Learning, knowledge and education are major themes of this century

Festo Didactic brings over 40 years’ experience to the table when developing solutions for fast learning and successful retention for the entire spectrum of automation and technology. This expertise and experience puts us in a key position in the market of the future. Demand for training will continue to grow rapidly. And that’s why we have set ourselves the goal of making learning ever more efficient. A great challenge for us. A great partner for you.

Everything from a single source

The Learning System for Automation includes all current automation topics in its product range: pneumatics, electropneumatics, hydraulics, electrohydraulics, electronics, electrical engineering, sensors, robotics, CNC technology, PLC and fieldbus technology, manufacturing technology and process engineering as well as mechatronics.

From fundamentals to a complete training centre

From basic training packages and technology-specific courses right through to the planning, control and handling of complex networked CIM systems and complete, fully furnished learning centres – we have created a world of learning for you which is tailored to your personal needs for efficient study and guaranteed learning success.

Your partner, worldwide

We speak your language! And we’re just around the corner – in more than 100 countries around the world. We’ll gladly visit you at your office or home – whether you want to book courses or buy software, books or other products. Or perhaps you want to use the extensive range of online services – we’re just a mouse click away!

www.festo-didactic.com

Festo Didactic
Your ideal partner for vocational and further training
Content

Software & Courseware ........................................................................ 7

-Workstation systems ........................................................................ 11

-Technology-orientated training packages ........................................... 18

-Robotino® – Learning and researching with mobile robot ............... 22

-Mechatronics and factory automation .................................................. 24

-Process automation and closed-loop control technology .......... 68

-Hybrid training factories .................................................................... 84
The quality of training concepts, the quality of the product and the company processes are integral parts of innovation. As the leading supplier of automation technology worldwide we offer you guaranteed quality.

However, the best training concepts are of little value if the products do not meet the demands of everyday practice.

Here too, we guarantee 100% quality:

- Festo Didactic’s training systems and components meet the requirements of all the relevant standards and guidelines such as DIN/ISO and VDE.
- Only industrial components are employed.
- Festo Didactic is DIN EN ISO 9001 quality certified.
- As a solution partner to Siemens Automation, we offer customised, forward-looking solutions using products and systems from Siemens Automation and Drives. Qualified product and system expertise combined with superior solution and sector competence provide the basis for this.
- As the first choice partner to „Siemens Automation Cooperates with Education“ (SCE), we offer customised solutions for research, development and training centres.
- Our customers’ opinions are important to us. That’s why we regularly commission customer surveys via the economic research institute TNS Infratest.
- Festo Didactic is to be awarded the Worlddidac Quality Charter certificate for excellence in products and services in the area of training.

The training hardware and study materials conform to the latest teaching requirements and perspectives.

The awards speak for themselves:

- MecLab®
  Worlddidac Award 2008
- Robotino®
  reddot Design Award 2006
  Worlddidac Award 2006
- Learnline
  Winner of international design prizes:
  IF product design award 2006
  Focus design award in Silver 2005
- FluidSIM®
  Worlddidac Award 1996
  digita award 1996
- MPS®
  Worlddidac Award 1998

The training hardware and study materials conform to the latest teaching requirements and perspectives.

The awards speak for themselves:

- MecLab®
  Worlddidac Award 2008
- Robotino®
  reddot Design Award 2006
  Worlddidac Award 2006
- Learnline
  Winner of international design prizes:
  IF product design award 2006
  Focus design award in Silver 2005
- FluidSIM®
  Worlddidac Award 1996
  digita award 1996
- MPS®
  Worlddidac Award 1998

The training hardware and study materials conform to the latest teaching requirements and perspectives.

The awards speak for themselves:

- MecLab®
  Worlddidac Award 2008
- Robotino®
  reddot Design Award 2006
  Worlddidac Award 2006
- Learnline
  Winner of international design prizes:
  IF product design award 2006
  Focus design award in Silver 2005
- FluidSIM®
  Worlddidac Award 1996
  digita award 1996
- MPS®
  Worlddidac Award 1998
Service with Value added

We have defined “Value added” for you

Festo Didactic is your partner in vocational and further training. We measure our success by your satisfaction – which is why we are constantly striving to optimize our products and services to meet your needs.

At your side

We speak your language! And we're just around the corner – in more than 100 countries around the world.

Swap shop

If a part is faulty after years of service – and you need an urgent replacement: no problem. Our replacement service offers to replace your part within a few days – for a moderate charge. Ask about it!

24-month warranty

Our quality pays off. That's why all of our products – with the exception of parts subject to wear – come with a 24-month warranty. We'll be there for you when you need us – even years later.

The Internet marketplace for schools and vocational training: www.festo-didactic.com

All you need is access to the Internet and a web browser to have a look around, to order products or to access our extensive range of services. We are at your service around the clock.

Create your customised three-dimensional training lab with LabCreator.

The software for this is now available free of charge – you can download it at www.festo-didactic.com.
Consistently adding value

Festo Training and Consulting: 40 years’ experience in training and 20 years’ experience in process optimisation.

Various projects in over 53 countries worldwide show that we can successfully design change processes together with our customers.

Seminars, workshops and corporate strategic planning simulations, public or in-house seminars. Gathering hands-on experience and learning using real products and training factories is always top priority. Individual learning success can be measured and thus the ability to quickly apply the knowledge gained to day-to-day work situations is a crucial indication of the quality of the training.

Training

Training and skills development programmes for technical staff and managers from industry.

More than 2,900 events are attended by more than 42,000 participants annually. Modular and high-quality course topics in more than 39 languages relate to the topics: people, technology and organisation.

Public or in-house training sessions with individually tailored content – hands-on learning with a focus on industry and fast transfer to industrial applications takes centre stage.

Certified skills development programmes for:
- Mechatronics engineers
- Production managers
- Maintenance managers

Consulting

Identifying and optimising value-added processes.

Together we trace the flow of information and products through your company from beginning to end, always with the aim of making it more efficient and to prevent waste. We use world-renown methods and tools which are also implemented at Festo. Together we define goals by which we can be measured.

Projects in the areas of:
- Production and logistics
- Management and teamwork
- Skills development
- Procurement and SCM
- Product development

You can find information, dates, locations and prices on the internet:
www.festo-didactic.com
Software from Festo Didactic

Excellent solutions for ...

– learning and teaching
– programming
– experimentation
– simulation
– visualisation
– management
– play
– operation and observation

... and more in digital format.

Software

- Digital training programmes/WBTs
- Interface EasyPort
- Designing/Simulating with FluidSIM®
- Projecting/Designing with EPLAN
- Simulating system and virtual learning environment CIROS®
- Corporate strategic planning simulation learn2work
- Programming software
- Visualisation software
- Multimedia database Mechatronics Assistant
Digital training programs: Knowledge delivered brilliantly

Freedom for the tutor and motivation for the pupil

– Outstanding didactic and multi-media training content
– Freedom to choose from attendance training, due to self-study phases
– Customised learning scenarios
– Feature-packed, with functions such as glossary, search, notepad
– Used in Classroom Manager
– Integration into training concepts via other formats (Word, Excel, PDF, etc.)
– Participant management
– Progress monitoring and certification

Training programs optionally offered as:
– CD-ROM
– Licence for local networks (on request)
– Web-based training (WBT) for Classroom Manager
– For installation on one of your servers
– For use over the Internet (on request)

If you have other wishes, we can provide you with a quotation for an e-learning solution tailored to your needs. We will be glad to advise you on all phases from conception through to the installation of complete learning management systems.
Structuring and delivering digital training aids in a simple manner.

Aids to everyday practice:
- You can compile your personal training aids library from existing and new digital training media (Word, Excel, Powerpoint, PDF, WBT, JPG, etc.).
- From the digital training aids you can quickly produce custom courses.
- The course structure maps out your training concept with a time frame, attendance courses, training aids, access requirements, certificates and a range of communications facilities.
- As the tutor, you have a constant overview of your trainees’ progress.
- You can make the structured knowledge available to specific colleagues based on access privileges. You decide who can access what.

Ordering information
- Classroom Manager (with up to 200 named registered users on 20 workstations simultaneously), CD-ROM with installation instructions.
- Classroom Manager (with up to 1000 named registered users on 100 workstations simultaneously), CD-ROM with installation instructions. General academic and trade schools can use this version of Classroom Manager for 2000 named registered users on 200 workstations simultaneously.
- Classroom Manager service package (1-day installation support, induction and training on-site in Germany)

System requirements
- Administrator rights are essential to carry out installation.
- In addition to Classroom Manager, the following free open-source components, bundled in the installation package, must be installed: Apache 2.x, MySQL 4.x or 5.x, PHP 4.x, Zend Optimizer
- The ports required by the standard installation are ports 80 (Apache) and 3306 (MySQL).
- The hardware should be an Intel/AMD x86 or x86-64 platform. No minimum requirements for CPU, memory or hard disk.
Theory and practice. We have a wide range of courseware tailored to your needs:

**Text books**
Standard books imparting basic knowledge. With many exercises and practical examples that can be solved without the hardware. Ideal for self-tuition and as a guide for trainers.

**Workbooks**
Practical exercises with supplementary notes, worked examples and data sheets. The exercises are based on the various Festo Didactic equipment sets. For comprehensive, practice-focused training.

**Dictionaries, manuals and technical books**
Offer specialised information for coverage of various topics in greater depth. Ideal for self-tuition or reference.

