adapter	540699
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For simple commissioning, simulation and display using the simulation box:

Simulation box, digital/analogue	526863
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For professional control using industrial controllers:

PID industrial closed-loop controller	544293
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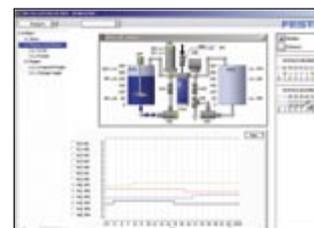
Necessary accessories

Replacement filter cartridge	544303
Power cable for power supply unit → Internet	

Training aims for project work

- Set-up, wiring and commissioning of a system for process technology
- Selection, application and actuation of process valves
- Measurement of electrical and process-related variables such as level and pressure
- Set-up and commissioning of control circuits
- Analysis of control processes and control circuits
- Parameterisation and optimisation of P, PI or PID controllers
- Drafting of open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance and servicing

Recommended training media



- Fluid Lab®-PA
- WBT Fundamentals of open and closed-loop control
- Design and simulation program FluidSIM® Pneumatics

Also order:

Workbook MPS® PA



DE	548590
EN	548591
ES	548582
FR	548593

Mixing station



Function

The mixing station mixes different recipes from three reservoir tanks. The liquid from one of the three reservoir tanks is pumped into the main tank in a controlled manner by opening the respective two-way ball valve. The finished mixture can be pumped to the next station via a second pump – or pumped back to the reservoir tank.

Measurement and control

Using a constant flow rate, the three raw materials are mixed to a recipe in the mixing station. The flow rate is recorded by means of an electronic flow sensor with impeller and additionally displayed using a variable-area flowmeter. The output signal from the flow sensor is converted to a standard signal from 0 – 10 V. The mixing station can also be actuated through binary means using the integrated comparator. The controller adjusts the necessary flow rate via the pump with analogue control – using a simple two-point controller or various dynamic controllers such as P, PI or PID. This permits a clear explanation of control technology on various levels.

Always the right mixture

The component mix of the mixing station offers a wide selection of typical components from process engineering. Pumps and process valves, various sensors for signal detection as well as electronic modules for signal conversion permit the right 'training mix'.

Sensors for detecting the filling level of containers.

Signal converters convert all analogue signals from the station to standard signals from 0 – 10 V.

Two-way ball valve with SYPAR scotch yoke rotary actuator, large optical display and directly connected NAMUR valve.



Mixing station	544254
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(with trolley, colour touch panel, mounting frame and power supply unit)

Also order:

Open-loop and closed-loop control with PLC:

PLC board with SIMATIC S7-313C	533526
SIMATIC S7 connecting cable set	544296
PLC board with CPX-FEC	541187
Festo CPX connecting cable set	544297
PLC board with Allen Bradley MicroLogix 1500	544300
Allen Bradley MicroLogix connecting cable set	544298
PLC board with Mitsubishi MELSEC	544301
Mitsubishi MELSEC connecting cable set	544299

Or alternative:

SIMATIC S7 EduTrainer Compact 313C	533018
SIMATIC S7 connecting cable set	544296

For working with Fluid Lab®-PA:

Fluid Lab-PA DE/EN/ES/FR	544304
EasyPort USB	548687
PC data cable RS232 male-female	162305
RS232 USB adapter	540699
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For simple commissioning, simulation and display using the simulation box:

Simulation box, digital/analogue	526863
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For professional control using industrial controllers:

PID industrial closed-loop controller	544293
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Necessary accessories

Power cable for power supply unit → Internet	
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Training aims for project work

- Construction, wiring and commissioning of a system for process technology
- Selection, application and connection of various flow sensors
- Measurement of electrical and process-related variables such as level and flow rate
- Design and commissioning of control circuits
- Analysis of control processes and control circuits
- Parameterisation and optimisation of P, PI or PID controllers
- Drafting of open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance and servicing

Recommended training media



- Fluid Lab®-PA
- Web-based training program, Fundamentals of open and closed-loop control
- Design and simulation program FluidSIM® Pneumatics

Also order:

Workbook MPS® PA



DE	548590
EN	548591
ES	548582
FR	548593

Reactor station



Function

The reactor station brings liquid to the right temperature. Depending on the recipe selected, different temperature profiles with different stirring times are activated. A cooling pump is activated to cool the liquid. The tempered liquid can be pumped onwards to the next station using a separate pump.

Measurement and control

Sensors detect the filling level of the reservoir in the reactor station. This facilitates lessons on simple control exercises for monitoring the pumps right up to complete control projects involving complex processes.

Exact adherence to the various temperature profiles when activating the recipes is achieved by means of temperature control. The temperature sensor (PT100 resistance thermometer) supplies a unit signal of 0 – 10 V via the measuring transducer. The controller with P, PI or PID control algorithm can approach the set-point temperature values via the dynamically controlled heating unit and keep the values constant. Simple control exercises, for example control using the two-point controller, can be realised using the reactor station. Control technology is clearly and practically explained in this way.

Heating and stirring

Key basic operations in many process engineering systems involve heating and stirring. The components of the reactor station are designed to permit a wide range of experiments in this area.

Infinitely adjustable **heating** with control signal from 0 – 10 V.

Stirrer with DC motor.

Signal converters convert all analogue signals from the station to standard signals from 0 – 10 V. Practical for the purpose of experimentation: integrated comparators also supply purely binary signals.



Reactor station	544255
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(with trolley, colour touch panel, mounting frame and power supply unit)

Also order:

Open-loop and closed-loop control with PLC:

PLC board with SIMATIC S7-313C	533526
SIMATIC S7 connecting cable set	544296
PLC board with CPX-FEC	541187
Festo CPX connecting cable set	544297
PLC board with Allen Bradley MicroLogix 1500	544300
Allen Bradley MicroLogix connecting cable set	544298
PLC board with Mitsubishi MELSEC	544301
Mitsubishi MELSEC connecting cable set	544299

Or alternative:

SIMATIC S7 EduTrainer Compact 313C	533018
SIMATIC S7 connecting cable set	544296

For working with Fluid Lab®-PA:

Fluid Lab-PA DE/EN/ES/FR	544304
EasyPort USB	548687
PC data cable RS232 male-female	162305
RS232 USB adapter	540699
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For simple commissioning, simulation and display using the simulation box:

Simulation box, digital/analogue	526863
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For professional control using industrial controllers:

PID industrial closed-loop controller	544293
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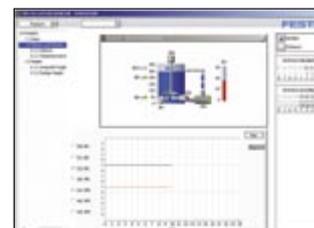
Necessary accessories

Power cable for power supply unit → Internet	
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Training aims for project work

- Construction, wiring and commissioning of a system for process technology
- Selection, application and connection of temperature sensors
- Measurement of electrical and process-related variables such as level and temperature
- Use and connection of measuring transducers
- Design and commissioning of control circuits
- Analysis of control processes and control circuits
- Parameterisation and optimisation of P, PI or PID controllers
- Drafting of open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance and servicing

Recommended training media



- Fluid Lab®-PA
- Web-based training program open and closed-loop control

Also order:

Workbook MPS® PA



DE	548590
EN	548591
ES	548582
FR	548593

Bottling station



Function

The bottling station fills bottles with liquid. The liquid is pumped into the dosing tank from the reservoir. These bottles are transported to the filling position via conveyors. A pneumatic separator separates the bottles. The bottles are filled with different filling quantities from the dosing tank in accordance with the recipe selected.

