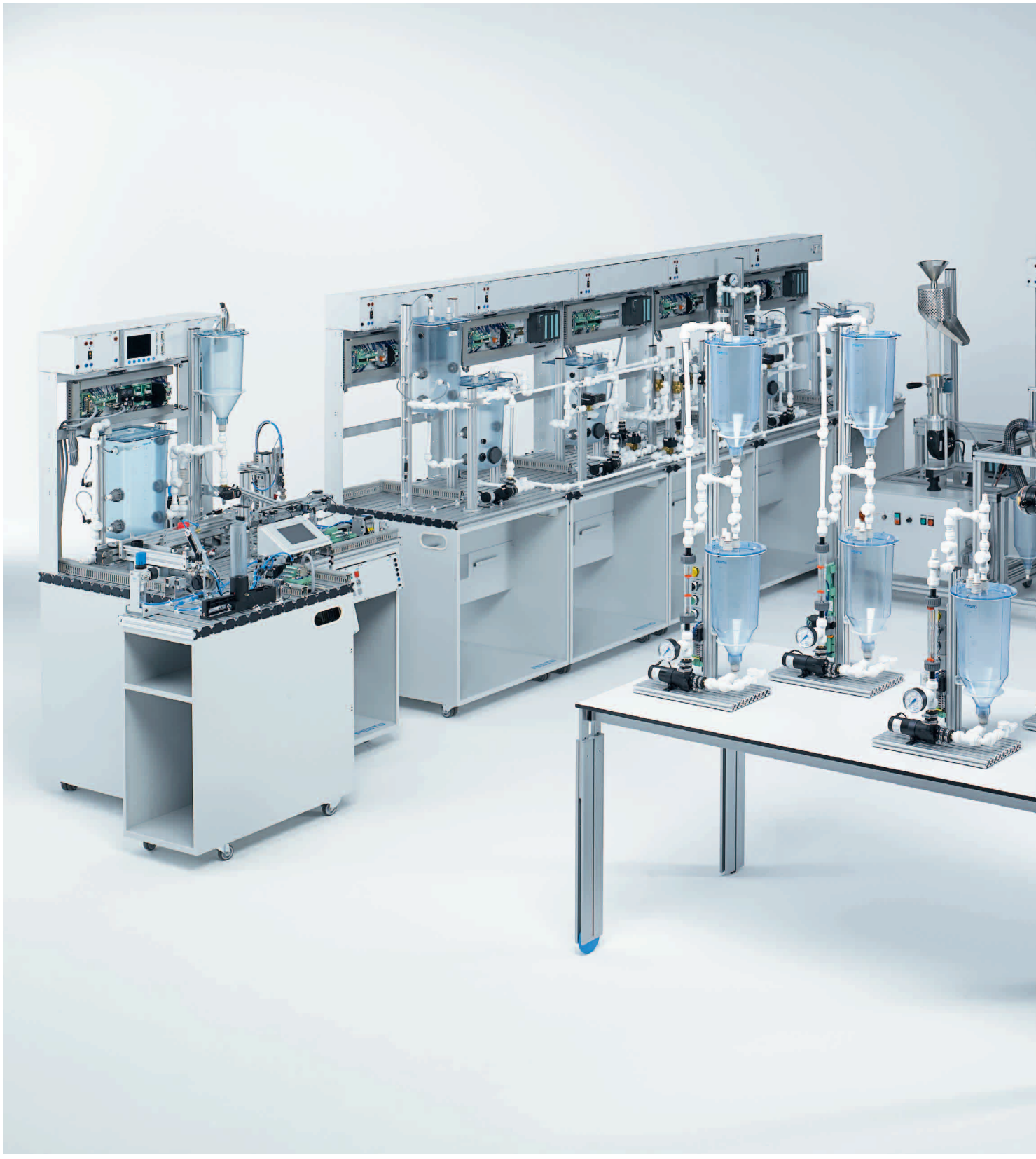
Process automation, Closed-loop control technology, EDS® – Environmental Discovery System

Learning systems and services
for basic and further training

FESTO

Process automation and closed-loop control technology
EDS® – Environmental Discovery System



Flexible room concepts
Innovative workbenches

Equipping of learning rooms according to individual requirements

Flexible use of space
We will present you with an individual concept based on the spatial conditions and specific requirements of the location. In doing so, we will focus on cost-effective and optimal use of space, as well as multi-functional equipment. Training in the areas of electrical engineering, pneumatics, or mechatronics, as well as theoreti cal training or lectures, can take place in the same room. Using the ceiling system, industrial connectors, and universally mobile equipment, the room layout can be adapted in just a few minutes.

Efficient and versatile use of rooms saves space and cost.

The benefits for you
During the consultation you will benefit from our years of experience not only in the training market, but also with installing numerous training centers, complete workshops, and labs. We will take into account the latest safety requirements, and our high quality standards guarantee a long service life.

We will be glad to provide an on-site concept and planning consultation.

Multi-functional teaching rooms
– Individual
– Flexible
– Cost-efficient

Our room concept offers individual options for your learning environment equipment. Mobile workbenches and ceiling-retractable utility supplies that you can fold back up into the ceiling ensure flexible and cost-efficient utilization of rooms.

For further information regarding flexible room concepts see:
→ www.festo-didactic.com

Main components of room concept

Storage
Both workbenches and equipment can be stored neatly and compactly in intelligent storage systems in the same room or in an adjoining room; an advantageous flexibility provided by our overall concept.

Workstation system
The mobile supports for the learning systems enable a high degree of flexibility with virtually unlimited options. The workbenches can be optimally adapted to any teaching situation, quickly and simply. This refitting option enables highly efficient space utilization, and therefore, the greatest possible cost efficiency and safety.

Power supply
The flexible ceiling system is a holistic concept for multi-functional rooms, which enables hands-on and theoretical teaching with appropriate utility supplies. With energy, compressed air, and a data connection directly at the learning location, the ceiling system is ideal for basic and specialized technical training.

Media

Multimedia training programs
Effective learning solutions

Festo Didactic's flexible training programs allow instructors the freedom to be creative, increasing student motivation.

All our training programs have the following features:
– Unparalleled didactic and multimedia course topics
– Scope for self-study during classroom-based training
– Learning scenarios can be individually customized
– Varied program functions, such as a glossary, search function, notes
– Can be used in conjunction with Classroom Manager
– Can be integrated into training concepts which use other media (Word, Excel, PDF, etc.)
– Participant guidance
– Monitoring of learning progress and certification

The training programs are optionally available as follows:
– CD-ROM
– License for local networks (on request)
– Web-based training (eLearning course) for Classroom Manager
– For installation on one of your servers or in your Learning Management system
– For integration in open-source software (such as Moodle, Ilias, etc.)
– Alternative lease option available directly via the Internet using myleCampus

Festo Didactic also provides customized E-Learning packages for specific needs and gladly offers step-by-step guidance and advice from the design phase through the installation of the complete Learning Management System.

Overview of our programs:

Fluid engineering
– Pneumatics
– Electropneumatics
– Hydraulics
– Electrohydraulics

Electrical engineering
– Electrical safety measures
– Electrical engineering 1
– Electrical engineering 2
– Electronics 1
– Electronics 2

Automation technology
– Sensor technology 1
– Sensor technology 2
– Discover MPS® 200
– Actuators – DC motor
– Electric drives 1
– Electric drives 2
– Open- and closed-loop control
– GRAFCET
– PLC programming in accordance with IEC 61131
– LOGO! Training
– Fieldbus technology
– Machine vision
– Safety engineering
– Process automation

Metalworking
– Turning
– Milling
– Drilling
– Materials science

Technology and Environment
– The fascination of technology
– Renewable energies

Lean Management/Lean Production
– Value stream analysis and mapping
– Poka Yoke
– 5S – Workstation organization
– TPM – Total Productive Maintenance

Management systems
– Classroom Manager
– Content Builder
– Local Knowledge Manager
– Competence Manager
– Recruiting Manager
– Classroom Manager Enterprise

System requirements for eLearning courses
– PC with Win 2000/XP/Vista/Windows 7
– Flash Player, version 8.0 or higher
– Sound card
– DVD drive
– Screen resolution: minimum 1024 x 768 pixels

Languages
All of our eLearning courses are available in several languages. The language is selected when starting the eLearning course and can be changed directly on every page during the training, and includes a multilingual dictionary for every training program.

We will provide an individual quotation for any language not listed.

PLC programming in accordance with IEC 61131

Programmable logic controllers play a central role in automation. These devices are used to control machines and systems.

The program of a programmable logic controller can be flexibly adapted for any task. Various programming languages, which are all based on the IEC 61131 international standard, are available for creating the control program in conformance with standards.

This training program allows users to get to grips with function charts, ladder diagrams, instruction lists, sequential function charts and structured texts in five programming languages. Through the use of various practice-related examples, the programming languages are presented step by step.

Contents:
- Programmable logic controllers
- Project organization
- Programming languages in accordance with IEC 61131
- Link-orientated programming languages
- Sequential function chart
- Structured text
- Sequence programming project

The training program provides beginners with an ideal introduction to IEC-compliant programming.

In addition to trainees, pupils and students, it also appeals to skilled workers, technicians and engineers who have previously only programmed in IL, LDR or FCH. The higher, IEC-compliant languages provide a range of benefits to be discovered and used.

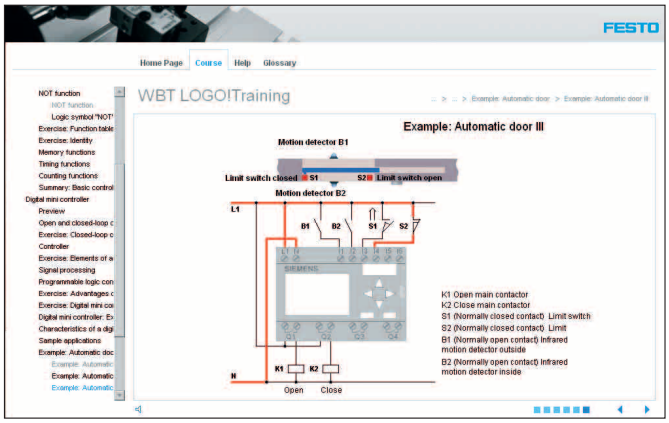
E.g. single license with CD-ROM/DVD
Online de/en/es

Order no.	**574488**

Network de/en/es

Order no.	**574489**

LOGO! Training



The LOGO! training program provides an introduction to logic functions, beginning with AND & OR functions and processes, which are shown in function tables. These are followed by other basic control functions, such as memory, timer, and counter functions. The next part of the course begins by covering the basics of open- and closed-loop control circuits and exploring the elements of a controller. Finally concluding with a detailed focus on the features and applications of mini-controllers.

From the contents:
- Basic technical functions (AND & OR function, memory function, timer function, counter function)
- Digital minicontrollers (differentiation between open- and closed-loop control)
- Control components
- Positioning with digital mini-controllers
- Design and function of a mini-controller
- Cyclical program processing
- Areas of application
- Programming languages

E.g. single license with CD-ROM/DVD
Online de/en/es/fr/zh

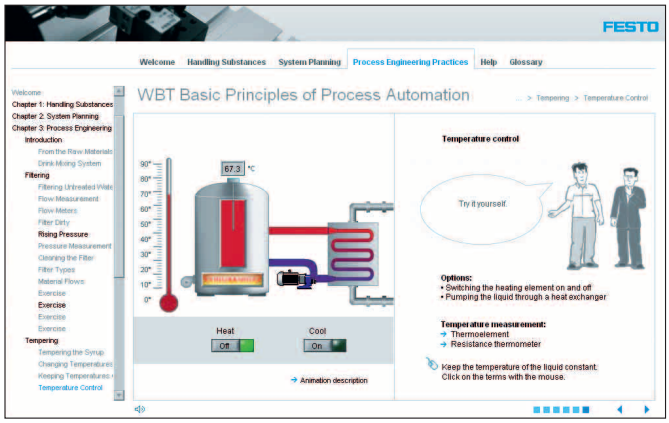
Order no.	**540941**

Network de/en/es/fr/zh

Order no.	**540943**

Our authoring tool:
Content Builder
Devise and design your own training media

Process automation



Basic principles of process automation
This training program deals with the broad spectrum of technical process automation in a compact way. The characteristics and special features of process automation are conveyed in a simple manner via images from real situations, graphical representations of physical-technical processes and animated processes which you yourself can manage and control.

From the contents:
The three chapters “Handling substances”, “System planning” and “Process engineering processes in practice”, give you a step-by-step guide 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 your training.

– **Handling substances**
Product manufacture is usually subject to defined physical and chemical characteristics. The student’s awareness should be heightened so that he/she can accurately assess production conditions and deal with them correctly.
– **System planning**
This guides the student around a planning office, providing an insight into the planning and development of a system. The student 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.
– **Process engineering processes in practice**
The vast number of process engineering processes can be reduced to four typical ones: filtration, tempering, mixing and filling. Design and function are analyzed using the four MPS® PA stations and the modular products from Festo Didactic and answers given to any questions that may arise when studying process engineering processes.

E.g. single license with CD-ROM/DVD
Online de/en/es/fr/et/sv/pt/zh

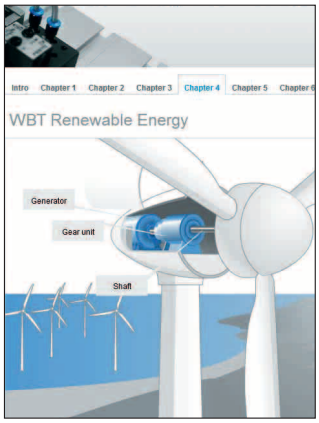
Order no.	**567705**

Network de/en/es/fr/et/sv/pt/zh

Order no.	**567706**

Our authoring tool:
Content Builder
Devise and design your own training media

Technology and Environment



Renewable energies
Day after day, we consume enormous amounts of energy in the form of electrical power, for example to operate industrial machines and public transport systems such as the underground and suburban railways, as well as lighting and other household appliances.

In addition to conventional forms of energy, renewable energy is available to us as well, and will become more and more significant for our supply of energy in the future.

Basically, there are three types of energy available to us for generating electrical power: fossil fuels, nuclear fuels and renewable energy.

This training program provides you with an overview of the different sources of energy. We would like to offer you a detailed introduction to renewable energy sources, and show you how we can make use of them.

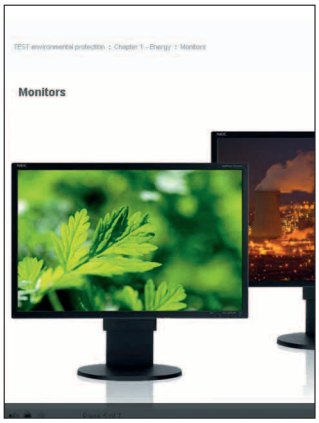
From the contents:
– Solar energy
– Water power
– Wind power
– Geothermal energy
– Bio-energy
– Energy storage
– Perspectives

E.g. single license with CD-ROM/DVD
Online de/en/es/fr

Order no.	**574490**

Network de/en/es/fr

Order no.	**574491**



Environmental protection in the office
Environmental protection has become an essential part of modern working life. You can actively reduce your impact on the environment and the climate in your everyday work.

Our web-based training “Environmental Protection in the Office” provides you and your employees with concrete methods to make your daily working routine more environmentally friendly. Not only will this allow you to save on energy, water and office supplies but it will also help to reduce the costs of these resources.

From the contents:
– The carbon-neutral office
– Saving electricity
– Paper as a raw material
– Environmentally friendly office supplies
– Sustainable waste management
– Saving and protecting water

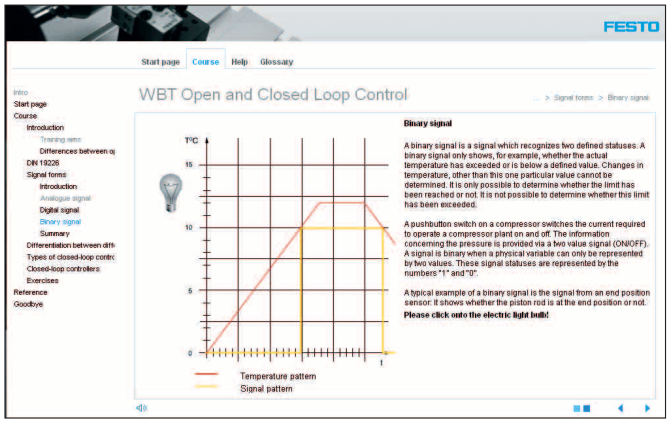
E.g. single license with CD-ROM/DVD
Online de

Order no.	**576322**

Network de

Order no.	**576323**

Open- and closed-loop control



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)

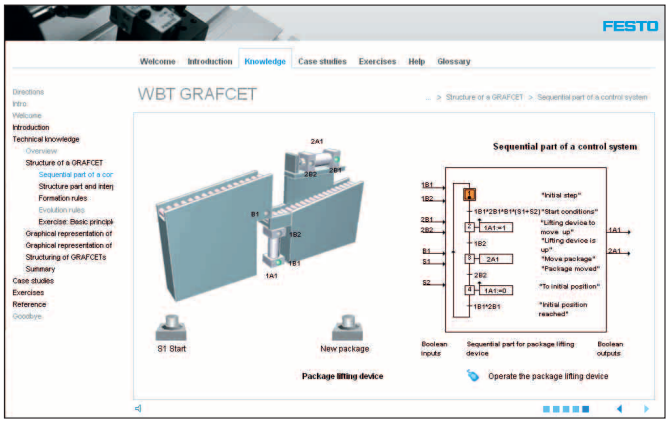
E.g. single license with CD-ROM/DVD
Online de/en/es/fr/zh

Order no.	**540947**

Network de/en/es/fr/zh

Order no.	**540949**

GRAFCET



GRAFCET – The new specification language for sequential function charts

Good documentation is a prerequisite for the quick construction and smooth commissioning of a system. As a result, products reach customers quicker. Furthermore, the sequence description is an important tool for quickly and accurately locating and eliminating errors and thus reduces production downtimes. GRAFCET can describe what the function chart has previously been unable to represent.

It introduces the new standard step by step, with the aid of practice-related examples.

From the contents:
- Definitions
- Advantages of GRAFCET
- Differentiation from PLC programming language
- Configuring a GRAFCET
- Graphical representation of the language elements
- Graphical representation of the sequential structures
- Structuring of GRAFCETS
- Case studies
- Exercises
- Glossary

E.g. single license with CD-ROM/DVD
Online de/en/es/fr/zh

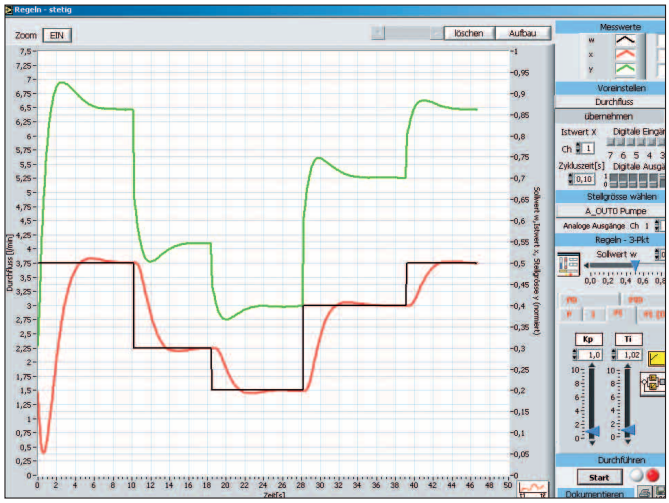
Order no.	**557688**

Network de/en/es/fr/zh

Order no.	**557689**

Our authoring tool:
Content Builder
Devise and design your own training media

FluidLab® PA closed loop
Control engineering in focus



Using FluidLab® PA step by step to teach and demonstrate the fundamentals of control technology. The EasyPort is used to connect the PC and real hardware, e.g. the EduKit PA, the MPS® PA compact workstation or the MPS® PA filtration station, mixing, reactor, filling.

Settings
Parametrization of sensor values with factor and offset to represent the physical quantities as well as signal attenuation per median filter for the analog input signals. Display of the physical value in the variable units field. Other possible settings are the inversion of the controller direction, Y offset in the continuous rules and the selection of the simulation mode.

Menu: Measurement
All binary and analog process data, for example the signal statuses of the sensors, process fittings and pump, can be displayed graphically and evaluated directly. To record the sensor characteristic and determining a step response, functions are available such as selection of measuring channels, adjusting the test time or cursor evaluation with zoom function.

Menu: Characteristic curve
The characteristics of a final control element (e.g. pump or proportional valve) is investigated in various perspectives (voltage for flow, flow for pressure, pressure for voltage).

Menu: 2-point controller
Typical applications are level and temperature controlled systems.

Menu: Continuous regulation
Experimentation, configuration and optimization of the control processes (P, PI, PD or PID controller) with immediate effect in the process. Controlled systems can be operated via mouse click. Trouble-free documentation of the control parameter is possible. The measured values and curve profiles can be documented comprehensively. The **block diagram** can be displayed as a function menu for all continuous controllers with current numerical values.

Industrial controller functions
System operation like in a process control system. It is possible to specify nominal values, display warning limits and switch the controller between manual and automatic.

Simulation
A simulated process model illustrates the sequence identically to the operation of the real hardware.

FluidLab® PA for **MPS® PA stations** is included.