**Transparency sets, videos**
Didactically designed for easy-to-follow and interesting presentation.

**Posters**
The large DIN A1 formats are a clear and striking medium for the presentation of complex subject matter.

**Working material**
Media for optimum training, reducing preparation time and cutting classroom time.

**Courseware**
- Pneumatics
- Hydraulics
- Sensors
- Electronics/PLC/Electrical closed-loop control technology
- Mechatronics/Handling technology/Process automation
- Metal technology/CNC technology
- GRAFCET/Automation technology
- Working material

Take a look for yourself and check out our training offers on the Internet at:

[www.festo-didactic.com](http://www.festo-didactic.com)
Workstations and training packages: Innovative technology with value added

The modular training system with many practical details

The universal aluminium profile plate used in conjunction with ergonomically designed workstation systems provide the perfect training environment for basic and further training in automation technology.

Learnline
Winner of international design awards:
– iF Product Design Award 2006
– Focus Design Award (silver) 2005

Profile plate/profile columns
All of the components can be flexibly positioned and securely mounted in the profile slot using hammerhead nuts or Quick-Fix®. Components can now be mounted on the profile plate with to-the-millimetre accuracy. A mounting system for all technologies and areas of application. You can also select the profile plate width to match your needs.

Quick-Fix® mounting system
The extensive profile plate permits systematic arrangement of the components in accordance with the circuit diagram, for example, to make the transfer of information from the drawing to the actual system as easy as possible for the participants. Using the patented Quick-Fix® mounting system you can mount components on the profile plate easily, safely and with little effort.

Quick and easy connections
Using standard outer diameter tubing from Festo. Sturdy, more reliable and easy to handle. Almost all pneumatic, hydraulic and electrical connections are on the top of the components for better ergonomics.

Festo industrial components – Learning with innovative technology
Practice-oriented basic and further training using industrial components provides you with the necessary confidence for your daily work. You can now also use Festo valve terminals in basic training.
The universal laboratory furniture

Learnline and Learntop
The modular workstation systems for basic and further training. With many practical details to make teaching and learning easier.

With Learnline, you have an integrated storage principle that can be used for training in pneumatic, hydraulic or electrical engineering without the need for modifications. Design and function are combined, which is evident in every practical detail. Learnline consists of basic mobile and stationary units with a cable/oil tray, various modular systems and extension elements, rolling and fixed containers, in addition to special storage systems, attachments and the corresponding accessories. The modular workstation system offers a multitude of configurations and mounting options. Expert consultants in over 50 countries are available to prepare an individual quotation for you.

Learntop is the least expensive worktop support system for entering the world of Festo Didactic training packages at a low price.

Quality from Festo
We don’t make compromises when it comes to quality. Workmanship and functionality are of the highest level. The torsionally rigid design and the high-quality coating of the work surface and frame guarantee a long service life despite many stresses and strains. Learnline can handle the rigorous routine of everyday teaching as well as a vibrating load during hydraulic position control. Even high mechanical forces, e.g. of servo-hydraulics, proportional pneumatics or robotic superstructures, can be easily accommodated by Learnline.

Versatile, flexible and expandable
One glance at the basic structure proves that Learnline meets a multitude of requirements. After all, with just a few individual and well thought-out components results can be achieved which are geared towards the needs of people, the available space and to any technical challenges. The functional profile column is a prerequisite for modularity. As the central attachment point, it opens up a multitude of options for putting together each desired configuration.

All components can be placed anywhere on the slotted assembly board and can be fastened tightly and securely in the profile slot with a T-head nut or the patented Quick-Fix® without any effort and without additional tools. On the slotted assembly board, everything can be exact down to the last millimetre. A mounting system for all technologies and applications.
Planning with the LabCreator
Define rooms in 2D and design in 3D! Use our 3D models and keep up to speed with the automatic software and library updates. Equip your laboratory with learning systems and add your own designs. You can create professional laboratories or entire training centres in just a few steps. The effects will be impressive. Detailed descriptions are available for all learning systems. Download your free LabCreator from the Internet today.

Keeping order
It doesn’t matter whether you keep your training packages in the Sys-tainer or in the container. The stor-age equipment from Festo Didac-tic always ensures you have a quick overview. The lockable containers are equipped with self-closing drawer runners and a safety stop. Every drawer holds up to 20 kg. The shipping packaging for the pneumatic and hydraulic equipment sets can be used as orderly drawer inserts. That saves material and gives you a quick overview of the drawer contents.

Integrated electrics
With various electrical insert panels, a supply duct and different superstructures, workstations can be put to universal use. The mounting frames can be used for a large number of assembly boards and ER units. The ER mounting frame is compatible with the electrical components of the training packages. Alternatively, you can choose an A4 mounting frame according to the electrical engineering standard.

Learnline and Learntop

Standard for design and function
Learnline – Winner of international design prizes:
– iF product design award 2006
– Silver Focus design award 2005

Planning with the LabCreator
Define rooms in 2D and design in 3D! Use our 3D models and keep up to speed with the automatic software and library updates. Equip your laboratory with learning systems and add your own designs. You can create professional laboratories or entire training centres in just a few steps. The effects will be impressive. Detailed descriptions are available for all learning systems. Download your free LabCreator from the Internet today.

Keeping order
It doesn’t matter whether you keep your training packages in the Sys-tainer or in the container. The stor-age equipment from Festo Didac-tic always ensures you have a quick overview. The lockable containers are equipped with self-closing drawer runners and a safety stop. Every drawer holds up to 20 kg. The shipping packaging for the pneumatic and hydraulic equipment sets can be used as orderly drawer inserts. That saves material and gives you a quick overview of the drawer contents.

Integrated electrics
With various electrical insert panels, a supply duct and different superstructures, workstations can be put to universal use. The mounting frames can be used for a large number of assembly boards and ER units. The ER mounting frame is compatible with the electrical components of the training packages. Alternatively, you can choose an A4 mounting frame according to the electrical engineering standard.

Learnline online configurator
Familiarise yourself with Learnline’s functional design and configure your workstation quickly and easily on the Internet according to your individual requirements. Opt for a predefined standard workstation or put togeth-er your own configuration accord-ing to your wishes. Slotted assembly boards, drawer units and accessories can be easily selected and added to your configuration. The result is a graphic representation of your selec-tion with a parts list.
Mobile workstations: More versatile than ever

Flexible and modular
Learnline is of modular design and offers an almost unlimited range of configuration possibilities for your Learnline workstation.

High mobility and optimum use of space
Individual or group training workstations can be created with a minimum of effort wherever they are required. Transport through doors is also possible. This mobile workstation is designed in such a way as to permit several people to work simultaneously. This is further facilitated by the two integrated fixed drawer units that ensure quick and easy access to the required components of the Learning System.
Stationary workstations: Ergonomic and versatile

The stationary solution
With its stationary workstations the Learnline system is able to meet any requirements for standard desk systems, but with greater functionality. It offers a generous work surface and also provides considerable legroom thanks to the wheeled drawer units. The drawer units ensure quick and easy access to the required components.

Vertical or inclined?
The tried and tested profile plate is attached to the stable profile of the inclination unit. Thus, the angle of the profile plate can be infinitely adjusted until it reaches a horizontal position. The layout of the exercise is therefore always ergonomically correct.
Laboratory furniture for electrical engineering
New!

Festo Didactic is the sole supplier of Haid KG products on the didactic market. We are happy to assist you with planning, selecting and sizing your workstation or laboratory.

Give us a call!

Table substructures
A wide spectrum of workbench substructures form part of the Swing program. Under-workbench units and roller containers with drawers in various depths, either with or without pull-out shelf, form the basic equipment. It is also available in ESD version, installations for electronic and electrical engineering. We offer special floor units for PCs.

Professional laboratory equipment
Intelligent and innovative laboratory solutions for electrical engineering – from single workstations to complete laboratories.

Together with our partner Haid KG, we are developing the Swing laboratory furniture series. Haid KG specialises in consulting, developing, planning and producing equipment for electronic and electrical engineering, laboratory furniture systems for research and training, as well as ergonomically designed laboratory and assembly workstations.

Choose from a multitude of matching modular workstations, intelligent and reliable solutions for power supply, device technology, cabinet systems and all the necessary high-quality accessories. It goes without saying that all products have been tested for safety.

www.festo-didactic.com
In addition, you can completely equip your laboratory space with multimedia workstations and cabinet systems.

**Swing profile columns**
The Swing profile solution optimally meets all demands in terms of visual appearance, functionality as well as both flexibility and modularity. The cable duct integrated into the profile facilitates the concealed laying of cables and compressed air supply lines. The cable duct and any unused connection elements are sealed with cover profiles to keep them clean. Levelling screws in all table legs round off the overall concept.

**The floating tabletop**
The Swing profile and the worktop are connected via delicate yet stable connecting components, making the entire system transparent. Swing add-on workbenches are connected to the basic workbench. The height-adjustable worktops lock into one another seamlessly and are all supported by the legs in the centre.

**Basic** is the functional, inexpensive laboratory equipment system for electrical engineering, with solid worktop supports made of powder-coated steel tubes. It consists of workbenches in six different widths and three depths.
Basic and further training redefined!

The new training packages for the fundamentals of pneumatics and electropneumatics.

- TP 101: Pneumatics, Basic level
- TP 102: Pneumatics, Advanced level
- TP 201: Electropneumatics, Basic level
- TP 202: Electropneumatics, Advanced level
- TP 210: Measurement in pneumatics
- TP 220: Pneumatic drive units

Optimum path to learning

The path to learning from the first project to the last is now even more systematic. From simple direct actuation (TP 101) to sequence controls with signal overlap (TP 202), all of the fundamentals are covered. Nonetheless the new content remains understandable and clear for students, which means that the new training packages are also suitable for self-tuition.

Innovative training packages

- Pneumatics
- Hydraulics
- Sensors
- Electronics/PLC
- Fieldbus
- Electrical drives
- Accessories and optional components
- Change from Blue to Silver
The new sets of Festo equipment: New components and new teaching concept for staff with practical competencies.

Project-oriented teachware
Projects develop out of exercises. Complexity increases from project to project and information just learned is consolidated in follow-on projects.

