Compact Catalog 2026

Ideas and Highlights from Festo Didactic

FESTO



Compact Catalog 2026

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Welcome!

This compact catalog provides a streamlined overview of the most recent and popular learning systems from across our portfolio.

We've brought together our latest solutions, added suggestions for expanding or combining products, and included a brief introduction to our qualification plans concept to support structured teaching.

Jump into the topics you teach and discover practical learning systems designed for your classroom.



Introduction 4

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Complete catalogs

Several dedicated product catalogs provide an in-depth look at our offerings in specific technical areas:

- Factory Automation
- Pneumatics/Hydraulics
- Electrical Engineering
- Process Automation

Browse and download them from our → **website**

Important note:
CE compliance

Some of the products advertised in this document may not be sold or delivered in countries that require compliance to CE regulations; please check with a sales representative for details.

Questions? Contact us.

Our service team will promptly assist you, whether for commercial or technical requests.

Send your detailed request to
→ **services.didactic@festo.com**

Holistic Approach

Step by Step to Success

From your initial idea to the operation and maintenance of your educational facility, we support every step – from planning and commissioning to long-term success, all from a single source.



Target accuracy
To help you achieve both your educational and financial goals, we support you from the very beginning of your project – by defining your specific needs and ensuring they are fully met.

Range of services
Rely on our unique portfolio of learning systems and technologies when designing, planning, and equipping your laboratories or workshops.

Complete service
From day one, you receive full support from your dedicated contact person. Throughout every stage of your project, you benefit from a single, reliable source for all services and solutions.



Holistic Approach

A Complete Learning Experience

Every element of the learning environment must work together to support meaningful skill development – and that's exactly what we help you achieve.



Courseware
Ready-to-teach learning content available in multiple formats, combining curated theory, practical exercises and projects, and clear learning objectives – giving you high-quality resources to deliver engaging, industry-relevant lessons with confidence.

Learning systems
From modular training packages to full-fledged learning factories, our robust, industrial-grade equipment brings real-world technology into the classroom – enabling learners to build practical skills through authentic, hands-on experience.

Digital tools
Innovative educational technologies – including our digital learning portal, VR/AR applications, and simulation software – help learners grasp complex concepts, support safe experimentation, and make learning more interactive and personalized.

Training and support
With certification programs, expert guidance, workforce development, and responsive customer service, you can use our solutions confidently and sustainably – so you get the most from your investment and ensure long-term success.

Individualized Digital Learning

Festo Learning Experience

In today's digital world, technical education and professional development require a holistic approach – and that's exactly what Festo LX delivers. The Festo LX digital learning portal provides expertly designed content across a wide range of technical fields. By combining industrial expertise with didactic excellence, it offers unique, engaging, and effective learning experiences.

Festo LX: the digital portal for your journey through the world of learning.

Stay Engaged
Videos, animations, and real tasks

Learn Anywhere
Access content anytime, on any device

Track Progress
Monitor learning success in real time

Integrated learning: theory meets practice

Customize
Adapt content to your learners' needs

Assign
Easily share with groups or individuals

Assess & Improve
Evaluate results and refine your teaching

Create
Use 800+ courses or design your own with the LX Creator AI



LX Creator AI

Let the intelligently integrated AI support you in creating professional content. Develop your own learning courses, assessments, and learning paths, and easily adapt our existing courses to meet your specific needs.

Learning Content: Structured, Always Up to Date, Available Anytime

All Media in One Central Location

Integrated Simulation

FluidSIM is now fully integrated into Festo LX and accessible directly from any browser, without the need for additional software or switching between windows or devices.



Integration into your existing learning management system? Need single sign-on? Concerns about data storage or IT security?

→ **Discover all features of Festo LX and subscription options**

Contact us and we will advise you on the integration of Festo LX into your IT environment.

- Festo LX is hosted on European servers
- Festo LX complies with the highest IT security standards
- Annual security audits including penetration tests
- Festo LX supports single sign-on via OAuth and SAML
- Integration into your LMS is possible

Adapt Learning to Every Learner

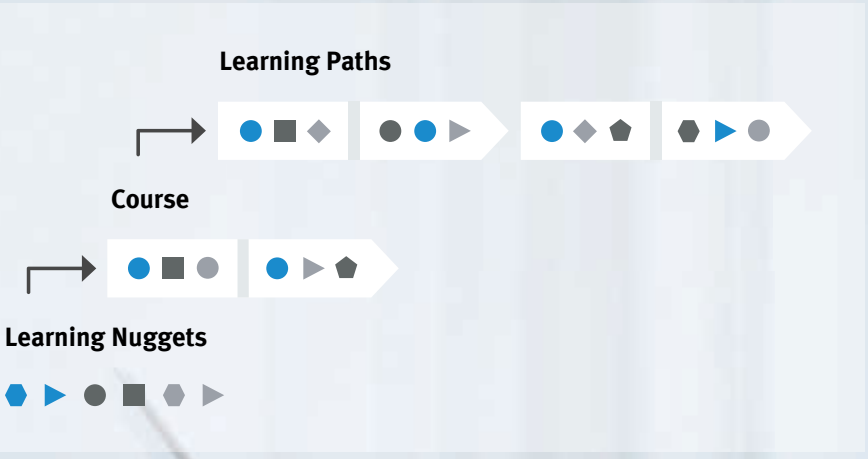


The LX licensing model – simple and clear

Floating licenses allow instructors to significantly reduce the time required for license management, since licenses are not permanently assigned to individual users. For learners, this creates greater flexibility, as they can access the software whenever they need it without being limited to fixed usage times. Overall, the licensing model enables more efficient use of resources and enhances the learning experience.

The Power of Learning Nuggets
Each course in Festo LX is built from muggets – compact, self-contained learning units. Nuggets can be combined, reused, or customized to meet specific learning goals. This modular structure allows teachers and learners to focus precisely on what is needed, ensuring both flexibility and targeted progress.

From Nuggets to Learning Paths
Learning paths connect nuggets and courses into meaningful sequences. They provide structure and direction, guiding learners step by step from foundational knowledge to advanced skills. Teachers can create their own custom paths or use predefined ones tailored to specific job roles or technical topics. Learning Paths can also be combined flexibly to form comprehensive learning experiences.



The key points at a glance:
- Annual subscription plans starting from 1 license
- Plans for educational or industry users
- No manual license management required
- All available languages in one license
- Access to standard Festo LX functionalities
- Tutorials on how to use Festo LX are included
- Optional LMS integration and SSO

→ **Explore your subscription options**

Tailored Technical Education

Curriculum to Close the Skills Gap



Based on the competency requirements of various job profiles, we develop didactically prepared basic, focus, and advanced topics in the areas of factory automation, Industry 4.0, and electrical technology. In this way, we provide a comprehensive, competency-based, and digitally accessible qualification plan for education and training.

We also integrate the latest technical innovations from industry into our learning solutions. This ensures that vocational programs and educators can effectively teach the skills needed to prepare skilled workers for the jobs of the future.

Our curriculum consists of individual topic-specific courses. A course usually consists of several complementary elements:

Theory (eTheory and eLearning courses) – to ensure an easy entry into the subject

Practice (eLab courses) – in order to grasp the topic in a practical context, tasks are carried out on Festo Didactic learning systems

Test (learning success control) – to determine whether the learning objectives of the course have been achieved

Teacher's Guide (User Guide) – to make teaching easier for teachers

The basic principles of the curriculum

Action competency

Our curriculum is structured in such a way that not only technical competencies but soft skills and social competencies can be built up.

Motivation

With our curriculum, we ensure that learners can identify with the subject and celebrate small wins along the way. The respective goal is always clearly defined.

Practical relevance

The learning content is successfully applied using our hands-on training systems.

Flexibility

The curriculum is mapped in our digital learning portal Festo LX, allowing learners to access the learning content anytime and from anywhere.

Gradually increased complexity

The difficulty of the learning content increases slowly so as not to overwhelm learners.

Different types of courses

For more variety and learning enjoyment, we offer an array of course formats, including eLearning-only courses, eLab courses, eTheory courses and evaluations.

Multimedia approach

By using different learning media, various learning styles are taken into account. Media competence can also be increased in this way.

Modularity

The curriculum consists of adaptable learning paths and single topic courses that can be added optionally and individually.

Overview of the

Mechatronics Curriculum





Mechanical Engineering Fundamentals

Mechanical Manufacturing Fundamentals
– Introduction to the SkillsMagazine Kit Project
– Solderless and permanent connection technology
– Technical Documentation
– Drilling
– Measurement Technology and Quality Assurance
– Turning
– Milling
– Additive Manufacturing and CAx-Systems
– CNC Manufacturing
– Commissioning of the Stacking Magazine

Pneumatic
– Pneumatic Fundamentals

Electropneumatic
– Electropneumatic Fundamentals

Automation Fundamentals

Automation Fundamentals Industry
– Commissioning the SkillsConveyor (unmounted)
– Hard-Wired Programmed Control (Industry)
– AC Motor Control (Industry)
– Basics of PLC Programming LOGO!
– Basics of Sensors
– Basics and Applied PLC Programming S7

Automation Fundamentals Laboratory
– Commissioning the SkillsConveyor (Industry-mounted)
– Hard-Wired Programmed Control (Laboratory)
– AC Motor Control (Laboratory)
– Basics of PLC Programming LOGO!
– Basics of Sensors
– Basics and applied PLC Programming S7

Core hardware required: SkillsMagazine



Additional products for competency deep dive:
TP 101, TP 201, TP 47220, and TP 1011

Core hardware required: SkillsConveyor



Additional products for competency deep dive:
SkillsPackages, TP 1221, EduTrainer

→ **Get a detailed overview of the curriculum and direct links to learning paths in Festo LX**





I4.0-Related Technology Topics

Fundamentals of Smart Automation Technology
– Basics Sensors and Actuators
– Introduction to Industry 4.0
– From Object ID to Product Memory with RFID
– Plant Visualization with HMI
– Smart Sensors for Smart Systems

Smart Safety and Maintenance Technologies
– Basics Pneumatics
– Basics of Machine Safety
– Introduction to Industry 4.0
– Smart Maintenance

Modern Control Technologies for Intelligent Systems
– Basics of PLC Programming
– System Expansion
– Introduction to Industry 4.0
– PLC Programming for Smart Systems
– Artificial Intelligence in Production

I4.0-Related Infrastructure Topics

Industrial Communication and IT Security
– Industrial Communication with PROFINET
– Industrial Communication with OPC UA
– Plant Control and Commissioning with MES
– Energy Efficiency in Production
– IT-Security for Production Systems

Mobile and Autonomous Robotics
– Mobile and Autonomous Robotics with Robotino 4

Core hardware required: MPS 400 Stations



Additional product for competency deep dive:
TP 1321

Core hardware required: MPS 403



Additional products for competency deep dive:
Energy Efficiency and IT Security packages, and Robotino

Overview of the

Electrical Technology Curriculum





Basic skills

Learning paths cover areas such as:

- Electrical and industrial safety
- Fundamentals of electricity and electronics
- Introduction to automated systems

Electrical and automation skills

Learning paths cover areas such as:

- Electrical motor control
- Industrial electrical installations
- Automation technologies
- Pneumatics and electropneumatics
- Building system technology

An adaptable qualification plan

The Electrical Technology Curriculum is a flexible, modular training program designed to equip a wide range of professionals – including electrical engineers, technicians, operators, and maintenance personnel – with the essential skills to operate, maintain, and troubleshoot electrical systems across diverse industries and applications.

It features ready-to-use, fully customizable learning paths and courses that combine digital content, hands-on equipment, and software tools, providing learners with practical experience and preparing them for real-world challenges.

Your benefits

- Discover ready-made learning paths and courses that fit right into your program.
- Speed up lesson prep with turnkey materials and activities.
- Easily see how each topic connects – with clear prerequisites and follow-ups.
- Inspire students with engaging, modern resources and learning tools.
- Measure progress with assessments.
- Stay ahead with up-to-date, industry-aligned teaching.

→ **Get a detailed overview of the curriculum and direct links to learning paths in Festo LX**





Advanced electrical and automation skills

Learning paths cover areas such as:

- Condition monitoring and maintenance
- Advanced electrical motors and drives
- Power electronics
- Power supply quality
- Advanced industrial automation

Specialized skills

Learning paths cover areas such as:

- Power generation, transmission, and distribution
- Renewable energy systems
- Process automation

Various learning systems are integrated into the learning paths of the Electrical Technology Curriculum.
Among the main ones are:

- Electeo, for learning the fundamentals of electronics and electricity
- The EMS – whether in the EMS A4 or EMS Classic version – for exploring electromechanics, power electronics, and more
- SkillsConveyor, for applying electrotechnology in factory automation









Portable Learning Systems

Small Size, Big Learning

Are you facing challenges like remote learning needs, limited lab space, or budget constraints? Training systems housed in suitcases offer a practical solution in a compact format without compromising on educational value. Discover our selection of learning suitcases that combine convenience and quality!

Electrotechnology



Basic Motor Controls
TP 1221-P conveys the fundamentals of industrial electric motor control technology and how to install, test, and troubleshoot the most common motor controllers.



Variable-Frequency Drives
LV 3356 * introduces students to motor drives, VFD operation with basic and advanced control functions, load types and control methods, and troubleshooting.