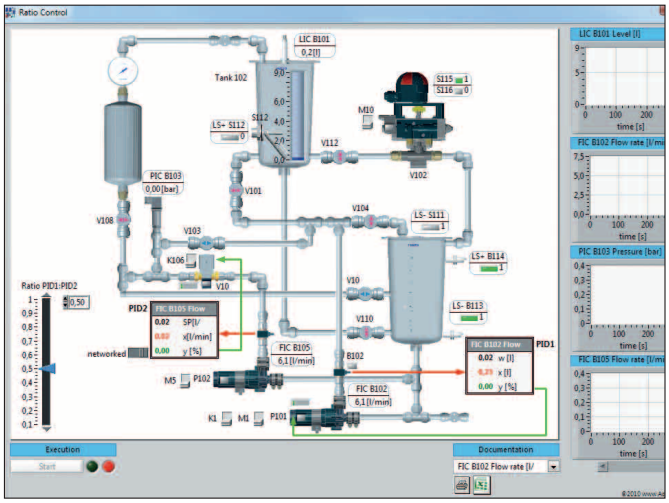
Single license on CD-ROM de/en/es/fr/sv

Order no.	**544304**

8+1 Multiple license on CD-ROM de/en/es/fr/sv

Order no.	**567139**

FluidLab® PA multi loop
For multi-variable control



EasyPort for level, flow rate, pressure or temperature control with:
– PID cascade controller for the
– level and flow rate control circuits with disturbance variable forwarding for a constant final control element
– PID ratio controller for two flow rate control circuits and a constant final control element
– PID limiting controller for flow rate and pressure control circuits and a constant final control element
– PID controller with disturbance variable forwarding for pressure control with flow rate disturbance variable by means of a proportional valve
– PID controller with disturbance variable forwarding for temperature control with non-constant heating/cooling final control element
– PID selecting controller for temperature control with non-constant heating final control element
– Detailed process visualization with manual control components for controlling the actuators

To carry out the tests, different hardware variants with additional components are required:
– MPS® PA Compact Workstation
– MPS® PA Reactor Station

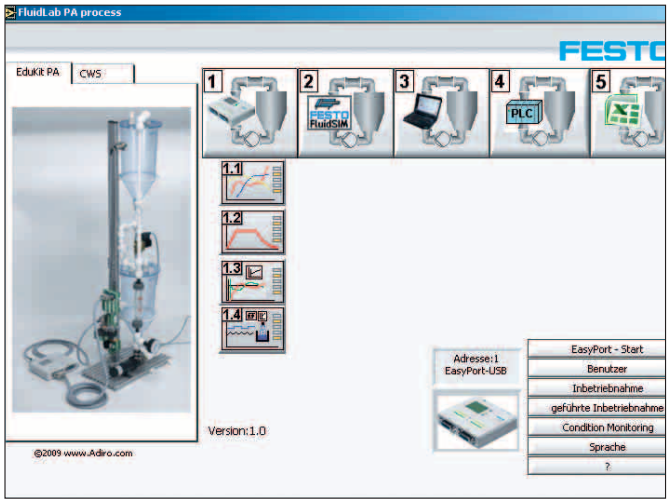
FluidLab® PA for **MPS® PA stations** is included.

Single license on CD-ROM de/en/es/fr

Order no.	**8026834**

FluidLab® PA process

Getting started in process engineering



Simple application of complex relationships
The clear menu structure proceeds from the commissioning of the EduKit PA or Compact workstation to the process engineering using the example of a bottling plant.

Menu: Guided commissioning
A check list like in industry. After processing, the system is activated. A commissioning protocol can be printed out for documentation.

Condition monitoring
Safety and efficiency are checked by means of permanent recording of machine status. Detects and analyzes deviations with FluidLab® PA process.

Menu: Operation, open- and closed-loop control with the EasyPort
Experience the behavior of a system using simple process examples. Control-technology operations and continuous and discontinuous controllers are presented. Subsequent analyzes bring a valuable, understanding which can be transferred to the general technology. Especially general training aims, such as the concentrated observation and analysis of systems, are encouraged.

Menu: FluidSIM®
Develop and immediately test control-technology relationships – whether virtual or real. Program one's own process sequence in FluidSIM®: electrical circuit diagram, logic diagram and GRAFCET.

Menu: Virtual reactor
Animated by a sequencer – observing, analyzing and documenting the simulated processes. Production according to customer order and assessing and responding to error messages are in demand.

Menu: Virtual PLC – actuating with STEP 7, PLCSIM or CODESYS® simulation
Learn the basics of PLC programming and the logical processing of binary and analog signals. Test the program on a virtual or real model.

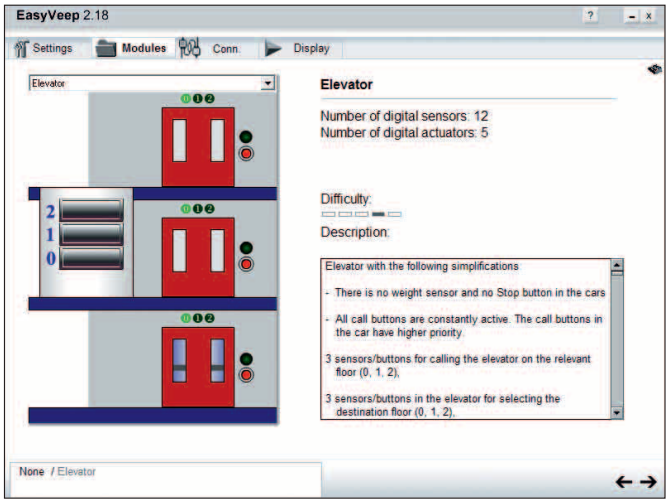
Menu: Filling with Excel interface
FluidLab® PA is transmitted order data from MS Excel via the DDE interface, e.g. the number and volume of the bottles. Conversely, the current status of the plant, for example the level of the storage tanks, is reported.

FluidLab® PA for **MPS® PA stations** is included.

Single license on CD-ROM de/en/es/fr
Order no. **567224**

8+1 Multiple license on CD-ROM de/en/es/fr
Order no. **567225**

EasyPort USB
Interface for measuring, open-loop control, closed-loop control



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, through which connections can be made.

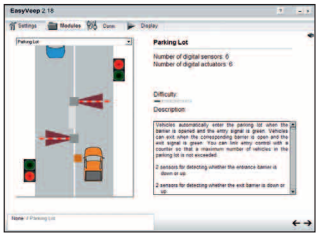
Technical data
- 24 V power supply via separate screw terminals or via SysLink connectors
- Interface to PC (galvanically isolated): USB 2.0, RS 232. Up to 4 modules can be connected via a USB hub. Transmission speed: 115 kbaud
- Analog interface: sub-D 15-pin socket, 12 bit resolution, 4 analog inputs, 2 analog 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 ActiveX Control from LabVIEW, C++ or Visual Basic

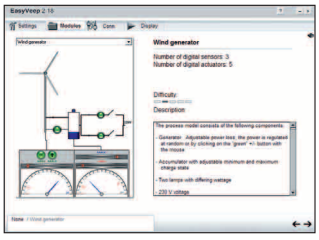
EasyPort USB 19”
- Technical data as with EasyPort USB
- However, for installation in a 19” support system
- Front plate: 19” plate with 36 HP

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.

EasyVeep is easy to install and offers exciting fields of application. The topics covered include the following:
- 7-segment display
- Alarm systems
- Level crossings
- Lifts
- Garage doors
- Multi-level car parks
- Sluice gates
- Sorting systems
- Hot water tanks
- Washing machines
- Wind generators
- and much more





Connects the simulation to the real world

Example applications	**Measuring**	**Control (open loop)**	**Closed-loop control**	**Controlling a simulation**
PC: **Software and simulations**	– FluidLab®-PA – FluidLab®-P – FluidLab®-H – LabVIEW – C++ – Visual Basic	– FluidSIM® (only digital) – S7-PLCSIM – Codesys® Soft-SPS – LabVIEW – C++ – Visual Basic	– FluidLab®-PA – FluidLab®-P from version 2.0 – LabVIEW – C++ – Visual Basic	– EasyVeep® – FluidSIM® – CIROS® – LabVIEW – C++ – Visual Basic
Interface: **EasyPort USB**	Interface: USB  Interface: digital/analog	Interface: USB  Interface: digital/analog	Interface: USB  Interface: digital/analog	Interface: USB  Interface: digital
Real training equipment	– Simulation box, digital/analog – MPS® PA – TP 210 – TP 610 EasyPort USB is the PC interface for receiving analog measurements and digital signals. Measurement data logged via: – FluidLab®-PA – FluidLab®-P – FluidLab®-H	– Simulation box, digital/analog – MPS® PA – MPS® – TP 301 EasyPort USB is the PC interface to control actual processes or simulations on a PC via an actual PLC. Actual process, controlled via: – S7-PLCSIM – FluidSIM® – Codesys®	– Simulation box, digital/analog – MPS® PA – TP 210 – TP 610 EasyPort USB is the PC interface to control an actual closed-loop controlled system. Closed-loop controlled system, controlled via: – FluidLab®-PA – FluidLab®-P from version 2.0	– Any PLC – Simulation box, digital – EduTrainer® Recommendation: The Codesys® starter kit with CECC-LK and EasyPort USB contains everything that is needed to start on the subject of control ➔ www.festo-didactic.com Simulated process, displayed via: – CIROS® – FluidSIM® – EasyVeep®

EasyPort USB	**548687**

EasyPort USB 19”	**8021637**

Scope of delivery
– EasyPort USB/EasyPort USB 19”
– 24 V connecting cable on 4 mm safety plugs
– USB cable
– CD-ROM: EasyVeep®, EasyOPC driver, datasheet, ActiveX control, examples of control using LabvVIEW

Also order:

For EasyPort with a real process or SimuBox:

I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
Analog cable, parallel, 2 m	529141

For EasyPort with a real PLC:

I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover	167106

For EasyPort, freely wireable, with any PLC:

I/O data cable with SysLink connector IEEE 488 and bare cable-end sleeves	167122

For EasyPort with an EduTrainer®:

I/O data cable, crossover, with terminal socket, 0.3 m	167197

For EasyPort with a real PLC or SimuBox:

Analog cable, crossover, 2 m	533039

CODESYS starter kit with CECC-LK and EasyPort USB	8024001
Universal connection unit, digital (SysLink)	162231
Quick-Fix screw adapter	549806

Teachware

Teaching materials for basic and advanced training

Theory and practice, our range

– Automation/PLC
– Mechatronics/Process automation
– CNC technology/Equipment
– Pneumatics
– Hydraulics
– Electrical engineering/Electronics

A wide range of different teaching materials for ongoing basic and advanced training are available for these topics.

Technical literature and textbooks
The technical literature and textbooks provide the basis for studying technologies and processes. For trainers and teachers, they are essential for preparing courses. They also provide practical exercises with professional guidelines for those who do not enjoy self-study on a PC.

Workbooks
For more than 50 years, Festo Didactic has been at the forefront of industrial training with training packages with equipment sets and tailored workbooks that include exercises and sample solutions (including CD-ROM). The exercises are based on real industrial practices and have been successfully implemented in a wide range of specialized training.

Dictionaries and manuals
Symbols, rules, standards, formulae, etc. You don't need to have everything in your head, but you do need to know where to find it!

Legal security

Festo Didactic's teaching materials are already in widespread use for a diverse range of purposes. With the new licenses, the legal basis for individualized use has now been established. From now on, users have the option of choosing one of three types of license, to ensure an optimized – and legally secure – use of Festo's teaching materials tailored to your needs.

Choose from the following types of license:

Campus license
The standard option for commercial (professional) use. Ideal for all those wishing to use the training materials at a single location.

Enterprise license
For large (international) companies and educational institutions with multiple locations.

For information on each of the license types, please see the following table.

Note:
– The license types are valid for all Festo Didactic training materials.
– The full rights of use are set out in the legal information contained in the purchased training materials.

Properties	Campus license	Enterprise license
Scope of delivery	Teaching material (workbook with multimedia CD-ROM*)	As agreed
Document protection	–	–
Document can be modified	X	X
Reproduction rights	X	X
Multilingual version*	–	X*
Target group	Commercial/educational organizations (single location)	Commercial/educational organizations (multiple locations)
Shop	FESTO	FESTO

* The languages offered vary depending on the training material.

Process automation
Workbooks

EduKit PA Workbook
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.

B. Schellmann, H. Kaufmann
Edition 2009, 430 pages, in folder, incl. CD-ROM.

Campus license (➔ Page 15):

de	**563969**
en	**563971**
es	**563973**
fr	**563975**

MPS® PA Workbook
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 analyzing 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, 430 pages, in folder, bound, incl. CD-ROM.

Campus license (➔ Page 15):

de	**548590**
en	**548591**
es	**548592**
fr	**548593**

Closed-loop pneumatics Workbook
The 21 exercises contained in this workbook offer a practical introduction to closed-loop control pneumatics. Besides fundamentals, the workbook also covers subjects such as the function of various controllers and control circuits, empirical setting of controller parameters and the influence of interference variables. You will need equipment set Closed-loop control pneumatics, TP 111 to carry out the exercises.

The workbook includes:
– Sample solutions
– Training notes
– Multimedia CD-ROM with supplementary media
– Exercise sheets for trainees

J. Gerhartz, D. Scholz
Edition 2001, 542 pages, in folder.

Campus license (➔ Page 15):

de	**94459**
en	**94465**
es	**533499**
fr	**94347**

Reading samples at:
www.festo-didactic.com

EDS® – Water Management
Workbooks

Water purification
After having worked through the exercises in the “Water purification” workbook, learners will be able to:
– Control the basic processes of precipitation, flocculation and sedimentation
– Measure the chlorine content and deal with chlorine dosage in the system
– Name problems caused by too high or too low a chlorine dosage

M. Groß, C. Klippstein, P. Maurer, Y. Salazar, T. Schwab, K. Treffry-Goatley, J. Voortman, C. Wehlers
Edition 2014, 82 pages, color, in folder.

Campus license (➔ Page 15):

de	**8028713**
en	**8027887**

Water supply
After having worked through the exercises in the “Water Supply” workbook, learners will be able to:
– Highlight special features of different pump types
– Understand the influences on pump performance during water supply
– Identify the interaction between pressure and flow rate in a piping system
– Control water supply using different valve types
– Describe the meaning of different pressure zones in a water distribution network
– Detect water losses in distribution networks and highlight problems in leak detection

M. Groß, P. Maurer, Y. Salazar, T. Schwab, K. Treffry-Goatley, C. Wehlers
Edition 2014, 138 pages, color, in folder.

Campus license (➔ Page 15):

de	**8028712**
en	**8027888**

Wastewater transport
After having worked through the exercises in the “Wastewater Transport” workbook, learners will be able to:
– Transport solid matter in a sewer system using different flow speeds
– Name the effects of exceeding the hydraulic capacity
– Name the basic mechanisms that make flushing necessary
– Describe the functions of a rain overflow basin
– Explain the functional principle of a flow basin for solid matter retention

M. Groß, C. Klippstein, P. Maurer, Y. Salazar, T. Schwab
Edition 2014, 82 pages, color, in folder.

Campus license (➔ Page 15):

de	**8028711**
en	**8027889**

Wastewater treatment
After having worked through the exercises in the “Wastewater Treatment” workbook, learners will be able to:
– Simulate central processes related to the sedimentation of sludge
– Analyze the behavior of floc with different flow rates and solid matter content
– Name the consequences of hydraulic overload of a wastewater treatment plant
– Describe the basic function of aerobic water treatment and the role of sludge recirculation
– Measure the amount of dissolved oxygen and highlight the advantages of continuous measurement

M. Groß, C. Klippstein, P. Maurer, Y. Salazar, T. Schwab, K. Treffry-Goatley, J. Voortman
Edition 2014, 122 pages, color, in folder.

Campus license (➔ Page 15):

de	**8028710**
en	**8027890**

EDS® – Water Management
Workbooks

Monitoring, controlling and optimizing operations
After having worked through the exercises in the “Monitoring, controlling and optimizing operations” workbook, learners will be able to:
– Control the level using a two-point controller and a linear controller
– Control the flow rate using a proportional-integral controller
– Understand the features of different controller types and reliably implement the controllers
– Identify the impacts of different controller settings on energy consumption
– Find the best control strategy for ventilation

M. Groß, Y. Salazar, T. Schwab, J. Strittmatter
Edition 2014, 110 pages, color, in folder.

Campus license (➔ Page 15):

de	**8028709**
en	**8027891**

Energy optimization in water and wastewater treatment plants
After having worked through the exercises in the “Energy optimization in water and wastewater treatment plants” workbook, learners will be able to:
– Recognize the difference in energy consumption between a free and narrow piping system
– Identify potential for energy savings and energy conversion in water and wastewater treatment plants
– Compare different control strategies with regard to their energy requirements in order to optimize the efficiency of plant components
– Calculate the costs of different control strategies
– Implement energy management processes and methods

M. Groß, P. Maurer, Y. Salazar, T. Schwab, J. Strittmatter
Edition 2014, 186 pages, color, in folder.

Campus license (➔ Page 15):

de	**8028708**
en	**8027892**

Membrane Filtration
After having worked through the exercises in the “Membrane filtration” workbook, learners will be able to:
– Describe the operating modes of membrane filtration and backwashing processes
– Understand the fundamental principles of various membrane techniques
– Describe differences between the cross-flow and dead-end filtration
– Check the functionality of the membrane via pneumatic actuation and monitoring
– Identify and understand the relationship between trans-membrane pressure and filtering efficiency

Kevin Treffry-Goatley, Christian Wehlers, Peter Maurer, Thomas Schwab, Zaheer Ahmed Shariff
Edition 2015, ca. 80 pages, color, in folder

Campus license (➔ Page 15):

de	**8042104**
en	**8042102**

Sand filtration
After having worked through the exercises in the “Sand filtration” workbook, learners will be able to:
– Explain how rapid sand filtration works
– Understand the relationship between the feed to the filter and the filtrate rate
– Differentiate between dry and wet filtration
– Explain how deep bed filtration works
– Explain how backwashing has to be carried out and the steps involved
– Optimize the backwashing process for different sand beds

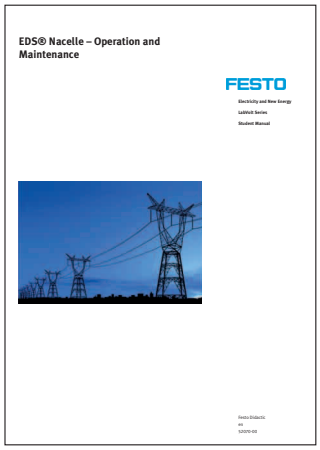
Peter Maurer, Yvonne Salazar, Thomas Schwab, Zaheer Ahmed Shariff
Edition 2015, ca. 84 pages, color, in folder

Campus license (➔ Page 15):

de	**8042099**
en	**8042097**

Reading samples at:
www.festo-didactic.com

EDS® – Environmental Discovery System
Workbooks



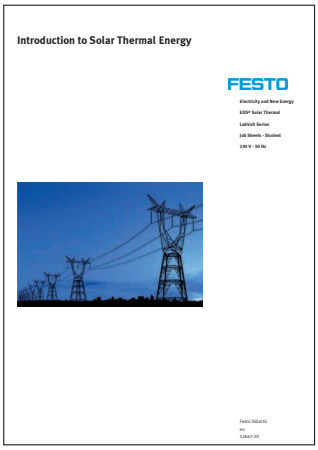
Training documents
EDS® Nacelle – Operation and maintenance
In this training course, you will find out more about how wind power is used to generate electrical energy. The course focuses on the operation, troubleshooting and maintenance of the equipment. A basic understanding of electrical and hydraulic systems is required before starting the course. The documentation explains the different parts of a wind turbine and provides useful information for future wind turbine technicians and operators.

The workbook contains theory and exercises that are directly related to the Wind Power Generation training system.

Overview:
– Electrical graphic symbols (IEC and NEMA)
– Graphic symbols for hydraulic and pneumatic systems
– Hydraulic schematic
– List of alarms and warnings
– Material Safety Data Sheet (MSDS)
– Specifications for instructors
– Lubricants, Grease, Transmission oil, Hydraulic oil
– Hydraulic oil filter
– Hydraulic pump and motor
– Transmission parts
– Generator coupling tolerances

Campus license (➔ Page 15):

de	**8060757**
en	**8060754**
es	**8060756**
fr	**8060755**



Training documents
EDS® Solar Thermal
EDS® Solar Thermal is a modular training system that explains the core processes of solar thermal systems. These training course documents contain information on the following three topics:

Introduction to solar thermal energy
– Fundamentals of thermal energy
– Trainer familiarization and safety
– Site analysis
– System dimensioning

Solar thermal energy systems
– Solar heating and cooling
– Collecting thermal energy
– Storing/exchanging thermal energy
– Supplying/regulating thermal energy

Multi-loop systems
– Trainer familiarization and safety for closed-loop water purification
– Closed-loop surface heating
– Closed-loop air heating
– Closed-loop drainback systems
– Closed-loop combination systems

Campus license (➔ Page 15):

SI Standards, en	**8060789**
SI Standards, fr	**8060790**
SI Standards, de	**8060792**
SI Standards, es	**8060791**
Imperial Standards, en	**8060788**

Process automation and closed-loop control technology

MPS® PA – The Modular Production System

Water – Bulk materials – Chemicals – Energy

Training in process automation

Didactic and methodology standards

Practical training on actual production and industrial systems is rarely possible, which is why models are used. These must be realistic and be tailored to different target groups.

You will find that the modular projects, stations, systems and learning factories from Festo Didactic meet these requirements.

Modularity and integration in MPS® PA

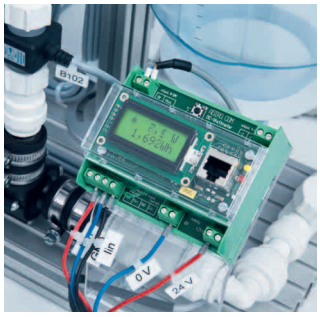
The MPS® PA would not deserve its name if it was not actually a system with modular equipment for basic and advanced training in process automation. In the MPS® PA you will find simple systems for introducing measuring technology and closed-loop control, as well as systems for the designated target groups.

The great thing about it is that all systems are compatible and supplement one another, and they are 100% compatible with all other components of the modular production system.

- Start with the EduKit PA
- Set complex exercises with the MPS® PA Compact Workstation
- Enjoy the variability of the MPS® PA stations
- Design sophisticated projects with the PA 204 complete MPS® system or a hybrid learning factory

Learning software: Supporting every stage of learning
The ideal system for anyone focused on processes and automation: How does a filling system for lemonade work? And what needs to be taken into account when designing and constructing this kind of system?