Practice-related problems
Taken from actual industrial applications. The projects are selected to represent actual industrial scenarios. Drawings, pictures and videos are additionally used to visualise the actual application.

With extended part on fundamentals
If you want to work competently with pneumatics, you need to know more than just about components and circuits: physical basics, technical calculations, safety, working economically, analytical fault-finding and professional documentation. Now in the enhanced workbook.

Includes a multimedia-CD-ROM
Containing photos and videos of industrial applications and circuit diagrams. Theoretical information is conveyed using animated cutaway models for greater clarity. Work sheets and exercise sheets can be reprinted as necessary.

Structured approach and professional documentation
All of the necessary steps from planning, through execution with functional control, to handover to the customer are supported by worksheets.

New components with Festo quality
The selection of components and the versions for the training packages have been especially matched to the projects in the workbook. With this, the essential learning objectives can be taught with a reasonable investment. With original industrial quality components from Festo.

New organisation and packaging
The new training packages are supplied in the practical Systainer. The Systainer provides a well-ordered storage system for the training package and of course it also fits into other workstation drawer units.

New subjects:
**TP 220 pneumatic drives**
The TP 220 extends the TP 201 training package with the fundamentals for pneumatic drives. The learning objectives are the selection and dimensioning of various modern types of drive, taking account of the special characteristics as well as considering costs and safety. Every drive is straightforward as a single assembly and is thus appropriate for differing starting levels of the trainees. The exclusive use of industrial components reinforces the necessary practical approach and ensures a quick transfer of knowledge from the theoretical to the practical side.

www.festo-didactic.com
Innovative training packages with detailed practical functions

Festo Didactic’s training packages are of modular design. This means that you can start today with the basic pneumatics level and then continue to the advanced level tomorrow, or start again with electropneumatics – the choice is yours.

Would you like your training to focus on a special theme? All of the equipment set components can be individually ordered to supplement your existing equipment sets with suitable teachware:

www.festo-didactic.com

Plug in – clamp – you’re done
Using the patented QuickFix® mounting system you can mount components on the profile plate easily, safely and with little effort. Don’t forget – almost all pneumatic, hydraulic and electrical connections are on the top of the components where they can be easily accessed.

The perfect storage system
The drawer insert serves as an organiser for quick and orderly storage of individual parts in the workstation drawer units – included in the scope of delivery of the training packages. The new pneumatic training packages are supplied in the practical Systainer whose inserts also fit into the drawer units.

State-of-the-art coupling technology
Leak-proof hydraulic couplings mean less pollution, thus protecting the environment. The quick coupling sockets are self-sealing when decoupled. During the coupling process, only the face of the coupling is coated with oil.
Industrial applications at your fingertips
Learning through innovative technology. Practice-oriented training and vocational training using industrial components provides you with the necessary confidence for your daily work. The selection of components and the versions for the training packages have been especially matched to the projects in the workbook. With this, the essential learning objectives can be taught with a reasonable investment.

Open for all systems
The EduTrainer® concept enables the principles of industrial controllers to be taught in a classroom setting. The system supports the integration of PLCs from other manufacturers thanks to the SysLink and 4 mm connector interfaces.

New subjects:
- Equipment set TP 220 – Advanced level: Drives in pneumatics
- Equipment set TP 240 – Advanced level: Sensors in pneumatics
- Equipment set TP 1110: Sensors for object detection
- New Equipment sets for PLC and electronics training: EduTrainer® Universal

New teaching concept:
- Project-oriented teachware includes a multimedia-CD-ROM: Projects develop out of exercises. Complexity increases from project to project and information just learned is consolidated in follow-on projects. Containing photos and videos of industrial applications and circuit diagrams. Theoretical information is conveyed using animated cutaway models for greater clarity. Worksheets and exercise sheets can be reprinted as necessary.

Blended learning package for equipment sets
The training package, software for designing circuits or simulation, training software, textbooks, workbooks containing exercises and worksheets, cutaway models as well as videos in a variety of languages provide a convenient training environment, whatever the subject matter.

- Practice-related problems taken from actual industrial applications: The projects are selected to represent actual industrial scenarios. Drawings, pictures and videos are additionally used to visualise the actual application.
- With extended part on fundamentals: If you want to work competently with pneumatics, you need to know more than just about components and circuits: physical basics, technical calculations, safety, working economically, analytical fault-finding and professional documentation. Now in the enhanced workbook.

www.festo-didactic.com 21
How do I make a robot move along a line?

Which robot team scores most goals?

Which robot can complete an obstacle course in the fastest possible time?

Experiencing technology
The Robotino® not only contains technology, it also enables the technology to be experienced through a large number of captivating tasks drawn from the everyday world.

Understanding technology
Modularity means that all technical components, such as the electric drive units, sensors and camera, of Robotino® can not only be directly understood but can also be learned about through their integrated system response.

Using technology
Trainees integrate and apply lots of technical features and functions, such as electric drive engineering, kinetics, sensors, control technology, vision systems and programming techniques.

Ready-to-use immediately
Unpack Robotino®, switch it on and start the lesson, experiment or research project.

The special appeal
The Robotino® is autonomous! Numerous sensors, a camera and a high-performance controller provide the system with the necessary „intelligence“. So when it is correctly programmed, it can handle the tasks assigned to it autonomously.

The current trend
Alongside industrial robotics, the market for mobile robots and service robots is becoming increasingly important. By using the Robotino®, you will be keeping your training in line with a major technical and commercial advance.

The awards
- Worlddidac Award 2006
- reddot design award winner 2006
Interactive learning with Robotino® View

Always online
Robotino® View is the interactive, graphical programming and learning environment for Robotino®. It communicates directly with the robot system via wireless LAN, with no need for code compiling or downloading to the controller. You can send signals directly to the motor controller, display, scale and evaluate sensor values, or have a live camera image displayed and further processed. Robotino® thus becomes an online experimentation field, e.g. for control technology.

Intuitive programming
Robotino® View is a visual programming language. Sequences and links are formed by wiring functional modules. The program corresponds to your idea of robot behaviour and is created „intuitively“. This means that parallel processes (multi-tasking) can also be defined and are easy to program.

First steps with Robotino® SIM Demo
The integrated 3D simulation simulates the moving behaviour, the distance sensors and the camera in a predefined working environment. This enables you to test your first Robotino® View programs in the simulation before using them on the real Robotino®.

Robotino® View basic principles

The application window
The workspace is divided into two areas:
- Display of the created functional block or flow diagrams. The current input and output values of the functional blocks can be displayed as an option.
- Display of the parameterisation/interal data of the status units, such as, for example, the live camera image, or the PID parameters for the motor regulation, which can be changed online.
- Printout of the graphical program as a PDF document

The library categories
- Logic contains all the major logical linking operations
- Mathematics contains the basic mathematical operations
- Vector calculation with conversion in Cartesian or polar coordinates
- Generators contains the basic functions for signal generation
- Filters for smoothing values
- Robotino® hardware contains all the components of the robot system, such as the motor controller, camera, distance sensors, protection strip, power supply, odometry, grippers, power output, rotary encoder input.
- Input devices for controlling using a joystick or via a virtual operating panel
- Sequence control contains basic functions for creating a sequencing program
- Communication: write global variables/data to or read from a file, OPC client for communication with external control systems

www.festo-didactic.com 23
Mechatronics and factory automation

MPS® – The Modular Production System
- System description
- MPS® Transfer system/Project kits
- MPS® Stations
- MPS® 200 Complete systems
- MPS® 500-FMS Flexible production

MicroFMS – CNC and robot technology similar to industry

MultiFMS – Learning platform with MPS®, transport system, CNC

iCIM – Professional CIM training/EMCO CNC technology

iFactory – Innovative training factory for industrial engineering
As practical training on actual production and industrial systems is seldom possible, MPS® prepare trainees for the demands of their profession in the best possible way.

With MPS®, you determine the degree of complexity:

- Small projects with MPS® project kits and the MPS® transfer system
- Complex problem definitions with MPS® stations
- Multi-layered projects with interconnected stations, integrated systems and training factories
As practical training on actual production and industrial systems is seldom possible, MPS® prepares trainees for the demands of their profession in the best possible way.

**Practice and industry-focused**
Planning, assembly, programming, commissioning, operation, maintenance and troubleshooting of production systems can be taught via MPS® at various levels of complexity:
- With innovative technology
- With systematic use of industrial components
- In close cooperation with market leaders in automation

**Optimising processes**
MPS® expertise can be translated immediately into industrial practice. That’s why MPS® is also used as a training system for process optimisation and production cost reduction:
- SMED (Single-Minute Exchange of Die)
- FMEA (Failure Mode and Effect Analysis)
- KANBAN
- TPM (Total Productive Maintenance)

**Teach soft skills using MPS®**
MPS® not only imparts technical expertise, but also enhances personal development:
- Teamwork
- Cooperation
- Learning skills
- Independence
- Organisational ability

MPS® motivates budding mechatronics specialists to use individual and structured approaches to quickly find solutions.
A good modular system has clear interfaces: mechanical, electrical and software-related. This permits modifications for future developments. Flexibility of the learning system is an important factor in successful project work. High modularity ensures that the individual stations and modules remain as manageable training workstations that meet the needs of different learning levels.

**Mechanical**

Flawless workpiece transfer between the various modules and stations via a defined standard transfer point in the plane formed by the profile plate grid and at a height which is dictated by matching all transfer points to the height of the belt transport system.

With the profile plate as the mounting system, MPS® can also be connected to our Learning System training package.

**Electrically**

We have defined the SysLink interface for connection of digital inputs and outputs. This connects components in the Learning System on the I/O side.