AC/DC Fundamentals
LV 3351 * includes a range of common electrical components in AC and DC electrical circuits to introduce students to all the essential concepts of electricity.

Industrial Mechanics



Exploring Mechanisms
LV 3342-A * introduces students to the world of mechanical power transmission by the study of basic principles and simple machines.

Programmable Logic Controllers



Advanced PLC Programming
LV 3355 enables students to grasp PLC operation and addressing, and to program in four languages. With a Siemens S7-1200 or an Allen-Bradley * CompactLogix.



Allen-Bradley MicroLogix 1400
LV 3240-E * helps students learn to operate, program, and troubleshoot a basic PLC-controlled system.

Fluid Power



Pneumatics
TP 101 America fosters essential knowledge of basic pneumatic systems.



Electropneumatics
TP 201 America builds on TP 101 to convey the fundamentals of electropneumatics.

Note: Products marked with a * cannot be sold or delivered in countries that require CE compliance; please check with a sales representative for details.

MecLab

Introduction to Mechatronics

Introducing beginners to mechatronics can be challenging: abstract concepts, complex systems, and limited hands-on experience often slow progress. MecLab addresses these challenges with a structured, practice-oriented learning system that makes automation tangible from the start.

The three MecLab stations represent simplified models of typical production processes found in automated factories and are built exclusively with industrial components.

MecLab stations can be used individually or combined with one or two additional stations to create flexible training scenarios.





Control with FluidSIM Light / MecLab

The MecLab stations are controlled using FluidSIM for MecLab software in combination with the EasyPort interface. FluidSIM enables the creation and simulation of pneumatic, electrical, and PLC-based control circuits.

The Stacking Magazine Station stores and separates MecLab workpieces.

Learning goals
- Fundamentals of pneumatics
- Single-acting and double-acting cylinders
- Solenoid valves and sensors (magnetic limit switches)
- Connecting tubing and wiring
- Relay control systems

The Conveyor Station transports and sorts workpieces.

Learning goals
- Control of DC motors
- Inductive and opto-electrical sensors
- Relay circuits, pole-changing circuits
- PLC programming, control with logic operations
- Structure and wiring

The Handling Station moves and assembles MecLab workpieces.

Learning goals
- Fundamentals of electropneumatics, double-acting cylinders, solenoid valves, vacuum grippers
- Magnetic limit switches
- Developing and simulating electric and electropneumatic circuits
- Relay control systems, control with logic
- PLC controllers, sequencers

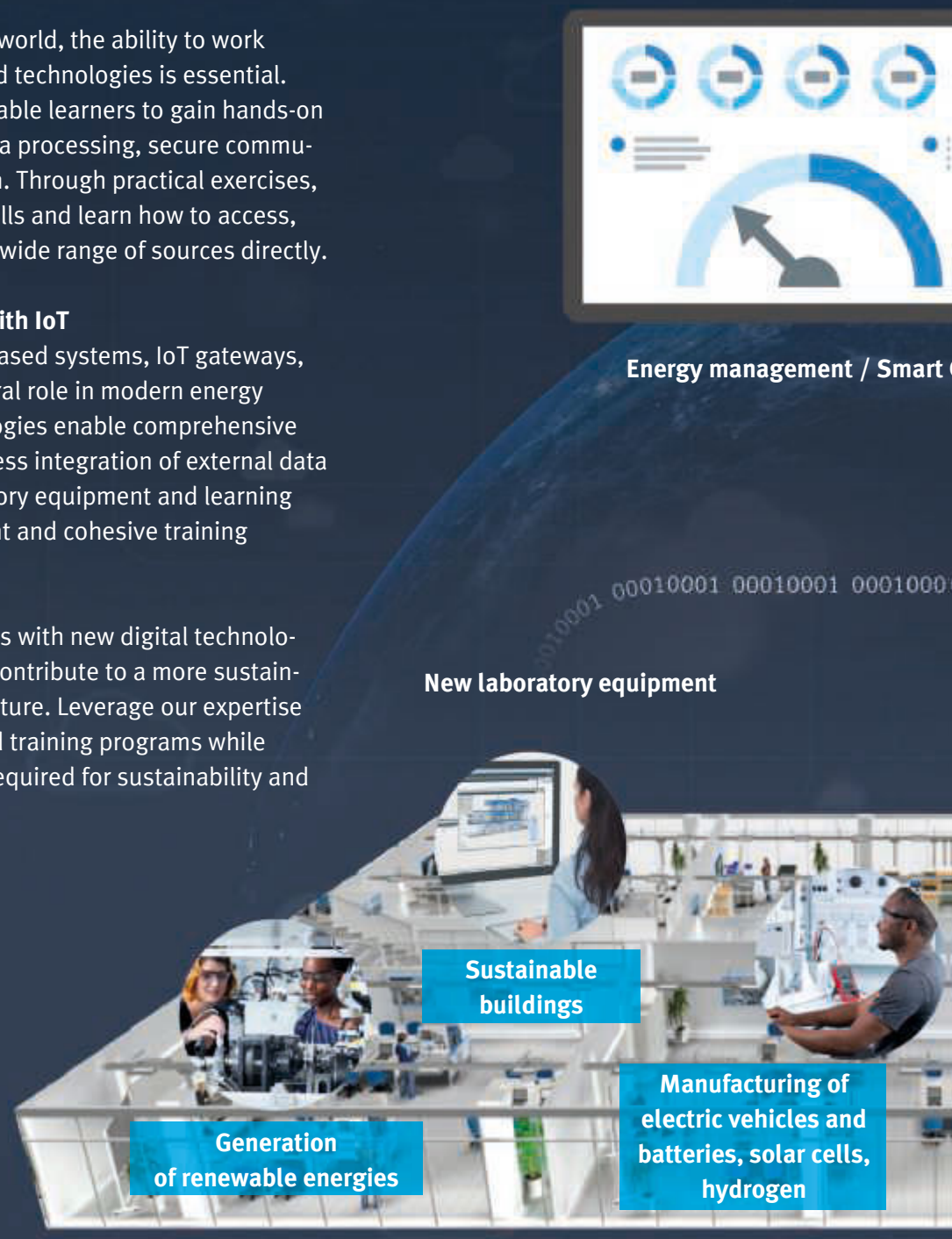
Learn more about MecLab
→ festo.com/meclab

Green Skills for Sustainability

In an increasingly connected world, the ability to work confidently with IoT and cloud technologies is essential. Our educational solutions enable learners to gain hands-on experience with real-time data processing, secure communication, and data integration. Through practical exercises, they develop future-ready skills and learn how to access, analyze, and use data from a wide range of sources directly.

Using Energy Intelligently with IoT
Connectivity through cloud-based systems, IoT gateways, and dashboards plays a central role in modern energy management. These technologies enable comprehensive data visualization and seamless integration of external data sources with existing laboratory equipment and learning systems – creating an efficient and cohesive training environment.

By connecting proven systems with new digital technologies, educators can actively contribute to a more sustainable and resource-efficient future. Leverage our expertise to enhance your teaching and training programs while fostering the competencies required for sustainability and modern industrial practice.




Take the blue path to green skills:
Explore relevant learning solutions
on our dedicated → web page
Grid
Cloud
IoT Gateway
Visualization / dashboard
00010001 00010001 10001000 10001000 10001000 10001000 10001000
Integration of existing
laboratory equipment and learning systems
Integration of data
from external systems
Sustainable
manufacturing
Water management

Renewable Energy Systems



Study the principles of solar and wind power generation



Training packages in **Solar and Wind Power TP 8012** (see page 78) is designed to support the development of skilled workers – such as electricians, renewable-energy technicians, service technicians, and electrical technicians or engineers – who are responsible for planning, installing, maintaining, and repairing residential and commercial renewable-energy systems.

Topic overview: photovoltaic panels and wind turbine generators, safety, energy storage, inverters, grid connection, network synchronization.



→ **Video**

Study the full spectrum of renewable energy – from production to grid integration



Our line of **Electric Power Technology Learning Systems** (see page 80) are built on a modular, expandable platform ideal for studying and analyzing renewable energy systems through the lens of electrical engineering principles.

Topic overview: Solar/wind/hydro power, energy storage, transmission and distribution, numerical relaying, smart and micro grid.

Note that these learning systems (LV 8010) cannot be sold or delivered in countries that require compliance to CE regulations.



Master large-scale wind power generation



→ Video

The **Nacelle – Wind Turbine Learning System** is a complete and interactive replica of the nacelle of a commercial wind turbine that demonstrates how wind energy is captured and converted into electrical power.

The nacelle and the optional pitch hubs prepare future wind turbine technicians for real-world operation, troubleshooting, and maintenance situations in a practical and safe environment.



Install and service solar thermal energy systems



The S**olar Thermal Learning System** gives students a clear, hands-on understanding of how solar heat is collected, stored, and distributed by letting them build and operate realistic heating setups – from radiant floors to solar water heaters. Main targeted skills:

- Installing solar-thermal components
- Operating solar-thermal heating systems
- Measuring system parameters
- Configuring open- and closed-loop thermal systems
- Troubleshooting and analyzing system performance



Install and service solar and wind energy systems



The **Solar/Wind Energy Learning System (LV 46120)** forms a complete, hybrid renewable energy production unit that teaches students how solar panels and wind turbines are used in today's domestic and industrial installations. Main targeted skills:

- Installing components and operating the system
- Wiring, measurement, and data logging
- Diagnosing and repairing system faults
- Understanding system efficiency and power flow

Note that the learning systems (LV 46120) cannot be sold or delivered in countries that require compliance to CE regulations.



Semiconductor Manufacturing Training

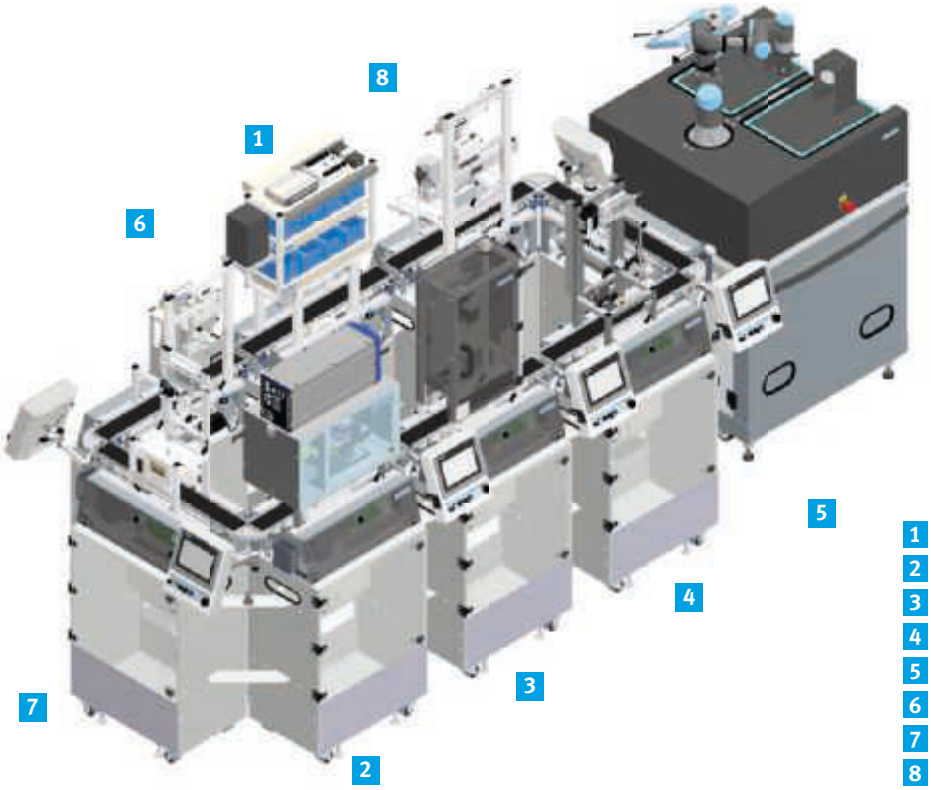
Semiconductor production demands a highly skilled workforce – are your training programs keeping pace? Our learning solutions equip students with the competencies required to thrive in today's highly automated and digitized fabrication environments.

With classroom-ready tools that immerse learners in semiconductor-specific processes, you can bring industry-relevant training directly into your school or training center – and transform learners into in-demand technical talent ready for the fab floor.



The Core: CP Lab for Semiconductor NEW

The CP Lab is a well-established Industry 4.0 learning factory, adaptable to a wide range of training needs and technical topics. With its new semiconductor-specific modules – such as Wafer Laser Engraving, Electrostatic Discharge (ESD), and Robot-Assisted Wafer Handling – it becomes an ideal platform for comprehensive semiconductor manufacturing training.