Measurement and control

The filling level of the dosing tank is detected in the filling station using an analogue filling level sensor. The controller regulates the filling level to the required setpoint value via the dynamically controlled pump (0 – 10 V). The filling level in the dosing tank is kept constant during filling, which optimises the quality of the filling process. Various control algorithms such as P, PI or PID can be applied and optimised during experiments. The characteristics of the control process can be modified using hand valves already integrated. Control technology is clearly and practically explained in this way.

Transporting, separating, filling

Few segments of the diversified process industry are associated with such a wide range of end products as the food industry. All foodstuffs, whether dairy products, baked goods, juice, beer or wine have their own requirements with regard to the handling and production of the corresponding end products. Transporting, separating, proportioning and filling play an important role here.

Optical sensors, adjustable using background suppression, monitor transportation on the conveyors of the bottling station.

The pneumatic separator ensures that there is never more than one bottle at the filling position.

The filling quantity can be easily adjusted by selecting different recipes.



Bottling station	544256
(with trolley, colour touch panel, mounting frame and power supply unit)	

Also order:

Open-loop and closed-loop control with PLC:

PLC board with SIMATIC S7-313C	533526
SIMATIC S7 connecting cable set	544296
PLC board with CPX-FEC	541187
Festo CPX connecting cable set	544297
PLC board with Allen Bradley MicroLogix 1500	544300
Allen Bradley MicroLogix connecting cable set	544298
PLC board with Mitsubishi MELSEC	544301
Mitsubishi MELSEC connecting cable set	544299

Or alternative:

SIMATIC S7 EduTrainer Compact 313C	533018
SIMATIC S7 connecting cable set	544296

For working with Fluid Lab®-PA:

Fluid Lab-PA DE/EN/ES/FR	544304
EasyPort USB	548687
PC data cable RS232 male-female	162305
RS232 USB adapter	540699
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For simple commissioning, simulation and display using the simulation box:

Simulation box, digital/analogue	526863
I/O data cable with SysLink connectors (IEEE 488) at both ends	34031
Analogue cable, parallel	529141

For professional control using industrial controllers:

PID industrial closed-loop controller	544293
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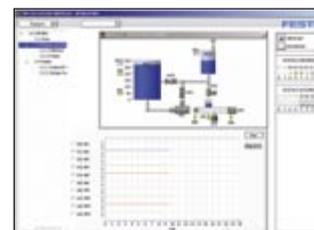
Necessary accessories

Bottle set	544302
Power cable for power supply unit → Internet	

Training aims for project work

- Construction, wiring and commissioning of a system for process technology
- Selection and application of filling level sensors
- Measurement of electrical and process-related variables such as level
- Design and commissioning of control circuits
- Analysis of control processes and control circuits
- Parameterisation and optimisation of P, PI or PID controllers
- Drafting of open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance and servicing

Recommended training media



- Fluid Lab®-PA
- Design and simulation program FluidSIM® Pneumatics
- Web-based training program, Fundamentals of open and closed-loop control

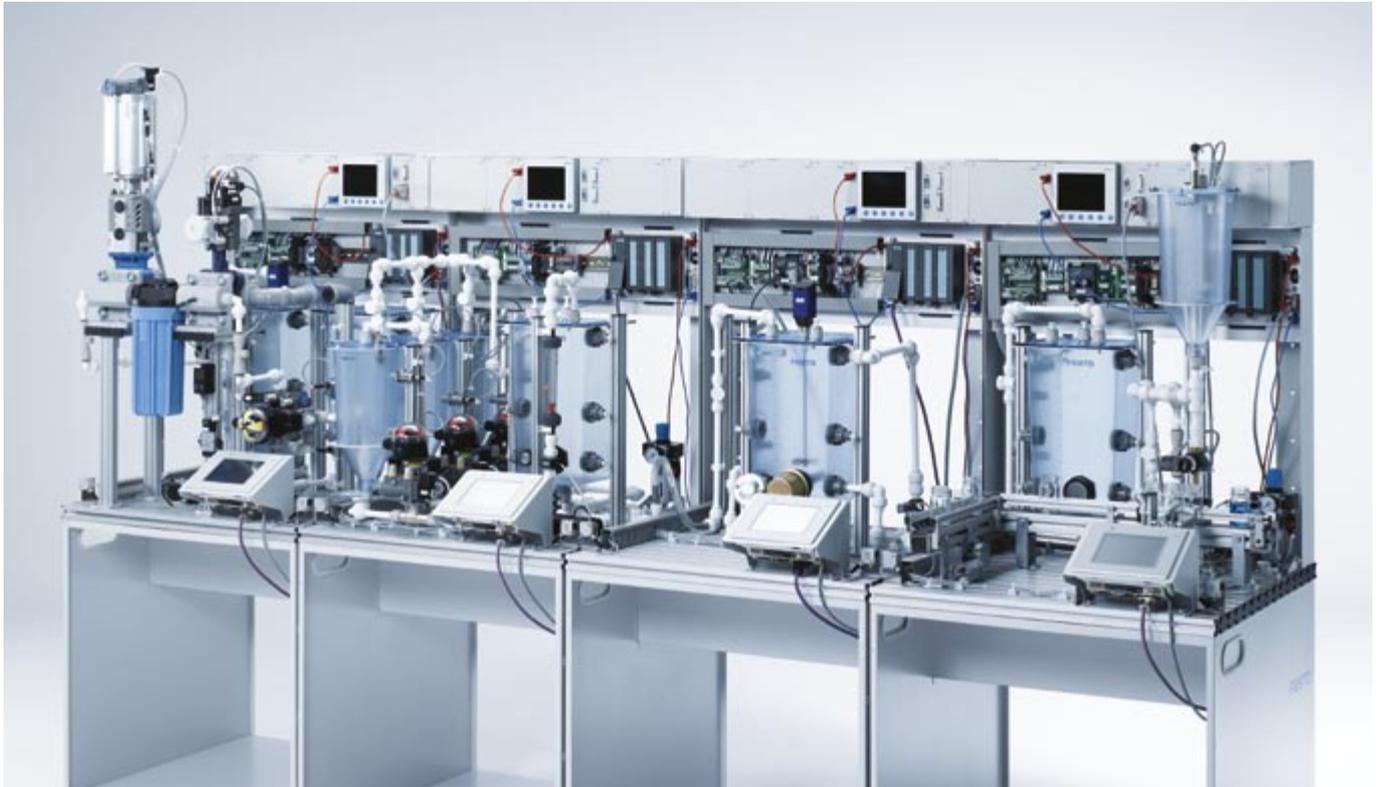
Also order:

Workbook MPS® PA



DE	548590
EN	548591
ES	548582
FR	548593

MPS® PA 204 Complete system



With a P, PI or PID control algorithm, (closed-loop) control technology is taught in a demonstrative and practical manner. The temperature sensor – for the Reactor station a PT100 resistance thermometer is used – delivers a uniform signal of 0 – 10 V via the measuring transducer. By way of the continuously controllable heater the controller sets the nominal temperatures and keeps them constant.



At a constant flow rate, the three input materials are mixed into a recipe on the Mixing station. The flow rate is recorded by an electronic flow sensor with an impeller, and is additionally displayed with a float-type flow meter. The controller sets the required flow rate by way of the analogue controlled pump.



The pressure regulation ensures a constant high filtering quality by means of back-flushing. The pressure sensor features an LCD display, analogue output and switching output, always delivering the correct value. A constant high quality is maintained by means of the proportional-pressure regulator.



In the Filling station the level of the dosing tank is recorded with an analogue level sensor. By way of the continuously controllable pump the controller regulates the level to the appropriate nominal value. During filling, the level in the dosing tank is kept constant, thereby optimising the filling quality.

MPS PA 204 SIMATIC S7-300	544248
MPS PA 204 Festo CPX-FEC	544249
MPS PA 204 Allen Bradley ML 1500	544250
MPS PA 204 Mitsubishi MELSEC FX1N	544251

PLC control packages include:

SIMATIC S7-300

- 4 x PLC board with SIMATIC S7-313C, 1 x programming cable
- 1 x STEP 7 Professional for Training programming software
- 4 x SIMATIC S7 connecting cable set

Festo CPX-FEC®

- 4 x Festo CPX-FEC® PLC board, 1 x programming cable
- 1 x FST programming software, 4 x Festo CPX connecting cable set

Allen Bradley ML 1500

- 4 x Allen Bradley PLC board with Micro Logix 1500, 1 x programming cable
- 1 x RS-Logix 500 Starter programming software, 4 x Allen Bradley connecting cable set

Mitsubishi MELSEC

- 4 x PLC board with FX1N, 1 x programming cable
- 1 x GX IEC Developer FX Trainer Package programming software
- 4 x Mitsubishi connecting cable set

The MPS® PA 204 system contains everything you need for training:

Stations: Filtering, mixing, reactor, filling (with trolley), colour touch panel, mounting frame and power supply unit

Accessories: 4 x simulation box digital/analogue, 1 x bottle set

Control technology: 1 x PLC control package, 1 x EMERGENCY-STOP board, 2 x EMERGENCY-STOP control panel, 4 x EasyPort, 4 x PID industrial controller

Software: 4 x FluidLab® PA training software

Function

The system consists of the Filtering, Mixing, Reactor and Filling stations. The Filtering station filters a fluid. The filtrate is pumped out of the first tank via different process valves through the filter into the second tank. The filtered fluid is added to the first tank in the Mixing station. The Mixing station mixes different recipes from three storage tanks. The finished mixture is pumped to the Reactor station. The Reactor station regulates the temperature of the fluid. Different temperature profiles, with different mixing times, are run depending on the selected recipe. The Filling station bottles the fluid. The bottles are carried on conveyor belts to the filling position. A pneumatic separator marshals the bottles. The bottles are filled with different quantities from the dosing tank, depending on the selected recipe.

Special training aims

- Set-up, wiring and commissioning of a system for process technology
- Measurement of electrical and process engineering variables such as level, flow rate, pressure and temperature
- Set-up and commissioning of control circuits
- Assessment of control response
- Networking of process engineering systems
- Process operation and monitoring, system management
- Selection, deployment and control of process fittings
- Analysis of controlled systems and control circuits
- Parameter setting and optimisation of P, PI or PID controllers
- Writing open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance and servicing



Included in the scope of delivery: Various facilities for measuring, controlling and regulating

- Simplifies commissioning, simulation and display using the simulation box
- Multi-media measuring, controlling, regulating, operating, monitoring and commissioning using Fluid Lab® PA.
- Start processes in the PLC or monitor them with the touch panel
- The control task can be handled by the PLC or by the industrial controller also provided for each station. The controller parameters are then set on the touch panel or directly on the industrial controller. All process variables are displayed in a user-friendly way – including trend graphs – both on the touch panel and on the industrial controller.

The PA complete system MPS® provides everything needed for an efficient start in measurement and control technology.

Successful project work based on modular construction

Learning by doing – the MPS® PA system offers accessible, hands-on process technology. Some project ideas can be implemented in a flash, and risk-free.

Also order:

Workbook MPS® PA



DE	548590
EN	548591
ES	548592
FR	548593

Accessories and optional components



1 PID industrial closed-loop controller

The MPS® PA closed-loop controller with P, PI or PID control algorithm permits the control of dynamic processes in MPS® PA stations. The controller is a universal multi-channel process and program controller with a registration function for monitoring signal curves. The setpoint specification is transferred to the controller via a 15-pin Sub-D interface. A further 15-pin Sub-D interface senses the actual value and an actuator is controlled using the manipulated variable. Parameterisation and configuration of the controller is possible using the controller itself or using a setup program.

Consisting of:

- Device with dimensions 144 mm x 130 mm for a DIN control panel cut-out measuring 92 mm x 92 mm and an installation depth of 170 mm
- Installed in a 19" control panel
- Interface for RS232 and Profibus DP, effected via a 9-pin Sub-D plug connection
- 4 mm safety sockets for the 24 V voltage supply
- CD-ROM with setup program and programming cable for convenient configuration using a PC
- The device can be integrated in a data network using the PROFIBUS DP interface
- Modules can be retrofitted by the user
- UL certification

- System requirement

- for the setup program:
- PC with Win95, 98, NT4.0, WIN 2000, WIN ME, WIN XP
- At least Pentium 100
- 32 MB RAM
- 15 MB space on hard disk
- CD-ROM drive

Order no. 544293



2 PLC board with CPX-FEC®

PLC board with modular controller and FST programming environment.