SysLink connects:
- MPS® station with PLC board to form a complete station
- MPS® station with EduTrainer® for control from the ER or A4 frame
- MPS® station with SimuBox, to test the station
- PLC board via EasyPort with CIROS® Mechatronics
- PLC board via EasyPort with FluidSIM®, for example as part of the „Magazine module“ project

**Interface to the virtual world**

We offer two process simulation programs for PLC training: FluidSIM® and CIROS® Mechatronics. They are described in detail in the software chapter.
The range of MPS® stations and systems enables you to dictate the function of the MPS®!

The MPS® stations assume an extremely wide range of tasks as functioning individual stations in the automated model factory.

With complete solutions – equipped with everything you could possibly need for training – the MPS® 200 systems offer the ideal introduction to the world of automated production. This is guaranteed through successful and practice-oriented training right from the start.

Simple handling tasks or complex assembly processes – the pallet transport system offered by the MPS® 500-FMS systems facilitates a flexible production set-up that can model almost all the functions of a complex production system.

Handling
Different objects made of various materials are ejected, separated, gripped, transported and sorted.
- MPS® stations: Distributing, Testing, Processing, Handling, Pick&Place, Buffering, Robot and Sorting
- MPS® 200: MPS® 202-Mechatronics, MPS® 203-Fieldbus, MPS® 203-IT
- MPS® 500-FMS: MPS® 501-FMS, MPS® 502-FMS, MPS® 505-FMS

Simple assembly
Assembly of measuring instruments (clock, hygrometer and thermometer) in a housing.
- MPS® stations: Pick&Place and Fluidic Muscle Press
- MPS® 200: MPS® 205-Mechatronics

Complex assembly process
Assembly of a complete pneumatic cylinder comprising body, piston, spring and end cap.
- MPS® stations: Robot and Assembly, optionally end cap production using Punching station
- MPS® 200: MPS® 202-Robotics, MPS® 210-Mechatronics
- MPS® 500-FMS: MPS® 503-FMS, MPS® 504-FMS, MPS® 506-FMS, MPS® 507-FMS
Practice and industry-focused
Planning, assembly, programming, commissioning, operation, maintenance and troubleshooting of production systems can be taught via MPS® at various levels of complexity:
- With innovative technology
- With systematic use of industrial components
- In close cooperation with market leaders in automation

Optimising processes
MPS® expertise can be translated immediately into industrial practice. That’s why MPS® is also used as a training system for process optimisation and production cost reduction:
- SMED (Single-Minute Exchange of Die)
- FMEA (Failure Mode and Effect Analysis)
- KANBAN
- TPM (Total Productive Maintenance)

Teach soft skills using MPS®
MPS® not only imparts technical expertise, but also enhances personal development:
- Teamwork
- Cooperation
- Learning skills
- Independence
- Organisational ability

MPS® motivates budding mechatronics specialists to use individual and structured approaches to quickly find solutions.
MPS® Transfer system
Get moving with mechatronics and electronics training
New!

Keeping training moving
The MPS® transfer system has been developed for everyone who wants to make headway with training, be it for the electrical or metal trades or for training technicians and engineers in mechatronics.

The key features of the MPS® transfer system are its innovative technology and the consistent use of industrial components.

Transfer line
The transfer line is made of solid profiles and can be used to transport workpieces or workpiece holders. Top quality, flexible, well thought-out and modular, it is the basis for numerous successful projects.

Drive concept
DC motor, AC motor, servo motor or a motor with integrated CAN controller - the belt can be combined with all motor types with just a few simple actions. Professional clutches and toothed belt gearing simulate practical industrial applications while providing optimum training flexibility.
Control
The transfer system is compatible with microcontrollers such as the LOGO! or more complex control systems with a wide variety of configurations. We can produce the ideal control system for you, tailored to your needs.

Multimedia support
Digital training programs for specific topics relating to the MPS® transfer system facilitate effective training, including the very latest trends in automation technology. The Machine Vision training program provides the perfect introduction to modern industrial image processing.

Modules
The individual modules are complete automated units that can easily be integrated into a single transfer line. The MPS® transfer system focuses on topics such as sensors, electrical positioning, handling, assembly, camera inspection, barcode scanning, RFID and many more, making it an ideal platform for forward-looking projects.

Mechatronics and factory automation
MPS® Transfer system/Project kits

Workstation
A range of laboratory equipment and a trolley specially tailored to the MPS® transfer system creates the optimum working environment for you.

Experience
Several kilometres of our transfer solutions are already providing a reliable material flow in the AFB, ICIM, MPS® 500 and iFactory training factories for our customers and partners worldwide. This guarantees a well thought-out concept with a high quality design to strict industrial standards.

Just as in industry
Belts play a crucial role in automated production. Products are transported using belts of different widths or even double belts. On the MPS® transfer system, material is transported on a standard industrial belt.
Control and networking with all industrial standards

Networking like the professionals
The MPS® transfer system features standardised interfaces, A4 mounting frames, the integrated 19” mounting frames on the belt and a variety of different control components.

All modules are available with both I/O wiring and a range of bus connections. We supply different software components for all modules. These can be integrated into state of the art automation solutions. The transfer lines and modules can also be operated without networking.

Ready to go with:
- I/O
- AS-interface
- CAN bus
- Profibus DP
- Ethernet TCP-IP
- Profinet
- Profinet CBA
- ASISafe
- PROFIsafe
The MPS® transfer system is flexible and can be used with a wide range of controllers, drives and modules. It enables various stations and systems to be set up for training.

Additional system solutions on experimentation plates in DIN A4 portrait format, e.g.
- Modern drive components
- Contact-based controllers
- Operation and observation using operator or touch panel
- Safety modules
and many other innovative solutions are available on request.

Thanks to our know-how built up over countless projects, we can support you in choosing or defining your own modules, stations and systems, tailored to your needs.
MPS® transfer lines can be flexibly combined and used in a variety of different ways:

**In sequence**
Simply connecting transfer lines in sequence provides combinations of different sizes.

**With MPS®**
The MPS® transfer lines can also be combined with the MPS® modular production stations from Festo Didactic without the need for additional components. This results in an unmatched variety of systems.

**Directly on the belt – or with workpiece holders**
With the MPS® transfer system, both options are possible: workpieces can either be transported directly on the belt or on pallets, with or without an ID system.

**90° connection**
Transfer lines can be combined „around corners“ without additional modules. This enables complete loops to be achieved with just four lines.
The stations in the Modular Production System at a glance

A production line in a factory can be made up of individual production cells. Each cell has a specific function in the process (distribution, testing, processing, handling, assembly, storage). You can select an application or process that meets your requirements from a range of individual stations.

By effectively combining individual stations, you can assemble your production system.

Learn about the functions and training aims of the individual stations as well as their possible combinations on the following pages.
Combining stations

A new interface concept that offers many possibilities for direct combination of individual stations. Various aspects determine the decision as to which combination is required:
- Training aims
- Supplementation of existing stations
- Budget

The complete systems MPS® 200 section gives an overview of the most popular combinations.

MPS® stations can be combined as follows:

<table>
<thead>
<tr>
<th>Stations</th>
<th>Possible direct downstream stations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Testing</td>
</tr>
<tr>
<td>Distributing/Distributing ASI</td>
<td>+</td>
</tr>
<tr>
<td>Testing</td>
<td>+</td>
</tr>
<tr>
<td>Processing</td>
<td>+</td>
</tr>
<tr>
<td>Handling</td>
<td>+</td>
</tr>
<tr>
<td>Buffer and transport section*</td>
<td>+</td>
</tr>
<tr>
<td>Pick&amp;Place</td>
<td>+</td>
</tr>
<tr>
<td>Fluidic Muscle Press</td>
<td>+</td>
</tr>
<tr>
<td>Robot</td>
<td>+</td>
</tr>
<tr>
<td>Assembly/Assembly and punching**</td>
<td>+</td>
</tr>
<tr>
<td>Separating***</td>
<td>+</td>
</tr>
<tr>
<td>Storing</td>
<td>+</td>
</tr>
</tbody>
</table>

Distributing → Separating → Processing → Robot → Assembly → Storing

Pick&Place → Fluidic Muscle Press → Sorting
Combination using a conveyor

The conveyor enables all MPS® stations to be interconnected. The conveyor is simply mounted between two stations as the linking element. This facilitates the set-up of customised training arrangements.

Distributing ➔ Conveyor ➔ Sorting

<table>
<thead>
<tr>
<th>Robot</th>
<th>Assembly/Assembly and punching**</th>
<th>Separating***</th>
<th>Storing</th>
<th>Sorting/Sorting DP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>

* The transport section can be set up for varying project work using the project modules and used between MPS® stations for flexible transportation of material.

** The Punching station can be used to upgrade the Assembly station.

*** The Separating station can be combined with two downstream stations placed at right angles.
MPS® 200 complete systems
With blended learning package and modular expansion options

Complete from A to Z
MPS® 200 systems come with all the required accessories, guaranteeing effective training from the very start. They range from small complete systems to entire mechatronic laboratory outfits.

- MPS® stations
- All necessary accessories such as trolleys, power supply units, control console, workpiece set, etc.
- Control package with programming software and cable
- Visualisation and simulation software

The new interface concept offers many possibilities for direct combination of individual stations. Various aspects determine the decision for this combination or that:
- Training content
- Supplementation of existing stations
- Budget

MPS® 202-Mechatronics
Small but complete
Distributing, Sorting

MPS® 203-Fieldbus
Mechatronics and fieldbus technology
Distributing with AS-interface, Testing, Sorting with Profibus DP
Flexibly expandable
Of course you can also gradually expand your MPS® 200 system with stations, modules and components or with additional web-based training programs.

Blended learning package included
Each MPS® 200 system includes a package of web-based training programs as well as FluidSIM® Pneumatic and Mechatronics Assistant, the tool for professional training. Some packages include CIROS® Robotics, CIROS® Programming and CIROS® Mechatronics.