These and other questions in the area of process automation are answered by the Basic principles of process automation self-study program. This could be used right at the beginning of a series of courses and provides a motivating introduction to the process industry in general schools.



Energy efficiency: Today's issues for tomorrow's world
Control engineering is not simply a topic in a list of learning objectives in automation technology. Without control, there is no chance of increasing efficiency, no chance of preventing energy from being wasted and no sustainability.

This is why the MPS® PA includes modern performance measurement components. This enables energy efficiency to be clearly represented and put into an interdisciplinary context.

Industry-oriented basic and advanced training

MPS®PA is based on industry standards. Automation solutions and trends from market leaders characterize the MPS® PA concept. From manual control to a fully automated bottle filling system.

In a learning environment like this, training courses can be designed for every level of training: From general technical training through to basic and advanced training for technicians and engineers.

EduKit PA:
Introductory projects
The EduKit PA is ideally suited for small budgets, restricted space or an initial introduction to measuring technology and closed-loop control. The interaction of technology, software and structured teachware fits seamlessly into both professional training and general technical training.

MPS® PA Compact Workstation:
All processes in one system
Anyone who is looking for more than one control loop to provide the greatest possible variety of industrial training, will find the perfect solution in the MPS® PA Compact Workstation. Its minimal size provides:
– Industrial measurement, open- and closed-loop control
– 4 basic control loops
– Leaning scenarios for automation (sensor technology, PLC, operation and monitoring) based on continuous processes
– Compact, state of the art industrial technology

4 processes:
Individual or in combination
One control loop may perhaps be sufficient for basic teaching in measurement and control engineering for the chemical and water sectors. The stations of the MPS® PA provide a single control loop with learning content from all process engineering areas.

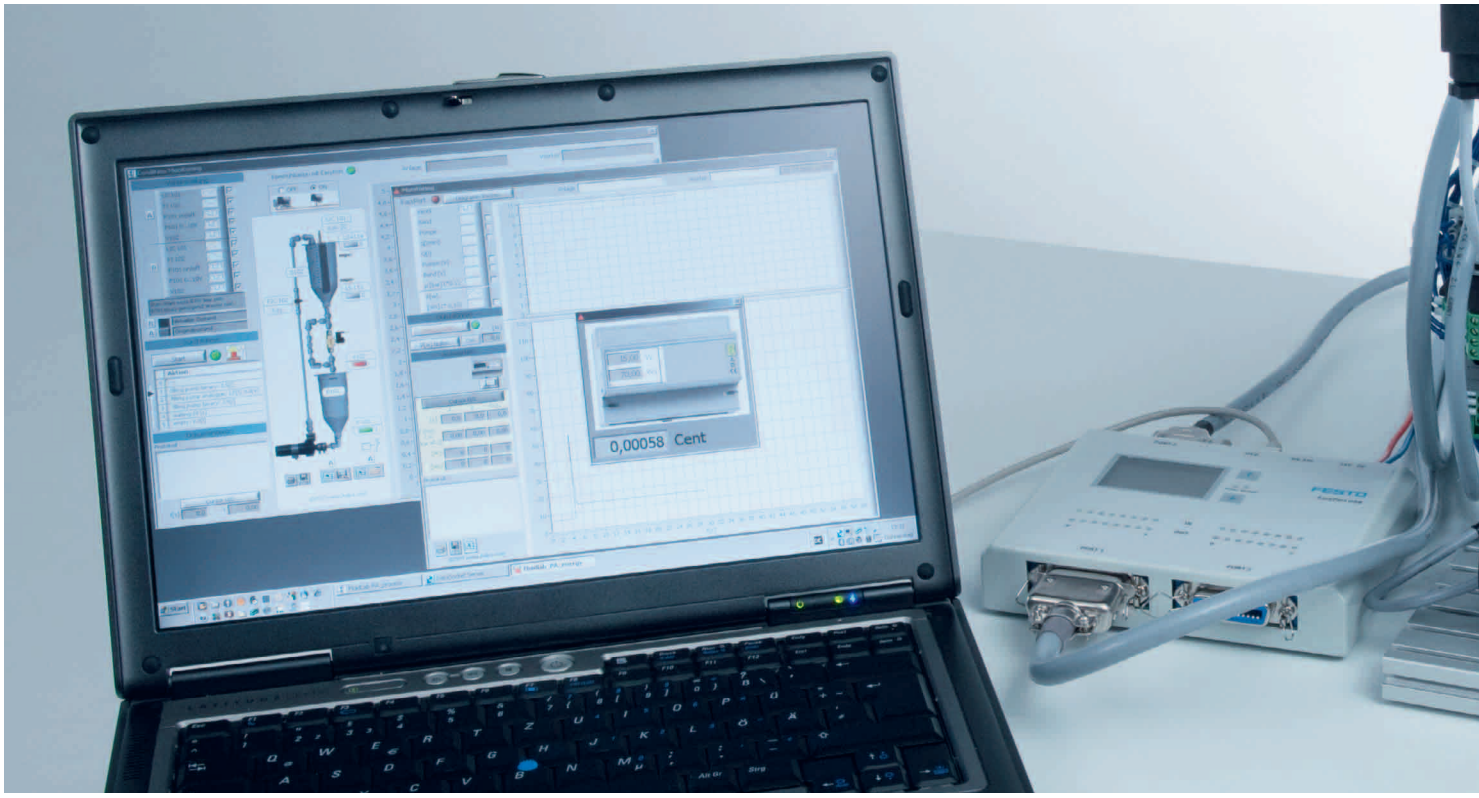
If a variety of typical control loops is important, simply combine the stations into a small-scale process engineering learning factory.

Learning factories:
Competences for hybrid production
Production and process automation can rarely be separated in most industrial environments. Discrete and continuous production processes are merging.

The requirements of engineers at process control level, maintenance engineers and process designers are becoming increasingly complex. The hybrid learning factories from Festo Didactic provide the appropriate range of learning processes for specialist staff.

EduKit PA

The introduction to process engineering and closed-loop control



Mobile and practical for beginners

The significance of closed-loop control is increasing constantly in all areas, since energy and resources can be saved using this technology. Moving towards efficient production, individual steps need to be planned, processes understood and verified. The EduKit PA modular projects provide a simple and safe introduction to process engineering and closed-loop control.

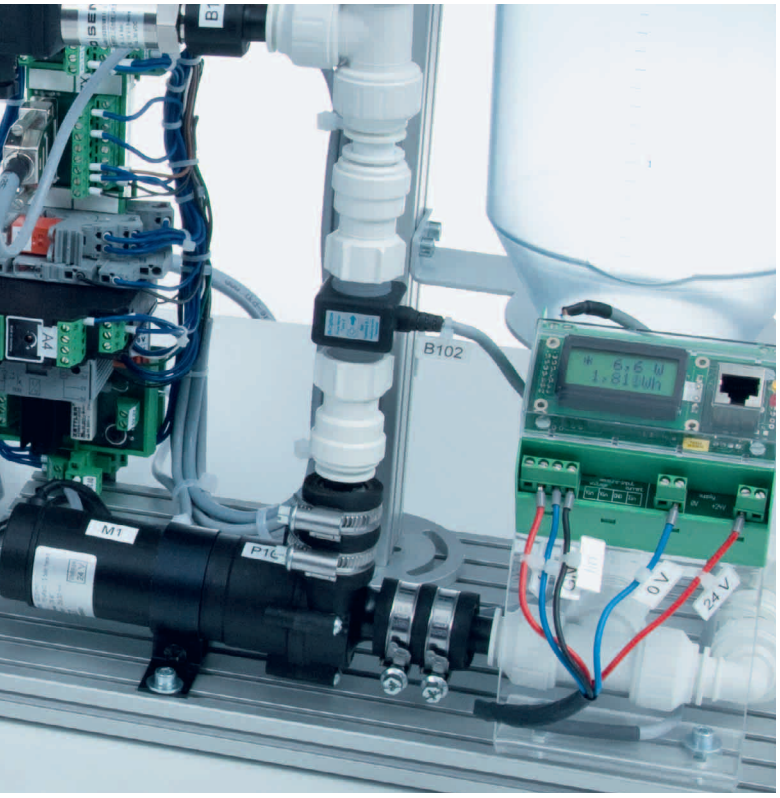
MSR specialist in 2 stages
The EduKit PA Basic provides a step-by-step introduction to manual measurement and open- and closed-loop control, using the example of a simple system with level, flow, and pressure control.

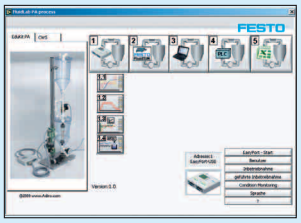
The EduKit PA Advanced adds the automation technology, with pressure, flow, and ultrasound sensors and an I/O connecting board for a controller of your choice. A 2/2 way solenoid valve controls the filling into the lower tank. An industrial process valve can also be used here.

The choice of controller is yours!
As everywhere, in the EduKit PA the SysLink interface guarantees problem-free connection to any type of controller:
– The SimBox for initial familiarization with the process and for commissioning
– FluidLab® PA process, the measuring and exercise software designed for the EduKit
– LabVIEW for designing measuring and control applications, with finished VIs
– An EduTrainer® Universal and any other PLC

Ready to use
Unpack, set up and use. Setting up the first EduKit PA subsystem is part of putting together the project.

The modular concept (Basic and Advanced) meets the requirement of setting exercises for differentiated training. The EduKit PA provides appropriate projects for technical training in schools and for professional training.





Learning environments with FluidLab® PA process

With the EduKit PA, you benefit from industrial technology on the one hand and methodical software support on the other. FluidLab® PA process guides the student step-by-step, exercise by exercise through the world of measuring and control engineering. What is shown on the screen is actually happening in the actual system or simulation. FluidLab® PA process gives the students the feeling of being in the control station, thus contributing to a high level of motivation.

The learning concept

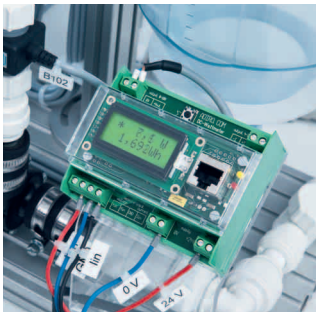
The learning concept of the EduKit PA supports experimental learning, as well as teaching supported by the courseware.

The experience of Festo engineers and the industrial experience of our trainers have been incorporated in many instances. It is therefore no surprise that EduKit PA is being used for advanced training of specialist staff in industry throughout the world.

Hot topic:
Energy efficiency

In the chemical and pharmaceutical industry and in the food industry, we find state of the art technologies that help to prevent energy and resources being wasted. The EduKit PA includes scenarios in which hot topics such as energy efficiency and environmental protection can be illustrated.

2 supplementary sets provide the necessary equipment for further practical experiments:
– A DC Wattmeter for energy measurement
– A modern pinch valve for flow optimization



Energy monitoring with DC Wattmeter
How can I save power? When should I save power? Which equipment eats up power? These questions are crucial to ensuring efficient management of energy – in the domestic sphere and in production.

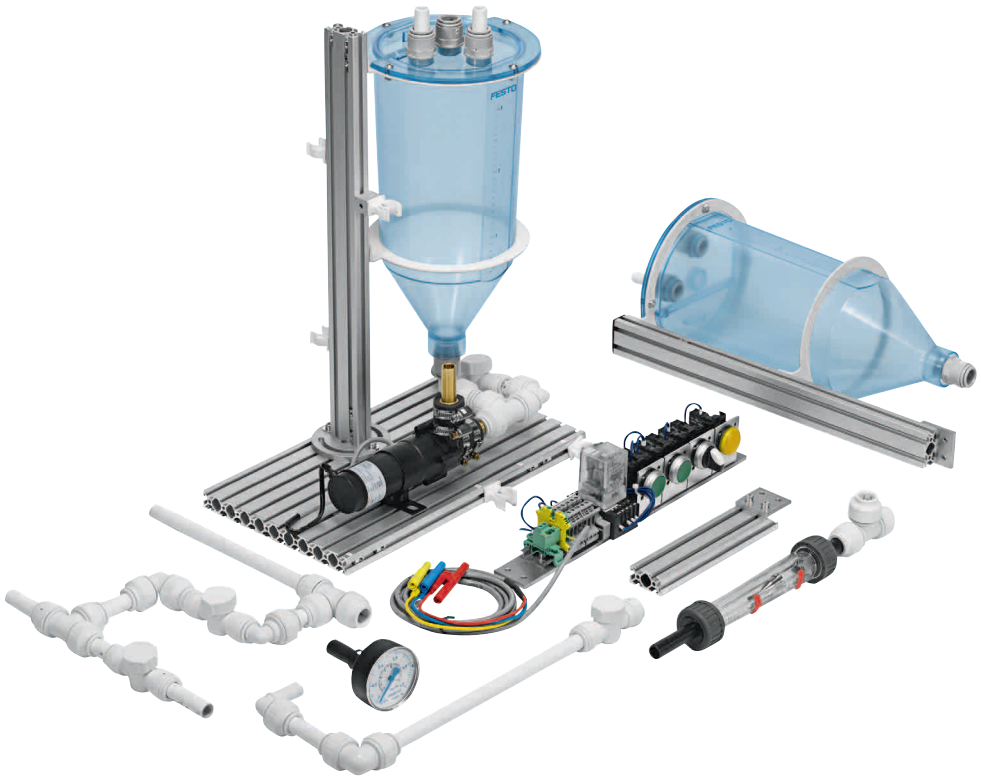
Identifying potential savings first involves measuring current consumption. The DC Wattmeter is used as a smart meter for training systems.

High tech alternative: pinch valve
An increasing number of valves and drives are operated pneumatically in process engineering. In many cases, this is safer, more economical and more energy efficient.

The new, highly elastic, pneumatically operated pinch valve seals the production flow gas tight with 2 to 3 bar differential pressure supply. Thanks to its rebound resilience it returns to the open position with no drive after venting, guaranteeing an almost friction-free flow of material.

EduKit PA Basic

Unpack and away you go



The 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

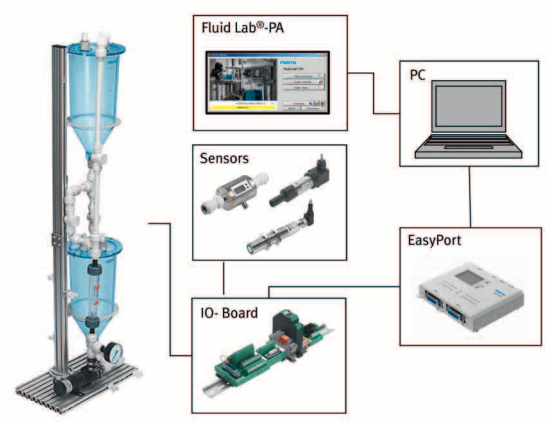
EduKit PA Basic	**549822**

The most important components at a glance:

1x Pump	170712
2x Tank, round	548596
1x Flow meter	548604

Accessories, also order:

Tabletop power supply unit ➔ www.festo-didactic.com	
Pipe and tubing cutter	7658
Tool set	539767



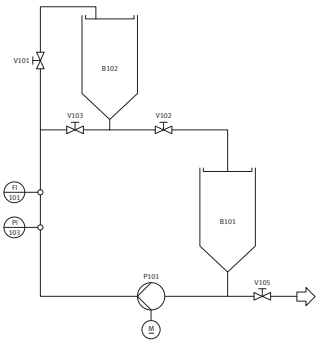
Learning content for project work

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

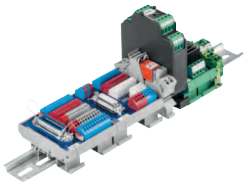
Commissioning and measured data acquisition:
- System start-up
- Recording measured values with changed valve position, changed voltage on the pump or different fill heights
- Observation of level, pressure, and flow, as well as time response

Presentation and documentation:
- Creating assembly instructions
- Documenting measured values
- Graphical analysis
- Presenting project process



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

EduKit PA Advanced

1


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6


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	**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, magnetic-inductive	8079872
5	1x Pressure sensor 0 – 400 mbar	549826
6	1x 2/2-way solenoid valve	549827

Recommended accessories for control:

EasyPort USB	548687
FluidLab PA process: Getting started in process engineering ➔ Page 11	
FluidLab-PA closed loop: Control engineering in focus ➔ Page 10	
I/O data cable with SysLink connectors (IEEE 488), 2.5 m	34031
Analog cable, parallel, 2 m	529141

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

Possibilities of expansion:

2-way ball valve	549828
Float switch sensor, top	548597

Also order:

Workbook

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

Campus license (➔ Page 15):

de	**563969**
en	**563971**
es	**563973**
fr	**563975**

Supplementary media:
eLearning course Process automation ➔ Page 8

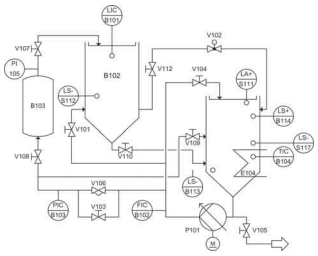
MPS® PA Compact Workstation

Measurement, open and closed loop control in minimal space

Optimum use of space

Do you have limited space or do you want high complexity from an individual training station?

If so, the MPS® PA Compact Workstation with 4 integrated control loops is the perfect solution.



Core competence: The RI flowchart
As the flowchart shows, the individual control loops can be activated simply by adjusting the ball valves. The flexible piping system allows quick changes to the flow pattern or integration of additional components.

Huge flexibility
Controllers and operating units are not permanently installed, but are simply clicked into place in the ER mounting frame. This enables the controller, operating unit or touch panel to be replaced in next to no time.

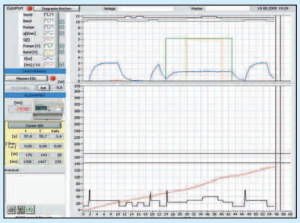
Option: refrigeration engineering
The standard version of the MPS® PA Compact Workstation provides 4 control loops. In addition, a cooling unit with heat exchanger and a water/air cooler are available. This results in even more options for temperature control.

Hot topic: energy efficiency

As everywhere in automation, software plays an outstanding role in the Compact Workstation, e.g. in measuring technology. The process data can be clearly visualized using the measuring software and then analyzed by either the whole class or as group work.

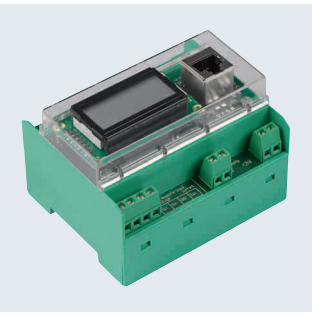
The exciting questions waiting to be answered:
– What process steps lead to unwanted increased energy consumption?
– How can consumption peaks be avoided?
– What does it achieve, what does it cost?
– Which investments or changes will achieve the greatest effects?

Training with the MPS® PA Compact Workstation becomes a multi-faceted, exciting and cross-subject project.



Networked technologies
An increasing number of valves with pneumatic drives are being used in water supply and disposal. This is safer and more energy efficient. Therefore, no modern learning system should be without a 2-way ball valve with pneumatic process drive and signal box. It represents the increasing integration of different technologies in process automation.

Professional performance recording
The Sentron PAC4200 multifunction measuring unit from Siemens records and saves measured values such as voltage, current and energy consumption, allowing analysis of the network quality. The unit can be incorporated into master control systems and energy management systems via Ethernet.



On the trail of waste
Identifying potential savings means first of all: measuring current consumption. The Wattmeter acts as a smart meter for training systems with a 24 V DC power supply and a maximum of 120 Watts. A switchable interface for 0 – 10 V DC or 4 – 20 mA is integrated for data transmission. Ethernet is available as an option.

MPS® PA Compact Workstation

with level, flow rate, pressure and temperature controlled systems

Function
The four controlled systems in the MPS® PA Compact Workstation can each be operated individually.

Using a corresponding controller, the level and flow rate controlled system can be set up as a cascade control system.

The design of the sensors and valve actuators allows the use of both continuous (e.g. P, I, PI, PID) and discontinuous controllers (e.g. two-point controllers) in testing. The pumps can be controlled using either direct actuation or speed adjustment.

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

Variants
The MPS® PA Compact Workstation is available in a number of different designs to suit the focus of your training.

The **Process Instrumentation** version is fitted with parameterizable sensors and includes a capacitive level sensor (two-rod probe), a magnetic-inductive flow meter with evaluation unit and HART interface and a configurable pressure and temperature sensor PT100.

The MPS® PA Compact Workstation **Energy** is equipped with current and power meters, and includes the measuring and training software FluidLab® PA Energy.