- Power supply: 24 V DC
- Digital inputs: 16 (24 V DC)
- Digital outputs: 16 (24 V DC, maximum 500 mA)
- Analogue inputs: 2 (12 Bit, 0 – 10 V, 0/4 – 20 mA)
- Analogue outputs: 2 (12 Bit, 0 – 10 V, 0/4 – 20 mA)
- SysLink interfaces:
 - 1x cable for connection to station,
 - 1x cable for connection to console,
 - 1x lead for connection to EMERGENCY-STOP
- Serial interfaces:
 - 1x RS232 programming interface
- Ethernet interfaces:
 - 1x TCP/IP, 10 Mbit/s
- Integrated web server

Order no. 541187

RS232 programming cable

The RS232 programming cable for the CPX-FEC® enables direct connection to a PC.

Order no. 151915

FST for FEC®

FST for FEC® contains convenient functions for programming, testing, commissioning and servicing of automation projects. The reliable programming languages statement list (STL) or ladder diagram (LDR) are available for programming.

Includes user and training manuals. Software and training manual on CD-ROM (DE/EN).

System requirements

- PC with Win 95/98/NT4.0/2000/XP
- CD-ROM drive

DE	537927
EN	537928



3 Set of bottles

For the filling of fluids in MPS® PA Bottling station. The set comprises 20 bottles with the diameter of 40 mm, height of 22 mm and capacity of 50 ml.

Order no. 544302



4 PA workpiece set

To fill liquids into the MPS® PA Bottling station. The workpieces are compatible with the MPS® stations. For example, the pot in the Pick&Place station can be sealed with the lid. The set comprises 6 x housing black, 6 x housing red, 6 x housing silver, 6 x housing transparent, 24 x lid black. Dimensions: Height H = 25 mm, Diameter, outside D = 40 mm, Volume V = 15 ml.

Order no. 554301

Operator unit

Touch screen for the adjustable display of processes and data.

Scope of delivery:

- Festo 5.6" 256 colour FED-500 display
- Programming software FED Designer (multilingual)
- RS232 programming cable for loading projects
- Angled plate for mounting onto a slotted profile plate

Order no. 541146

Accessories and optional components

1 Profile plate 700/700

This board is twice as wide as the above-mentioned board; this allows two MPS® stations to be set up on one profile plate. Both sides have slots, so if necessary parts can be mounted on both sides. The slots are compatible with the ITEM profile system.

The plate is supplied with caps for the sides.

- Height: 32 mm
- Grid spacing (from slot to slot): 50 mm
- Width: 700 mm
- Length: 700 mm

We recommend the use of the appropriate rubber feet for mounting on tables, order no. 158343.

Order no. 159410

2 Trolley

The trolley makes an MPS® station a compact and mobile unit. The station is easy to mount on the trolley. The PLC board can also be fitted. Appropriate through-holes in the side panels enable orderly routing of cables. The front side is equipped with mountings for the control panel. The trolley is supplied complete with castors.

- Height (incl. castors, to bottom edge of profile plate): 750 mm
- Width: 700 mm
- Depth: 700 mm

Order no. 541139

3 Tool set

The tool set is an aid to easy working on MPS® stations.

A practical mini-systainer includes:

- 200 mm steel rule
- Open-jawed spanners size 7, 8, 9, 10
- Adjustable spanner
- Side cutter
- Insulation-stripping pliers
- Wire end sleeve pliers
- Screwdriver set, hex, 1.5 – 6
- Screwdriver, hex, 0.9; 1.3
- Screwdriver, cross-head, PZ02 – short
- Screwdriver, flat, 2.5 x 75; 4.0 x 100
- Screwdriver, flat, 1.2 – 1.6
- Tubing cutter
- Fibre-optic cable cutter
- Workpiece, red, black, silver
- 100 x cable binders 2.5 x 100
- 100 x wire end sleeves 0.25
- 100 x wire end sleeves 0.75

Order no. 539767



AFB factory hybrid production



Megatrend: Hybrid automation

It's a fact that production and process automation have become inseparable in almost all manufacturing environments. Hybrid automation represents the convergence of production and process automation which is more than logical, given the trend towards convergence of the two automation techniques in the so-called hybrid industries.

Hybrid industries are the industries which require systems and solutions for both process and production engineering. The most striking examples are the food, confectionery and tobacco industries and the pharmaceutical industry.

Whether process and production oriented, or hybrid production, Festo Didactic training factories offer a unique range of facilities for training in automation for all industries – from incoming goods, through process and production engineering departments, to outgoing goods.





The mix is the key

Mechatronics is also making its mark outside production automation. Intelligent drive solutions, featuring high-precision mechanical components, a range of different drives, measured data acquisition and evaluation as well as integrated communications interfaces, ensure safe, optimised process automation too.

Flexibility

Making processes more flexible, systemising product quality, responding faster to new market trends – the drinks industry has much more to do in this day and age than merely quenching our thirst. On the one hand there is a need to establish and maintain a broad product spectrum and introduce new products in order to generate new demand, while on the other, legislation is increasingly demanding greater transparency of manufacturing processes.



Innovative technology and innovative learning



Innovative technology

Pneumatic and electric drive technology from Festo is a byword for innovation in industrial and process automation – from the single product through to the turnkey solution. With the AFB training factory we are for the first time delivering a learning environment which consciously incorporates trends and innovations from all areas of automation technology:

- Electric and pneumatic linear drive units
- Semi-rotary drives and grippers
- Valves and valve terminals
- Sensors
- Vision and control systems

The AFB training factory is designed and equipped like a state-of-the-art industrial plant, based on the automation know-how and engineering experience of Festo.