MPS® 203-IT
Remote maintenance, remote diagnosis
Distributing, Testing, Sorting

MPS® 205-Mechatronics
Everything you need for project work
Distributing, Testing, Pick & Place, Fluidic Muscle Press, Sorting

MPS® 202-Robotics
Handling and assembly
Assembly with robots

MPS® 210-Mechatronics
The all-rounder
Distributing, Testing, Processing, Handling, Buffering, Assembly with robots, Punching, Sorting
MPS® 500-FMS
Flexible production – compatible, modular and versatile

Thought and action in networked systems
It is becoming more and more common for specialists and engineers to be responsible for operation and maintenance of complex automated production systems. This requires the seamless interaction of all the technologies involved.

MPS® 500-FMS forms the basis for general technological training using practical problems from actual operational applications. It provides the perfect platform for analysing, understanding and mastering the interaction of mechanics, pneumatics, electrical engineering, control technology and communication interfaces – all absolutely critical for proper and successful management of networked systems.

The transport system
The transport facilities are a central component of automated production systems. The rectangular conveyor configuration of the FMF–F series offers all the characteristics of professional industrial systems:
- 6 working positions
- Pallet identification
- Valve terminal technology
- AS-i fieldbus technology
- PLC control cabinet
- S7-300 PLC controller
- Frequency converter
- AC drive motors
- EMERGENCY-STOP
- I/O port for station
- Dimensions: 3000 x 500 mm

The warehouse
Indispensable and technically challenging from a logistical point of view – automated warehouses facilitate flexible logistical concepts and short delivery times. The HRL20 offers all the functions of a full-size warehouse in a smaller format:
- Shelf with 5 x 4 locations
- Precision storage and retrieval robot – linear, X/Y/Z (DC/pn/DC)
- Positioning controller
- Gripper for workpieces
- S7-300 PLC controller
- Control panel
- Teach-in positions
- Interface to the conveyor system
- Dimensions: 700 x 900 x 1800 mm
Networked system operation – communication is key
Modern production systems are of modular design, with the modules or subsystems featuring powerful communication interfaces. The MPS® 500-FMS uses interfaces such as the I/O coupling, fieldbus and Ethernet similar to those used in typical practical applications.

From the sensor to the web: The optional software packages are an easy way of practicing displaying system data on the Internet.

The Vision system
Camera systems are ideal for use in production and quality assurance thanks to their versatility and reliability. The universally successful industrial system DVT is integrated in the MPS® 500-FMS system:
- Intelligent compact camera
- CMOS (colour on request)
- Resolution 640 x 480 pixels
- Incident light and transmitted light
- Computer link
- Evaluation software for PC

The tools of the trade – simulation for robots and systems
The use of simulation tools for programming systems and analysing system behaviour before or during construction saves time and money. The electrical, mechanical and physical behaviour of the models is the same as that of actual stations and is programmed using the same programming languages (MELFA BASIC and STEP 7). This enables the students to work safely on virtual systems before the tested programs are tried out on the actual system.

The process
The system is a factory comprising six areas linked via a transport system that produces the tried-and-tested short-stroke cylinders from the MPS®.

Incoming goods
Cylinder bodies are delivered to the Distributing station and forwarded to the Testing station after inspection.

Processing
The Processing station, which simulates a drilling process, represents the machining stage. The Handling station transports the material.

Quality assurance
The camera system checks the workpiece.

Assembly
An industrial robot in the Robot assembly station performs automated assembly.

Warehouse
Parts are stored in the Automatic warehouse station prior to shipping.

Outgoing goods
The Handling station transfers products from the conveyor to the Sorting station, where the products are sorted and made available for shipping.

10 stations – learn the basics in small groups
MPS® 500-FMS provides up to 10 individual stations for working in small groups of students – providing invaluable benefits for the practical side of training. Each station focuses on something different and offers various levels of complexity. The stations can be gradually brought together once the station-specific training aims have been achieved.
An introduction to the world of flexible manufacturing and integrated systems

All of the essential procedures for a fully automated, flexible manufacturing system – FMS – can be shown:
- Buffer of unmachined parts
- Separation
- CNC machine loading using robots
- CNC machining processes
- Buffer of finished parts
- SCADA/DNC options

The CNC machines used are PC-controlled, bench-mounted lathes and/or bench-mounted milling machines which correspond to an industrial standard in their structure and function. Industrial robots with powerful controllers (multi-tasking, path control) are used for loading and unloading. Owing to the modularity and the clearly defined interfaces, the MicroFMS systems can be combined both with one another and with MPS® stations.
MicroFMS:  
CNC and robot technology similar to industry

The control concept
Every CNC machine in MicroFMS has its own PC control system. On the PC, various industrial control systems such as the Siemens 810/820, 810D/840D, Heidenhain TNC 426 or the CAMConceptCAD/CAM system can be installed. Via an optional control panel, the user interface for the corresponding control system can be displayed.

For automated use, the CNC machines are equipped with an automatic door, pneumatic chuck and/or an electromagnetic vice and an I/O communication interface.

Spectrum of workpieces
The illustrated turned and milled parts can be manufactured for example from unmachined parts with a diameter of 30 or 40 mm.

Control, simulation and programming:
The software solution for MicroFMS
– Simple CAD/CAM system for turning and milling
– 3D simulating for turning and milling
– CIROS® Automation Suite

Individual solutions
Do you need a special solution or controller set-up? Call us – we have the solution for all your needs.

An impressive training concept that already has many loyal users. Discover for yourself the flexibility of MultiFMS. You will find numerous references with contact data for our customers on our website:

www.festo-didactic.com
Under the heading Services ➔ References
Level 1: Automated buffer operation via I/O communication between robot and CNC machine

Central control of the automated buffer operation is provided by the robot controller. Buffer operation is started and stopped via the MPS® control desk at the station robot.

Level 1 enables the automated processing of a buffer of unmachined parts. If different work-pieces are to be made, then the corresponding program must be manually pre-selected at the CNC machine. Communication between a robot and a CNC machine, such as starting and stopping the CNC machining, reporting completion, opening and closing the door, is controlled by the robot controller by setting and reading the I/O lines of the CNC machine robotics interface.

Level 2: Flexible buffer operation with a SCADA system

Robots, CNC and cell computers as well as an optional CAD/CAM laboratory are all networked together, via Ethernet. The DNC commands are transmitted from the cell computer to the CNC machine via whatever DNC interface is available (RS232 or TCP/IP).

Level 2 corresponds to the full functionality of flexible industrial manufacturing systems (FMS). Every unmachined part put in the buffer is assigned to a specific process plan. This means that differing workpieces can be manufactured in the system. Using DNC, the appropriate CNC programs for the workpiece are loaded into the machine via the cell computer. Optionally, a CAD/CAM laboratory can be networked with the system.
The name says it all – MultiFMS really is multifunctional.

The combination of three successful concepts in MultiFMS produces an extremely comprehensive training environment specifically for mechatronics engineers.

The subsystems MPS®, MPS® 500-FMS and MicroFMS can be operated both individually and in a network, meaning you get a wealth of combination possibilities precisely tailored to your training situation. System complexity is kept to a minimum thanks to the fact that the interface design is geared toward standardisation as part of the design process.
Multifunctional: MultiFMS

MultiFMS contains a series of MPS® stations that are formed around the transport system. These MPS® stations can be easily isolated from the transport system and used either individually or as an MPS® line for your training purposes. Each MPS® station has its own PLC controller, which means that a sizeable number of students can be trained on the 9 stations (full configuration). Each station also focuses on a single topic, for example testing, rotary indexing table, handling, robot assembly, positioning drives, conveyor, enabling many topics of relevance to automation technology to be addressed.

MPS®500-FMS

The pallet transport system is a central part of the MPS® 500-FMS system solution. It integrates the MPS® stations, warehouse and camera into a production system with logistics components that exhibit excellent flexibility in terms of material flow.

MicroFMS

MicroFMS brings CNC technology into play. One or two machines with a loading robot handle production of cylinder bodies in networked operation before these are transferred to the assembly line. The straightforward database-supported order administration system on the PC (optional) makes getting started with flexible production easy. Of course you can also operate the CNC machines individually in order to train students in the fundamentals of CNC.
The mechatronics learning platform that integrates MPS®, a transport system and CNC

Robots and CNC (1)
Up to two industrial robots perform typical tasks such as assembly and loading/unloading of machines in MultiFMS. This provides an ideal opportunity of illustrating the advantages offered by modern industrial robots thanks to their flexibility, precision and dynamism. The problems of controller coupling between robots and CNC controllers can be addressed in combination with the CNC machines.

The CNC machines and the accompanying software are ideally suited to teaching mechatronics engineers about CNC. All stages of product development can be reconstructed, from CAD design to machining.

Logistics and material flow (2)
There aren’t many production facilities that can manage without the logistics functions of transportation and warehousing.

What is a warehouse? In its simplest form a shelf. More exciting is the shelf robot – in our case a 3-axis cartesian robot with two positioning axes and one pneumatic axis, controlled using a PLC.

The transport system addresses the topics of frequency converters, fieldbus, pallet identification and PLC programming using examples. A good foundation for the challenges of the career.

Handling and processing (3)
Actuating cylinders, detecting sensors, moving axes – the daily bread of the PLC programmer. The most important thing in this context is the application of the correct programming methodology – a skill in itself. MultiFMS offers an excellent training environment in this regard thanks to the numerous MPS® stations.

Of no less importance is effective troubleshooting – after all, faults in production systems have to be eliminated quickly. This can also be systematically practised using MultiFMS.
MultiFMS: decentralised control technology

Makes even large systems easy to master

Each station has its own controller, which means that each station can also be used on its own. Synchronisation of the individual stations is performed via digital I/O at level 1 (L1).