MPS PA Compact Workstation Basic Design	**C41025**
MPS PA Compact-Workstation Process Instrumentation	**C41008**
MPS PA Compact Workstation Energy	**C41009**

MPS PA® Compact Workstation Basic Design
Scope of delivery:
Mechanical components: 2 reservoirs, pressure reservoir, plug-in tube system, filter regulating valve, mounting frame, profile plate
Sensors: 2 capacitive sensors, 2 float switches, ultrasound sensor, flow sensor, pressure sensor, temperature sensor PT100
Actuators: pump, proportional directional control valve, 2-way ball valve with pneumatic quarter turn actuator and end-position sensing, double-acting, heating
Electrical components: I/O connection board with measuring transducer, motor controller, I/O terminal, SysLink, 8I/8O, analog terminal, SysLink, 15-pin
Media: Technical documentation with workbook

MPS PA® Compact Workstation Process Instrumentation
Different scope of delivery to the basic design:
Sensors: capacitive level measurement, two-rod probe for continuous level measurement, magnetic-inductive flow meter with evaluation unit, on-site indicator and HART interface, pressure sensor, configurable with on-site indicator, temperature sensor PT100, configurable with on-site indicator, level vibration limit switch for fluids
Electrical engineering: signal conversion with parameterizable measured-value transducers, includes parameterization software and programming cable
Media: Technical documentation with workbook

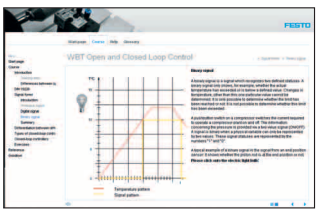
MPS PA® Compact Workstation Energy
Different scope of delivery to the basic design:
Electrical engineering: DC Wattmeter, power meter up to 5 A/24 V DC, incl. Ethernet interface, mounted on mounting bracket, AC multi-function meter PAC 4200 for measuring total output incl. Ethernet interface, built into 19" front panel
Software: FluidLab® PA energy
Media: Technical documentation with workbook

Recommended accessories:

MPS Trolley 700 x 700	E13003
Water-air cooler	8080632
Cooling unit with heat exchanger	C44001
FluidLab PA process: Getting started in process engineering ➔ Page 11	
Accessory kit MPS PA	C44003

Recommended training media, also order:

eLearning course Process automation ➔ Page 8
eLearning course Open- and closed-loop control ➔ Page 9



Control variants of the MPS® PA Compact Workstation

Control Kit SimBox
– Simulation box, digital/analog
– 24 V DC power supply cable
– I/O data cable with SysLink connector (IEEE 488), crossover
– Analog cable, crossover

Order no.	**C43016**

Control Kit PC3
– FluidLab PA closed-loop, single license
– EasyPort USB 19"
– Connecting cable set, length 1 m
– USB Ethernet Device Server
– USB cable, screened, length 5 m

Order no.	**C43028**

Control Kit F3
– Operator unit CDPX 7"
– Integrated switch with 2x RJ 45 port
– Integrated Soft PLC CODESYS® V3.5
– I/O module 16 DI/DO, 4 AI/2 AO, directly to 2x SysLink/1x analog cable
– Connecting cable 24 V DC
– Ethernet cable RJ45, length 5 m
– Software license CODESYS® V3 Runtime for CDPX
– CODESYS® p.b.F V3.5 development environment
– Designer Studio V1.9x with HMI client
– Sample application with control functions for the level, flow rate, pressure, and temperature for the MPS® PA Compact Workstation

Order no.	**C43031**

Control Kit S1-DP
– EduTrainer® Universal S7-314C-2PN/DP
– 19" operator unit for mounting frame
– IEC power cable 90°
– 2x I/O data cables with SysLink connectors to IEEE 488, length 2.5 m
– Analog cable, parallel, length 2 m
– PC adapter USB, length 5 m

Note:
STEP 7 software and programming cable must be ordered separately, if required.

Order no.	**C43014**

Control Kit S15-C
– EduTrainer® Universal S7-1512C-1PN
– 19" operator unit for mounting frame
– IEC power cable 90°
– 2x I/O data cables with SysLink connectors to IEEE 488, length 2.5 m
– Analog cable, parallel, length 2 m
– Ethernet cable CAT6, crossed, length 6 m
– Programming software STEP 7 TIA portal, single license

Order no.	**C43032**

Control Kit S12
– EduTrainer® Universal S7-1214C
– 19" operator unit for mounting frame
– IEC power cable 90°
– 2x I/O data cables with SysLink connectors to IEEE 488, length 2.5 m
– Analog cable, parallel, length 2 m
– Ethernet cable CAT6, crossed, length 6 m

Note:
STEP 7 software and programming cable must be ordered separately, if required.

Order no.	**C43008**

Touch Panel TP700 Comfort
For expanding the Control Kit S1-DP or S15-C. Touch Panel TP700 built into console housing, with connecting cable and application for the MPS® PA Compact Workstation.

Order no.	**C43019**

Touch Panel KTP700 Basic
For expanding the Control Kit S12. Touch Panel KTP700 built into console housing, with connecting cable and application for the MPS® PA Compact Workstation.

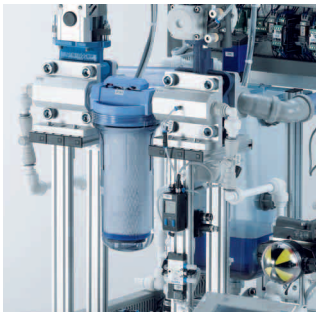
Order no.	**C43025**

MPS® PA
Process Automation Applications

Unlimited possibilities thanks to open interface concept

The new interface concept opens a wide range of options for directly combining the individual MPS® PA stations.

Deciding on one combination or another depends on various factors:
– Training content
– Supplementing existing stations
– Your budget
– Completely configured MPS® PA 204 system

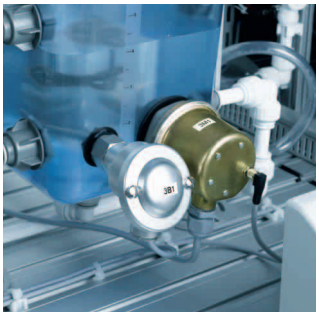


Filtering station
Aquarium, vacuum cleaner, atomizer, sewage plant, waterworks – filters are of critical importance in many areas and the key question is: how can I ensure a constant flow with any level of filter contamination? And how can the filter be cleaned more effectively? Perhaps using compressed air?

These questions are covered in the learning objectives for the filtration station. Towards the end of the training it becomes clear which open and closed loop control principles provide the right solution and which are the right technologies.

Mixing station
Food and confectionery, paints, construction materials, pharmaceutical products – the correct proportions of different materials are crucial to the quality of the end product. Constant metering and mixing of the components makes high demands on the controller and the equipment involved in the process.

The mixing station provides state of the art equipment, control components, controllers and operator control elements for demanding, motivating projects on one of the most common control loops in process automation – flow control.



Reactor station
To extend the shelf life of foods, improve the mixing capacity of liquids or allow them to be mixed, there are a large number of optimized heating processes in the chemical industry.

Temperature control makes extraordinary demands on the electronics and the components used as handling head is not without its problems. The reactor station demonstrates its realism in conjunction with the operation and monitoring software.

All four in one

Anyone who wants to use all four stations in a network should order them as a complete PA 204 MPS® system. The advantage: we commission and test the system. All you have to do is supply fresh water.

If you want to combine on site commissioning with instruction for the responsible trainers, you can take advantage of our MPS® PA commissioning service.

Continuous and discrete: MPS® PA across boundaries

Each of the MPS® PA stations represents a closed process, such as can be found in an identical or similar form in many industry sectors. Their control loops provide content for designing demanding courses in measuring and control engineering. They represent the most important continuous processes.

It is only in conjunction with the mechatronic MPS® stations that you can start to see what we mean by “system”:

All stations can be combined with one another. The MPS® PA stations can be linked to the mechatronic MPS® stations and the discrete processes they represent with no problems at all. The SysLink interface is the basis for this.

This means that you can move into the industrial reality of hybrid production with minimal investment.

From an individual MPS® PA station to an AFB factory, MPS® does not set any limits.

Bottling station
Customers get annoyed if there is less in a drinks bottle than it says on the label. For drinks producers, a consistent and guaranteed fill quantity is a crucial quality feature.

The bottling station represents a realistic industrial environment, in which all aspects of a quality optimized filling process can be learned and experienced. The projects focus on level monitoring and positioning of the containers to be filled.

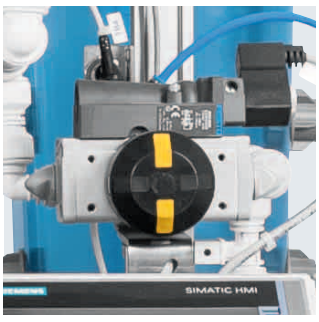
Standard with EduTrainer®
All stations of the MPS® PA will be delivered fully assembled. The stations will come the new SIMATIC S7-1500 controller generation in the TIA portal. It delivers maximum performance and user-friendliness for medium and high-end applications in plant automation.

Touch Panel TP 700
The Touch Panel TP700 Comfort of the Siemens HMI series is a 7” touch panel for advanced applications.

Comfort panel features include:
– Multiple interfaces for process communication
– Integrated PROFINET switch
– Programming from WinCC Comfort V11 (TIA portal)

MPS® PA Filtration Learning System

[X]



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, analog 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.

 [X] Illustration includes additional equipment and accessories

MPS PA Filtration Learning System	**8079862**

The most important components at a glance:

1x Filtration station	701291
1x Trolley	541139
1x EasyPort USB 19”	8021637
1x FluidLab-PA closed loop, Single license	544304
1x EduTrainer Universal A4 rack with SIMATIC S7-1512C-1PN	8065600
1x SIMATIC Touch Panel TP700 Operator unit	8079869
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Analog cable, parallel, 2 m	529141
1x Safety laboratory cable, 3 m	571817

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

Simulation box, digital/analog	526863
I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover	167106
Analog cable, crossover, 2 m	533039

Recommended accessories:

IEC power cable ➔ www.festo-didactic.com	
Replacement filter cartridge	544303
Compressor, 230 V	91030
120 V	565440

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
- Parameterization and optimization of P, PI or PID controllers
- Drafting of open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance, and servicing

Also order:

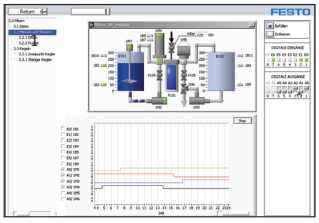
MPS® PA **workbook**

Campus license (➔ Page 15):

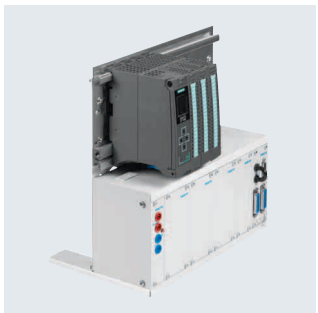
de	**548590**
en	**548591**
es	**548592**
fr	**548593**

eLearning course Process automation ➔ Page 8

FluidLab®-PA ➔ Pages 10 – 11



Recommended training media
- Design and simulation program FluidSIM® Pneumatics
- eLearning course Open- and closed-loop control



Edutrainer® Universal with Simatic S7-1512C-1PN
EduTrainer® Compact with modern, industry-standard Siemens S7-1512C-1PN controller ➔ Page 45

Order no.	**8065600**

SIMATIC Touch Panel TP700 Operator unit
The Touch Panel TP700 Comfort of the Siemens HMI series is a 7” touch panel for advanced applications.

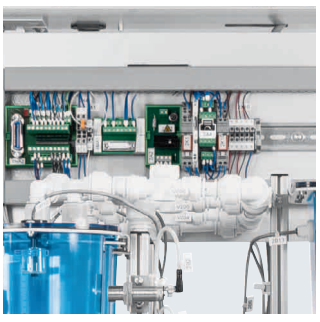
Order no.	**8079869**

EasyPort USB 19”
External PC interface as table-top equipment for the transmission of analog 0 – 10 V and digital 24 V process signals via USB to the PC ➔ Page 13

Order no.	**8021637**

MPS® PA Mixing Learning System

[X]



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 electromagnetic flow sensor 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 analog 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. With overflow protection thanks to additional sensors on each container, thereby virtually eliminating the possibility of overflow.

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

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

[X] Illustration includes additional equipment and accessories

MPS PA Mixing Learning System	**8079863**

The most important components at a glance:

1x Mixing station	701292
1x Trolley	541139
1x EasyPort USB 19”	8021637
1x FluidLab-PA closed loop, Single license	544304
1x EduTrainer Universal A4 rack with SIMATIC S7-1512C-1PN	8065600
1x SIMATIC Touch Panel TP700 Operator unit	8079869
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Analog cable, parallel, 2 m	529141
1x Safety laboratory cable, 3 m	571817

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

Simulation box, digital/analog	526863
I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover	167106
Analog cable, crossover, 2 m	533039

Recommended accessories:

IEC power cable ➔ www.festo-didactic.com	

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

Simulation box, digital/analog	526863
I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover	167106
Analog cable, crossover, 2 m	533039
Compressor, 230 V	91030
120 V	565440

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
- Parameterization and optimization of P, PI or PID controllers
- Drafting of open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance, and servicing

Also order:

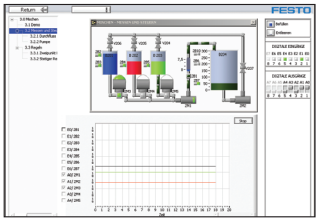
MPS® PA **workbook**

Campus license (➔ Page 15):

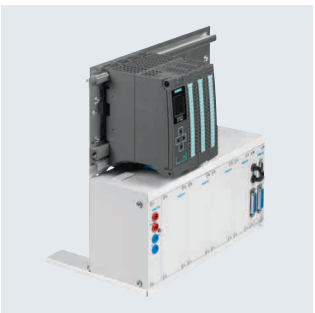
de	**548590**
en	**548591**
es	**548592**
fr	**548593**

eLearning course Process automation ➔ Page 8

FluidLab®-PA ➔ Pages 10 – 11



Recommended training media
- Design and simulation program FluidSIM® Pneumatics
- eLearning course Open- and closed-loop control



Edutrainer® Universal with Simatic S7-1512C-1PN
EduTrainer® Compact with modern, industry-standard Siemens S7-1512C-1PN controller ➔ Page 45

Order no.	**8065600**

SIMATIC Touch Panel TP700 Operator unit
The Touch Panel TP700 Comfort of the Siemens HMI series is a 7” touch panel for advanced applications.

Order no.	**8079869**

EasyPort USB 19”
External PC interface as table-top equipment for the transmission of analog 0 – 10 V and digital 24 V process signals via USB to the PC ➔ Page 13

Order no.	**8021637**

MPS® PA Reactor Learning System

[X]

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 setpoint 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 realized 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. A safe experimental environment permits integrated linking of the heater with the integrated temperature switch – thus ruling out the possibility of "running dry" in a practical way.

Stirrer with DC motor

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

 [X] Illustration includes additional equipment and accessories

MPS PA Reactor Learning System, 220 V	**8079865**
MPS PA Reactor Learning System, 120 V	**8079864**

The most important components at a glance:

1x Reactor station, 220 V	701293

or

1x Reactor station, 120 V	8079871

These components apply for both stations:

1x Trolley	541139
1x EasyPort USB 19”	8021637
1x FluidLab-PA closed loop, Single license	544304
1x EduTrainer Universal A4 rack with SIMATIC S7-1512C-1PN	8065600
1x SIMATIC Touch Panel TP700 Operator unit	8079869
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Analog cable, parallel, 2 m	529141
1x Safety laboratory cable, 3 m	571817
1x Water-air cooler	8080632

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

Simulation box, digital/analog	526863
I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover	167106
Analog cable, crossover, 2 m	533039

Recommended accessories:

IEC power cable ➔ www.festo-didactic.com

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
– Parameterization and optimization of P, PI or PID controllers
– Drafting of open-loop and closed-loop control programs
– Process operation and monitoring
– Inspection, maintenance, and servicing

Also order:

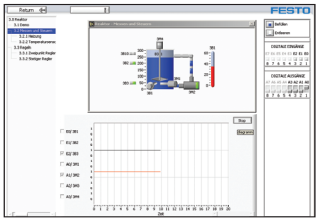
MPS® PA **workbook**

Campus license (➔ Page 15):

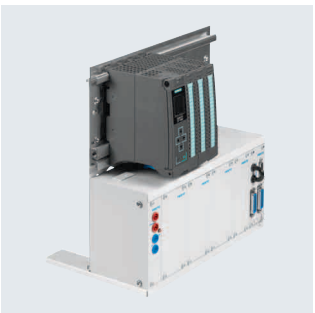
de	**548590**
en	**548591**
es	**548592**
fr	**548593**

eLearning course Process automation ➔ Page 8

FluidLab®-PA ➔ Pages 10 – 11



Recommended training media
eLearning course Open- and closed-loop control



Edutrainer® Universal with Simatic S7-1512C-1PN
EduTrainer® Compact with modern, industry-standard Siemens S7-1512C-1PN controller ➔ Page 45

Order no.	**8065600**

SIMATIC Touch Panel TP700 Operator unit
The Touch Panel TP700 Comfort of the Siemens HMI series is a 7” touch panel for advanced applications.

Order no.	**8079869**

EasyPort USB 19”
External PC interface as table-top equipment for the transmission of analog 0 – 10 V and digital 24 V process signals via USB to the PC ➔ Page 13

Order no.	**8021637**

MPS® PA Bottling Learning System

[X]

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 analog 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 optimizes the quality of the filling process. Various control algorithms such as P, PI or PID can be applied and optimized 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.

 [X] Illustration includes additional equipment and accessories

MPS PA Bottling Learning System	**8079866**

The most important components at a glance:

Bottling station	701294
Bottle set ➔ Page 48	567202
1x Trolley	541139
1x EasyPort USB 19”	8021637
1x FluidLab-PA closed loop, Single license	544304
1x EduTrainer Universal A4 rack with SIMATIC S7-1512C-1PN	8065600
1x SIMATIC Touch Panel TP700 Operator unit	8079869
1x I/O data cable with SysLink connectors (IEEE 488) at both ends, 2.5 m	34031
1x Analog cable, parallel, 2 m	529141
1x Safety laboratory cable, 3 m	571817

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

Simulation box, digital/analog	526863
I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover	167106
Analog cable, crossover, 2 m	533039

Recommended accessories:

IEC power cable ➔ www.festo-didactic.com	
Compressor, 230 V	91030
120 V	565440

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
- Parameterization and optimization of P, PI or PID controllers
- Drafting of open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance, and servicing

Also order:

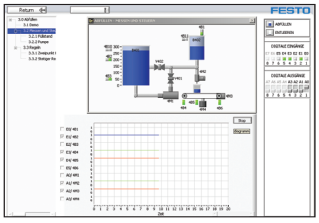
MPS® PA **workbook**

Campus license (➔ Page 15):

de	**548590**
en	**548591**
es	**548592**
fr	**548593**

eLearning course Process automation ➔ Page 8

FluidLab®-PA ➔ Pages 10 – 11



Recommended training media
- Design and simulation program FluidSIM® Pneumatics
- eLearning course Open- and closed-loop control

Edutrainer® Universal with Simatic S7-1512C-1PN
EduTrainer® Compact with modern, industry-standard Siemens S7-1512C-1PN controller ➔ Page 45

Order no.	**8065600**

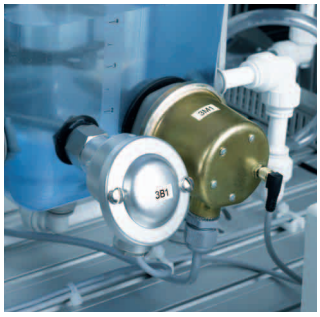
SIMATIC Touch Panel TP700 Operator unit
The Touch Panel TP700 Comfort of the Siemens HMI series is a 7” touch panel for advanced applications.

Order no.	**8079869**

EasyPort USB 19”
External PC interface as table-top equipment for the transmission of analog 0 – 10 V and digital 24 V process signals via USB to the PC ➔ Page 13

Order no.	**8021637**

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 analog controlled pump.

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

In the Bottling Station the level of the dosing tank is recorded with an analog level sensor. By way of the continuously controllable pump the controller regulates the level to the appropriate control value. During bottling, the level in the dosing tank is kept constant, thereby optimizing the bottling quality.

MPS PA 204 Learning system (S7-1500,TP700), 220 V	**8079868**
MPS PA 204 Learning system (S7-1500,TP700), 120 V	**8079867**

The PLC control packages includes:
SIMATIC S7-1500
4x EduTrainer® Universal with SIMATIC S7-1512C, 4x SIMATIC Touch Panel TP700 Operator unit, 1x Ethernet switch XB005 EduTrainer Compact

The MPS® PA 204 system contains everything you need for training:
Stations: Filtration, mixing, reactor, bottling with trolley, mounting frame and power supply unit
Control technology: 1x PLC control package, 1x EMERGENCY-STOP board, 2x EMERGENCY-STOP control panel, 4x EasyPort
Software: 4x FluidLab®-PA closed loop

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

Simulation box, digital/analog	526863
I/O data cable with SysLink connectors (IEEE 488) on both ends, crossover	167106
Analog cable, crossover, 2 m	533039

Recommended accessories:

IEC power cable ➔ www.festo-didactic.com	
Replacement filter cartridge	544303
Compressor, 230 V	91030
120 V	565440
Cooling unit with heat exchanger	C44001

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

- Simplifies commissioning, simulation and display using the simulation box
- Multimedia measuring, controlling, regulating, operating, monitoring and commissioning using EasyPort and FluidLab® PA closed-loop.
- Start processes in the PLC or operate and monitor them with the touch panel
- The control task is handled by the PLC. The controller parameters are set on the touch panel. All process variables are displayed in a user-friendly way – including trend graphs on the touch panel.

The MPS® PA complete system 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.

Function
The system consists of the Filtration, Mixing, Reactor and Bottling stations. The Filtration 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 Bottling station bottles the fluid. The bottles are carried on conveyor belts to the bottling position. A pneumatic separator separates 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 optimization of P, PI, or PID controllers
- Writing open-loop and closed-loop control programs
- Process operation and monitoring
- Inspection, maintenance, and servicing

Also order: MPS® PA **workbook**

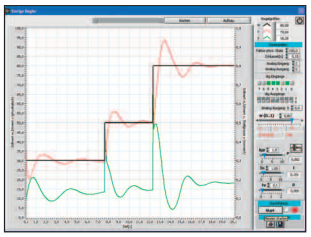
Campus license (➔ Page 15):

de	**548590**
en	**548591**
es	**548592**
fr	**548593**

eLearning course Process automation ➔ Page 8

Special license rules apply for schools and educational institutes in the commercial sector.

Measuring and controlling as in industry

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.	**Components**	**Operation and configuration**	**Advantages**
Simulation box			– Simple commissioning of an MPS® PA station – Testing and commissioning of process components or system components of a station
FluidLab®-PA closed loop or **FluidLab®-PA process**			– 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 optimization of control processes (2-point, P, PI, or PID controllers) – Analysis of the control response
PLC			– Programming of process sequences and recipe controllers – Analog signal processing – Operation and monitoring using the touch panel – Programming of PID controllers – Configuration and parameterization of P, PI or PID controllers

EduTrainer® Universal Preferred versions MPS® PA

A4 rack with SIMATIC S7-1500

The ultimate in power and efficiency

The controller family SIMATIC S7-1500 is a new controller generation in the TIA portal and a milestone in automation. It delivers maximum performance and user-friendliness for medium and high-end applications in machine and plant automation.