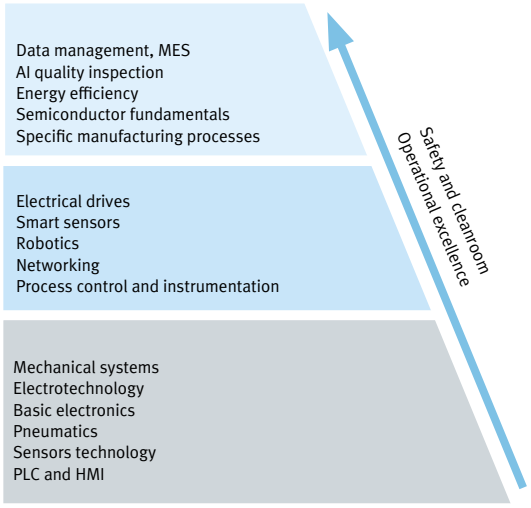


→ See it in action

The complete system includes:

1. CP Application i-Pick (pick by light) Waver
2. CP Application Wafer Laser Engraving **NEW**
3. CP Application Vision Control Camera with AI/ ML
4. CP Application Electrostatic Discharge (ESD) – **NEW**
5. CP Cobot Station UR3e for Wafer Handling – **NEW**
6. CP Application Magazine
7. CP Application Press
8. CP Application Workpiece Output





The Semiconductor Learning Path NEW

Training on the CP Lab system is supported by a comprehensive series of Industry 4.0 and semiconductor-specific courses, all accessible through the Festo LX digital learning portal, such as:

→ **Explore the path**



Electrostatic Discharge and Ionization Management in the Semiconductor Industry



Wafer Handling in the Semiconductor Industry



Industrial and AI-Supported Image Processing in the Semiconductor Industry



Data Management and Visualization in the Semiconductor Industry with Festo AX



Smart Cleanroom in the Semiconductor Industry



Environmental Control in the Semiconductor Industry

Learn more about industry characteristics on skills requirements and explore relevant learning solutions on our dedicated → web page

Furniture for Learning Environments

Create Customized Learning Rooms

Flexible learning spaces help teachers and students learn individually and in a self-directed way. Whether for team projects, interdisciplinary collaboration, or hybrid learning, well-designed spaces adapt to any requirement – independent of the technology used. To support this level of flexibility, we offer furniture lines developed specifically for technical training labs, with both fixed and modular workstations to match your needs.



elneosLine

Many innovations have been integrated into the elneos workstation and the elneosLine furniture system, including the profile system, structural frame, and workstation lighting. elneosLine brings high flexibility, modularity, functionality, and safety to your learning environment – and also stands out with its modern, timeless design. Color accents give the workstation system a contemporary, distinctive look.

Learnline

With our Learnline workstation system, you can choose either mobile or stationary configurations. The profile columns serve as Quick-Fix compatible mounting surfaces for both fluid and electrical engineering. The continuously adjustable profile plate ensures optimal use of space, and each workstation can be configured entirely according to your needs. Thanks to the integrated supply channel in the frame, all essential interfaces are positioned ergonomically within reach.

* This product may not be available in all countries.

TecDesign

With the TecDesign ceiling system, power, compressed air, and data connections are provided directly at the learning station, eliminating tripping hazards, tampering, and unauthorized use. Energy-efficient LED lights can be integrated into the system, removing the need for separate room lighting.

* This product may not be available in all countries.



flexible

Frameline

With the versatile Frameline furniture, the focus is on quick and straightforward adaptation to any room layout. Thanks to short setup times and the optional TecDesign ceiling system, subject changes can be carried out within minutes. The frames are height-adjustable, mobile, and complemented by mobile storage units. Individual – flexible – cost-efficient.

WorldSkills Competition Equipment

Train Like a Champion

Many of our learning systems are used in WorldSkills and EuroSkills competitions, where future skilled workers and technicians prove their abilities under demanding, industry-realistic conditions. Training on the same competition-grade equipment gives your students access to internationally standardized tools, builds their confidence, and helps them develop the skills expected of top performers worldwide.



Mechatronics
Skill 04

This competition challenges mechatronics technicians to design, assemble, program, and optimize automated production systems. Working with realistic industrial scenarios, they integrate mechanical, electrical, and pneumatic components, configure sensors and actuators, program PLCs, commission systems, and systematically troubleshoot faults.

Since 1991, competitors in this skill have been working on the modular production system **MPS** (see page 48). The MPS stations are used because they mirror real automated production worldwide.



Industry 4.0
Skill 48

This competition challenges aspiring digital production systems technicians to work at the leading edge of smart manufacturing. They implement Industry 4.0 in data-driven production environments by combining software and hardware that rely on industrial communication standards, MES, and IIoT platforms.

Competitors' skills are put to the test on our **CP Lab** (see page 30). They integrate sensors, actuators, and controllers – RFID systems, vision sensors, drives, PLCs, IO-Link devices... – configure networks, manage data acquisition and analysis, ensure cybersecurity, and more.



Water Technology
Skill 55

This competition challenges water engineering technicians to handle realistic industrial scenarios: monitoring process variables, adjusting control parameters, ensuring water quality, and troubleshooting automated water treatment systems in line with safety, hygiene, and environmental regulations.

Competitors perform hands-on tasks such as configuring sensors and actuators, tuning control loops, monitoring and recording process data, and diagnosing and correcting faults using our **EduKit PA** (see page 86) and stations from the **EDS Water Management** system (see page 91).

→ **Festo LX**

See tasks from previous competitions: Create your account on Festo LX and download the PDFs for free!

worldskills
Global Premium Partner





Renewable Energy
Skill 62

During this competition, future renewable technicians design small grid-tied and standalone systems including energy storage, install and configure photovoltaic, wind, and energy storage equipment, connect installations to the electrical grid, integrate monitoring, and then test, commission, and optimize performance.

To test their wind power skills, competitors typically perform realistic maintenance, fault-finding, and control tasks on our **Wind Turbine Nacelle Learning System** (see page 21).

… and other skills

Festo Didactic is also involved in other skills competitions, such as Industrial Mechanics Skill 01 and Industrial Control Skill 19.

For these skills, Festo provides competitors with **FluidSIM** (see page 53), **fluid power training packages** and workstations (see page 54), as well as the **Mechanical Drives Learning System** (see page 64).

Pictures on these two pages are a courtesy of WorldSkills International.

Lifelong Learning

Workforce Development

The continuous development of employees is essential for strengthening innovation, competitiveness, and long-term growth. As technology evolves rapidly and new roles emerge, employees must keep expanding their technical knowledge, problem-solving abilities, and key soft skills to stay prepared for the future.

Festo Didactic supports this transformation with a comprehensive training portfolio that helps learners build and deepen the skills required in modern industry. Through our close collaboration with Festo Automation, we gain direct insight into real industry challenges, enabling us to offer targeted, practice-oriented seminars.

Using state-of-the-art, fully integrated learning solutions, we help ensure workforce employability and productivity. Our programs cover core technologies such as factory and process automation and combine technical training with cross-disciplinary skills like process optimization, leadership, and communication for a truly holistic learning experience. Our expert trainers deliver content precisely tailored to each target group.

Our offering

The goal is maximum value creation. This can be achieved through training in various topics.



Technology
Development of technical competencies: core technologies of factory and process automation



Organization
Driving continuous improvements forward: strategic planning and process optimization along the value chain



People
Development of behavior and attitude: teamwork, communication skills, and leadership qualities



Innovation
Development of competencies for tomorrow: learning, leading, being prepared for future production in the context of Industry 4.0



Topic overview

- Pneumatics/hydraulics
- Industrial controls
- Electric drive technology
- Electrical engineering and electronics
- Process automation
- Factory automation
- Water management
- Industrial maintenance
- Supply chain management
- Lean production
- Process optimization
- Industry 4.0
- Machine safety



Expert guidance

- Public seminars – in person or online
- Company-specific training courses
- Consulting
- Individualized coaching
- Competence programs
- Business games
- Learning needs analyses, certifications, blended learning

Festo Didactic – World Leading Technical Education Solution Provider with Industrial DNA

Improve Qualification Programs

We offer training and services that support competence development in industry as well as in initial and continuing vocational education. In doing so, we ensure that the skills required by tomorrow's industry are already reflected in today's training.



5 good reasons to qualify your employees

1. Finding and retaining the right people
2. Indivdualized life-long learning
3. Performance and motivation
4. Megatrends and new technologies
5. Training pays off!

Explore local training options near you on our → website

Start Small – Grow Big: in 3 Steps to the Smart Factory

Holistic, Modular and Expandable:
The Learning System for Industry 4.0

In the cyber-physical learning factory, Industry 4.0 becomes tangible and easy to understand thanks to the innovative interaction between people, machines, and data. “Cyber-physical” means that the communication network and the physical system merge into a single integrated unit – one of the defining characteristics of Industry 4.0.



Convey Industry 4.0 knowledge in a compact form in a benchtop device

The expandable basis for variable and extendable learning content.

CP Lab: Several CP Lab stations in an industry-related pallet circulation environment

A fully-fledged Industry 4.0 system with different modules and all necessary components to impart comprehensive Industry 4.0 knowledge – also in an industry-related pallet environment.

CP Factory: The universal Industry 4.0 research and learning platform

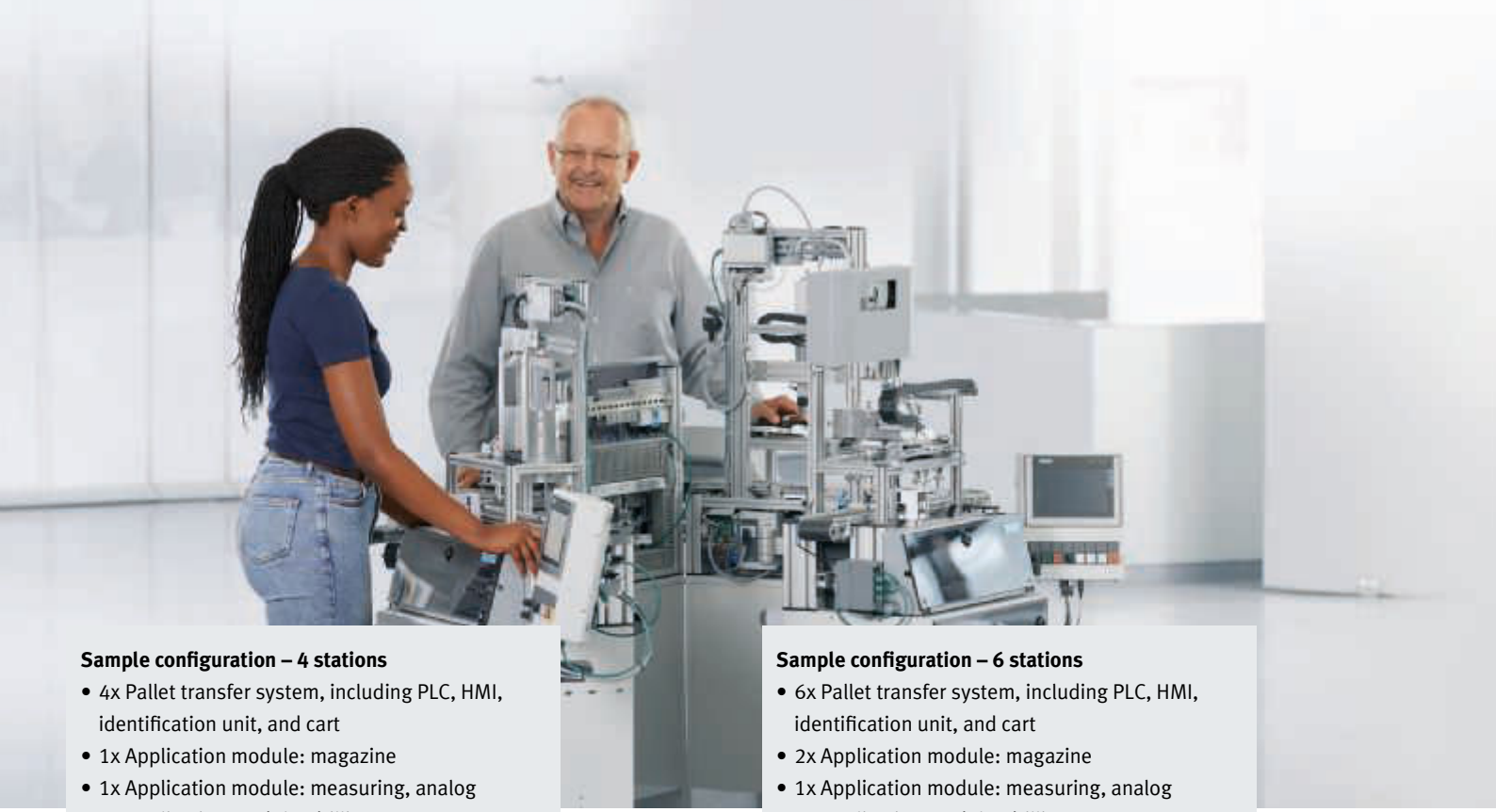
Model representation of the stations of a real production system – due to its adaptability and expandability, it represents many areas of the Industry 4.0 value chain.

Explore all our learning factories on our → website

Factory Automation and Digitalization

CP Lab: Your Introduction to Smart Manufacturing

This Industry 4.0 learning factory covers all key production processes, including separation, machining, and assembly. Individual orders from the MES are processed on dedicated conveyor systems, with lot-size-one production as the standard. Each conveyor can also be used independently as a commissioning and programming workstation. Additional project workstation features include RFID-based information transfer, MES system application (product and work plan definition), quality management, and statistical process control (SPC).