Innovative learning

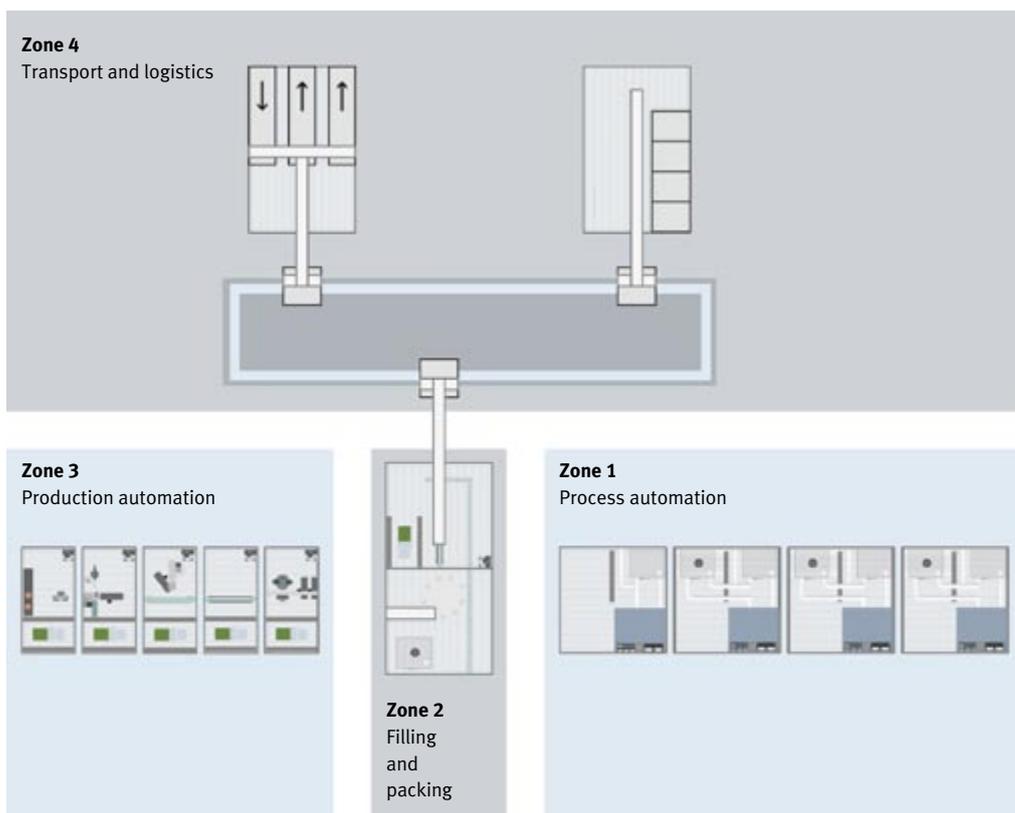
Only by engaging in innovative learning using innovative technology can trainees be optimally prepared for their future work. Comprehensive documentation, software tools for simulation and visualisation and a variety of WBTs complete the AFB range of facilities.



In focus: the production process for six-packs

Six-packs are produced in four zones of the hybrid training factory. The following processes are mapped:

- Production of the liquid
- Production and feed of the caps
- Bottle feed
- Transport
- Packaging
- Storage
- Order compilation
- Logistics



The production zones



Zone 1 Process automation

Filtering, mixing, temperature control; recording, evaluating and controlling typical process variables such as temperature, level, pressure or flow rate; pumping fluids; shutting off pipelines; installing, commissioning or maintaining butterfly valves, slide valves or ball valves. These are just some examples of the wide variety of possibilities in this section of the training factory.

Specialist knowledge of programming, such as recipe preparation, or of plant documentation, such as reading and drafting R-I flow charts or EMSR location diagrams are key focus areas in the training. Control technology plays a key role in process automation, in order to ensure high product quality. The processes selected for the training factory and the transparent design of the stations enables control technology to be taught in a practical and visual manner.

Zone 2 Filling and packing

Not only dosing, filling, capping and packing, but also the acquisition, storage and reliable management of product and quality data are key tasks in this section of the training factory.

Technologies such as RFID are becoming ever more prevalent in the production environment, in order to cope with the continually increasing number of product variants and to comply with the more stringent legal requirements in terms of product quality in the food or pharmaceuticals sector. Full recording of all ingredients or components used and the factors influencing the manufacture of a product must be ensured. Vision and sensor systems also play a key role in improving product quality and production flexibility.

In the training factory, for example, the position and fill level of each bottle and the state of completion of each lot is recorded by various optical sensors and a high-speed camera. The production data can be fully tracked by means of RFID tags in the bottle caps. A range of automation components, such as belts with electric drives, various handling units, programmable logic controllers and the latest operator control and monitoring tools, trainees are provided with an ideal platform to learn these key aspects.



**Zone 3
Production automation**

Fast cycle times, part gripping, handling, detection, differentiation, separation and mounting are characteristic features of production automation – the classic world of the mechatronics engineer. Programming controllers, adjusting sensors, operating, maintaining and servicing individual lines in a plant are typical activities.

In the training factory in this section the caps are produced, tested and fed to the bottles by the filling station. Programmable logic controllers monitor and control the production process. Various sensors record the end positions of the actuators or identify and differentiate between the work-pieces. Typical actuators used in production automation, such as linear cylinders, swivel cylinders, motors, parallel grippers or vacuum suction cups ensure fast, precise movement.

**Zone 4
Transport and logistics**

Almost all production facilities need logistics functions such as materials transportation or warehousing. At the AFB training factory, too, this is a key aspect: Empty six-packs have to be conveyed to the order compilation station or placed in storage. Completed six-packs are delivered just in time, or stored in an interim facility.

Chaotic or systematic warehousing, optimisation of the material flow, planning and prioritisation of orders are the key areas of focus in this section of the factory.

Particular demands are placed on line automation in this section too, however:

- Signals from the transport systems must be sent over long distances to the transport controller.
- High-performance drive units and positioning systems ensure fast, precise movement in the automatic warehouse.
- The communications required for this are based on systems such as the AS interface or CAN.

AFB training factory



Optimum operator control

Whether via touch panel, visualisation system or control panel, all the stations and the entire training factory can be operated and monitored in a highly user-friendly way.

Everything in hand

Whether bottle or six-pack, the professional handling units in the AFB training factory ensure a safe, precise, fast material flow.

Tried and proven

The MPS® stations, which have been deployed for training purposes thousands of times all over the world, supply the caps in the training factory. The stations particularly enable an optimum level of highly sophisticated training in mechatronics.

New

Automation technology is taught using state-of-the-art equipment; not just the new MPS® PA stations, but also the automatic warehouse, the filling station and the order compilation station.

AFB-FMRQ-BP-DSPB

On request

Package

Comprising:

Stations

Zone 1: MPS® PA filtering*, mixing*, reactor*, filling (quality sampling)* stations

Zone 2: AFB filling and order compilation stations

Zone 3: MPS® distribution**, separation**, processing**, buffering** and handling stations**

Zone 4: AFB pallet transport system, AFB automatic warehouse and AFB incoming goods and outgoing goods stations.

Software and media

STEP 7 Trainer Package programming software, CIROS® Automation Suite, Fluid Lab®-PA, Mechatronics Assistant, WinCC

* Including mobile base frame, touch panel and S7-300 PLC board.

** Including mobile base frame, MPS® control panel and S7-300 PLC board.

**Visualisation**

Either an overview of the complete plant or access to each individual station is available; the visualisation system at the AFB training factory permits monitoring of all signals and provides trend graphs of the analogue process variables, with remote access to the various functions and monitoring of all processes. All stations communicate via TCP-IP with the visualisation computer.

RFID option

Full tracking and documentation of the entire production process is demanded in more and more areas of industry. The AFB training factory also makes this possible: Production data such as the recipe or batch identifier are stored on the mobile data carriers fixed to each individual bottle and can be checked prior to shipping. This means that state-of-the-art RFID technology can now be integrated highly demonstratively into automation training.