EduTrainer® Universal with:

CPU S7-1512C-1PN (MPS)
– Main memory: 250 KB for programs and 1 MB for data
– Memory card included
– Interface: PROFINET IRT with 2-port switch

Inputs/outputs:
– 32 digital inputs (24 V DC)
– 32 digital outputs (24 V DC/0.5A)
– 5x analog inputs, 4x U/I, 1x R/RTD, 16-bit resolution
– 2x analog outputs, 2x U/I, 16-bit resolution

The mounting system
– EduTrainer® Universal, size 1 (W x H) 305 x 300 mm
– Can be placed on a desk or in an MPS® station
– Stable, powder-coated, sheet-steel mounting system
– 19” module simulation plate with 2x SysLink plug connector for MPS® station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.

S7-1512C-1PN (MPS-PA)	**8065600**

Notes
Order no. 8065600 is based on Siemens SCE Trainer Packages and each one contains one EduTrainer® including programming cable (Ethernet cable) and programming software STEP 7 TIA portal. When Siemens updates these Trainer Packages, the controllers are replaced by successor models. Subject to technical implementation.

Recommended accessories:

I/O data cable with SysLink connectors (IEEE 488), 2.5 m	34031
Analog cable, parallel, 2 m	529141
Safety laboratory cable, 3 m	571817

Other accessories:

Analog cable, crossover, 2 m	533039

Special license rules apply for schools and educational institutes in the commercial sector.

EduTrainer® Universal Preferred versions MPS® PA

A4 rack with SIMATIC S7-300

The industrial standard

The modular concept of the SIMATIC S7-300 offers professional PLC technology from the market leader, Siemens. With various CPUs, CPs and I/O modules, the S7-300 meets all automation requirements. This controller facilitates the use of a wide range of fieldbuses such as AS-interface, PROFIBUS DP and PROFINET.

The STEP 7 programming environment makes all industrially used PLC programming languages available, such as AWL, KOP, FUP, STEP 7-SCL, STEP 7-GRAPH and STEP 7-HiGraph.

EduTrainer® Universal with:

CPU 314C-2PN/DP (MPS PA)
– 192 KB RAM for program and data
– Includes MMC
– Interfaces: MPI, Profibus-DP, ProfiNet
– Inputs/outputs:
  24 digital inputs (24 V DC)
  16 digital outputs (24 V DC, 500 mA)
– 4 analog inputs, 12-bit, 20 ms, (±10 V, 0 to 10 V, ±20 mA, 0/4 to 20 mA), 1 Pt100 input
– 2 analog outputs (±10 V, 0 to 10 V, ±20 mA, 0/4 to 20 mA)

CPU 315F-2PN/DP (MPS-PA)
– 256 KB RAM for program and data
– Includes MMC
– Interfaces: MPI, DP, PN
SM 323:
– 16 digital inputs (24 V DC)
– 16 digital outputs (24 V DC, 500 mA)
SM 334:
– 4 analog inputs, 8 Bit (0 – 10 V, 0 – 20 mA)
– 2 analog outputs (0 – 10 V, 0 – 20 mA)

The holder system
– EduTrainer® A4 rack, desktop variant size 1, W x H 305 mm x 300 mm
– 19” module simulation plate with 2x SysLink plug connector for MPS® PA station and control panel, each with 8 digital inputs and 8 digital outputs and 1x D-sub 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
– Can be placed on the desk or in an MPS® PA station.
– Stable, powder-coated, sheet-steel holder system

1

1 S7-314C-2PN/DP (MPS PA)*	**8084652**
2 S7-315F-2PN/DP (MPS PA)	**567099**

Recommended accessories:

I/O data cable with SysLink connectors (IEEE 488), 2.5 m	34031
Analog cable, parallel, 2 m	529141
Safety laboratory cable, 3 m	571817
PC adapter, USB	539006
Programming software STEP 7 ➔ www.festo-didactic.com	

Other accessories:

Digital I/O module SM323 8E/8A	184550
Digital I/O module SM323 16E/16A	529142
Front-panel connector, screwed contacts, 20-pin	184554
Front-panel connector, screwed contacts, 40-pin	660560
Analog I/O module S7-SM334-4E/2A	184804
Analog cable, crossover, 2 m	533039

2

* Special license rules apply for schools and educational institutes in the commercial sector.

EduTrainer® Universal Preferred versions MPS® PA

A4 rack with Festo CPX-CEC CODESYS® V2.3

World language IEC 61131-3

Benefit from automation programming in a world language, based on IEC 61131-3.

Increased performance

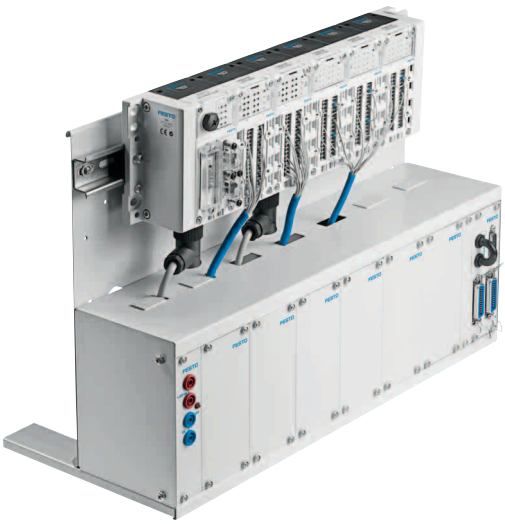
CPX-CEC means improved cycle times and more connectable actuators. The modular I/O system offers complete flexibility. Intelligent pneumatic and electric axes can be activated via fieldbus. The extensive CODESYS® function library provides diagnostics and condition monitoring options. Open- and closed-loop control – the solution for efficient automation of workstations or via remote control.

EduTrainer® Universal with:

CPX-CEC CODESYS® 2.3 (MPS PA)
- 400 MHz processor
- Data memory 32 MB flash/ 32 MB RAM
- Integrated web server
- Master CANopen fieldbus
- Communication via Ethernet (Modbus/TCP, EasyIP, TCP/IP)
- Process visualization using operator unit CDPX or OPC server

Inputs/outputs:
- 16 digital inputs (24 V DC)
- 16 digital outputs (24 V DC, 500 mA)
- 4 analog inputs (12 Bit, 0 – 10 V, 0/4 – 20 mA)
- 2 analog outputs (12 Bit, 0 – 10 V, 0/4 – 20 mA)

The holder system
- EduTrainer® A4 rack, desktop variant, size 1, W x H 458 x 300 mm
- 19” module simulation plate with 2x SysLink plug connector for MPS® PA station and control panel, each with 8 digital inputs and 8 digital outputs and 1x Sub-D 15-pin plug connection with 4 analog inputs and 2 analog outputs; emergency stop jumper to connect a safety circuit for disconnecting 8 digital outputs.
- Can be placed on the desk or in an MPS® PA station.
- Stable, powder-coated, sheet-steel holder system



CPX-CEC CODESYS 2.3 (MPS-PA)	**567275**

Notes

Includes Ethernet cable for programming the CPX-CEC.
The Codesys® V2.3 and V3.5 programming software can be downloaded for free on the Festo website.

Recommended accessories:

I/O data cable with SysLink connectors (IEEE 488), 2.5 m	34031
Analog cable, parallel, 2 m	529141
Safety laboratory cable, 3 m	571817

Other accessories:

Analog terminal	526213
Analog cable, crossover, 2 m	533039

Accessories and optional components

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4

1 **Trolley**
The trolley makes an MPS® station a compact and mobile unit. The station is easy to mount on the trolley. The EduTrainer® Universal, size 1, can be inserted and the emergency stop board connected. Appropriate through-holes in the side and rear panels enable orderly routing of cables. The front side is equipped with mountings for panels. The trolley is supplied complete with twin castors.
– Height (including castors, to bottom edge of profile plate): 750 mm
– Width: 700 mm
– Depth: 700 mm

Order no.	**541139**

2 **Pump**
Centrifugal pump for circulating and conveying (cooling) water
– 24 V DC
– 26 W
– Flow rate: approx. 10 l/min

Order no.	**170712**

3 **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 housings black
– 6 housings red
– 6 housings silver
– 6 housings transparent
– Diameter outside D = 40 mm
– Height H = 25 mm
– Volume V = 15 ml
– 24 lids black

Order no.	**554301**

4 **Bottle set**
For filling liquids or solid bulk materials in MPS® PA stations, for example a “Filling” station.

The set consists of:
– 20 transparent plastic containers (material: ABS/Terlux)
Diameter D = 40 mm
Height H = 60 mm
Capacity V = 50 ml
– 20 lids

Order no.	**567202**

1 **Tank, round**
The tank can be used with a variety of different mountings in the MPS® PA station for mixing and filling as well as with EduKit PA.
– Volumetric capacity 3 l
– Operating temperature max. 65 °C
– Scaling 0.5 – 3 l
– Incl. mounting material

Order no.	**548596**

Other variants on request.

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

Order no.	**8080632**

3 **Tool set**
The tool set is an aid to easy working on 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
– Fiber-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**

4 **Cooling unit with heat exchanger**
– Refrigerator with temperature controller and 4 l cooling tank with built-in circulation pump
– Cooling output: approx. 380 W at +30°C (RT)
– Temperature range: -10 °C to +40 °C
– Power supply: AC 230 V/50 Hz or 110 V/60 Hz
– Heat exchanger with profile foot
– 2 hand valves
– Connection accessories (flexible tube, connector etc.)
– Overall dimensions (W x L x H): 26 x 37 x 40.5 cm

Order no.	**C44001**

5 **DC Wattmeter**
The first step towards discovering potential savings involves measurement of power consumption. The DC Wattmeter is a smart meter for training facilities with a 24 V DC power supply and up to 120 W power consumption. All measured values can be read out via data transmission with the integrated Ethernet port. Power consumption is read out as an analog signal within a range of either 0 to 10 V DC or 4 to 20 mA.

Order no.	**573261**

6 **Replacement filter cartridge**
Replacement filter cartridge for MPS® PA Filtering Station.

Order no.	**544303**

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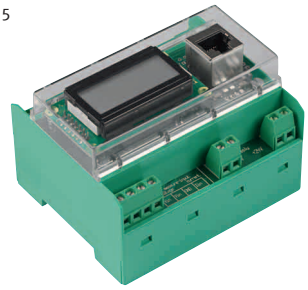

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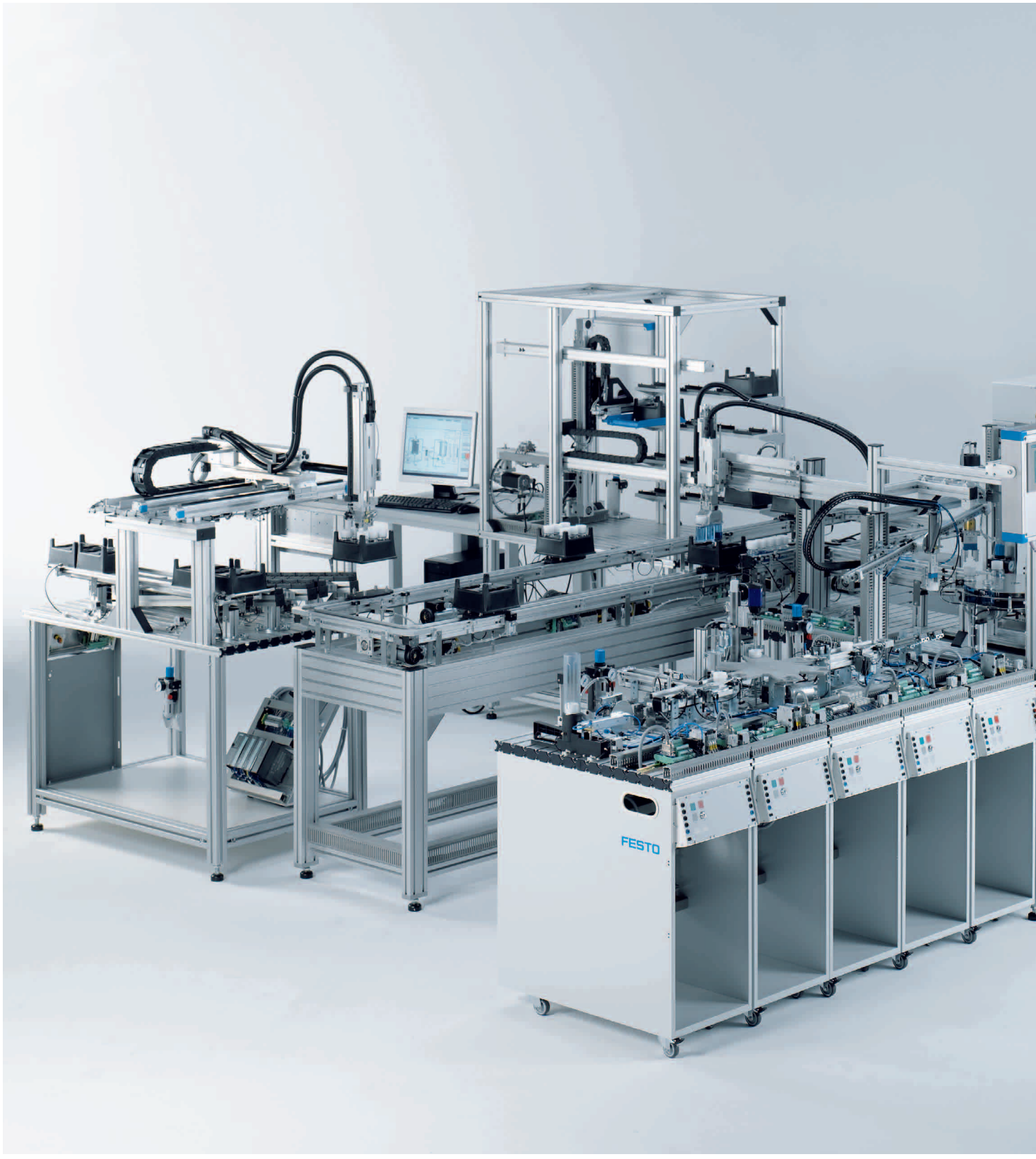
6


Hybrid training factories



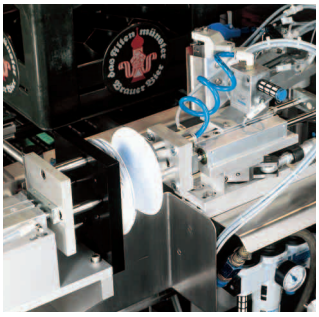
AFB factory hybrid production

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.

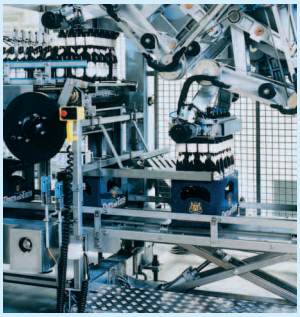
Hybrid industries are the industries which require systems and solutions for both process and production engineering. The most striking examples are the food, confectionery and tobacco industries and the pharmaceutical industry.

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.



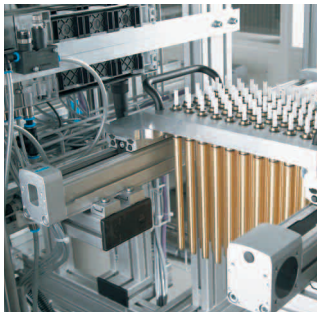
The mix is the key

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, optimized process automation too.

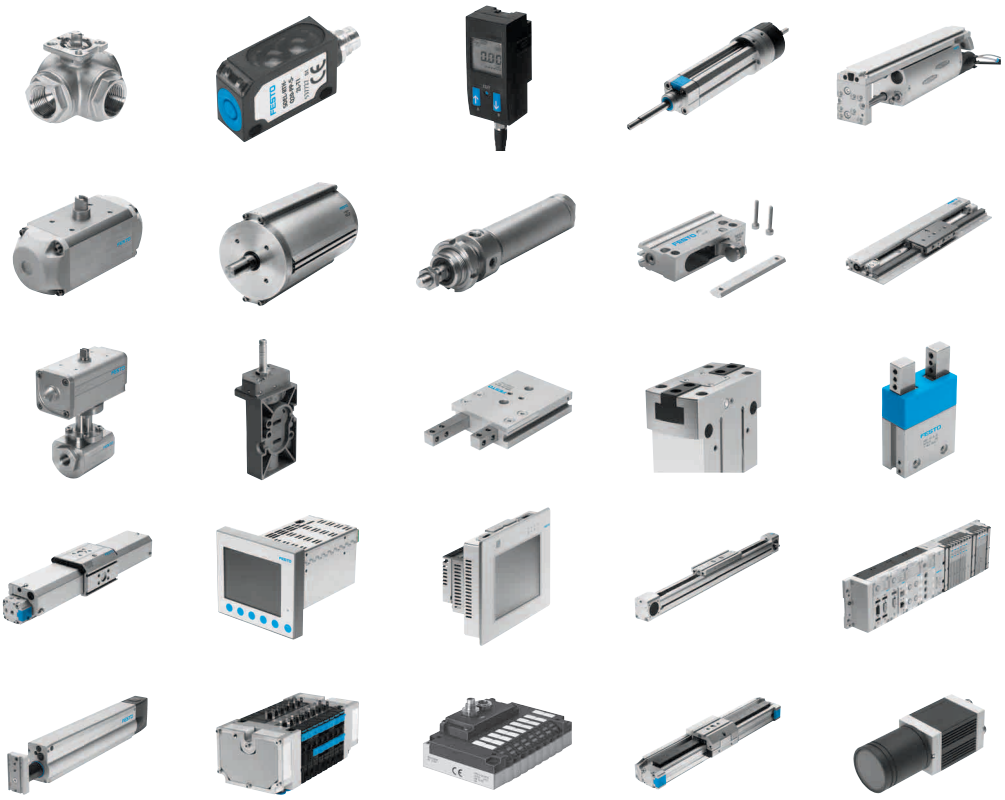


Flexibility

Making processes more flexible, systemizing 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



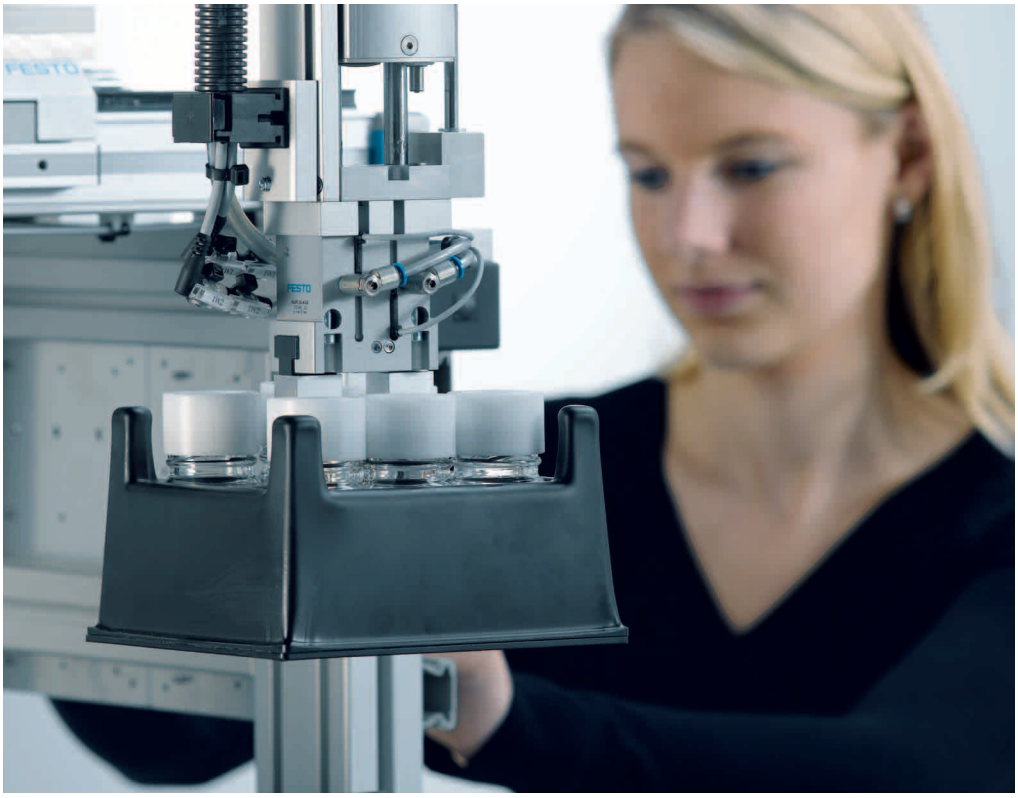
Innovative technology
Pneumatic and electric drive technology from Festo is a byword for innovation in industrial and process automation – from the single product through to the turnkey solution. With the AFB training factory we are for the first time delivering a learning environment which consciously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

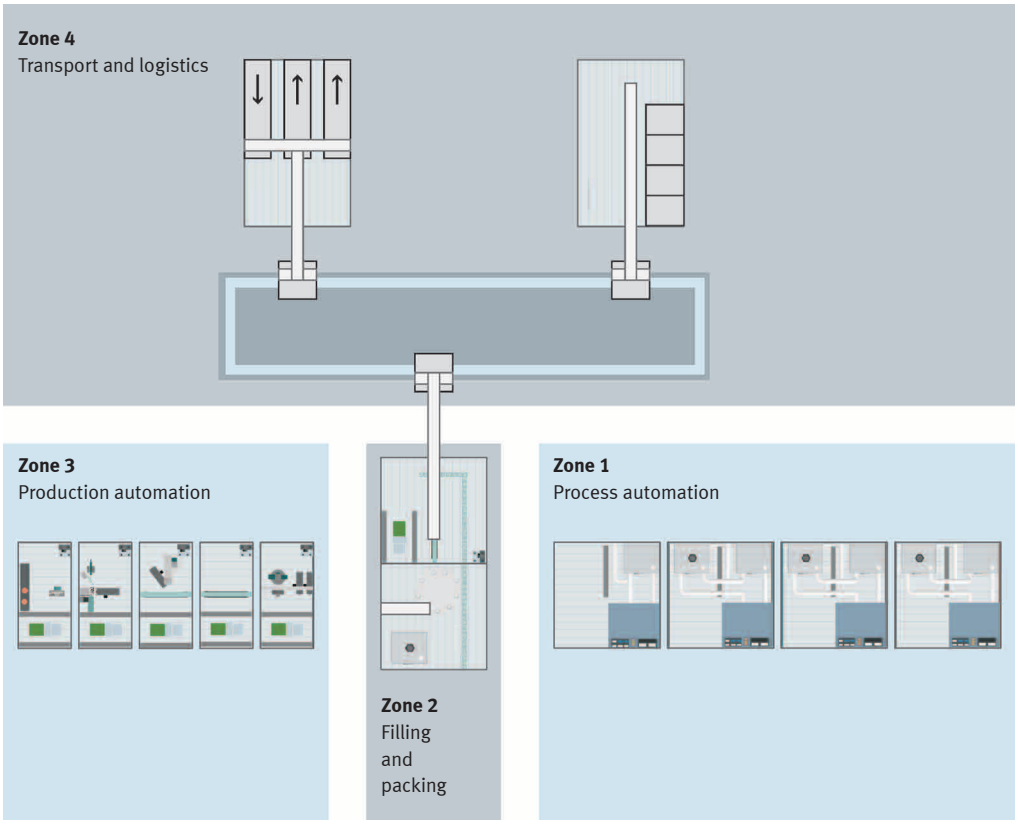
The AFB training factory is designed and equipped like a state-of-the-art industrial plant, based on the automation know-how and engineering experience of Festo.