Sample configuration – 4 stations

- 4x Pallet transfer system, including PLC, HMI, identification unit, and cart
- 1x Application module: magazine
- 1x Application module: measuring, analog
- 1x Application module: drilling
- 1x Application module: workpiece output
- 1x MES with 6 network licenses
- 1x Digital twin with CIROS, including 6 network licenses for students
- 1x Model library

Sample configuration – 6 stations

- 6x Pallet transfer system, including PLC, HMI, identification unit, and cart
- 2x Application module: magazine
- 1x Application module: measuring, analog
- 1x Application module: drilling
- 1x Application module: press
- 1x Application module: workpiece output
- 1x MES with 6 network licenses
- 1x Digital twin with CIROS, including 6 network licenses for students
- 1x Model library





Factory Automation and Digitalization

Artificial Intelligence and Machine Learning in Production



→ Video



CP Lab 4 with collaborative robot handling, artificial intelligence (AI) and machine learning (ML)

Two learning levels are supported:

- Level 1: Object recognition with the cobot camera (e.g., recognizing a hand). Basic understanding and use of AI applications.
- Level 2: Camera-based collaboration between cobot and worker. The cobot learns to interact and place workpieces into a worker's hand.

Sample configuration

- 4x CP Lab conveyor belt
- 1x UR3e station with camera and ML for collaboration with workers
- 1x intelligent drilling application module
- 1x magazine station with fill level sensors
- 1x muscle press station
- 1x production control PC for CP Lab
- 1x FactoryViews MES4, webshop licenses
- 1x Festo Smart Maintenance Kit
- 1x CIROS simulation software package

AI in Production with Industrial Intelligence



The learning factory demonstrates how machine learning supports the production process and serves as a platform for teaching and research in the field of AI in production.

CP Lab 6 with collaborative robot handling, artificial intelligence (AI) and machine learning (ML)

Three learning levels are supported:

- Level 1: Basic understanding and application of AI, e.g., detecting an anomaly in oven consumption.
- Level 2: Basic understanding of machine learning, including training a network, interpreting key figures, and optimizing ML applications.
- Level 3: Advanced machine-learning use, including understanding and modifying underlying algorithms for further optimization.

Identify problems before they occur – with predictive maintenance, quality and energy

Learning about AI in production with Industrial Intelligence is essential, enabling companies to act proactively rather than reactively. With Festo AX Industrial Intelligence and real-time data analysis, issues such as downtime, quality losses, and energy inefficiencies can be detected early. Integrating Festo AX into training and operations prepares organizations for a more efficient, cost-effective, and sustainable future.



Sample configuration

- 6x CP Lab conveyor belt
- 1x UR3e station with camera and ML for collaboration with workers
- 1x filling station for plastic tablets
- 1x camera station with ML
- 1x magazine station with fill level sensors
- 1x station for muscle presses
- 1x heating tunnel station
- 1x production control PC for CP Lab
- 1x licenses FactoryViews MES4, webshop, energy, machine learning
- 1x Festo AX
- 1x single-phase energy measurement box
- 1x IoT gateway
- 1x accessories for anomaly detection

Workstation Machine Learning



Artificial Intelligence (AI) and Machine Learning (ML) are increasingly and inexorably being used in more and more industrial application areas: whether for optimizing production processes, for minimizing resource consumption or for quality assurance.

Immerse yourself in this fascinating world with the “Machine Learning Vision” package! The application scenario used is the optical quality inspection of an application module. The learning system guides you through the typical processing steps, starting with the acquisition, storage, and preprocessing of the relevant data, the selection and training of a suitable AI/ML method, through to deployment in the actual application.

Example setup

- CP Lab camera module ML
- High-performance compact computer
- Workpiece carrier including pallet
- Front and rear shells in black, blue, red, grey
- 4 circuit boards
- 1 set of fuses
- Software tools as well as prepared data sets
- Teaching scenarios on fundamentals and application examples



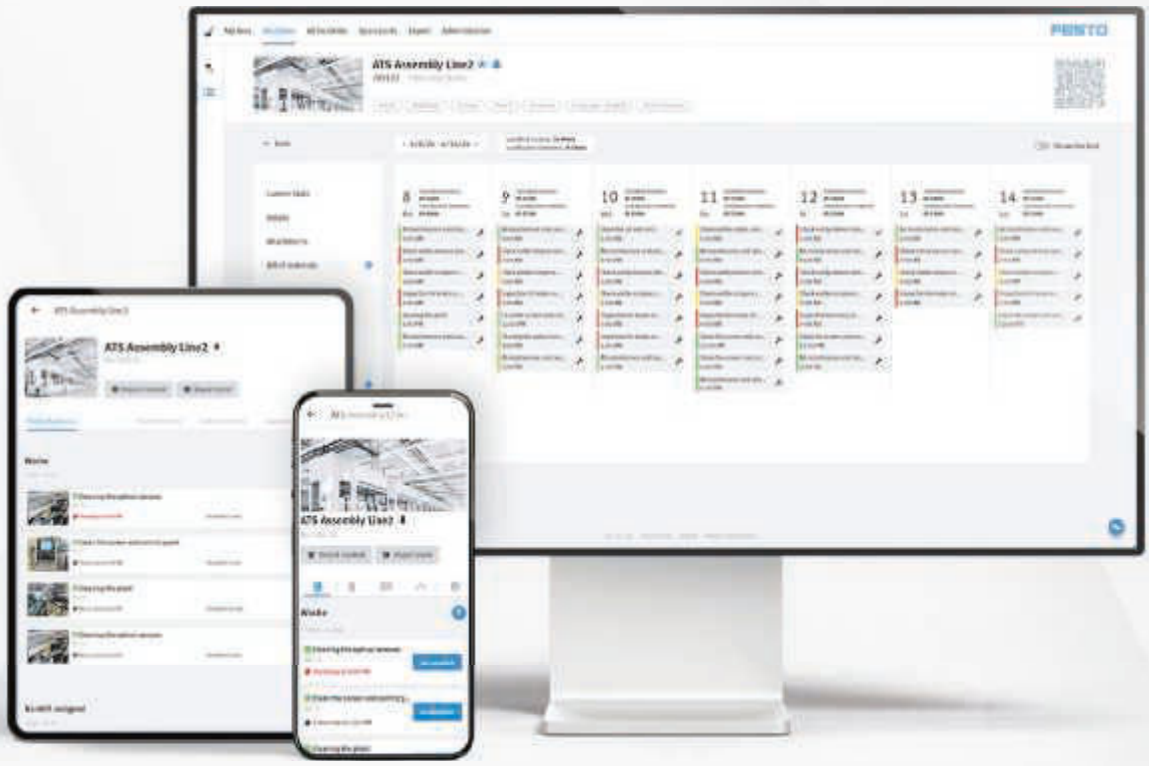
Festo AX Smartenance Education

Maintenance and servicing software (CMMS)
Efficient and transparent maintenance with Festo AX Smartenance Education. Would you like to have transparency regarding your systems at any time and from anywhere, increase their availability, and optimize maintenance? With the maintenance software Festo AX Smartenance Education, you minimize downtimes, optimize maintenance processes, and increase productivity. Improve your maintenance and servicing management and gain transparency regarding your systems.

The maintenance software from which your team benefits: Festo AX Smartenance Education is CMMS (Computerized Maintenance Management System) software and combines maintenance, maintenance management, and machine logbook in a single solution. Through the web application for maintenance or production managers, as well as the mobile app for maintenance technicians and machine operators, all relevant information about a machine can be accessed at any time and from anywhere.

Your advantages
- Fewer unplanned downtimes through optimized maintenance
- All data available on mobile devices and in the web application
- Increased efficiency in the team and improved collaboration
- Reduced administrative effort
- Interface to SAP Maintenance Management (S4/HANA)

Use cases
- Maintenance of teaching and learning materials
- Monitoring of safety equipment
- Keeping complex systems in operation
- Handling of malfunctions
- Prevention of future malfunctions through documented lessons learned
- Spare parts management for individual or complete systems



Collaborative Robot



The relevance of collaborative robotics in manufacturing and training environments has grown rapidly in recent years. Whether it's the fundamentals of robotics, coordinate systems, intuitive operation, or teaching, collaborative robots cover a wide learning spectrum.

In our training cell, topics such as palletizing, assembly, and pick-and-place tasks are addressed in a hands-on manner. Integration of the cell into our CP systems is straightforward, and connection to the MES system enables order-based processes with batch size 1.

Learning content
- Kinematics of a 6-axis robot
- Robot programming
- Teaching positions
- Palletizing tasks
- Interfaces (to the control architecture, as well as tactile interaction with the operator)
- Safety aspects of collaborative robots

CP System Cobot – Collaborative robot
When using collaborative robots in industrial environments, a simple and intuitive human-machine interface is crucial. In this learning system, this is achieved through worker collaboration using a camera system and machine learning.

Position data of a worker, captured via a 3D camera, is used to train a machine learning approach so that the robot can be controlled without manufacturer-specific knowledge, enabling the robot and worker to collaboratively perform assembly and handover of products.

Learning content
- Collaborative Robotics content
- Communication with a camera
- Basics of Artificial Intelligence / Machine Learning / Deep Learning
- Static gesture recognition
- Dynamic gesture control

CP Robot Assistant Station UR3e M, without Robotino docking
CP Robot Assistant Station UR3e D, with Robotino docking

Cobot with Worker Collaboration and Machine Learning



The learning system demonstrates the integration of robotics and CNC technology, which can be explored through a practical example. New communication methods, such as OPC UA, enable seamless connection between the two areas. The modular system allows learners to work at individual stations and can be quickly combined into a complete system. Raw parts can be loaded into and unloaded from the CNC machine simply by tapping.

Learning content
- Worker interaction
- CNC machine loading
- Various work and safety areas
- Communication with the CNC machine via OPC UA

Equipment variant: CP System Cobot
- Robot station with UR3
- Including collaborative gripper
- 2 material boxes for palletizing exercises
- Workpieces

Expansion
- 3D camera system for hand/gesture recognition
- Learning materials on AI/gesture control

This station can also be integrated into your CP Lab environment!

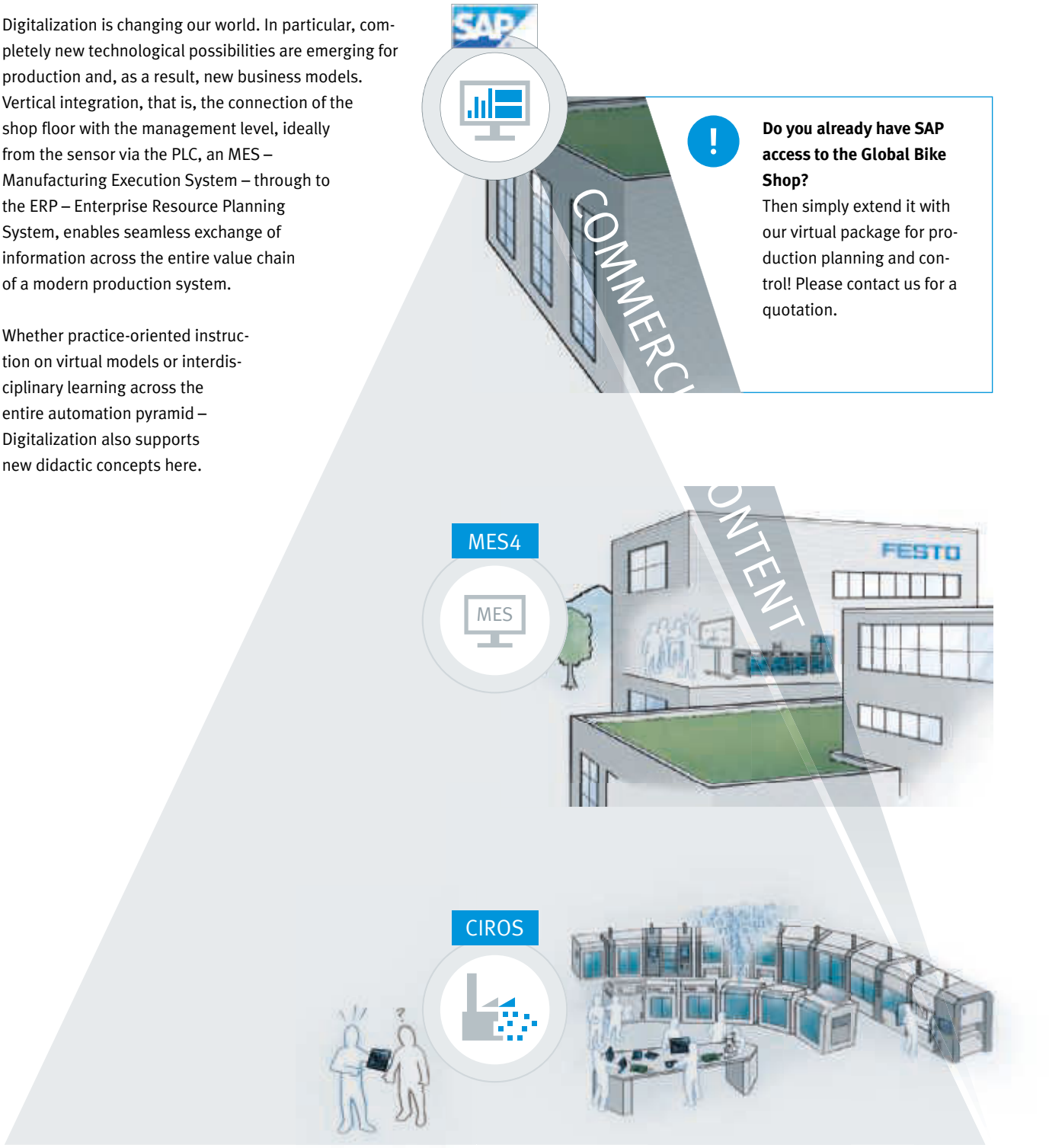
Equipment variant: Loading Cell
- UR3e robot station for handling and loading workpieces into a CNC machine

ERP System Instruction Through to the Digital Representation of the Learning Factory

Digital Learning Concepts for Vertical Integration

Digitalization is changing our world. In particular, completely new technological possibilities are emerging for production and, as a result, new business models. Vertical integration, that is, the connection of the shop floor with the management level, ideally from the sensor via the PLC, an MES – Manufacturing Execution System – through to the ERP – Enterprise Resource Planning System, enables seamless exchange of information across the entire value chain of a modern production system.