Function

The AFB training factory produces complete six-packs. All the production steps involved are covered, from production of the liquid through to packing of the containers and storage and shipping of the finished product.

The process automation section of the plant is where the liquid is produced: Raw materials are filtered, mixed together with other ingredients according to different recipes, temperature-controlled and stored ready for use. In-line samples can be taken from the ongoing process before the liquid reaches the filling station. Bottles from a belt conveyor are filled and capped on a rotary indexing table. The bottles are then sealed with machined and tested caps and packed into six-packs. Depending on the order, the

completed six-packs can be placed in interim storage via the belt rotation system or delivered for shipping. Empty six-packs can be conveyed back into the system on roller conveyors and either placed in storage or fed directly into the production process.

Training content

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

- Use of RFID technology
- Vision systems and camera inspection
- Use and programming of PLCs
- Application of various handling devices and grippers
- Application of various electrical drives (DC, AC)

- Application of frequency converters
- Use of multi-axis handling systems for handling and palletising
- Networking sensors and actuators via AS-interface
- Use and commissioning of a CAN network
- Networking automated systems with Ethernet TCP-IP
- Measurement and control of electrical and process engineering variables such as level, flow rate, pressure and temperature
- Process operation and monitoring, system management
- Selection, deployment and control of process fittings

AFB filling station



The filling station includes a large number of functions typical to the food industry: Bottle feed by conveyor, dosing with a dosing cylinder and filling and capping on a rotary indexing table.

The station can be operated both as a stand-alone unit or in conjunction with other stations.

In stand-alone operation the caps must be fed manually. When operated in conjunction with other stations, the caps can be fed by way of a handling station (MPS®). Filled and capped bottles are forwarded by conveyor to the next station (order compilation).

The liquid being filled is stored in a tank on the station. The tank can be filled manually or by way of additional process stations (e.g. MPS® PA).

The station is controlled by a PLC unit and operator control is via touch panel. Individual step and continuous cycle options are available. Status and messages are indicated graphically on the panel.

Special training aims

- Set-up, wiring and commissioning of an automated station
- Use of pneumatic linear units with variable stroke
- Use of pneumatic linear swivel units
- Controlling and monitoring material flow on a conveyor and a rotary indexing table
- Dosing and filling
- Process operation and monitoring



Order no. On request

AFB order compilation station

With a high-precision 2-axis industrial handling system, 2 by 3 bottles are packed into each six-pack on the order compilation station.

The bottles are carried on conveyor belts to the handling station. A high-speed camera checks the six-packs.

The camera features a built-in controller which handles the complete image evaluation process.

With its TCP-IP interface and the additional CAN master interface, the camera enables wide-ranging communication options.

The station is controlled via a PLC board. Different operation modes can be selected on the control panel.

Specific training content

- Set-up, wiring and commissioning of an automated station
- Use of pneumatic handling unit with gripper
- Controlling and monitoring material flow by conveyor
- Vision systems, quality and process control with intelligent cameras



Order no.

On request



AFB automatic warehouse station



The automatic warehouse can hold up to 16 six-packs on 4 levels each with 4 bays. A cartesian 3-axis handling system is used for stock movement. 2 toothed belt axes are driven by intelligent servomotors with an integrated servo amplifier, controller and CAN bus interface.

The third axis is executed as a rodless linear unit with precision guides.

The station is controlled by a PLC board with CAN master. The colour touch panel of the automatic warehouse provides user-friendly operation and monitoring.

Items can be easily taught-in, and stock levels clearly initialised and modified.

Specific training content

- Set-up, wiring and commissioning of an automated station
- Use of pneumatic linear units
- Electric drive and control technology
- Intelligent CAN bus technology
- Warehousing and logistics
- Process operation and monitoring



Order no. On request

AFB incoming goods/outgoing goods station

Full six-packs awaiting shipping are placed by the pneumatic 3-axis handling unit on one of the two outgoing goods ramps. The handling unit features a pneumatic linear gripper to grip the six-packs.

The axes used are pneumatic linear axes developed specially for industrial assembly and handling systems.

Empty six-packs can be fed in by way of the incoming goods conveyor.

The station is controlled by a PLC board. Different operation modes can be selected on the control panel.

Specific training content

- Set-up, wiring and commissioning of an automated station
- Use of pneumatic handling units with gripper
- Handling technology
- Controlling and monitoring material flow by conveyor belt and roller conveyor



Order no. On request



AFB pallet transport system



The material flow within the AFB lines is implemented by the pallet transport system. The six-packs are conveyed to the individual stations on pallets which are equipped with an identification system. The transport system features 4 stop points, and can be expanded at any time.

The belt segments are driven by 4 AC motors.

The control is handled by a PLC with frequency inverter – professionally housed in the control cabinet. Communication with the stop points is via AS interface. The pneumatic stoppers are controlled using industrial valve terminals.

Specific training content

- Set-up, wiring and commissioning of an automated station
- Use of AC motors
- Electrical drive technology
- Use of frequency inverters
- Pallet identification
- AS interface fieldbus technology
- Material flow and logistics
- Protection circuits
- Design of industrial control cabinets

Order no.

On request

AFB factory, focus on bulk goods

New!



Found everywhere!

There is a worldwide market behind the term „bulk goods“. In almost every branch of production, bulk goods can be found as raw materials, semi-finished materials or finished parts. Whether building materials, such as sand, gravel and cement, or foodstuffs, such as grain and sugar – bulk goods must be stored, dispensed, weighed, transported or packaged.

Practical training

The handling of bulk goods requires special know-how. The exclusive use of typical industrial components in the learning stations emphasises the required hands-on experience and ensures the quick transfer of knowledge from training to practice.

Conveying of bulk goods or complete production process?

The stations are specially designed for training on bulk goods and can be used individually as well as in a network with the stations of the AFB factory. This offers a training factory that includes the complete process chain, from providing and preparing raw materials, to quality testing, packaging, storage and finally the processing of customer orders.

Everything under control

Stations are controlled using the most modern automation and computer technology. With system visualisation the entire system can be viewed or each individual station can be accessed; it enables the monitoring of signal statuses, the remote access of different functions and the monitoring of all processes, directly on the system using a touch panel or via the master computer.

AFB stations, dispensing/sorting bulk goods

New!



Different types of conveying

A wide range of processes are used in production systems for handling bulk goods. It therefore makes sense that these can also be found in the AFB training stations for dispensing and sorting:

Conveying with a conveyor

In the dispensing station, the conveyor acts as a pressure feed. Corn is dispensed from its container via the conveyor to a funnel and is transported to the next station by means of compressed air.

Screw conveyor

With the screw conveyor, the bulk goods are carefully conveyed, making optimal dispensing possible. The dispensing screw is driven by a servo motor with a built-in controller.