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 visualization and a variety of eLearning courses complete the AFB range of facilities.

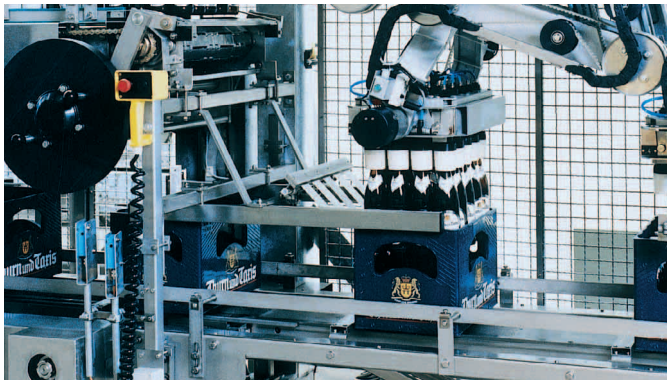
In focus: the production process for six-packs

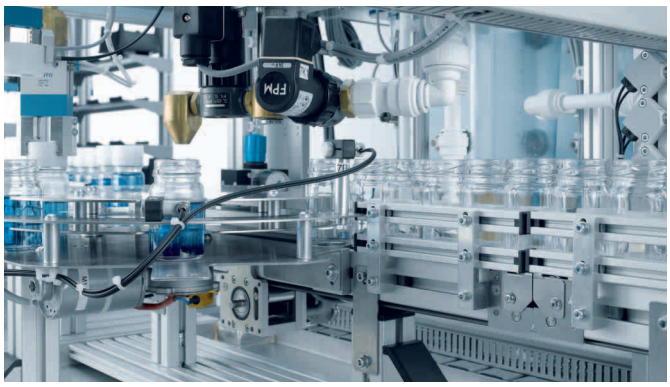
Six-packs are produced in four zones of the hybrid training factory. The following processes are mapped:
– Production of the liquid
– Production and feed of the caps
– Bottle feed
– Transport
– Packaging
– Storage
– Order compilation
– Logistics





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.

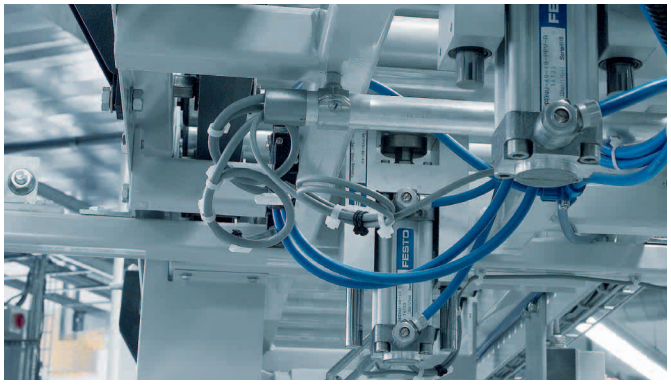
Specialist knowledge of programming, such as recipe preparation, or of plant documentation, such as reading and drafting R-I flowcharts or EMSR location diagrams are key focus areas in the training. Control technology plays a key role in process automation, in order to ensure high product quality. The 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.

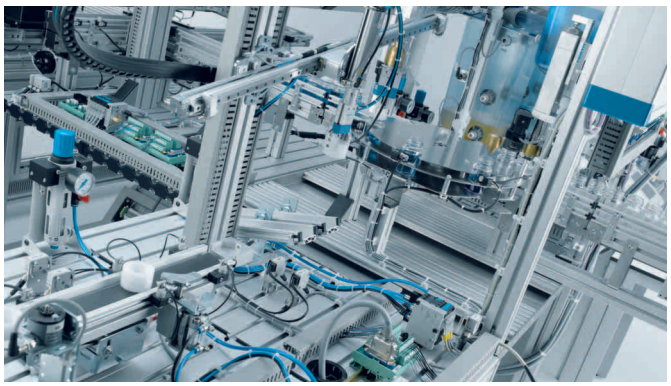
Zone 2:
Filling and packing

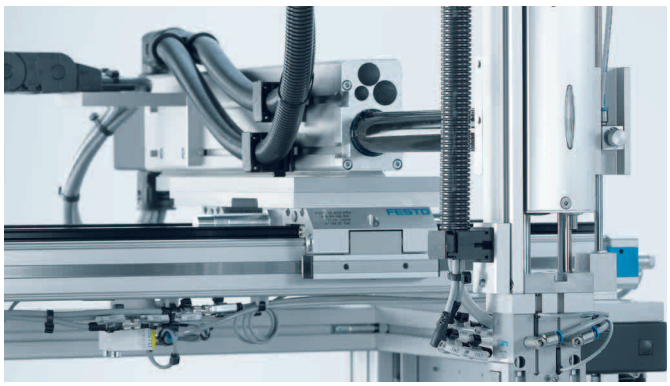
Not only dosing, filling, capping and packing, but also the acquisition, storage and reliable management of product and quality data are key tasks in this section of the training factory.

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.

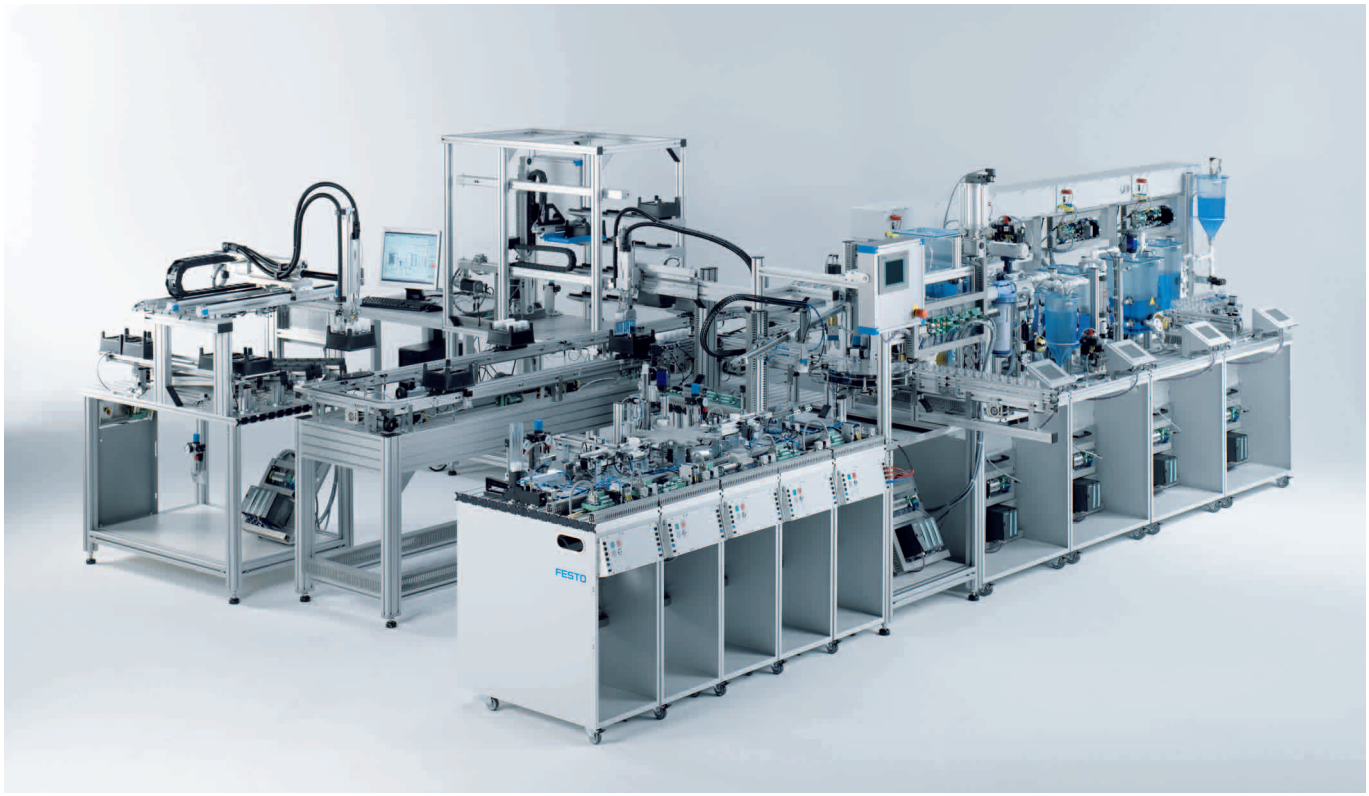
Zone 4:
Transport and logistics

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.

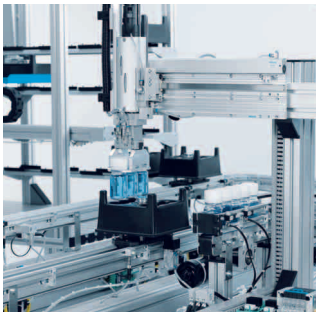
Chaotic or systematic warehousing, optimization of the material flow, planning and prioritizing orders are the key areas of focus in this section of the factory.

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

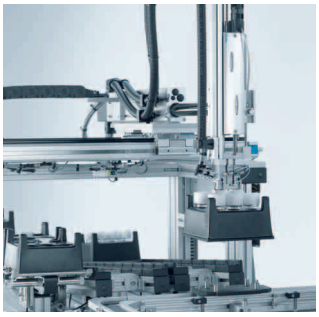


Optimum operator control
Whether via touch panel, visualization system or control panel, all the stations and the entire training factory can be operated and monitored in a highly user-friendly way.



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 station automatic warehouse and incoming goods and outgoing goods.
Software and media
STEP 7 Trainer Package programming software, CIROS®, FluidLab®-PA, Mechatronics Assistant, WinCC

* Including mobile base frame, touch panel and S7-300 EduTrainer® Universal.
** Including mobile base frame, MPS® control panel and S7-300 EduTrainer® Universal.

Visualization
Either an overview of the complete plant or access to each individual station is available; the visualization system at the AFB training factory permits monitoring of all signals and provides trend graphs of the analog process variables, with remote access to the various functions and monitoring of all processes. All training factory stations communicate via TCP-IP with the visualization 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 palletizing
– 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 way of additional process stations (e.g. MPS® PA).

The station is controlled by a EduTrainer® Universal 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.

Specific training content
- 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

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.

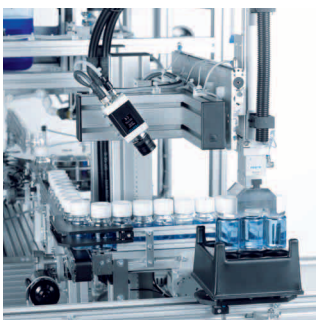
The camera features a built-in controller which handles the complete image evaluation process.

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

The station is controlled via an EduTrainer® Universal. 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

On request



AFB automatic warehouse station

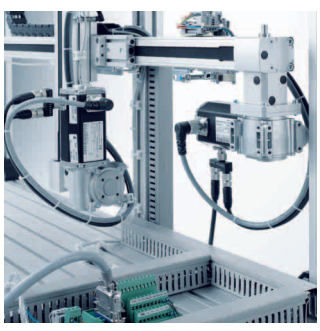
The automatic warehouse can hold up to 16 six-packs on 4 levels each with 4 bays. A cartesian 3-axis handling system is used for stock movement. 2 toothed belt axes are driven by intelligent servomotors with an integrated servo amplifier, controller and CAN bus interface.

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

The station is controlled by an EduTrainer® Universal with CAN master. The color touch panel of the automatic warehouse provides user-friendly operation and monitoring.

Items can be easily taught-in, and stock levels clearly initialized 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 bust technology
- Warehousing and logistics
- Process operation and monitoring



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.

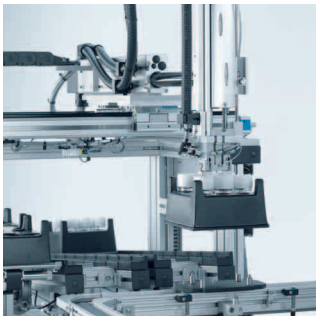
The axes used are pneumatic linear axes developed specially for industrial assembly and handling systems.

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

The station is controlled by a EduTrainer® Universal. 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

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

On request

AFB factory, focus on bulk goods

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 emphasizes 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 visualization 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

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.	**AFB-D**

AFB station sorting bulk goods

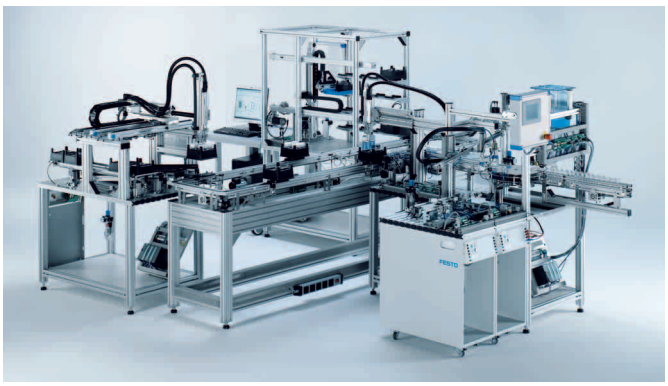
Order no.	**AFB-A**

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.

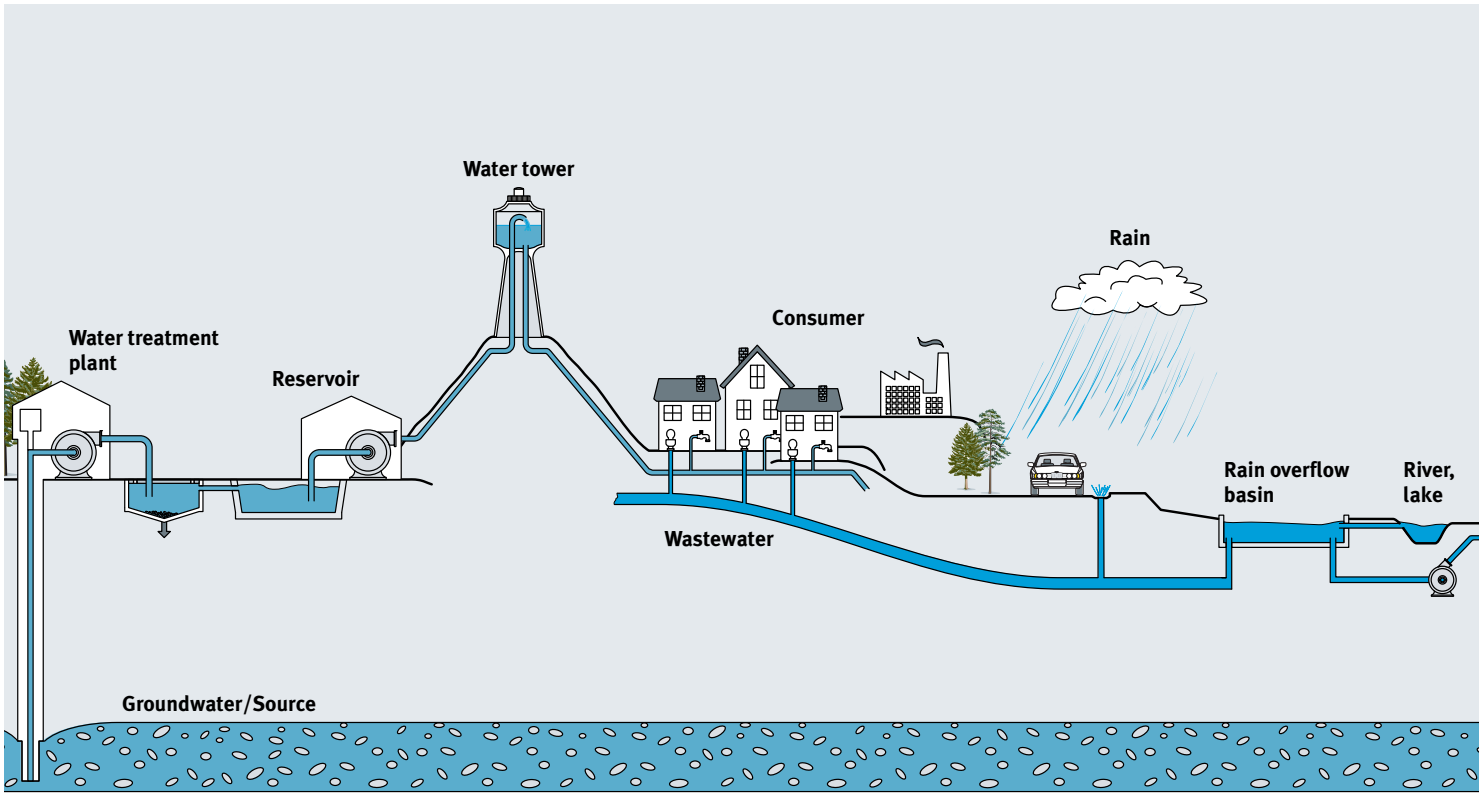
This means the stations can be deployed at any time individually or in small groups for teaching purposes, and the AFB training factory can be assembled in different project stages.



EDS® – Environmental Discovery System

EDS® Environmental Discovery System

Discovering the water circuit



Clean water for everyone: With modern technology!
Complex systems require responsible operation, as the applications have far-reaching effects on humans, the plant and the environment.

The different EDS® Water Management stations prepare users optimally for these varied tasks and systems with state-of-the-art technology.

Teaching the water circuit: In a small space!
Experience the complexity of corporate working processes from administration, technology and science in just a few square meters.

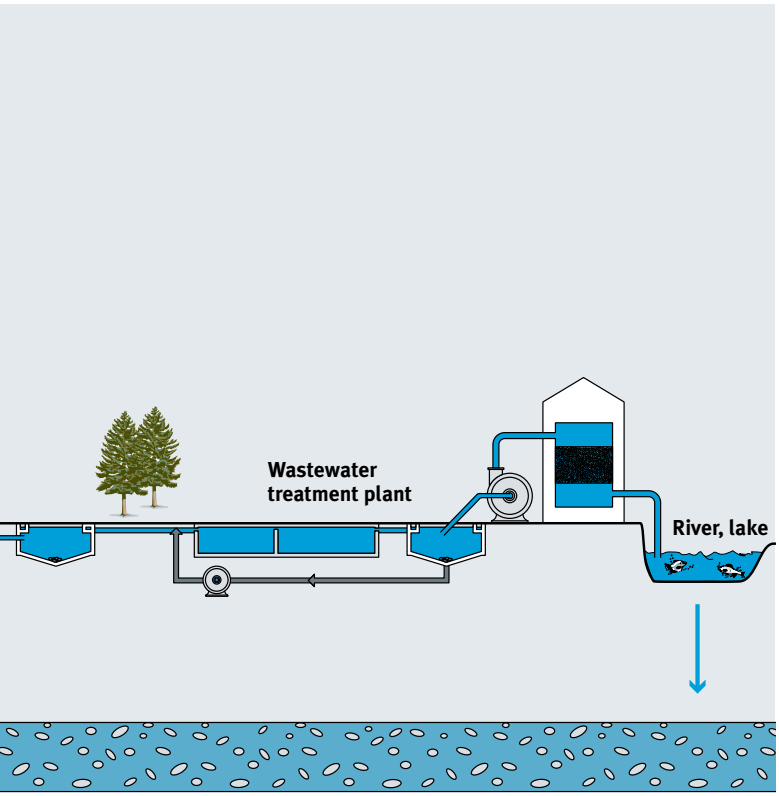
All stations are mobile and compact enough to fit on a table-top.

Experience process control engineering
One click in the control room needs to be thought through, as a switching signal changes the system functions invisibly to the operator. The effects often appear hours later. In the worst case, they can result in water pollution or wasted energy and resources.

EDS® Water Management allows you to experience the effects directly and rapidly.

Setup times and operating costs – Less is more
Add water, start PCs and software – and you're ready to start water circuit training.

Plastic granules are used as the soiled load and can be air-dried and re-used after utilization – reducing the operating costs of the training system to water and electricity.



Basic water circuit system
With the basic water circuit system, comprising the four main stations, you are ideally equipped to get to know the world of process command, measurement and control technology.

If you operate the stations individually, up to three students can work on the following learning areas:
– Plant engineering, process and laboratory technology
– Electrical engineering
– Automation/process control engineering and administration

Control test in the laboratory
Laboratory control tests are required to verify the in-line measurement technology of process engineering systems.