A second communication level (L2) for transferring data to the two computers at the control level can be installed in addition to and independently of level 1. Profibus or Ethernet is used here. Level 2 is not required for operation of the system, however it does increase its ease of use.

The control level in MultiFMS: for maximum ease of use

PC1: For visualising and operating the MPS® system

In practice, almost all large production systems are equipped with a system visualisation feature. We offer system visualisation and operation of the assembly line on the basis of WinCC or InTouch, depending on the PLC used in the system, as an optional extra for MultiFMS.

PC2: Order input and visualisation of the CNC cell

The cell computer (PC2) of the CNC cell facilitates input of a number of different CNC orders in one order batch. Each order can start its own CNC program via DNC. You can also define whether an order should involve turning or milling or turning and milling. In addition to order input, the CNC is dynamically visualised using a 3D representation.
CNC manufacturing as required
The material flow in MultiFMS

The two conveyor belt buffers stock two different cylinder bodies (1).

These are removed by the loading robot, fed to the CNC machining centre and then inserted in the magazine buffer (2).

Here, the height of the workpiece is measured. If the workpiece buffer is full, the CNC cell is notified and production of the workpieces is suspended until the buffer can accept more pieces (3).

The workpiece is then drilled (simulation) in the processing cell and tested (4).

Next the workpiece is transferred to the Vision system station for quality inspection (5).

The robot then transfers the workpiece to the Sorting station (6).

If this is full or out of order, the workpieces are buffered in the warehouse (7).

Finally they are transferred once more to the Sorting station when it is ready (8).
The full range of software and teachware for MultiFMS is also available to order:

**Mechatronics Assistant** (1)
A virtually inexhaustible source of useful information for trainers and trainees. This wealth of professionally prepared information is only available from the market leader. Free updates are all part of the deal. In this way you stay up to date.

**COSIMIR® Robotics** (2)
The virtual learning environment for robotics offering a comprehensive online tutorial on robotics and numerous ready-made robot workcells.

**COSIMIR® Professional** (3)
Model and simulate any type of complex robot cell using COSIMIR® Professional. This package provides a user-friendly program editor, many online functions as well as a teach-in function for robot programming.

**COSIMIR® Industrial** (4)
The programming package for robots. COSIMIR® Industrial was especially designed for Mitsubishi industrial robots. The program contains a program editor, download and upload functions. Teach functions as well as spatial simulation of the programmed robot.

**COSIMIR® PLC** (5)
COSIMIR® PLC for safe experimentation with PLC programs. You can use the integrated Soft PLC S7 PLC or any real PLC.

**CAD/CAM system – CAMConcept** (6)
CAMConcept from EMCO is a CAD/CAM system for turning and milling applications. Design simple parts with the integrated CAD functionality. Thanks to the user-friendly operation, you can then create your CNC program without any controller-specific CNC knowledge.

**3D simulation** (7)
This useful program is part of the WinNC machine controller installed on every EMCO CNC machine. The package can also be installed on other computers so that the process can be visualised.
Individual solutions

Do you need a special solution or controller set-up? Call us – we have the solution for all your needs.

An impressive training concept that already has many loyal users. Discover for yourself the flexibility of MultiFMS. You will find numerous references with contact data for our customers on our website:

www.festo-didactic.com
under the heading Services ➔ References
iCIM – the platform for research and training

iCIM systems play an important role in illustrating complex topics such as production logistics and sequence planning in flexible manufacturing systems (FMS):
– Material supply and disposal
– Planning algorithms for automated production lines
– and much more.

The exclusive use of open standards for communication and databases as well as the modular structure of the software provides numerous possibilities for realising your own ideas.

The interface between iCIM-ERP and iCIM-MES has been published. With suitable programming skills you can link the iCIM system into your existing PPS or ERP system.

A world of possibilities awaits – why not find out more?

Interdisciplinary with iCIM

Future technicians and engineers, but also sales staff and management, benefit from interdisciplinary training on iCIM systems. From the fundamentals of mechatronics to complex networked processes, the relationships between individual processes are illustrated in a clear and comprehensible way.
iCIM –
The platform for professional interdisciplinary CIM training.

MES
Planning is one thing – production is another. The MES in iCIM brings planning and production together. Using the CIROS® integration tool as a basis, we create and supply an open and modular MES solution for your system which you can modify if necessary. The wide range of standard interfaces means that virtually all automation devices can be integrated, which is an important consideration for those system components you already own.

Programming tools
We offer practical programming tools for each iCIM system for programming and setting the parameters for PLCs and robots. Cost-effective multiple licences for classroom scenarios are available for almost all packages.

PPS/ERP
How does a company function? Every company is certainly unique, but there are common aspects: Entering and managing customer data, entering and maintaining basic data, defining machines with their costs as manufacturing resources, maintaining parts lists. This gets really interesting when manufacturing orders are placed. How does the material availability look? Can the delivery dates be met? iCIM ERP is an industrial ERP system, which is optimised for iCIM systems and offers all commonly used functions and reports.

Virtual reality and 3D simulation
Creating and testing manufacturing processes on a PC – this is easy in the CIROS® Production virtual factory environment. Assemble a production line from the module library, create the matching MES project with one mouse click, enter the process parameters and start the process. The 3D simulation now clearly illustrates the procedure, with real robot programmes running in the simulated robots.

Just like a real system, the virtual systems can also be connected with iCIM ERP.
With perfectly matched software.
For effective planning and engineering.

The fascination of CIM
Computer-integrated manufacturing (CIM) provides an impressive display of what can be achieved with current technology:

- PCs, robots, programmable logic controllers and CNC machines communicate via networks.
- Processes are optimised through simulation, a whole host of production data is administered and made available in databases.
- Just about every process is "integrated", which means individual processes can no longer be considered in isolation.
- This requires all those involved in the production process to have an in depth understanding of the relationships between these individual processes.

CAD/CAM
CAMConcept from EMCO is a CAD/CAM system for turning and milling applications with integrated 3D graphic simulation. Design simple parts using the integrated CAD functionality and then create your CNC program – you don’t even need any controller-specific CNC knowledge.

Quality assurance
Industrial vision systems are increasingly becoming as important as verniers and probes. However, a sound knowledge of image processing and in particular lighting technology is required to design a vision application. Our intelligent compact camera provides all of the functions of a modern vision system and is ideal for both beginners and professional users.
iCIM 3000 –
The complete training system with potential

**iCIM 3000 system description**
Automatic warehouse, assembly station, testing station and CNC machines are combined into a flexible production system using a pallet transport system. Each station removes its designated pallet from the conveyor, processes the materials upon it and then replaces it on the conveyor. The cell computer coordinates control of the pallets to the workstations and their start in accordance with the planned process.

**Control technology and communication**
Each individual station has its own controller and can therefore also be used on its own for training purposes. In accordance with the latest technological trends, networking of the system is performed using Ethernet to ensure open interfaces and extendability.

**Flexible system design**
The unique object-oriented approach of the iCIM systems facilitates maximum flexibility when it comes to designing systems. The stations are positioned along the conveyor based on the space available – you decide the configuration. We also optionally supply transport systems in special sizes or with sorting gates and alternative tracks.

**Training included**
With iCIM 3000 you are not just purchasing an excellent training platform – you are also purchasing qualified training by our experts, the purpose of which is to equip you for the continued use of the system. The step-by-step training introduces the subsystems and their interfaces. Once you get to that stage, integrating them into a complete system is virtually child’s play.

**Training aims:**
- Industrial communication and networks
- Cell control and process planning
- System and robot simulation
- PLC and fieldbus technology
- Positioning technology and servo drives
- Handling and robot technology
- CNC programming and simulation
- CAD/CAM and DNC
- Pneumatic and electropneumatic components
iCIM 3000 complete package:

iCIM stations

Pallet transport system
- Dimensions LxW: 3000 x 1000 mm
- Transport height/track width: 788 mm/160 mm
- Working positions: 4, can be extended later
- Controller: S7-300

Automatic warehouse
- Dimensions LxWxH: 2380 x 1300 x 1800 mm
- Number of stock locations: 80
- Shelf robot: linear, X/Y/Z, DC servo
- Controller: S7-300

Robot assembly cell
- Dimensions LxW: 1100 x 700 mm
- Pallet buffer/magazine: 4/3
- Robot type/payload: 5-axis, 3 kg

Loading robot for CNC machines
- Robot type/payload: 6-axis, 3 kg
- Linear axis (7th axis): 2500 mm travel
- Pallet buffer/magazine: 4/3

CNC processing centre, series 155
- Travel X/Y/Z: 300/200/300 mm
- Output: 2.5 kW
- Tool drum: 10-station
- Controller type (PC controller): SINUMERIK 810/840 D

CNC lathe, series 250
- Travel X/Z: 100/300 mm
- Output: 5.5 kW
- Tool drum VDI 16: 12-station
- Controller type (PC controller): SINUMERIK 810/840D

Quality station with handling device
- Travel X/Z: 450/80 mm
- Measuring principle: tactile/analogue/linear variable differential transformer
- Measuring range/accuracy: 28 – 32 mm/z 0.1 mm
- Controller: S7-300

Robot programming
- Programming package for Mitsubishi robots.

Software:

CIROS® Automation Suite

Cell control
- Powerful MES software comprising the modules Visualisation, Process control, Process connection, Database and Simulation.

3D system simulation
- For simulation of the iCIM systems in a virtual reality environment. iCIM station library. User-friendly layout editor. Fully compatible with the non-virtual iCIM system.