High-speed quality checking and diagnostics

Imperfect grains are detected during conveying and automatically separated. This requires the quick detection and reaction of the actuators, which the human eye can hardly follow. To support the diagnostics and commissioning of these fast motion sequences, an intelligent compact camera system with up to 2000 images per second are used in the AFB factory. This means that the latest diagnostic techniques can be taught.



AFB station dispensing bulk goods

Order no. On request

AFB station sorting bulk goods

Order no. On request

One training factory – over 100 different training systems

More than 15 stations can be integrated into the AFB training factory. In addition to the new AFB stations it also features stations from the MPS® family and stations from the new MPS® PA product line.



The unique interface and communications concept enables quick and easy modification of the factory layout.



This means the stations can be deployed at any time individually or in small groups for teaching purposes, and the AFB training factory can be assembled in different project stages.



Festo worldwide

Argentina

Festo S.A.
Edison 2392
(B1640 HRV) Martinez
Prov. Buenos Aires
Tel. ++54 (0)11/47 17 82 00, Fax 47 17 82 82
E-mail: info@ar.festo.com

Australia

Festo Pty. Ltd.
Head Office (Melbourne)
179-187 Browns Road, P.O. Box 261
Noble Park Vic. 3174
Call Toll Free 1300 88 96 96
Fax Toll Free 1300 88 95 95
Tel. ++ 61(0)3/97 95 95 55, Fax 97 95 97 87
E-mail: info_au@festo.com.au

Austria

Festo Gesellschaft m.b.H.
Linzer Straße 227
1140 Wien
Tel. ++43 (0)1/91 07 50, Fax 91 07 52 50
E-mail: info_at@festo.com

Belarus

IP Festo
Minsk, 220035
Mascherov Prospekt, 78, Belarus
Tel. ++375 (0)17/204 85 58, Fax 204 85 59
E-mail: info_by@festo.com

Belgium

Festo Belgium sa/nv
Rue Colonel Bourg 101
1030 Bruxelles/Brussel
Tel. ++32 (0)2/702 32 11, Fax 702 32 09
E-mail: info_be@festo.com

Brazil

Festo Automação Ltda.
Rua Giuseppe Crespi, 76
KM 12,5 - Via Anchieta
04183-080 Sao Paulo SP-Brazil
Tel. ++55 (0)11/50 13 16 00, Fax 50 13 18 68
E-mail: info_br@festo.com

Bulgaria

Festo Bulgaria EOOD
1592 Sofia
9, Christophor Kolumb Blvd.
Tel. ++359 (0)2/960 07 12, Fax 960 07 13
E-mail: info_bg@festo.com

Canada

Festo Inc.
5300 Explorer Drive
Mississauga, Ontario L4W 5G4
Tel. ++1 (0)905/624 90 00, Fax 624 90 01
E-mail: info_ca@festo.com

Chile

Festo S.A.
Mapocho 1901
6500151 Santiago de Chile
Tel. ++56 (0)2/690 28 00, Fax 695 75 90
E-mail: info.chile@cl.festo.com

China

Festo (China) Ltd.
1156 Yunqiao Road
Jinqiao Export Processing Zone, Pudong,
201206 Shanghai, PRC
Tel. ++86 (0)21/58 54 90 01, Fax 58 54 03 00
E-mail: info_cn@festo.com

Colombia

Festo Ltda.
Avenida El Dorado No. 98-43
Bogotá
Tel. ++57 (0)1/404 80 88, Fax 404 81 01
E-mail: festo@festo.com.co

Croatia

Festo d.o.o.
Nova Cesta 181
10000 Zagreb
Tel. ++385 (0)1/619 19 69, Fax 619 18 18
E-mail: info_hr@festo.com

Czech Republic

Festo, s.r.o.
Modranska 543/76
147 00 Praha 4
Tel. ++420 261 09 96 11,
Fax ++420 241 77 33 84
E-mail: info_cz@festo.com

Denmark

Festo A/S
Islevdalvej 180
2610 Rødovre
Tel. ++45 70 21 10 90, Fax ++45 44 88 81 10
E-mail: info_dk@festo.com

Estonia

Festo OY AB Eesti Filiaal
Laki 11B
12915 Tallinn
Tel. ++372 666 15 60, Fax ++372 666 15 61
E-mail: info_ee@festo.com

Finland

Festo OY
Mäkituvantie 9, P.O. Box 86
01511 Vantaa
Tel. ++358 (0)9/87 06 51, Fax 87 06 52 00
E-mail: info_fi@festo.com

France

Festo Eurl
Numéro Indigo Tel. 0820/204640, Fax 204641
ZA des Maisons Rouges
8 rue du Clos Sainte Catherine
94367 Bry-sur-Marne cedex
Tel. ++33 (0)1/48 82 64 00, Fax 48 82 64 01
E-mail: info_fr@festo.com

Germany

Festo Didactic GmbH & Co. KG
Postfach 10 07 10
73707 Esslingen
Rechbergstraße 3
73734 Esslingen
Tel. ++49 (0)711/3467-0
Fax ++49 (0)711/347-54 88500
www.festo-didactic.de
did@de.festo.com

Greece

Festo Ltd.
Hamosfernas 40
11853 Athens
Tel. ++30 210/341 29 00, Fax 341 29 05
E-mail: info_gr@festo.com

Hong Kong

Festo Ltd.
Unit C&D, 7/F, Leroy Plaza
15 Cheung Shun Street
Cheung Sha Wan, Kowloon
Hong Kong
Tel. ++852/27 43 83 79, Fax 27 86 21 73
E-mail: info_hk@festo.com

Hungary

Festo Kft.
Csillaghegyi út 32-34.
1037 Budapest
Tel. ++36 (0)6/1/250 00 55, Fax 250 15 93
E-mail: info_hu@festo.com

India

Festo Controls Private Ltd.
237B,
Bommasandra Industrial Area,
Bangalore Hosur Highway,
Bangalore 560 099
Tel. ++91 (0)80/22 89 41 00, Fax 783 20 58
E-mail: info_in@festo.com

Indonesia

PT. Festo
JL. Sultan Iskandar Muda No.68
Arteri Pondok Indah
Jakarta 12240
Tel. ++62 (0)21/27 50 79 00, Fax 27 50 79 98
E-mail: info_id@festo.com

Iran

Festo Pneumatic S.K.
#1, Behbahan St. Ramsar ave
Tehran 1581975411
Tel. ++98 (0)21/88 82 92 25, Fax 882 21 62
E-mail: info_ir@festo.com

Ireland

Festo Limited
Unit 5 Sandford Park
Sandford Industrial Estate
Dublin 18
Tel. ++ 353(0)1/295 49 55, Fax 295 56 80
E-mail: info_ie@festo.com