EDS® Water Management is the ideal addition for combining your new knowledge directly with your laboratory, applying scientific skills.

General training content
– Controlling, regulating and monitoring physical variables such as levels, flows and pressure
– Technical/physical functions of sensors and actuators as well as wiring, adjustment and parameterization
– Analyzing controlled systems, parameterizing and optimizing regulators
– System operation, maintenance, troubleshooting and repair
– Plant engineering
– Optimization and energy monitoring
– Electronic data processing
– Reading and interpreting process flowcharts, electrical and pneumatic circuit diagrams

Hardware, software, teachware, training
For ideal training – The workbooks with theory sections and exercise scenarios are perfectly customized for the stations. There are digital training programs on many topics for presentation or self-learning phases. A wide range of training courses is available for training staff.

EDS® Water Management offers the required planning documents, e.g. electric and pneumatic circuit diagrams, process flowcharts, data sheets and operating instructions. All documents comply with European standards.

Member of IWA the international water association

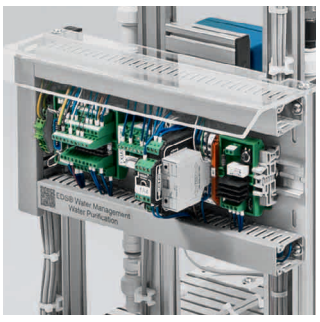
DWA Mitglied

Member of German Water Partnership

Water purification station

Water = Drinking water?

New



Function
The station represents a basic logic function of water treatment in the form of a water storage system with an overflow rim. A groundwater tank with a submersible pump is required for operation.

Focal points include:
– Setting flow rate values for volume control
– Level measurement via analog pressure measurement
– Level sensing via capacitive proximity sensors

The training documents reveal how a flocculation reaction is implemented by adding a flocculant, and how sedimentation can occur in spite of the flow.

Drinking water and chlorine
Chlorine is used worldwide to preserve drinking water. Over-metering not only increases the plant operator's costs unnecessarily, it also pollutes the environment and endangers the consumers. The additional chlorine measurement package with manual metering technology is a 1:1 training scenario for online chlorine measurement. This allows you to learn how to operate a chlorine metering system, and react to malfunctions and optimize the system.

Water purification station	8024504

The station is fully assembled, wired and tested.

Including control system with FluidLab®-EDS® Water Management, EasyPort, connecting cables, accessory set and “Getting Started” technical documentation.

Main components

3 l tank, including an overflow rim, capacitive proximity sensor, float switch, impeller flow sensor, pressure sensor , 2/2-way solenoid valve, non-return valve, electric connection board, aluminum profile plate.

Including control system with FluidLab®-EDS® Water Management, EasyPort, connecting cables, accessory set and “Getting Started” technical documentation.

For single operation, a water supply tank/ground water (order no. 8024503) is required.

Necessary accessories, also order:

1x	Water supply tank/ground water	8024503
1x	Tabletop power supply unit ➔ www.festo-didactic.com	

Recommended accessories:

1x	Additional chlorine measurement package	8025419
1x	DC Wattmeter	573261
1x	Trolley with plate	8039990
1x	Tool set	539767
1x	Pipe and tubing cutter	7658

General training content

➔ Page 71

Learning content for project work

– Function of an overflow rim
– Analog level measurement via a pressure sensor
– Capacitive proximity sensor for level querying
– Basic processes of precipitation, flocculation and sedimentation

Training content with water supply tank

– Activation of a pump for flow control
– Regulation variants with capacitive sensors for level control

Training content with additional chlorine measurement package

– Measuring chlorine content
– Effects of excessive or insufficient chlorine metering

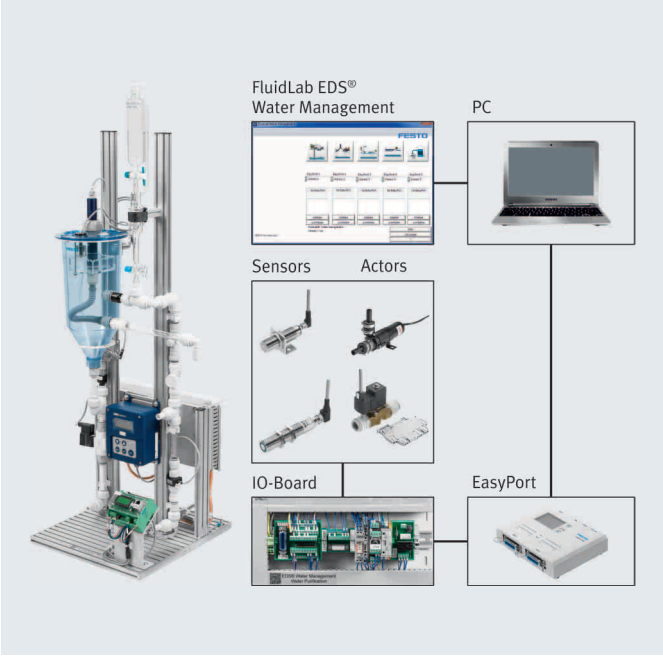
Technical data

– Water (10 – 15 l)
– Power supply: 24 V DC
– 3 digital inputs
– 3 digital outputs
– 4 analog inputs
– 1 analog output
– Dimensions (H x W x D): 355 x 1100 x 400 mm

Recommended training media

– Workbook Water purification
➔ Page 17

– Workbook Monitoring, Control and Optimization
– Workbook Energy Optimization
– eLearning course Open- and Closed-Loop Control
– eLearning course Process Automation
– Water supply technology training set ➔ www.festo-didactic.com
– Sewage technology training set ➔ www.festo-didactic.com



Water supply tank/ground water

Main components:

– Systainer with T-LOC system, 30 l
– Adapter for piping connectors
– Submersible pump
– Prefilter
– Float switch
– Water sieve
– Mobile roller system

Order no.	8024503

Additional chlorine measurement package

Optional extension for the water treatment station: Measurement of free chlorine. This package is equipped with a dropping funnel, a membrane-covered, amperometric measuring cell and an indicator that can be parameterized. The measuring cell functions within an operating range of 4 to 9 pH.

Order no.	8025419

Water supply station

To the very last drop ...

Function
The station deals with water storage and distribution via an elevated container, e.g. a water tower. The elevated container is filled via a pump, which can be operated in open- or closed-loop control mode. Water is withdrawn via valves.The process command software configures its switching characteristics. Depending on the withdrawal characteristics, feedback to the pump controller and shock loads for wastewater transport can result.

Balancing the water quantity provided with the water quantity delivered is another focus. In many water supply systems, leakages are a significant waste, and elimination by trained personnel is highly important.

Training by simulating a leakage using a valve, and subsequent location of the leakage are useful exercises.

Water supply station	8024505

The station is fully assembled, wired and tested.

Including control system with FluidLab®-EDS® Water Management, EasyPort, connecting cables, accessory set and “Getting Started” technical documentation

Main components

3 l tank, capacitive proximity sensor, float switch, impeller flow sensor, ultrasound sensor, centrifugal pump, 2/2-way solenoid valve, 2-way ball valve with pneumatic semi-rotary drive, electric connection board, aluminum profile plate.

Note

For single operation, a water supply tank/ground water (order no. 8024503) is required.

Necessary accessories, also order:

1x	Tabletop power supply unit ➔ www.festo-didactic.com	
1x	Compressor ➔ www.festo-didactic.com	
1x	Compressor accessories	102725

Recommended accessories:

1x	Water supply tank/ground water	8024503
1x	DC Wattmeter	573261
1x	Trolley with plate	8039990
1x	Tool set	539767
1x	Pipe and tubing cutter	7658

General training content

➔ Page 71

Learning content for project work

- Setting the pump to open- and closed-loop control mode and determining the effect on the delivery rate
- Determining the interaction between pressure and flow rate in a piping system
- Controlling the water supply via various valve types and showing the effects of shock loads
- Finding water losses in distribution networks and showing problems in leakage detection
- Measuring/controlling levels with ultrasound sensors
- Understanding and applying the function of pneumatically driven valves and fittings

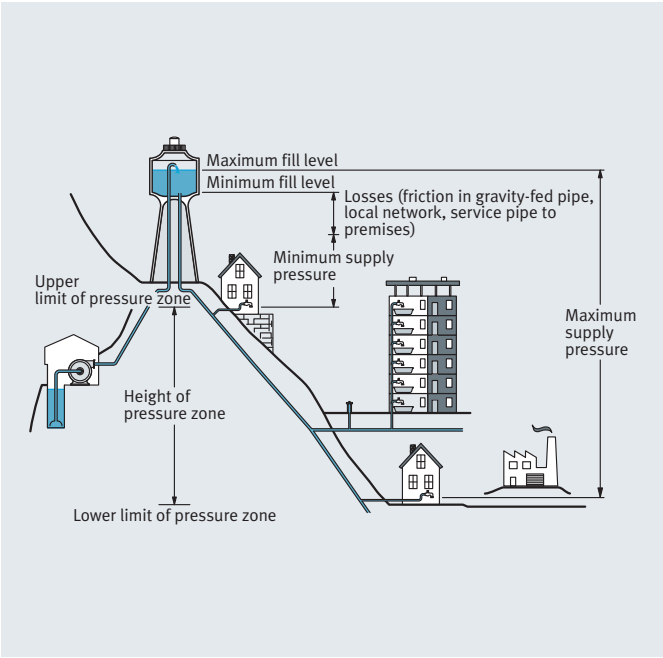
Technical data

- Operating pressure: 4 – 6 bar (50 l/min)
- Water (10 – 15 l)
- Power supply: 24 V DC
- 5 digital inputs
- 7 digital outputs
- 4 analog inputs
- 1 analog output
- Dimensions (H x W x D): 55 x 1200 x 400 mm

Recommended training media

- Workbook Water Supply ➔ Page 17

- Workbook Monitoring, Control and Optimization
- Workbook Energy Optimization
- eLearning course Open- and Closed-Loop Control
- eLearning course Process Automation
- Water supply technology training set ➔ www.festo-didactic.com
- Sewage technology training set ➔ www.festo-didactic.com



Trolley with plate

Stable sheet steel construction with table plate. Dimensions (W x H x D including rollers to bottom edge of profile plate): 700 x 770 x 700 mm

Order no.	8039990

DC Wattmeter

The DC Wattmeter is a smart meter for training facilities with a 24 V DC power supply and up to 120 W power consumption. All measured values can be read out via data transmission with the integrated Ethernet port. Power consumption is read out as an analog signal within a range of either 0 to 10 V DC or 4 to 20 mA.

Order no.	573261

Wastewater transport station

Water becomes wastewater

Function

The “wastewater transport” station teaches control technology for wastewater disposal and the associated processes. It comprises four sub-areas:

– Feeding device for supplying a soiled load
– Sewage pipe section with branch
– Tank with overflow rim as a rain retention and sedimentation basin
– Tank as a primary settlement tank for the biological stage and the option of starting sludge removal via a pneumatically automated fitting.

Plastic granules are used as the soiled load and can be air-dried and re-used after utilization. Flooding due to rainfall or problems transporting solids can be simulated realistically.

The fluids are supplied to the primary settlement tank via a pump. A flow meter records the flow rate, which is configured via a motor control system of the pump or a proportional media valve.

The media valve functions based on the principle of a pneumatically activated constriction-hose valve. The throttle opening can be configured via air pressure with a proportional pressure regulator valve. That allows the effects on energy efficiency and the flow control quality to be shown clearly.

Wastewater transport station	8024506

The station is fully assembled, wired and tested.

Including control system with FluidLab®-EDS® Water Management, EasyPort, connecting cables, 1x accessory set with sedimentation granules and “Getting Started” technical documentation.

Main components

3 l tank, including overflow rim, 1 l tank, gravity duct, capacitive proximity sensor, float switch, magnetic-inductive flow sensor, ultrasound sensor, centrifugal pump, proportional media valve, proportional pressure regulator valve, pneumatic slide, metering screw for metering solids, electric connection board, aluminum profile plate.

Note

For single operation, a water supply tank/ground water (order no. 8024503) is required.

Necessary accessories, also order:

1x Tabletop power supply unit ➔ www.festo-didactic.com	
1x Compressor ➔ www.festo-didactic.com	
1x Compressor accessories	102725

Recommended accessories:

1x Water supply tank/ground water	8024503
1x Sedimentation granules	8037688
1x DC Wattmeter	573261
1x Trolley with plate	8039990
1x Tool set	539767
1x Pipe and tubing cutter	7658

General training content

➔ Page 71

Learning content for project work

– Transporting solid matter in a sewer system using different flow velocities
– Effects of exceeding the hydraulic capacity
– Naming the basic mechanisms that make flushing necessary
– Functions of a rain overflow basin
– Basic functions of sedimentation in a flow basin
– Level measurement with an ultrasound sensor
– Functions of pneumatically driven valves and fittings

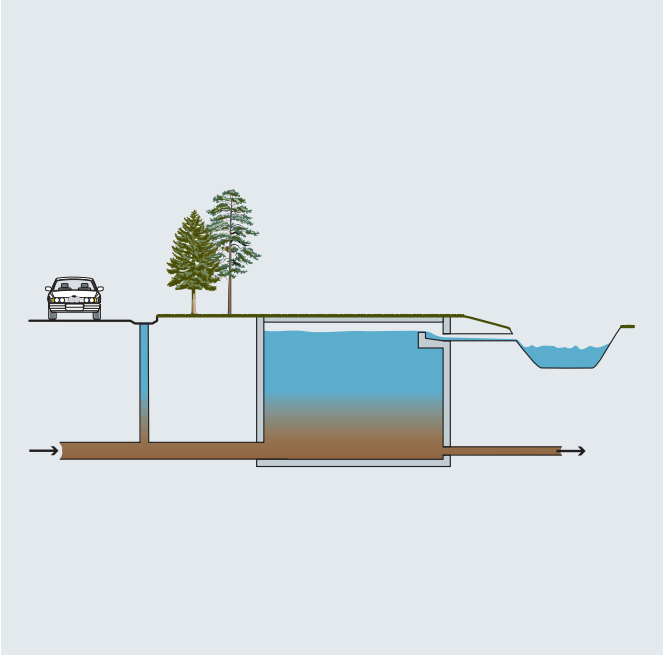
Technical data

– Operating pressure: 4 – 6 bar (50 l/min)
– Water (10 – 15 l)
– Power supply: 24 V DC
– 5 digital inputs
– 5 digital outputs
– 4 analog inputs
– 2 analog outputs
– Dimensions (H x W x D): 1200 x 1200 x 400 mm

Recommended training media

– Workbook Wastewater transport ➔ Page 17

– Workbook Monitoring, Control and Optimization
– Workbook Energy Optimization
– eLearning course Open- and Closed-Loop Control
– eLearning course Process Automation
– Water supply technology training set ➔ www.festo-didactic.com
– Sewage technology training set ➔ www.festo-didactic.com



Sedimentation granules

For demonstrating the sedimentation process:
– Plastic granules, red
– Volume content 0.5 l (corresponds to approx. 340 g)
– Packaged in a PVC wide-neck container

Order no.	8037688

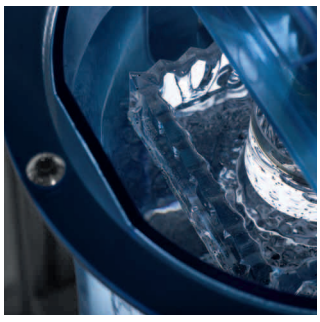
Compressor

Oil-lubricated, extremely quiet (45 dB (A)) compressor. Ideally suited for use in classrooms. With pressure regulator and water separator.

230 V	91030
100 – 120 V	565440

Wastewater treatment station

More than just sludge treatment



Function
The station maps the physical functions of wastewater treatment after the sludge treatment and contains an aeration tank and a secondary settlement tank. Plastic granules are used as the soiled load and can be air-dried and re-used after utilization. The sludge return has a flow measurement system with an adjustable pump for setting and monitoring the sludge return ratio.

The oxygen feeding on the station functions using an electrically adjustable compressed air diaphragm pump. Combined with the available oxygen sensor, there is also an option of extending the oxygen feeding system to a control circuit.

Economical oxygen regulation
Adding oxygen to water is not only relevant in the wastewater sector, but also in fish breeding or bioreactors.

In order to guarantee energy-optimized oxygen feeding, in-line oxygen measurement is required and must be combined with the oxygen feeding actuator in a control circuit. That avoids unnecessary energy use and possible biochemical malfunction.

EDS® Water Management forms a neutral learning environment on the subject of oxygen feeding regulation. Periodic addition of sodium sulphite (Na2SO3) to the upstream supply water causes a continuous oxygen consumption, thus simulating the oxygen demand of bacteria eating up organic substances in a real biological treatment of wastewater.

Handling with real wastewater is too complex and therefore not planned.

Wastewater treatment station	8024507

The station is fully assembled, wired and tested.

Including control system with FluidLab®-EDS® Water Management, EasyPort, connecting cables, accessory set with sedimentation granules and “Getting Started” technical documentation.

Main components

3 l tank, including an overflow rim, 10 l tank, ventilation system, capacitive proximity sensor, float switch, magnetic-inductive flow sensor, centrifugal pump, 2/2-way solenoid valve, electric connection board, aluminum profile plate.

Note

For single operation, a water supply tank/ground water (order no. 8024503) is required.

Necessary accessories, also order:

1x	Tabletop power supply unit ➔ www.festo-didactic.com	

Recommended accessories:

1x	Additional oxygen measurement package	8025418
1x	Water supply tank/ground water	8024503
1x	Sedimentation granules	8037688
1x	DC Wattmeter	573261
1x	Trolley with plate	8039990
1x	Tool set	539767
1x	Pipe and tubing cutter	7658

General training content

➔ Page 71

Learning content for project work

– Behavior of flakes at different flow velocities and different solid loads
– Hydraulic overloading of a wastewater treatment plant and the consequences
– Basic function of aerobic water treatment
– Function of sludge return
– Analog level measurement via a pressure sensor

Training content with additional oxygen measurement package

– Measuring the quantity of dissolved oxygen
– Showing the advantages of continuous measurement/control of the oxygen content

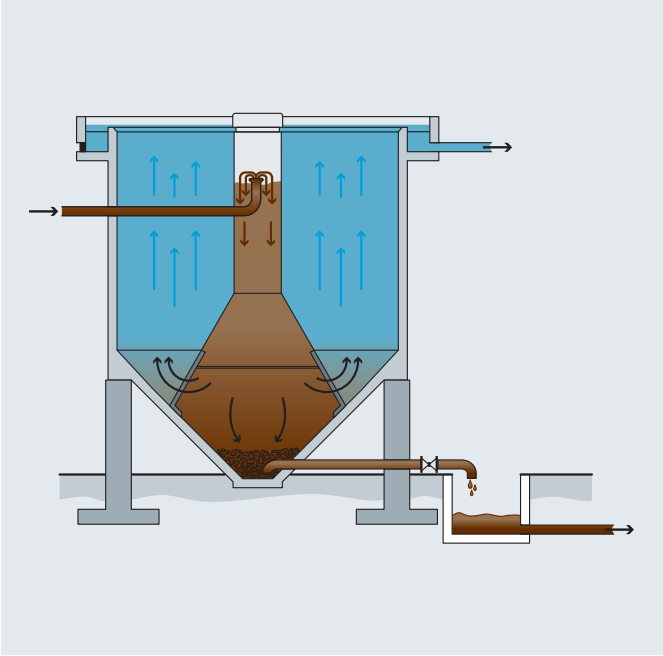
Technical data

– Water (10 – 15 l)
– Power supply: 24 V DC
– 5 digital inputs
– 5 digital outputs
– 4 analog inputs
– 2 analog outputs
– Dimensions (H x W x D): 710 x 900 x 400 mm

Recommended training media

– Workbook Wastewater Treatment ➔ Page 17

– Workbook Monitoring, Control and Optimization
– Workbook Energy Optimization
– eLearning course Open- and Closed-Loop Control
– eLearning course Process Automation
– Water supply technology training set ➔ www.festo-didactic.com
– Sewage technology training set ➔ www.festo-didactic.com



Water supply tank/ground water

Main components:

– Systainer with T-LOC system, 30 l
– Adapter for piping connectors
– Submersible pump
– Prefilter
– Float switch
– Water sieve
– Mobile roller system

Order no.	8024503

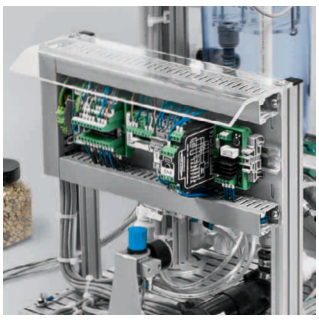
Additional oxygen measurement package

Optional extension for the wastewater treatment station. Measuring cell for dissolved oxygen with integrated optoelectronics. Measuring principle: Oxygen-dependent luminescence.

Order no.	8025418

Sand filtration station

For the tough jobs



Function

This station focuses on the filtration processes for separating solids frequently used in drinking and sewage technology. As in nature, the sand layers are used to retain the undissolved and suspended pollutants via deep-bed filtration as it trickles through. The pollutants are trapped in the sand layer and are deposited as filter cake. With time, the permeability decreases, the water level above the sand layer rises and is recorded via sensing. The sensor signal shuts off the inlet and starts the backwash process.

Parameterization of the filtration process is configured on the PC via the enclosed software, such as the change of the backwash time or the pressure adjustment of the purge air to break up the filter cake.

The structure of the different filter layers with quartz sand and quartz gravel in different grain sizes and corresponding monitoring of the cleaning performance through the transparent filter housing is a special aspect.

Sand filtration station	8024508

The station is fully assembled, wired and tested.

Including a water supply tank/ground water, control system with FluidLab®-EDS® Water Management, EasyPort, connecting cables, accessory set and “Getting Started” technical documentation

Main components

3 l tank, including overflow rim, capacitive proximity sensor, float switch, magnetic-inductive flow sensor, centrifugal pump, 4.75 l sand filter unit, proportional media valve, proportional pressure regulator valve, pneumatic valve terminal with 5/2-way solenoid valves, non-return valve, pressure sensor, electric connection board, aluminum profile plate, 1x quartz sand and quartz gravel.