3D robot simulation

Robot option
- (A1) 6-axis assembly robot, 1 kg
- (A2) 6-axis assembly robot, 3 kg
- (A3) SCARA assembly robot, 6 kg
- (F1) 5-axis loading robot, 2 kg
- (F2) 6-axis loading robot, 1 kg

Upgrades and optional packages (not included in the scope of delivery):

Upgrades/modifications
- Whether further stations, modified system layouts or integration of existing system parts – we are happy to address any special requests you have in the area of control technology. Why not benefit from our experts’ many years of experience?

Robot Vision optional package (V1)
- Industrial CMOS compact camera with integrated illumination and Ethernet interface. Resolution 640 x 480 pixels. Stable stand with tilt adjustment. The camera determines the gripper parameters for the robot assembly station. Includes professional image processing software.

CNC option
- We are happy to offer you iCIM 3000 with alternative robots and CNC machines:
  - (C1) CNC machine, series 55
  - (C2) CNC machine, series 105

Robot option
- (A1) 6-axis assembly robot, 1 kg
- (A2) 6-axis assembly robot, 3 kg
- (A3) SCARA assembly robot, 6 kg
- (F1) 5-axis loading robot, 2 kg
- (F2) 6-axis loading robot, 1 kg

www.festo-didactic.com 59
iCIM engineering service

Requirements analysis
Off-the-peg solutions might seem better value at first glance, however here at Festo we focus on long-term benefits for our customers. That’s why each iCIM quotation always starts with a qualified requirements analysis. Experienced project advisors discuss with you your expectations for the new training equipment and share with your their experiences of using it on a day-to-day basis, thus avoiding unsatisfactory investments.

Advice
You will then receive competent advice on the training equipment for you based on the requirements analysis. Our primary objective here is to fulfil your goals, irrespective of our product range. Our cooperation with a number of renowned partners means that we will always design the right solution for you.

Engineering service
Our experienced technicians and engineers are specialists in the planning and equipping of training systems and have at their disposal powerful tools that represent the state of the art. PLC and robot programming systems, simulation systems, EPLAN and CAD programs are effective tools for translating customer requirements into reality. We will help you to implement your ideas quickly, reliably and cost-effectively.

System integration
Existing system parts can often be integrated as subsystems, provided suitable interfaces are available. This protects earlier investments.

Customised training
You know your strengths – and weaknesses. We give you the opportunity of defining your training profile with us. The result? A training course tailored to your exact personal requirements:

- ERP/PPS
- MES
- Communication
- Robotics, simulation
- Vision system
- CAD/CAM, CNC
- PLC programming
- Fieldbus
- System simulation

Upgrade
Festo offers planning reliability and continuity. Systems can be gradually extended and updated over a number of years. Give us a call – we’re happy to assist you with your stage-by-stage project planning.

We are a solution partner to Siemens Automation.

Solution Partner
Automation
SIEMENS
Individual solutions – Systematic variety

iCIM is as varied as factory automation itself
Hundreds of installations across the globe have given rise to a range of solutions that are ideally suited to interdisciplinary basic and further training in the area of factory automation and CIM:

Transport systems
– Double-track system
– Single-track system

Automatic warehouse
– With 20 stock locations
– With 40 stock locations
– With 88 stock locations

Robot assembly
– With 5-axis robot, 2 kg load
– With 6-axis robot, 1 kg load
– With 5-axis robot, 3 kg load
– With 6-axis robot, 3 kg load
– With 4-axis robot, 5 kg load

Cartesian assembly system, Robot Vision, CNC machines, loading robots for CNC machines
– With 5-axis robot, 2 kg load
– With 6-axis robot, 1 kg load
– With 6-axis robot, 3 kg load

Quality assurance
– Via analogue sensor
– Via digital vernier caliper
– 3D measuring machine

Driverless transport systems

Robot welding

Power screwdriver station

Worldwide references
Universities, colleges and vocational training schools around the world are benefiting from the unique iCIM system concept. Detailed information on these projects can be found on the Internet:

www.festo-didactic.com
under the heading Services ➔ References

Why not call us?
We’re happy to advise you!
CNC training: An investment in the future

The training program
Festo Didactic has incorporated CNC training into its learning system, thereby satisfying requirements for basic and further training for the area of metal working.

CNC programming and machining, critical tasks in many metal-working factories, place high demands on students.

The machine manufacturer EMCO offers a unique training concept comprising high-quality machines, modular software and accompanying courseware to meet these demands.

EMCO is the leading machine manufacturer in Austria with sales of around one million machines and has been the market leader in CNC training for many years.

EMCO software – Modular software for greater investment protection
CNC machines from EMCO are ideally suited to training. Standard CNC machines are normally permanently connected with the machine controller. If your controller requirements change, switching to a new controller will almost always mean buying a new machine. With EMCO, however, you can emulate all common industrial controllers on just one machine:
- SINUMERIK 810/820
- SINUMERIK 810/840D
- Fanuc Series 0
- Fanuc Series 21
- Heidenhain TNC 426
- EMCOTronic TM02
- PAL

The concept of the interchangeable controller
The CNC is controlled by a conventional PC on which the required controller software is installed. A number of controllers can be installed on one PC. Switching between controllers is done by simply exchanging the controller-specific key module and takes less than a minute. All that remains is to start the controller software and away you go!

EMCO courseware
Multimedia and interactive teaching and learning materials provide all the technical information you need. The combination of aesthetics, information and practical application encourages motivation and attention.

Festo Didactic is the exclusive sales and service partner for EMCO CNC training systems in Germany.
iFactory
Training factory for production planning and factory organisation
New!

Innovation inspired by challenges

Need to convert an entire production line during lunch? Reacting to new market demands at short notice – is it even possible?

What's the best way to construct a flexible production line ... so that you can react quickly to market turbulence?

Realising dreams
The iFactory is the convertible training factory everyone dreams of, not just production planners. The iFactory has a systematic modular construction, enabling you to try out new ideas immediately realistically.

Convertible and modular
The adaptability of the iFactory makes modification simple and enables you to create completely new production layouts in just a few moments. Simple and clear interfaces make for intuitive handling and operation – the key to creative production planning and engineering.

Variable production
The iFactory training factory produces different table sets according to each individual customer order. RFID technology in the workpiece holders enables each stage of the production process to be tracked.

Many different variants of the product can be produced by varying the material and the mounting position used. This means you can use the iFactory training factory to examine and train the complexity of a modern production process – right down to batch 1.
Quality tested
It’s not just the products produced using the training factory that are subjected to constant quality testing. All iFactory production cells are also assembled, wired, programmed and thoroughly tested before use.

Industrial quality without compromises
All production cells are constructed professionally and to industrial standards, with no compromises. Training in the factory reflects industrial reality, whether at a manual workstation, in the warehouse or at a fully automatic robot work cell.

Pathfinder
All production cells are equipped with topology feedback so that the master computer – an SQL server – automatically recognises the constructed production line.

All system settings and configurations are generated automatically while arranging and connecting the iFactory cells.

Intelligent network
The SCADA system includes a PC with a control cabinet and its own control system. All cells are networked using the SCADA system. In addition to order input, it allows complete operation and monitoring of the entire production line.
The modules

New!

The convertible training factory
Production cells such as conveyors, deflectors and a wide variety of assembly and quality inspection cells make up the modules in the iFactory convertible factory. The modules contain the latest automation technology such as a range of different drives, assembly robots and handling and image processing systems.

By simply combining these elements you can create any type of production line and expand it whenever you wish.
The Institute for Industrial Manufacturing and Management or IFF (Institut für Industrielle Fertigung und Fabrikbetrieb) and Festo Didactic have developed an innovative learning environment for advanced Industrial Engineering (aIE). This forms the foundation of an excellent post-academic, basic and further training programme for industrial engineers already working in the industry, i.e. technical managers, planners and designers of production processes.

„If a company wants to ensure its survival and its competitiveness, it is absolutely essential that production planners and those responsible for factory organisation learn how they can react to market turbulence without interfering with existing production runs,“ states Professor Engelbert Westkämper, head of the IFF at the University of Stuttgart and the Fraunhofer Institute for Manufacturing Technology and Automation (Institut für Produktionstechnik und Automation, IPA).

The area referred to until now as „industrial engineering“ – essentially work and process planning – must be linked in the future with the tools of the digital factory and modular production systems in order to improve adaptability. The use of innovative technology within the digital and virtual factory can further increase the potential for optimisation. This is what the Stuttgart production researchers call „advanced Industrial Engineering“.

The need to be able to continually optimise factories and production systems for the future is massive. However, the range of options currently available for further training which focuses on aIE and is practice-oriented is no longer sufficient. That is why Professor Westkämper initiated the innovative training factory. It uses a unique and novel combination of methods to convey knowledge: a physical model factory, a digital learning island and theoretical modules.
Process automation and closed-loop control technology

MPS® PA – The Modular Production System

- System description
- MPS® EduKit PA/Project kits
- MPS® PA Compact Workstation
- MPS® PA Stations and MPS® PA 200 Complete systems
Few industries have as many facets or are as interesting as the process industry, which produces a wide range of products for the most diverse areas of daily life.

On the one hand, the chemical industry produces preliminary products for other industries. This group includes base chemicals, petrochemicals, polymers as well as refined and special chemicals. Key consumers include the automotive, packaging and building industries.

On the other hand, chemical products are used in the areas of health, the environment and nutrition. As well as the chemical and pharmaceutical industry, the process industry includes other sectors such as the biotechnology, paper and food industries.

Even though the end products may differ, automation is making huge leaps forward in each of these areas. International competition and the resultant pressure to continually increase productivity as well as a continuously expanding range of variants and strict requirements for process and quality assurance demand automation solutions.
Modular
The modularity of the learning system enables you to realise a diverse range of configurations for typical production processes from very different industries in a safe learning environment.