Israel

Festo Pneumatic Israel Ltd.
P.O. Box 1076, Ha'atzma'ut Road 48
Yehud 56100
Tel. ++972 (0)3/632 22 66, Fax 632 22 77
E-mail: info_il@festo.com

Italy

Festo S.p.A
Via Enrico Fermi 36/38
20090 Assago (MI)
Tel. ++39 02/45 78 81, Fax 488 06 20
E-mail: info_it@festo.com

Japan

Festo K.K.
1-26-10 Hayabuchi, Tsuzuki-ku
Yokohama 224-0025
Tel. ++81 (0)45/593 56 10, Fax 593 56 78
E-mail: info_jp@festo.com

Korea South

Festo Korea Co., Ltd.
470-1 Gasan-dong, Geumcheon-gu
Seoul #153-803
Tel. ++82 (0)2/850 71 14, Fax 864 70 40
E-mail: info_kr@festo.com

Latvia

Festo SIA
Deglava 60
1035 Rīga
Tel. ++371 67/57 78 64, Fax 57 79 46
E-mail: info_lv@festo.com

Lithuania

Festo UAB
Karaliaus Mindaugo pr. 22
3000 Kaunas
Tel. ++370 (8)7/32 13 14, Fax 32 13 15
E-mail: info_lt@festo.com

Malaysia

Festo Sdn.Berhad
10 Persiaran Industri
Bandar Sri Damansara, Wilayah Persekutuan
52200 Kuala Lumpur
Tel. ++60 (0)3/62 86 80 00, Fax 62 75 64 11
E-mail: info_my@festo.com

Mexico

Festo Pneumatic, S.A.
Av. Ceylán 3, Col. Tequesquahuac
54020 Tlalnepantla, Edo. de México
Tel. ++52 (01)55/53 21 66 00, Fax 53 21 66 55
E-mail: festo.mexico@mx.festo.com

Netherlands

Festo B.V.
Schieweg 62
2627 AN Delft
Tel. ++31 (0)15/251 88 99, Fax 261 10 20
E-mail: info_nl@festo.com

New Zealand

Festo Limited
MT. Wellington
Auckland NZ
Tel. ++64 (0)9/574 10 94, Fax 574 10 99
E-mail: info_nz@festo.com

Norway

Festo AS
Ole Deviksvei 2
0666 Oslo, Norway
Tel. ++47 22 72 89 50, Fax ++47 22 72 89 51
E-mail: info_no@festo.com

Peru

Festo S.R.L.
Calle Amador Merino Reyna #480, San Isidro
Lima, Perú
Tel. ++51 (0)1/222 15 84, Fax 222 15 95

Philippines

Festo Inc.
KM 18, West Service Road, South Superhighway
1700 Paranaque City, Metro Manila
Tel. ++63 (0)2/776 68 88, Fax 823 42 19
E-mail: info_ph@festo.com

Poland

Festo Sp. z o.o.
Janki k/Warszawy, ul. Mszczonowska 7
05090 Raszyn
Tel. ++48 (0)22/711 41 00, Fax 711 41 02
E-mail: info_pl@festo.com

Romania

Festo S.R.L.
St. Constantin 17
010217 Bucuresti
Tel. ++40 (0)21/310 29 83, Fax 310 24 09
E-mail: info_ro@festo.com

Russia

Festo-RF OOO
Michurinskiy prosp., 49
119607 Moscow
Tel. ++7 495/737 34 00, Fax 737 34 01
E-mail: info_ru@festo.com

Singapore

Festo Pte. Ltd.
6 Kian Teck Way
Singapore 628754
Tel. ++65 62 64 01 52, Fax ++65 62 61 10 26
E-mail: info_sg@festo.com

Slovakia

Festo spol. s r.o.
Gavlovicová ul. 1
83103 Bratislava 3
Tel. ++421 (0)2/49 10 49 10, Fax 49 10 49 11
E-mail: info_sk@festo.com

Slovenia

Festo d.o.o. Ljubljana
IC Trzin, Blatnica 8
1236 Trzin
Tel. ++386 (0)1/530 21 00, Fax 530 21 25
E-mail: info_si@festo.com

South Africa

Festo (Pty) Ltd.
22-26 Electron Avenue, P.O. Box 255
Isando 1600
Tel. ++27 (0)11/971 55 00, Fax 974 21 57
E-mail: info_za@festo.com

Spain

Festo Pneumatic, S.A.
Tel.: 901243660 Fax: 902243660
Avenida Granvia, 159
Distrito económico Granvia L'H
ES-08908 Hospital de Llobregat, Barcelona
Tel. ++ 3493/261 64 00, Fax 261 64 20
E-mail: info_es@festo.com

Sweden

Festo AB
Stilmansgatan 1, P.O. Box 21038
20021 Malmö
Tel. ++46 (0)40/38 38 40, Fax 38 38 10
E-mail: info_se@festo.com

Switzerland

Festo AG
Moosmattstrasse 24
8953 Dietikon ZH
Tel. ++41 (0)44/744 55 44, Fax 744 55 00
E-mail: info_ch@festo.com

Taiwan

Festo Co., Ltd.
9 Kung 8th Road
Linkou 2nd Industrial Zone, Linkou #244
Taipei Hsien Taiwan
Tel. ++886 (0)2/26 01 92 81, Fax 26 01 92 87
E-mail: info_tw@festo.com

Thailand

Festo Ltd.
67/1 Moo 6 Phaholyothin Road
Klong 1, Klong Luang,
Pathumthani 12120
Tel. ++66 29 01 88 00, Fax ++66 29 01 88 33
E-mail: info_th@festo.com

Turkey

Festo San. ve Tic. A.S.
Tuzla Mermerciler Organize
Sanayi Bölgesi, 6/18 TR
34956 Tuzla - Istanbul/TR
Tel. ++90 (0)216/585 00 85, Fax 585 00 50
E-mail: info_tr@festo.com

Ukraine

Festo Ukraina
Borisoglebskaja 11
Kiev 04070
Tel. ++380 (0)44/239 24 33, Fax 463 70 96
E-mail: info_ua@festo.com

United Kingdom

Festo Limited
Applied Automation Centre, Caswell Road
Brackmills Trading Estate
Northampton NN4 7PY
Tel. ++44 (0)1604/66 70 00, Fax 66 70 01
E-mail: info_gb@festo.com

United States

Festo Corporation (New York)
Call Toll-free 800/993 3786
395 Moreland Road, P.O.Box 18023
Hauppauge, N.Y. 11788
Tel. ++1 (0)314/770 01 12, Fax 770 16 84
E-mail: info_us@festo.com

Venezuela

Festo C.A.
Av. 23, Esquina calle 71, No. 22-62
Maracaibo, Edo. Zulia
Tel. ++58 (0)261/759 09 44, Fax 759 04 55
E-mail: festo@festo.com.ve