Necessary accessories, also order:

1x	Tabletop power supply unit ➔ www.festo-didactic.com	
1x	Compressor ➔ www.festo-didactic.com	
1x	Compressor accessories	102725

Recommended accessories:

1x	DC Wattmeter	573261
1x	Trolley with plate	8039990
1x	Tool set	539767
1x	Pipe and tubing cutter	7658
1x	Quartz and and quartz gravel	8039989

General training content

➔ Page 71

Learning content for project work

– Separation of pollutants via a quartz sand and quartz gravel layer
– Deep-bed filtration and structure of a filter cake
– Measurement of pressure loss via the sand filter
– Automated filter process and sand filter backwashing
– Parameterizing the process steps
– Functions of pneumatically driven valves and fittings
– Creating a Micheau diagram

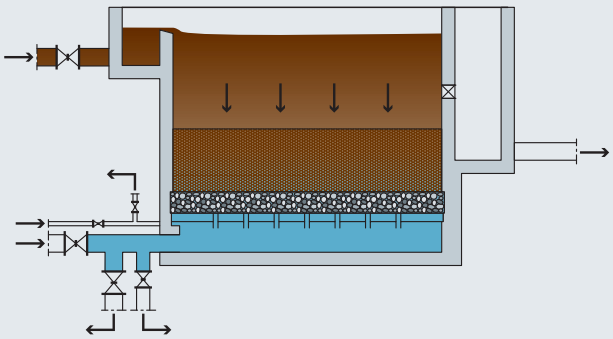
Technical data

– Operating pressure: 4 – 6 bar (50 l/min)
– Water (10 – 15 l)
– Power supply: 24 V DC
– 6 digital inputs
– 8 digital outputs
– 4 analog inputs
– Dimensions (H x W x D): 355 x 1350 x 400 mm

Recommended training media

– Workbook Rapid sand filtration ➔ Page 18

– Workbook Monitoring, Control and Optimization
– Workbook Energy Optimization
– eLearning course Open- and Closed-Loop Control
– eLearning course Process Automation
– Water supply technology training set ➔ www.festo-didactic.com
– Sewage technology training set ➔ www.festo-didactic.com



Water supply tank/ground water

Main components
– Systainer with T-LOC system, 30 l
– Adapter for piping connectors
– Submersible pump
– Prefilter
– Float switch
– Water sieve
– Mobile roller system

Order no.	8024503

Quartz and quartz gravel

Used in treating drinking and wastewater as a natural filter material. The filter medium is delivered in various grain sizes to optimize sand filtration.

Order no.	8039989

Membrane filtration station

For the finer things

Function
Membrane filtration is highly topical in modern water treatment. Depending on the pore size, the principle is used in water treatment.

Drinking water and wastewater treatment in the form of microfiltration and ultrafiltration is another area of application. The objective of both methods is retaining pathogenic germs, for example. The differences between the cross-flow and dead-end filtration operating modes are covered.

The membrane filtration station maps both processes. In cross-flow operation, the trans-membrane pressure is set for optimal filter performance. The inflows to and outflows from membrane filters can be measured and thus the performance of the membrane can be determined.

The backwash process takes place automatically if the filter performance is insufficient. Backwashing uses system filtrate created previously. The pressure resistance test checks the functionality of the membrane.

Other typical applications include:
– Reverse osmosis for seawater desalination
– Process water treatment in the pharmaceutical industry
– Steam generation in power stations

Membrane filtration station	8024509

The station is fully assembled, wired and tested.

Including control system with FluidLab®-EDS® Water Management, EasyPort, connecting cables, accessory set and “Getting Started” technical documentation.

Main components

3 l tank, including overflow rim, 3/2-way ball valve, membrane filter unit, capacitive proximity sensor, float switch, magnetic-inductive flow sensor, pneumatic valve terminal with 3/2-way solenoid valves, 5/2-way solenoid valve, membrane pump, proportional media valve, proportional pressure regulator valve, pressure sensor, electric connection board, aluminum profile plate.

Note

For single operation, a water supply tank/ground water (order no. 8024503) is required.

Necessary accessories, also order:

1x Tabletop power supply unit ➔ www.festo-didactic.com	
1x Compressor ➔ www.festo-didactic.com	
1x Compressor accessories	102725

Recommended accessories:

1x Water supply tank/ground water	8024503
1x DC Wattmeter	573261
1x Membrane filter unit	On request
1x Trolley with plate	8039990
1x Tool set	539767
1x Pipe and tubing cutter	7658

General training content

➔ Page 71

Learning content for project work

– Membrane filtration operating modes like filtration and back-washing
– Presentation of the theoretical basic principles of various membrane filtration (micro-, ultra-, nanofiltration and reverse osmosis)
– Process engineering differences between the cross-flow and dead-end filtration
– Automated integrity test for quality testing the membrane via pneumatic actuation and monitoring
– Effect of the transmembrane pressure on the filter performance
– Functions of pneumatically driven valves and fittings

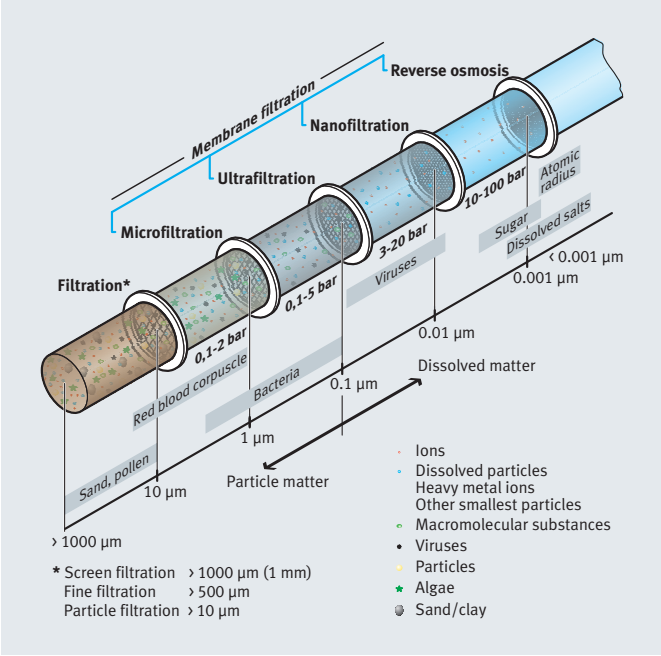
Technical data

– Operating pressure: 4 – 6 bar (50 l/min)
– Water (10 – 15 l)
– Power supply: 24 V DC
– 8 digital inputs
– 8 digital outputs
– 4 analog inputs
– 2 analog outputs
– Dimensions (H x W x D): 710 x 1250 x 400 mm

Recommended training media

– Workbook Membrane filtration
➔ Page 18

– Workbook Monitoring, Control and Optimization
– Workbook Energy Optimization
– eLearning course Open- and Closed-Loop Control
– eLearning course Process Automation
– Water supply technology training set ➔ www.festo-didactic.com
– Sewage technology training set ➔ www.festo-didactic.com



Tool set

The tool set is an aid to easy working on stations. A practical mini-systainer included.

➔ Page 49

Order no.	539767

Membrane filter unit

Interchangeable filter unit with a pore size of 0.02 µm. Including connections to the pipe system and blanking plug.

Order no.	On request

Basic water circuit system

Fully equipped – Four becomes one!

[X]

Function
Efficiency and economy are not only in demand in the water sector – save time and money with the basic system. The basic water circuit system, comprising all necessary water supply and disposal stations which also function independently of one another.

Use in a control room
The students initially control the individual stations in manual override using a simulation box.

The included EasyPorts are then used to control and observe the stations via the control software.

One PC, to which all four EasyPorts are connected, controls the complete system.

For perfect classes
The workbooks with theory sections and exercise scenarios are perfectly customized for the stations and guarantee ideal class preparation.

The learning system components map real processes, making the exercises interesting and informative.

Additional oxygen measurement package

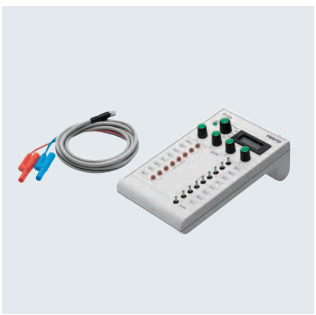
Additional chlorine measurement package

DC Wattmeter

Water supply tank/ground water

EasyPort

Simulation box, digital/analog



[X] Illustration includes additional equipment and accessories

Basic water circuit system	8024501

The basic system stations are fully assembled, wired and tested.

The water circuit basic system contains:
1x Water treatment station
1x Water supply station
1x Wastewater transport station
1x Wastewater treatment station
1x Water supply tank/ground water including cables
1x Additional chlorine measurement package
1x Additional oxygen measurement package
1x Digital/analog simulation box, including cables
4x EasyPorts including cables
4x FluidLab®-EDS® Water Management Control Software
4x DC Wattmeters

Notes
For single operation, a water supply tank/ground water (order no. 8024503) is required.

Necessary accessories, also order:

1x	Tabletop power supply unit ➔ www.festo-didactic.com	
1x	Compressor ➔ www.festo-didactic.com	
1x	Compressor accessories	102725

Recommended accessories:

3x	Water supply tank/ground water	8024503
5x	Trolley with plate	8039990
1x	Tool set	539767
1x	Pipe and tubing cutter	7658
	Commissioning service	On request
	Sewage technology training set	8038316
	Water supply technology training set	8038315

General training content
➔ Page 71

Learning content for project work
All training content of the individual stations apply. It is supplemented with the following training content:
– Showing dependences in a water circuit
– Increasing the degree of complexity by networking systems
– Identifying interactions of hydraulic flow and delivery rate beyond the limits of the station
– Getting to know the importance of different pressure zones in a water supply network

Technical data
– Operating pressure: 4 – 6 bar (50 l/min)
– Water (30 – 40 l)
– Power supply: 24 V DC
– Dimensions (H x W x D): 2760 x 1150 x 400 mm

Recommended training media
Workbooks EDS® Water Management
– Water Treatment
– Water Supply
– Wastewater Transport
– Wastewater Treatment
– Monitoring, Control and Optimization
– Energy Optimization
➔ Pages 17 – 18

– eLearning course Open- and Closed-Loop Control
– eLearning course Process Automation

Sewage technology training set
How does a wastewater treatment plant work? Explains and demonstrates sewage technology with didactically designed magnet cards, etc.
– Plastic case
– 60 DIN A7 magnet cards
– 44 learning cards in a set (playing card-size)
– 130 questions on a USB stick for instructors

Order no.	8038316

Water supply technology training set
Water, waste, energy: Showing connections on whiteboards or flipcharts with didactically designed magnet cards. All important stations/structures in the water and energy circuit are shown as color pictograms.
– Plastic case
– 62 DIN A7 magnet cards

Order no.	8038315

Trolley with plate
Stable sheet steel construction with table plate. Dimensions (W x H x D including rollers to bottom edge of profile plate): 700 x 770 x 700 mm

Order no.	8039990

EDS® Solar Thermal

Efficient and realistic hands-on training

Solar Thermal Energy
This learning solution is a solar hot-water heating system that teaches students the basic principles of thermal energy and how it can be collected, stored, and supplied.

During the course of their training, students learn how to install the system components, operate the system, and measure different parameters, such as pressure, temperature, and flow rate.

Flexible applications
Students can set up various realistic heating systems, such as radiant floor heaters, passive and active solar water heaters, space heaters, and hot water heat exchangers.

Real-world equipment
Using high-quality components found in residential, commercial, and industrial applications, this training platform includes: a small-scale hot water supply, a radiator, and a hydronic floor-heating system that teach students how solar radiant energy can be harnessed from the sun and converted to solar thermal energy in order to increase air, water, and surface temperatures in residential, commercial, and industrial buildings.

EDS Solar Thermal, 230 V/50 Hz	**8046646**
EDS Solar Thermal, 120 V/60 Hz	**8046647**

Necessary accessories, also order:

IEC power cable ➔ www.festo-didactic.com	
IEC power cable 90° ➔ www.festo-didactic.com	

Other accessories:

Evacuated Tube Solar Collector	8046648

Main components

1x Solar Thermal Workstation, 2x Analog Thermometer, 2x Pressure Relief Valves, 1x Plate Heat Exchanger, 1x Check Valve Assembly (with two Drain Valves), 2x Circulator Pump, 1x Temperature Sensor, 2x Expansion Tanks, 1x Automatic Air Vent, 1x Radiant Floor, 2x Fill Bowl, 1x Hoses and Accessories, 1x Halogen Work Light, 1x Multimeter, 2x Hand-Operated Two-Way Valves, 1x Radiator, 2x Rotameter

Also order:
Training course documents

EDS® Solar Thermal
– Introduction to Solar Thermal Energy
– Solar Thermal Energy Systems
– Multi-Loop Systems

Campus License (➔ Page 15):

Imperial Standards, en	**8060788**
SI Standards, en	**8060789**
SI Standards, fr	**8060790**
SI Standards, de	**8060792**
SI Standards, es	**8060791**

Technical data
– Weight: ca. 120 kg
– Dimensions:
W 1400 x D 760 x H 1760 mm

Training content

Introduction to Solar Thermal Energy
– Thermal Energy Fundamentals
– Trainer Familiarization and Safety
– Site Analysis
– System Sizing

Solar Thermal Energy Systems
– Solar Heating and Cooling Systems
– Collecting Thermal Energy
– Storing/Exchanging Thermal Energy
– Supplying/Controlling Thermal Energy

Multi-Loop Systems
– Closed-Loop Water-Heating Trainer
– Familiarization and Safety
– Closed-Loop Surface Heating
– Closed-Loop Air Heating
– Closed-Loop Drainback Systems
– Closed-Loop Combination Systems

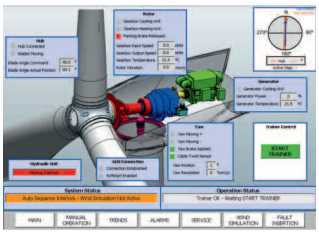
Your advantages
– Includes everything required to function as a stand-alone, hands-on learning workstation
– Made with the same components that students will potentially see in their own homes, schools, or workplace
– Manufactured to the highest quality standards
– Wide range of commercial-grade components
– Fixed plate electrical panel has all electrical devices securely fixed to the side of the trainer with a power supply, differential controller, thermostat controller, and connection block
– Comprehensive curriculum consisting of fully-illustrated student manuals containing job sheets and/or work orders
– Estimated program duration: 32 hours

Evacuated Tube Solar Collector
The EDS® Evacuated Tube Solar Collector is an add-on for the EDS® Solar Thermal that permits the heating of water through the tubes and the observation of the effects on the water temperatures. Its function is to replace the standard flat panel solar collector of the EDS® Solar Thermal.

Order no.	8046648

EDS® Nacelle – Wind Power Generation

Compact and robust



The “pitch”
The EDS® Nacelle – Wind Power Generation Training System is a complete scaled-down version of commercial wind turbine nacelles, making it an excellent substitute for expensive real life equipment. Space efficient and affordable, the machine fully interacts with users, thus enhancing the learning experience.

Fully loaded
The training system consists of a complete drive train that includes the main shaft, a gearbox with a transparent side cover, speed sensors, a hydraulic brake, and an asynchronous generator. The yaw system is fully operational and features a 61 cm (24”) slewing bearing, a gear motor, a drive, a position sensor, and fail-safe hydraulic brakes. A manual hydraulic pump and an accumulator, as found in real-world wind turbines, are also included. A PLC controls the different functions of the nacelle and is located in an electrical enclosure together with all the other electrical components.

Simulating Reality – working for real
A wind vane and an anemometer are located in a transparent enclosure on top of the training system to monitor wind speed and wind direction. Although they are not measuring actual wind, the control system managed by the user, simulates the process, causing the weather sensors to react and send signals to the control system which take the simulated parameters into account.

EDS Nacelle – Wind Power Generation 230 V/50 Hz	**8046642**
EDS Nacelle – Wind Power Generation 120 V/60 Hz	**8046643**

Necessary accessories, also order:

IEC Power cable ➔ www.festo-didactic.com
IEC power cable 90° ➔ www.festo-didactic.com

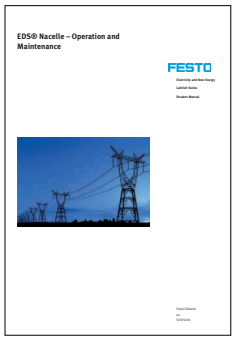
Recommended accessories:

Electrical Pitch Hub – Wind Turbine Learning System ➔ www.festo-didactic.com
Hydraulic Pitch Hub – Wind Turbine Learning System ➔ www.festo-didactic.com
Power Generator for the Wind Turbine Learning System ➔ www.festo-didactic.com

Also order:

Training course documents

Nacelle – Operation and Maintenance

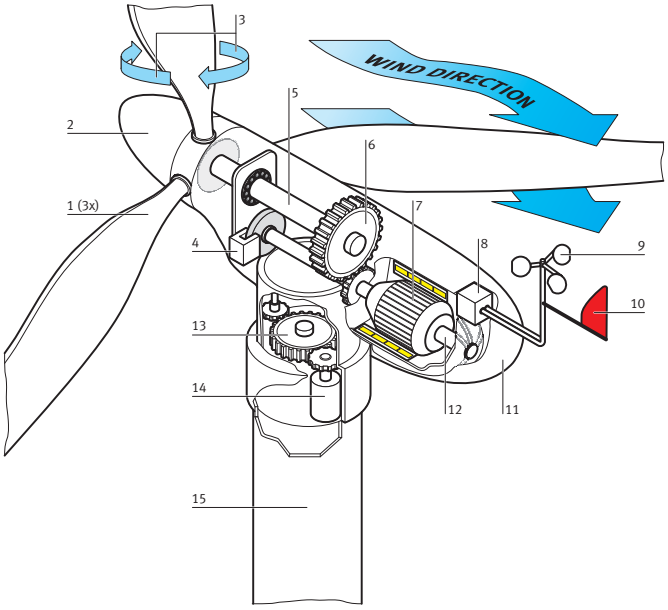


Campus License (➔ Page 15):

de	**8060757**
en	**8060754**
es	**8060756**
fr	**8060755**

Training content

– Nacelle Familiarization, Safety, and Control System
– User Interface and Wind Simulation
– Gearbox, Coupling, and Alignment
– Basic Hydraulic Circuit
– Hydraulic Brakes
– Electrical Circuit and Panel
– Troubleshooting



1 Blades
2 Rotor
3 Pitch
4 Brake
5 Low-speed shaft
6 Gear box
7 Generator
8 Controller
9 Anemometer
10 Wind vane
11 Nacelle
12 High-speed shaft
13 Yaw drive
14 Yaw motor
15 Tower

CE Version

The leakage current of the EDS® Nacelle – Wind Power Generation is high (> 30 mA) due to its industrial components. This can cause 30 mA Residual Current Devices (RCDs) to trip. RCDs are required by certain local regulations for leakage current detection. As an alternative, it is possible to use a 300 mA RCD. User safety remains ensured due to the additional grounding cable supplied with the system. If the use of 300 mA RCDs is prohibited by local regulations, an isolation transformer is available (part number 8064358). It is specially designed to eliminate high leakage currents and avoid the undesired tripping of RCDs. For more information, refer to the Optional Equipment section of the datasheet.

Isolation Transformer 230 V/50 Hz	**8064358**

Services

Make more of your potential

Service solutions tailored to your equipment and needs. A qualified team provides services that will enable you to maximize the capacity of your learning systems.

Knowing that your equipment is effectively maintained will allow you to focus on what is most important: teaching.

Worldwide availability? No problem.
We are able to deliver our training services around the world in local languages to the high standard that both you and we require.

Installation, commissioning and training will be carried out by qualified technicians in order to guarantee safe, efficient setup and make sure your team can use your new products straight away.

Free software, demos and reading samples – For example, EasyVeep is a new graphic 2D process simulation software containing a number of attractive examples for PLC training that is available for download free of charge. You can sample many of our software products and all our books free of charge on the Internet using test and demo versions.

Service solutions –
To suit your needs
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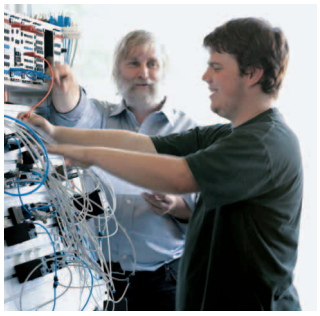
– Commissioning
– Training
– Demos and reading samples
– Seminars
– Service contracts
– Extended warranty



Certification
Instructor certification trainings help you to get the best possible use out of your new learning system. Our qualified instructors introduce the equipment and provide the training material, as well as explaining how to perform the exercises and integrating them quickly into your existing training programs. These training sessions can be conducted on your premises, at a Festo core location, or via video conference.

Festo is a global engineering and manufacturing company that maintains its own global training and consulting teams for customers all around the world.

Operating in the same economic sector and environment as our customers, we have a level of understanding and insight into your challenges that allows us to meet your needs by providing targeted training and consulting solutions.

Customized service contracts give you peace of mind as our team takes care of your equipment. Available services include on-site hardware maintenance and calibration, warranty extension and repairs, continuous instructor training, and much more.

Personal advice
We will be glad to provide a consultation regarding concept and planning on site.

For more information, please contact your Festo contact person or write to: seminare@festo.com

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 EduTrainer® Universal with analog inputs and outputs is required additionally.

For efficient operation in the lesson, we also recommend:
– EasyPort
– FluidLab®-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 FluidLab®-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 FluidLab®-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**

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 positioning and methods set us apart. Our trainers and consultants are practicians. 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 recognize 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 FluidLab®-PA software ensure that the knowledge acquired is transferred into practice.

Specific customer training, e.g. the basic principles of control engineering
Customized 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 (FluidLab®-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)

Notes

Notes

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