Train efficiently
Festo – The partner to the process industry
Festo is fast becoming a key partner to the process industry. It is only logical that the process automation learning system benefits from this know-how and is tailored to the requirements of different industries through its consistent modularisation:
- Water supply and disposal industry
- Food industry
- Bulk goods industry
- Chemical and petrochemical industries
- Biotechnology/pharmaceutical industries
- Paper industry

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

The goal of Festo Didactic is to offer further training that not only supports personnel in companies with current problems, but that also provides new approaches to future tasks.

Festo is fast becoming a key partner to the process industry. Close coordination with our parent company, Festo AG & Co. KG., ensures the use of the most modern equipment and systems in our learning systems and a source of first-hand expertise for our trainers.

However our focus and methodology also set us apart. Our trainers and consultants are practicians. They are familiar with the requirements of the participants attending their courses, including those requirements that go beyond the purely technical.

We set ourselves a high standard. You will immediately notice the difference between our seminars and those offered by other providers. We provide new answers to old questions – answers that will help you to take that critical step in your operational projects.

Open seminar on MCR fundamentals of control technology
The participants will acquire basic knowledge and skills in the areas of electrical engineering as well as measurement and control technology. They will learn about the basic structure, mode of operation and application of process engineering systems and be able to use this equipment. The procedure for the identification of control systems, selection of a suitable controller and definition and setting of control parameters will also be explained.

Target group
The seminar is recommended for anyone seeking training in the fundamentals of control technology.

Training aims
- Project planning, standards, flow charts
- Analysis of the sensors, actuators, components and control systems in a system
- Measurement transformation of physical measurement variables
- Analogue value processing with Siemens S7
- Analysis, recording and evaluation of various control processes such as level, flow rate, pressure and temperature
- Commissioning of a test system
- Basic principles of control technology, P, I, PI and PID controllers in theory and practice
- Definition: Y – W – Z – X – etc., amplification, rate time, reset time, dwell time, balance time, inactive time
- Setting of the control parameters for different control processes
- Practical utilisation of applications in the process industry: use of an industrial controller as control equipment, use of a Siemens PLC (S7-300) as control equipment

Specific customer training course, for example fundamentals of control technology
Customer-specific training course for those employed in the areas of maintenance, servicing and operational support. The following training aims are conveyed to the participants using the professional training equipment of Festo Didactic through „learning by doing“:
- Cross section of all controller types (P, I, D, PI, PD, PID)
- Controller technologies (Fluid Lab®-PA, industrial controllers and modern PLCs)

Looking for something more?
Workshop offering more complex exercises on practical operational support and maintenance, for example:
- Replacement and reuse of sensors and their incorporation into a control process
- Error localisation through diagnosis of the controller characteristics
- Control process with inactive time on request
Fluid Lab®-PA can be used to teach and demonstrate the fundamentals of control technology. The main components required for actuating the MPS® PA stations using a PC are the „EasyPort D/A“ and the Fluid Lab®-PA software.

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

**Key features:**
Three main functions are integrated in Fluid Lab®-PA in combination with the EasyPort D/A:

- **M** as in measurement
  For detection and evaluation of measured variables from 8 digital/4 analogue input signals.

- **C** as in open-loop control
  For binary or continuous control of 8 digital/2 analogue outputs.

- **R** as in closed-loop (regulated) control
  For freely selectable closed-loop control functions such as 2-point, P, I, PI and PID.

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

**„Settings“ menu item**
The following parameters can be set here for the four analogue input channels and the sensors connected to them:
- Factor
- Offset
- Filter
- Inversion

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

**„Process Sequence“ menu item**
The process sequence of each station can be easily started from Fluid Lab®-PA. All of the process steps are visualised and can be monitored on the flow chart.

**„Measuring and Control“ menu item**
All the functions of the MPS® PA station can be clearly and directly controlled. The states of the process valves, pumps and sensors are graphically recorded, which means they can be directly evaluated. The following functions are provided for recording the sensor characteristics and determining the step response:
- Selection of measuring channels
- Factor for physical scale
- Adaptation of the time scale
- Display of the input signals
- Setting of output signals, switching on/off of the manipulated variable
- Printing of the measured value display or saving as a .jpg file

**„Analysis“ menu item**
Analyses of a wide range of process components can be directly performed using predefined exercises, for example:
- Recording of sensor characteristics
- Recording of pump characteristics
- Recording of heating characteristics

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

**„2-Point Controller“ and „Continuous Controller“ menu item**
For easy parameterisation of the required controller with an immediate effect on the process. One click of the mouse starts various controller functions for the selected control system. Documentation of the controller parameters is also straightforward. The measured values and characteristic curve profiles can be easily printed out.
From the kit to the training factory
Application and process-oriented learning systems

Industry-oriented basic and further training

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

<table>
<thead>
<tr>
<th>The closest thing to reality</th>
<th>Components</th>
<th>Operation and configuration</th>
<th>Advantages</th>
</tr>
</thead>
</table>
| The MPS® PA learning system is based on industrial standards. The MPS® PA concept is based on a market leaders’ automation solutions and trends. | SimuBox | – Simple commissioning of an MPS® PA station  
– Testing and commissioning of process components or system components of a station | |
| | Fluid Lab®-PA | – Commissioning and testing of an MPS® PA station  
– Analysis of process components and control processes of an MPS® PA station  
– Monitoring and analysis of the process sequences of a station  
– Testing, configuration and optimisation of control processes (2-point, P, PI or PID controllers)  
– Analysis of the control response | |
| | PLC | – Programming of process sequences and recipe controllers  
– Analogue signal processing  
– Operation and monitoring using the touch panel  
– Programming of PID controllers  
– Configuration and parameterisation of P, PI or PID controllers | |
| | PLC with external industrial controller | Same as PLC, plus:  
– Operation of an industrial controller (manual operation, automatic operation)  
– Parameterisation of industrial controllers (P, PI or PID control algorithm)  
– Configuration of measuring ranges, setpoint value limits and alarm limits  
– Self-optimisation with oscillation or step response method | |
The significance of control technology is increasing constantly in all areas as energy and resources can be saved using this technology. To achieve efficient production, individual steps must be planned, sequences understood and double-checked.

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

EduKit PA

The new project kits for process and control technology

New!

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

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

Optimisation relative to your space requirement

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

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

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

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

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

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

Piping and instrument flow chart (1)
An important part of project work in process engineering is developing a piping and instrument flow chart. A piping and instrument flow chart explains the electrical, measuring and control technology functions using measuring points and final control elements. The measurement variable or another input variable, its processing, its direction of action and directional specifications and positions should follow from the chart.

Mounting frame (2)
Can be equipped with accessories for controllers, control unit and/or touchpanel. It can also be converted from the ER format to DIN A4 format at any time by the user. The activation and/or control devices can be replaced in just seconds.

Pneumatic drive (3)
With ball valve and signal box. Training aims: Design and application areas of various metering and shut-off devices when controlling the flow of liquids.

Intelligent in the field – closed-loop control with the CPX/FEC valve terminal and the FED 120 touchpanel (4)
The Festo Front End Controller with integrated web server and Ethernet interface is ideally suited to current communication tasks.

Scope of delivery of the Compact Workstation
Basic version including manual without actuation components

Mechanical components, fully assembled
– 2 containers
– Reservoir
– Plug-in piping system
– Aluminium profile benches
– Mounting frame
– Profile plate 700 x 700 x 32 mm

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

Actuation components
– Pump
– Proportional directional control valve
– Ball valve with pneumatic drive
– Heater

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

Commissioning and training on-site upon request.

Accessories
– Trolley
– Tabletop power supply or power supply unit for the mounting frame
– Control kit

Recommended training media:
– Fluid Lab®-PA including analogue/digital EasyPort
– Web-based training program, Fundamentals of open and closed-loop control
Teaching today using the technology of tomorrow

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

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

**Slide, flap or ball valve**
The correct valve in use.

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

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

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

Various aspects determine the decision as to which combination is required:
- Training aims
- Supplementation of existing stations
- Budget

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

MPS® PA stations can be combined as follows:

<table>
<thead>
<tr>
<th>Stations</th>
<th>Filtration</th>
<th>Mixing</th>
<th>Reactor</th>
<th>Bottling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filtration</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Mixing</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Reactor</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Hybrid industries are the industries which require systems and solutions for both process and production engineering. The most striking examples are the food, confectionery and tobacco industries and the pharmaceutical industry.

Whether process and production oriented, or hybrid production, Festo Didactic training factories offer a unique range of facilities for training in automation for all industries – from incoming goods, through process and production engineering departments, to outgoing goods.
The mix is the key
Mechatronics is also making its mark outside production automation. Intelligent drive solutions, featuring high-precision mechanical components, a range of different drives, measured data acquisition and evaluation as well as integrated communications interfaces, ensure safe, optimised process automation too.

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

Innovative technology

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

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

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

Innovative learning

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

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

Zone 1

Process automation

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

Specialist knowledge of programming, such as recipe preparation, or of plant documentation, such as reading and drafting R-I 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.
Hybrid training factories  AFB factory  Training factories for hybrid production processes

Zone 4
Transport and logistics

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

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

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

Zone 3
Production automation

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 workpieces. Typical actuators used in production automation, such as linear cylinders, swivel cylinders, motors, parallel grippers or vacuum suction cups ensure fast, precise movement.

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.
Individual solutions

Need to meet special requirements? Numerous installations worldwide have resulted in a number of solutions specially focussed on hybrid automation.

Contact us with your requirements. We will design your optimum learning environment and implement it in a way closely linked to the actual process. We look forward to designing solutions with you for specific areas such as:

- Water treatment
- Cooling and refrigeration technology
- pH value measurement
- Conductivity measurement
- Integration of process control engineering
- Palletising
- Identification systems (RFID, barcode)

With our know-how in project planning, instrumentation, design and selection of process components, system integration and programming, through to didactic implementation, we will help you to put your ideas into practice quickly, reliably and cost-effectively.