Whether practice-oriented instruction on virtual models or interdisciplinary learning across the entire automation pyramid – Digitalization also supports new didactic concepts here.



Do you already have SAP access to the Global Bike Shop?
Then simply extend it with our virtual package for production planning and control! Please contact us for a quotation.

CIROS – Digital Representation of our Learning Factories

Realistic 3D simulation of automation systems ranging from simple to very complex: you explore the motion dynamics of mechatronic systems in virtual reality. Use our digital representation to simulate your PLC programs. In CIROS you will find not only a selection of Industry 4.0 learning stations, but also a large number of PLC-controlled modules as well as robot stations.

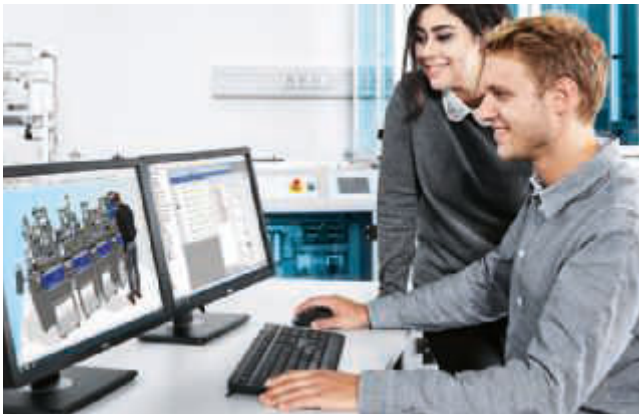


- 6x CIROS Education
- 6x Siemens TIA Portal Trainer Package
- TIA Portal V20

MES and CIROS – Fully Virtual Production Planning and Control

Connect one or more stations of the learning factory to an MES system and in this way learn new topics such as:

- Communication and networking
- Product definition: new creation, work plans
- Data management and analysis
- Analysis and optimization of production planning



- 1x MES4 for CP Lab with 6 network licenses, including 1x PC with TFT monitor
- 1x CIROS Studio with 6 Educational network licenses, the professional working tool for creating simulation models
- 1x model library incl. pre-configured learning factories

CIROS 7: New models of CP Lab and MPS

- Model streaming 360° videos, export of HTML5 animation
- Renderings optimized for Intel HD graphics cards
- New EzOPC driver

Start as a new user or ask us about upgrade options for existing licenses.

Recommended learning material

- Extension WebShop

Industrial Automation and Digitalization

Networking and Data Security



Training package “IoT Gateway”



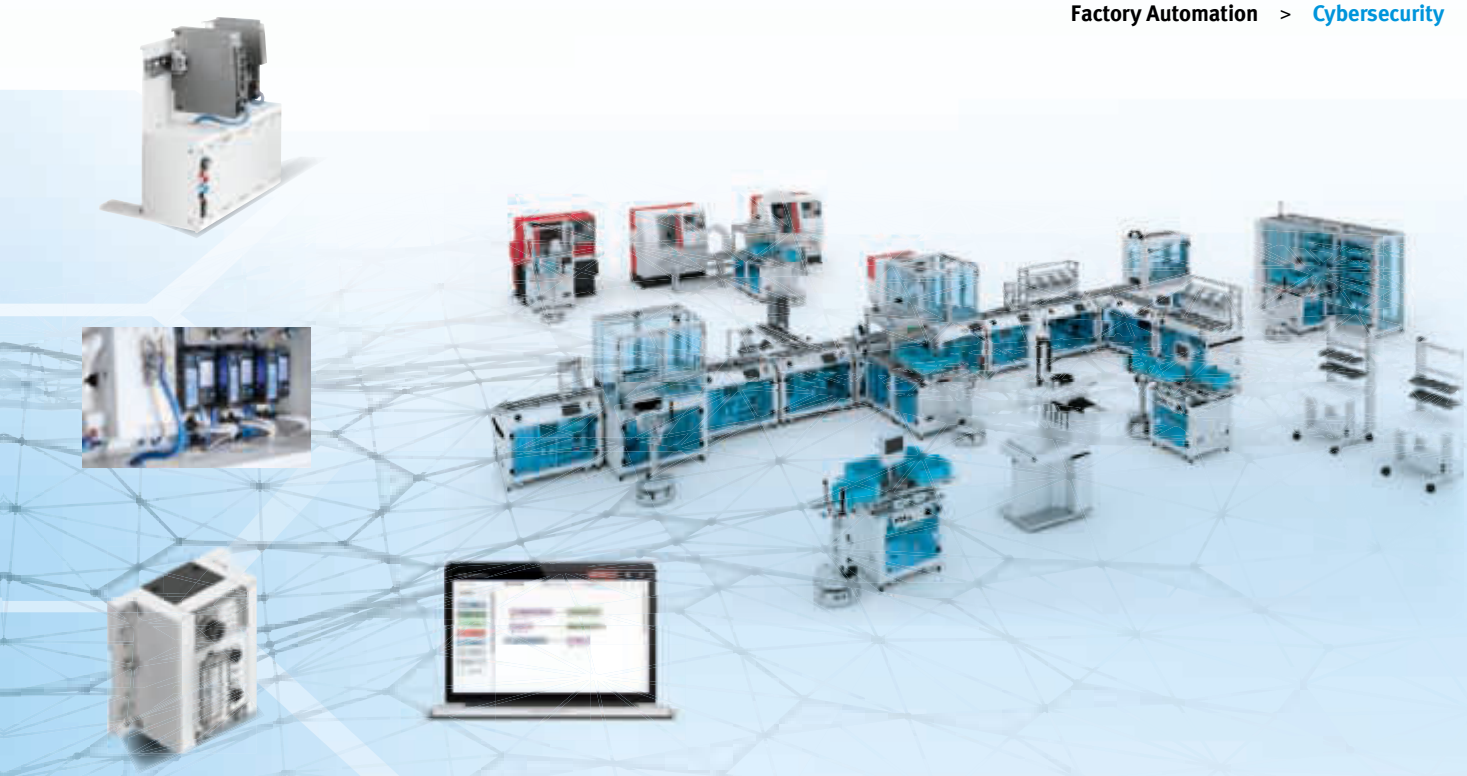
Bring your sensors “into the cloud”! Training package on cloud, MQTT, and Node-RED with practical tasks. Teach current topics such as:

- Cloud connectivity
- MQTT applications
- Edge computing via Node-RED

Theoretical fundamentals support understanding of the practical applications.

Equipment set consisting of:

- CPX IoT gateway
- 2x M12 network cable
- Mounting material



Training package “Networks and IT Security”

Training package on networking and data security with practical tasks, which are becoming increasingly important in industry:
- Network fundamentals
- High availability
- Segregation of networks
- Remote access

Theoretical fundamentals complement the tasks precisely. Prepared software setups and example solutions optimize learning in the laboratory.

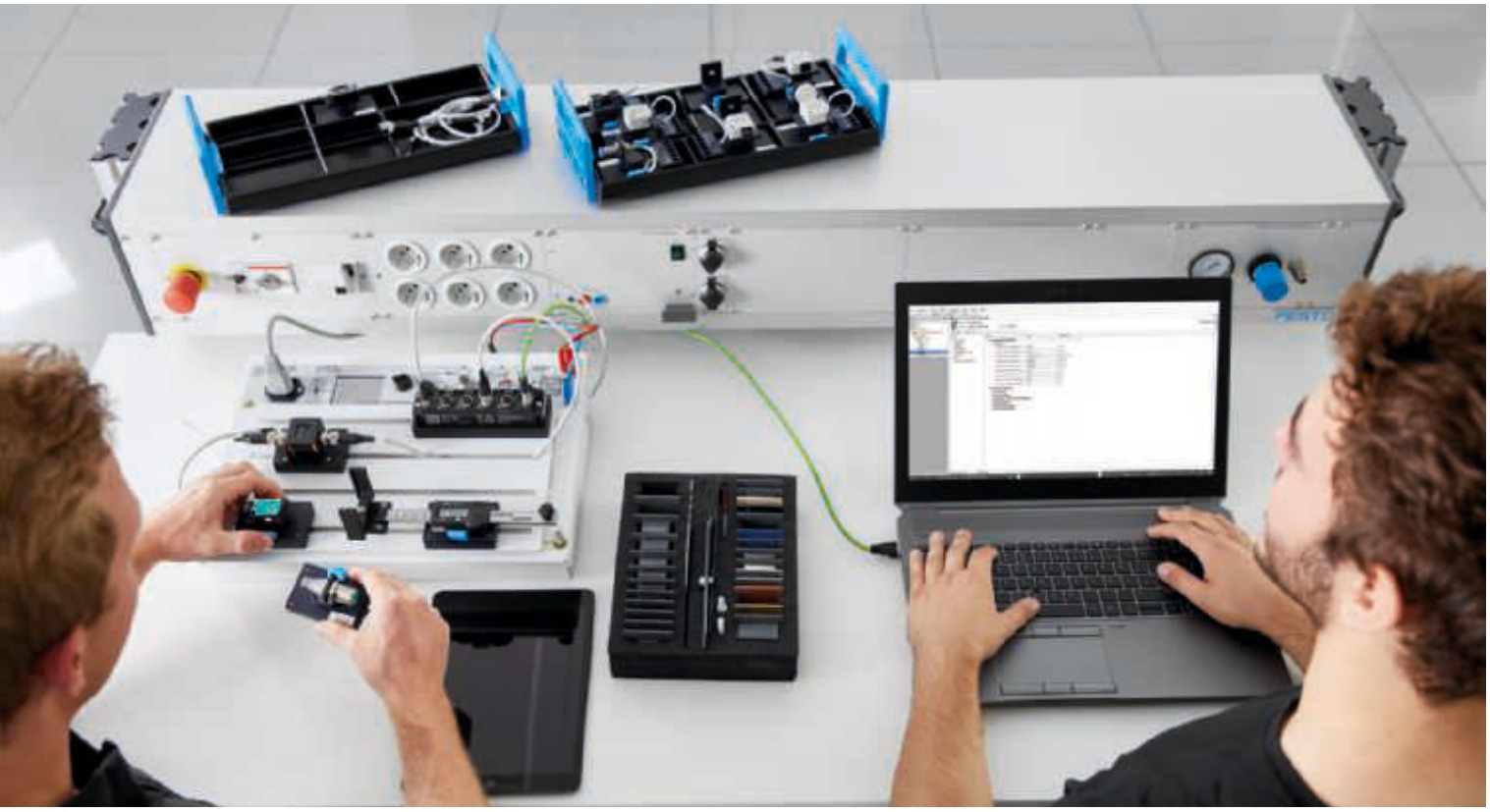
Training package TP 1333 consisting of:
- 2 EduTrainer with Siemens router and switch
- Ethernet cable set



Expand your existing systems with NetLab:
Convey all content on the topic of networked automation systems in a practical manner directly on your system. **Pre-configured scenarios support the representation of realistic environments**.

Available for CP and MPS.

Sensor Technology



Object detection is one of the most important applications in automated systems. With **TP 1311** students learn to:

- Design, function, and characteristic values of sensors for object detection
- Connection and circuit technology
- Influence of shape, material, surface, and color on the switching behavior of sensors
- Terms for describing characteristic values and functional behavior
- Design of logical interconnections
- Sensor selection according to boundary conditions

Smart sensors process standardized electrical signals using a microprocessor. Information on the type, condition, and location of the sensor is additionally provided by smart sensors via the serial bus, such as IO-Link. With **TP 1312** students learn to:

- Design, function, and characteristic values of smart sensors
- Selection of the right sensor for the right application
- Using the appropriate software tools
- Setting up communication via IO-Link
- Installing, connecting, and parameterizing IO-Link sensors
- Defining predictive maintenance factors
- Troubleshooting a defective sensor
- Monitoring the status of a sensor in an application
- Integrating smart sensors with IO-Link into a PLC program
- Use of smart sensor technology in the context of Industry 4.0

- Equipment sets TP 1311 and TP 1312
- Sensor workstation

PLC Programming



Local network with PLC, switch, HMI and PC
- Create visualizations using graphics and text
- Creation of functions and function blocks
- Programming sequential function charts for sequence controls
- Operation and monitoring using the Siemens HMI KTP700
- Creation of alarm function blocks
- Creation and configuration of networks
  - Addressing
  - Fault detection



Basic PLC training
- Structure and function of PLCs
- Operation of the TIA Portal
- Programming languages according to DIN EN 61131
  - Number systems
  - Addressing
  - Operation blocks, function blocks, functions
  - Logical operations
  - Counters, timers, clock generators
- Checking I/O signals with a multimeter
- Optimization of programs

Example setup
Training Station Networking–Visualization
- 6x EduTrainer Universal S7-1512C
- 6x Touch Panel KTP700 EduTrainer
- 6x Ethernet Switch XB005 EduTrainer
- 6x TIA Portal, WinCC Basic

EduTrainer Universal
- Use in upright or horizontal position or in the A4 frame
- 4 mm safety laboratory sockets
- Simulators for binary and analog inputs
- LED or LCD display of the binary and analog outputs
- SYSLink connection with the EasyPort model
- Robust steel housing
- EduTrainer S7-1512C

Configuration example – each EduTrainer can be individually equipped via the configurator on the website.



Also available: Advanced PLC Learning System
Help students efficiently learn PLC and HMI programming by providing hands-on experience with industrial control equipment and realistic, graphic-terminal-based examples that mirror real PLC applications. Offered in two versions: Siemens or Allen-Bradley PLC.

SkillsConveyor – the New All-Rounder

The new standard learning system for basic training in automation technology and mechatronics. Anyone who wants to succeed in the professional environment of automation technology needs solid basic competencies. The SkillsConveyor is the foundation of our solution offering for basic training in the field of automation technology. A new benchmark in modularity in terms of hardware, software, and courseware, as well as seamless integration into our curriculum, makes the SkillsConveyor the optimal basic learning system for technical education.

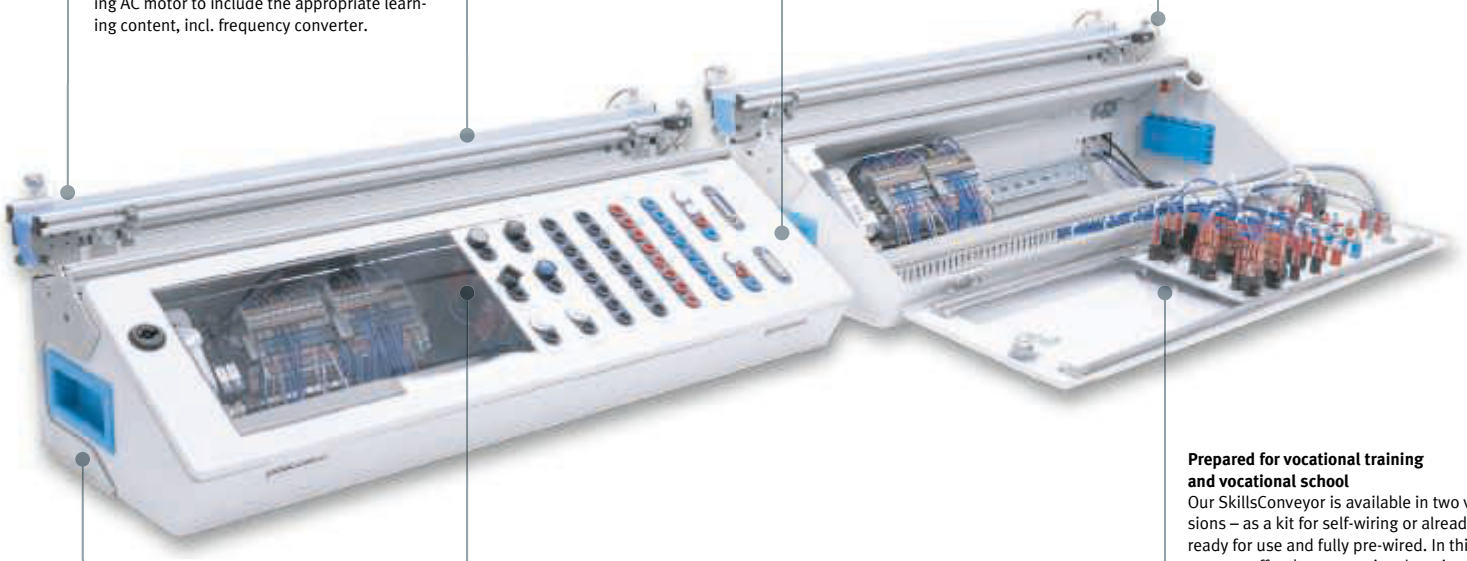
Flexible drive concepts
The supplied DC motor is connected to the SkillsConveyor via a universal flange. The motor can be easily replaced and the learning system can thus be expanded by a corresponding AC motor to include the appropriate learning content, incl. frequency converter.

Special conveyor belt
Through simple modifications the SkillsConveyor enables both the transport of individual workpieces as well as of pallets.

External controllers
Our universal interface to the control level enables different control concepts up to and including the simple integration of custom solutions.

- PLC EduTrainer
- PLC via control cabinet
- Easyport / FluidSIM®
- Simulation box I/O

Sensors and actuators
Through the simple and flexible exchange of sensors and actuatorsenable learners to quickly and easily build their own automation solutions and independently acquire new learning content.



Prepared for vocational training and vocational school
Our SkillsConveyor is available in two versions – as a kit for self-wiring or already ready for use and fully pre-wired. In this way, we offer the appropriate learning system for different time budgets and varying requirements for practical wiring skills.

Ergonomic and simple design
The removable drawer and the foldable control box ensure flexibility in handling – particularly advantageous in confined spaces. In addition, the simple design facilitates easy commissioning and ergonomic operation.

Intuitive operation and customization
Thanks to the variable labeling of the operating and signaling elements, the independent development of circuits and circuit diagrams is also enabled beyond the learning scenarios of basic education.

See more on the → **website**

Watch videos on → **YouTube**

Learning with the SkillsConveyor

The world is in a state of constant change. In order to participate actively in this process, we need innovative, creative companies. However, the introduction of new technologies is only half the battle, because we need qualified specialists who know how to use them effectively. Well-trained employees are the decisive quality factor. For the initial and continuing training of specialists, use our SkillsConveyor with the appropriate learning paths and thus secure the foundation for innovation and success.

School environment
Almost tool-free, without consumable materials

Industrial environment
for the development of manual and practical skills

Fundamentals metal technology



1

Fundamentals automation



2

For a sound and up-to-date qualification in the fundamentals of mechanics and automation, we recommend a combination of practice-oriented training with learning systems, simulation software, and appropriate eLearning courses.

Learning path "Fundamentals of automation technology"

- **Discover possible learning scenarios with the SkillsConveyor**
- **Commissioning the SkillsConveyor**
- **Relay-based control system**
- **Wiring and controlling AC Motors**
- **Fundamentals of PLC programming (LOGO)**
- **Fundamentals of PLC programming (S7)**

On our digital learning portal Festo LX, courses are prepared in various complementary formats:

Theory (eTheory and eLearning courses) – to ensure an easy introduction to the topic

Practice (eLab courses) – include tasks on Festo Didactic learning systems in order to understand the topic in a practical context, including an instructor guide to make it easier for teachers to use the digital courses in their lessons.

Test (learning success assessment) – to determine whether the learning objectives of the course have been achieved.

Festo Learning Experience

All available learning courses that are thematically suited to the SkillsConveyor can be found on our digital learning portal Festo LX:



Getting started with the SkillsConveyor

Commissioning of a mechatronic system (SkillsConveyor unassembled with accessories)



The conveyor belt is driven by a DC motor via a motor controller. The front contains various operating elements and sockets, which can be wired individually depending on the learning scenario. At the beginning and end of the belt there are optical sensors for the detection of workpieces. The learning contents are:

- Wiring, assembly and disassembly of mechatronic systems
- Commissioning and use of different sensors and actuators
- Sequence description with GRAFCET

Contents

- 1x SkillsConveyor unassembled – kit + systainer for shadow boards OR
- 1x SkillsConveyor assembled

Additionally included accessories:

- 1x EasyPort USB
- 1x bench power supply unit
- 1x simulation box, digital

Relay-based control and AC motor control in the training package



With this training package, realistic projects are carried out on the SkillsConveyor conveyor system. The structure, function, and areas of application of the electrical components as well as their use are taught. The correct selection of switching elements and devices plays an equally important role as the proper use and adjustment of protective devices. Using examples, the general functional principles are explained and the basic knowledge of contact-based control technology up to motor control is comprehensively conveyed.

Contents

- 1x SkillsConveyor assembled
- 1x TP 1211 equipment set: Fundamentals of contact-based circuits
- 1x AC motor (star/delta)
- 1x add-on package with 4 mm adapter cable for AC motor

Fundamentals of PLC programming with TIA Portal and S7



With this trainer package for six workstations, you receive a basic equipment set for getting started with programming in the TIA Portal with the associated actuator model. The learning content includes, among other things, the commissioning of a conveyor belt system, the fundamentals of PLC programming, and fault diagnosis on a mechatronic system and in the TIA Portal. Two simulation boxes enable learners to test the hardware in advance and to control it without programming knowledge.

Class set for 6 learners

Contents

- 6x SkillsConveyor assembled
- 6x EduTrainer PLC Siemens 1215C
- 2x simulation box, digital

SkillsConveyor application module “Sorting process”



Integrate the "Add-on SkillsPackage Distributing and Sorting" into your SkillsConveyor and benefit from fast and simple assembly. Simply connect additional sensors and actuators and use the comprehensive course material for setup and programming. This solution, which does not require compressed air and can optionally be expanded pneumatically, enhances your competencies in PLC programming, sensor technology, and analog value processing.

Contents
- 1x workpiece feeder
- 2x sorting chute
- 1x sensor mounting frame
- digital and analog sensors

Training package for electronics technicians for automation technology – a continuous learning concept up to the AP1



The learning package for expanding the SkillsConveyor consists of a control cabinet and various mechanical, electrical and pneumatic components as well as sensors for setting up various relay-based (VPS) and motor control systems. The PLC that can be installed in the control cabinet and the frequency converter can be used to control the SkillsConveyor. Electronics technicians for automation technology can therefore use the combination of control cabinet, actuator model and AC motor very effectively for AP1.

Contents
- 1x control cabinet
- 1x PLC Siemens 1512C with software
- 1x frequency converter SINAMICS G120
- 1x AC motor (star/delta)
- 1x test kit EAT AP1 actuator model

Machine learning in automation technology



This learning package covers the use of the SkillsConveyor in combination with artificial intelligence and machine learning. The learning objectives include the application of artificial intelligence and machine learning in image processing, the use of convolutional neural networks, supervised machine learning, and computer vision for image classification. In addition, users learn how to upgrade existing systems with IoT technology. The kit offers practical application options for solving real-world problems.

Contents
- SkillsConveyor assembled
- Bench power supply unit
- EasyPort USB
- Introduction to Machine Learning, IoT Kit

MPS – Mechatronics for World Champions



Our MPS 400 all-round learning factories are the right choice for those who wish to convey a large amount of learning content in a very small space, supported by numerous learning materials. They are based on single workpiece flow and cover not only a broad spectrum of state-of-the-art Industry 4.0 content, but also the fundamentals of mechanics, mechatronics, and automation. Using modular system components, learning factories can be assembled for various occupational and training profiles and form the basis for the WorldSkills competition in the field of mechatronics.

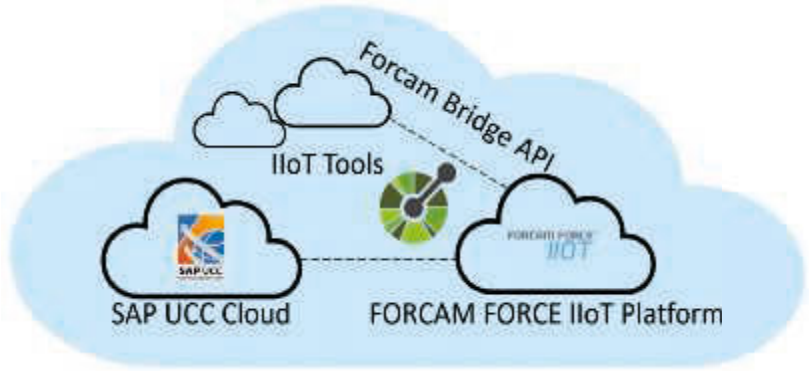
MPS 403-1 / MPS 403-1-R

Compact All-Round Learning Factory for Mechatronics and I4.0



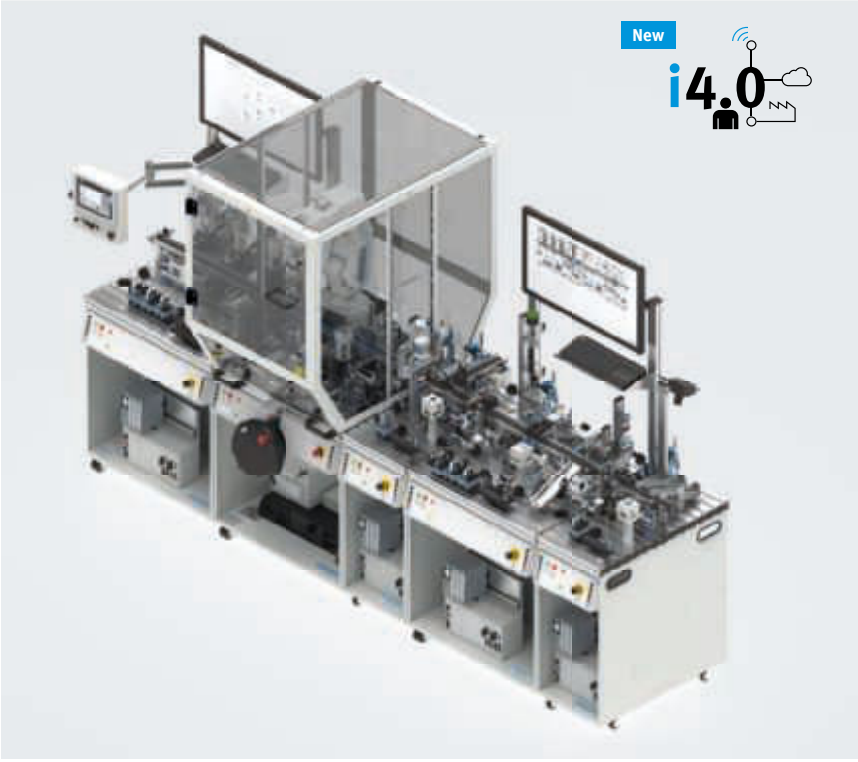
Learning content

- Networking of multiple stations, controllers and I/O units with an MES-centered software environment via network-based protocols (OPC UA, IO-Link, PROFINET, TCP-IP, Node-RED)
- Programming of industrial touch panels and introduction to modern human-machine interfaces, such as augmented reality and web interfaces
- Introduction to new business models through IIoT retrofitting using web interfaces
- Introduction to new business models through IIoT retrofitting using a webcam and single-board computer, as well as the application of algorithms from the field of machine learning
- Manufacture of customer-specific products through Webshop-induced production orders
- Vacuum and parallel gripper technology as well as conversion of production systems



MPS 405-R

Productivity, Efficiency, Cost-Effectiveness



Learning content overview

- Networking multiple stations, controllers, and I/O units with an MES-centered software environment via network-based protocols (OPC-UA, IO-Link, PROFINET, TCP-IP, Node-RED)
- Programming industrial touch panels and gaining familiarity with modern human/machine interfaces such as augmented reality and web interfaces
- Familiarity with RFID and network technology, and intelligent IO-Link–based sensors
- Learning about new business models using IIoT retrofitting by means of a webcam and microcomputer, as well as learning the use of machine learning algorithms
- Production of customized products using production orders developed through an online store
- Vacuum and parallel gripper technology as well as retrofitting production plants
- Capturing source data for statistical process control (SPC)
- Tactile height measurement and weighing technology with strain gauges and measurement amplifiers



IIoT retrofitting
An IIoT solution based on a small computer and a webcam opens up new perspectives for learners regarding innovative business models by retrofitting existing industrial systems. State-of-the-art technologies and algorithms from the field of machine learning are used in the process.

TP 1321 Machine Safety

What is important when talking about safe machines? What needs to be considered? Use this equipment set to learn the fundamentals of machine safety:

- Hazards and safety in operation (labelling, safety concepts, risk analysis)
- Emergency stop / emergency off
- Two-hand safety control
- Securing access to the machine
- Enabling switch
- Non-contact protective devices (light grid/light curtain)

The equipment set consists of the following components:

- 1x base frame with associated switch plates
- 1x safety relay PNOZ4.1 in A4 module
- 1x two-hand relay PNOZ6.1 in A4 module
- 1x door for mounting various safety devices
- 1x safety switch without interlock
- 1x safety switch with interlock
- 1x non-contact safety switch
- 1x magnetic guard locking device
- 1x position switch
- 1x sliding door with position switch
- 1x enabling switch
- 1x M12 adapter – 4 mm safety socket
- 1x multifunctional signal lamp
- 1x M12 cable set



3D Simulation of Systems, Controllers and Robots with CIROS

CIROS supports training in

- PLC programming
- Mechatronics
- Troubleshooting in mechatronic systems
- Robotics
- Robot programming
- Modelling
- Mobile robotics – autonomous transport systems
- Commissioning and optimization of automated systems
- Manufacturing Execution System through the provision of virtual flexible production systems

Learning scenarios

Robotics training

As typical equipment for a robotics laboratory, we recommend real robot workstations, for example the MPS Robot Station with the optional expansion stages, as well as CIROS Education and CIROS Studio as a virtual learning environment for the simulation of various industrial robotics applications.

Learners can program offline and test the programs safely in the simulation. With CIROS Studio, the tested programs can be loaded into the real robot and commissioned. The models in CIROS Education are digital twins of the real robot workstations from Festo Didactic.

PLC training

With the virtual MPS stations in CIROS Education, systems are available for different training levels in PLC technology. The models can be connected directly to the TIA Portal or via the EasyPort interface and controlled by a real PLC. The fault simulation extends the training content with strategies for fault localization and troubleshooting.

System simulation
Fault simulation
Control simulation
Robot simulation
Model explorer
CIROS
Mechatronics simulation
Model editor
Extensive model libraries
Robot programming



CIROS Education
- Robotics – fundamentals and programming
- PLC programming in conjunction with TIA Portal, CODESYS
- Fault finding in models
- 3D real-time simulation incl. physics, sensor, transport and fault simulation
- OPC and MES interface
- Model editor, model library
- Storage function for programs and position lists

CIROS Studio
- Functionality similar to CIROS Education
- 3D modeling (CAD import, CAD functions, libraries)
- Storage function for models
- Online interface to Mitsubishi robots
- RCI Explorer for analysis and parameterization of the drive unit

CIROS Education
- Approx. 150 models ready for immediate use
- 6x licenses

CIROS Studio
- Single license
- 6x Education licenses

Robot Cell in Learning Factories



Robots take on the task of handling and assembling workpieces and assemblies in many industrial applications. Becoming familiar with these fields of application is essential for getting started in robotics. Learners have access to a comprehensive learning concept consisting of robot cells, simulation, and interactive courses. The CIROS software is used in the learning process for programming, simulation, and information. All robot work cells from Festo Didactic are available as a digital twin in CIROS.

Learning content

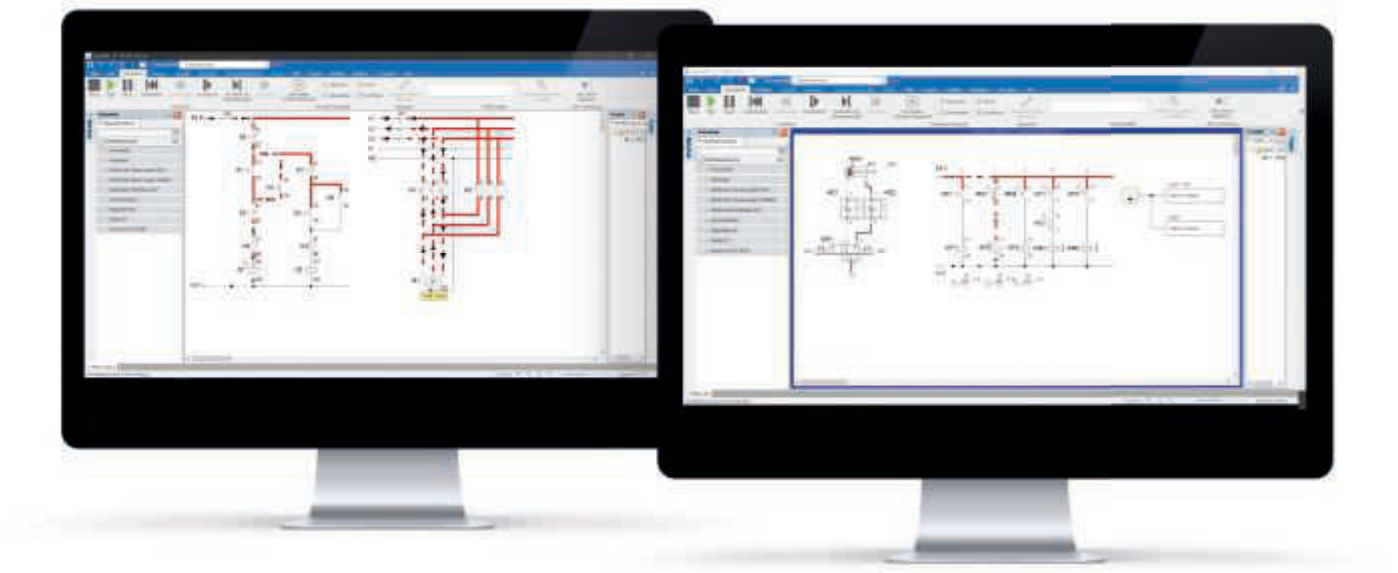
- Integration of an industrial robot into an assembly process
- Robot teaching in a complex assembly environment
- Commissioning of complex systems
- Maintenance, servicing, and troubleshooting of complex systems
- Programming industrial robots with the integration of sensors and additional actuators
- Programming multitasking applications

- MPS Robot and assembly station with industrial 6-axis robot Mitsubishi RV-2FRB
- Enclosure with safety sensors
- Workpieces
- 6x CIROS Education for programming and simulation of the cell

Are you interested in other robot systems or applications?
Please contact us to discuss all possibilities.

Design and Simulation With FluidSIM 6 and FluidSIM 365

The Right FluidSIM for Every Technology – Pneumatics, Hydraulics, Electrical Engineering



FluidSIM has been the world's leading simulation software for over 25 years, enabling the creation and simulation of circuit diagrams in pneumatics, hydraulics, and electrical engineering. FluidSIM supports the development of valuable technical competencies by allowing users to design circuits, bring them to life through simulation, and optimize them through interaction. The simulation of control systems and processes has long been an industrial standard, helping to prevent errors while increasing efficiency and quality.



PLC control with FluidSIM



Electrohydraulic drive control with FluidSIM

FluidSIM at a glance

- Learn about the effects of changes in a technical setup and observe the immediate consequences through real-time simulation
- Extensive library with pneumatic, hydraulic, electrical, electronic, and digital components
- Real and virtual measuring instruments
- Content tailored to learning systems from Festo Didactic
- Various usage options (web, Windows) and licensing options
- Rapid lesson preparation and individual learning
- Fault models for developing skills in troubleshooting and fault prevention
- Create GRAFCET diagrams and integrate them into simulations
- Lesson organization: assign learning materials to learners using expert mode
- Interfaces to practical applications in order to test theoretically acquired knowledge in practice
- Now integrated into Festo LX NEW

→ Watch FluidSIM videos

→ Try FluidSIM for free

→ See all FluidSIM details and licensing options

Stationary Workstation, Pneumatics and Electropneumatics Measurement, Control and Regulation



Convenient learning arrangement for training in pneumatics, electropneumatics, as well as in measurement and control

- Fundamentals of pneumatics and electropneumatics
- Structure and function of important assemblies
- Analyzing, setting up, and developing circuits
- Sensors for object detection and in fluid power technology
- Measuring and controlling with a PC
- Fundamentals of control engineering

Example setup

- 1x training package 101, 201, 210
- Cable sets, power supply unit
- Accessories





Also available: TP 101 and TP 201 America Portable

Convey fundamental pneumatics and electropneumatics knowledge in convenient, rugged suitcases. No special furniture required! Courseware available. FluidSIM optional. Expansion with TP 260 Digitalization in Pneumatics recommended.

Stationary Workstation, Electropneumatics Measurement, Control and Regulation

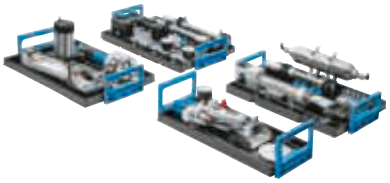


Compact learning arrangement for training in electropneumatics, measurement and control, digitalization

- Fundamentals of electropneumatics
- Structure and function of important assemblies
- Analyzing, setting up, and developing circuits
- Sensors for object detection and in fluid power technology
- Digitalization of analog state variables
- Measuring and controlling with a PC
- Fundamentals of control engineering

Example setup

- 2x Training package 201, 210
- Cable sets
- Power supply units
- Accessories



Also available: TP 101 and TP 201 America

Teach future professionals the fundamentals of pneumatics and electropneumatics with the well-known Lab-Volt fluid power courseware using equipment sets from Festo. FluidSIM optional.

Extension: Equipment Set Process – Fundamentals of Digitalization

Graphical programming describes automated processes in a manufacturer-independent way and forms the foundation for programming digital controllers. A 3D model illustrates typical production system processes, providing an ideal basis for teaching graphical programming and the fundamentals of digital control.

Fundamentals of graphical programming
- Overview of key GRAFCET elements and the relevant standard
- Operating modes
- Hierarchical structures
- Coarse and fine structures (macros)
- Development of example GRAFCETs
- Sequence control using GRAFCET



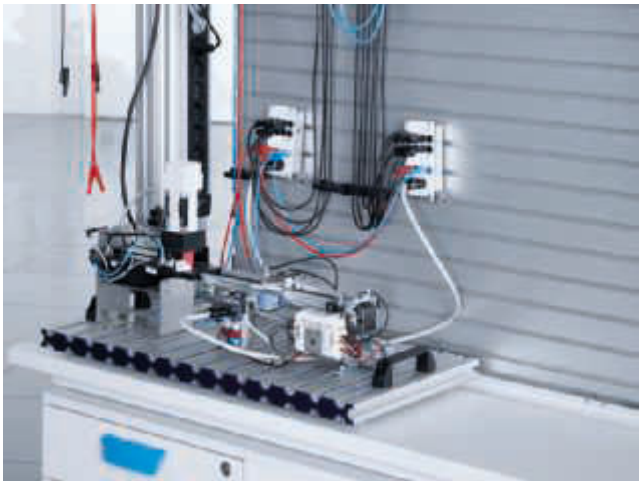
Suggested equipment
- Equipment set Process

Extension: PLC Technology, Operation and Monitoring, Networking

Digital control systems and networking are newly introduced learning content in metalworking occupations. They are essential for ensuring safe and reliable work on smart machines and interconnected systems.

Topic coverage
- Structure and operating principles of a PLC
- Hardware configuration using the TIA Portal
- Instantiable function blocks: purpose and application
- Inputs and outputs, variables, naming conventions, and prefixes
- Graphical and textual programming languages
- Program development using GRAFCET
- Basic logic functions and signal storage
- IEC timers and IEC counters
- Sequential control systems

Networking
- Operating principle of Ethernet networks (switching)
- Addressing methods (Ethernet and IP)
- Creating and setting up networks (connection HMI and PLC)



Suggested equipment
- LOGO!/S7-1200
- Touch panel
- Switch

Extension: Digitalization in Pneumatics

Smart machines and systems consist of autonomous components that operate and communicate independently. Controllers collect process data and transmit it to a Manufacturing Execution System (MES).

Based on this data, the MES derives information about system status, initiates service actions, and triggers the ordering of spare parts and materials. Using a simplified, practical example, learners work on project-based tasks related to smart manufacturing and intelligent maintenance.

Topic coverage
- Collection of production data such as pressure, flow rate, cycle time
- Deriving actionable information from collected data
- Targeted maintenance in the context of predictive servicing
- Process monitoring using web services
- Receiving and responding to push notifications

Extension: Complete Learning Path Digitalization

Digitalization is changing everyday professional life in industry and trades. This learning path is designed for metalworking occupations and guides learners through the fundamentals of smart systems and intelligent maintenance. By systematically expanding the training system on the way to digitalization, learning content is combined with practical exercises. The learning path is divided into 7 subject areas.



VTUX, the latest intelligent valve on the industrial market, is integrated into TP 260.





Suggested equipment
- Equipment set Digitalization in Pneumatics TP 260

Example setup for the learning path
- Equipment set Electropneumatics TP 201
- Equipment set Measurement and Control TP 210
- Equipment set Process
- LOGO!/S7-1200
- Equipment set Operation and Monitoring
- Supplementary equipment set Digitalization in Pneumatics

Workstation Hydraulics



Basic learning arrangement for training in hydraulics
- Structure, function and key data of the hydraulic power unit, valves and actuators
- Measurements and calculations of pressures and flow rates
- Characteristic curves of important hydraulic assemblies
- Design and optimization of hydraulic circuits
- Circuits with hydraulic cylinders
- Safe commissioning

Example setup
- 2x TP 501
- Hydraulic power unit
- Hose lines
- Laboratory cables
- Power supplies
- Accessories
- Learnline mobile

Workstation Mobile Hydraulics

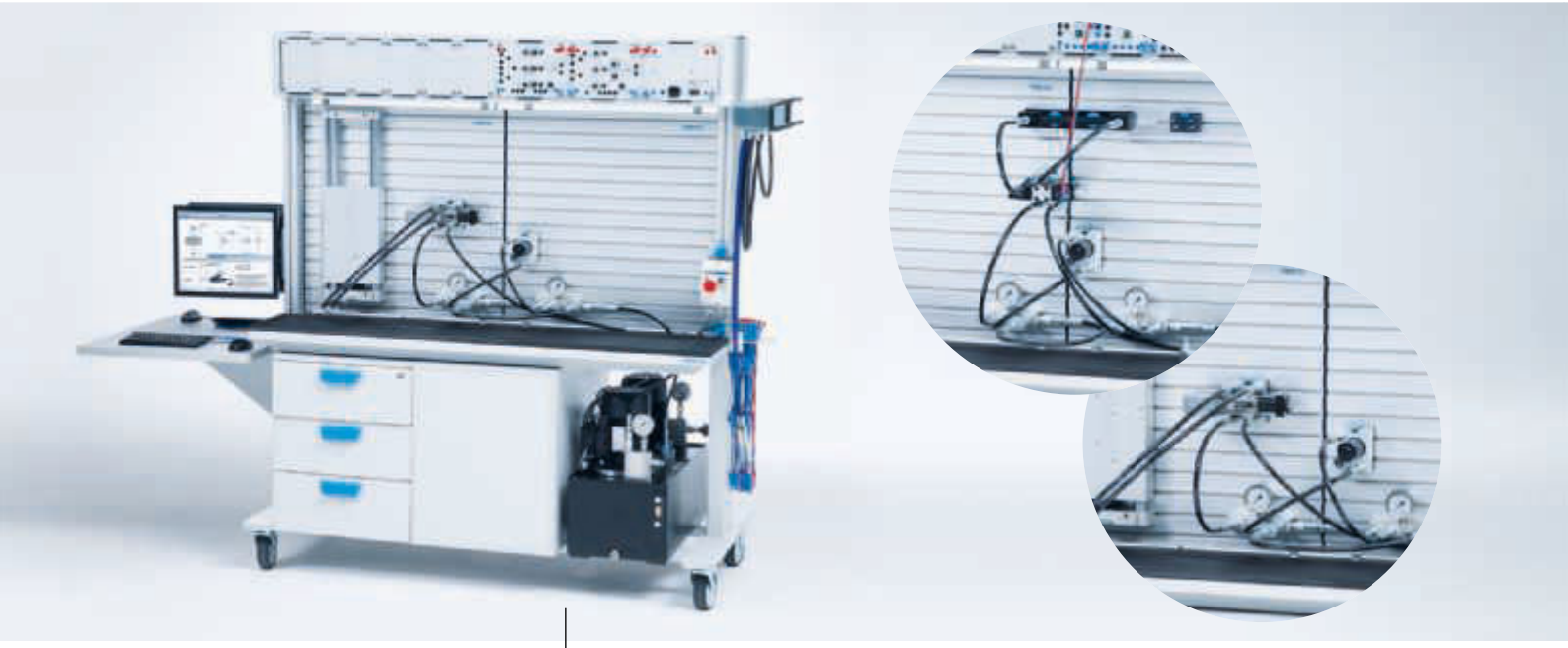


Hydraulic drives used in vehicles, agricultural machinery, and construction equipment have specific requirements, with a strong emphasis on occupational safety, energy efficiency, and operating comfort. The workstation's key advantages include excellent component accessibility, clearly structured assembly configurations, and an ergonomic, clean working environment.

- Working hydraulics 1:
  - Holding load – lowering
  - Circuits with multiple actuators
  - Open center load sensing
- Hydrostatic steering system
  - Types of steering
  - Emergency steering characteristics
  - Overload behavior
  - Prioritization of steering
- Working hydraulics 2
  - Function of the variable displacement pump
  - Closed center load sensing
  - Hydraulic pilot control of valve blocks
  - Load-pressure-independent flow distribution

Example setup
- 1x TP 800 Mobile hydraulics
- PC-based diagnostic system
- Load-sensing hydraulic power unit
- Hose lines
- Learnline mobile
- Accessories

Workstation Electrohydraulics/Diagnostics



Example setup
- 2x TP 501, 601, 610
- PC-based diagnostic system
- Hydraulic power unit
- Hose lines and accessories

Compact training station for education in electrohydraulics and measurement technology
- Power units and components of electrohydraulics
  - Solenoid valves
  - Signal modules, relays
  - Sensors
- Hydraulic circuits
  - Direct and indirect control systems
  - Signal storage, logic
  - Pressure-dependent control systems
  - Sequential control systems
  - GRAFCET
- Measurements and calculations
  - Measuring non-electrical quantities
  - Interpreting measurement results
  - Analytical troubleshooting
  - Hydraulic energy

Expansion possibilities through component sets
- Proportional Hydraulics TP 701: Electrohydraulic circuits with variable pressure and flow are simplified and efficiently controlled through the use of proportional valves.
- Control Hydraulics TP 511: Control valves are used in highly dynamic hydraulic drives. Zero overlap and a linear valve characteristic enable easy commissioning and high control quality. Drive behavior can be influenced by adjusting inertia and load to optimize control loop performance.



Also available: TP 501 and TP 601 America
Teach future professionals the fundamentals of hydraulics and electrohydraulics with the well-known Lab-Volt fluid power courseware using equipment sets from Festo. FluidSIM optional.

Workstation
Digitalization in Hydraulics



With the **training package TP 660**, learners are prepared for automation tasks on existing systems and acquire the competence to carry out system modernizations.

Learning objectives
- Understand key production performance indicators, including Overall Equipment Effectiveness (OEE)
- Recognize the benefits of digitalization for improving production efficiency and OEE
- Implement digitalization solutions on conventional machines
- Select appropriate sensors for digital data acquisition
- Analyze digital data for condition monitoring
- Implement a digital troubleshooting system to support effective maintenance
- Improve process reliability and OEE through digital functions
- Develop user competence in proportional hydraulics, sensor technology, PLCs, and industrial networking

Benefits
- Preparation of learners for automation tasks on existing systems
- Knowledge of production key figures
- Action competence for carrying out modernization tasks
- User competence in proportional hydraulics, sensors, PLCs, and network technology

Prerequisites
- Hydraulic power unit with fixed-displacement pump
- Equipment set TP 601 – Electrohydraulics – Basic level

CNC Technology



We integrate CNC training into modern learning environments to meet the needs of both initial and continuing training. CNC programming and machining, a key skill in many vocational and technical careers, places high demands on learners.



CNC Mill 260

The Concept Mill 260 combines key advantages of a didactic CNC milling machine: a compact working area, state-of-the-art drive technology with 6.8 kW output, and a 20-slot tool magazine with a fast double gripper.

CNC Turn 260

High-level CNC training requires the right equipment, and the PC-controlled Concept Turn 260 provides all the necessary capabilities. Its servo motor technology and high machining accuracy support effective learning.

Interchangeable controls

The interchangeable control concept from EMCO is unique. Users can train on up to nine standard industrial CNC controls using a single machine. Anyone trained on an EMCO system can therefore operate almost any CNC machine across a wide range of companies.

See all CNC learning solutions on our → **website**

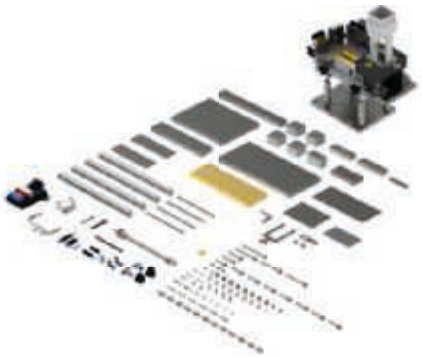
Fundamentals of Metalworking



The **SkillsMagazine Kit** provides a manufacturing project that teaches the fundamentals of metalworking, key cutting processes, component design, additive manufacturing, and the commissioning of mechatronic systems. All learning content is delivered through practical, hands-on courses hosted on Festo LX.

Learning goals

- Apply production methods such as drilling, countersinking, reaming, scribing, punching, filing, and forming
- Apply turning and milling techniques
- Design components, create technical drawings, and apply the fundamentals of additive manufacturing
- Prepare work plans, test plans, and technical drawings
- Install and commission a mechatronic system



The SkillsMagazine Kit
consists of semi-finished products as well as mechanical, pneumatic and electrical components.

Expansion possibilities

- SkillsMagazine Project Work and Commissioning Set
- SkillsConveyor, for further integration into mechatronics systems

Mechanical Drives



→ Video

Despite the increasing digitization of production and the rise of Industry 4.0, fundamental manual skills and traditional technologies remain essential for ensuring the continuous operation of industrial plants.

Mechanical drive systems with moving components are core elements in most machines and industrial installations. These systems must be correctly installed, commissioned, maintained, and repaired to guarantee reliable performance.

The **Mechanical Drives Learning System** allows learners to work hands-on with a wide range of components, tools, and techniques related to mechanical drive systems, helping them gain extensive practical experience.

The starting point is the Workstation package, which allows basic experimentation. It is designed to be expanded with various level packages:

- Belt, chain, and gear drives – Levels 1 and 2
- Shaft alignment, couplings, bearing, seals – Level 3
- Clutches, brakes, ball screws, linear bearings – Level 4

The Workstation Package covers the following topics:

- Introduction to mechanical drives
- Safety
- Pillow block bearings and shafts
- Motor, variable frequency drive, and tachometer
- Shaft alignment and couplings
- Torque, power, and efficiency

Metrology and Quality



→ Video

Measuring physical dimensions – such as length, angle, roundness, and diameter – is part of everyday work in many manufacturing and industrial occupations.

A strong understanding of measurement and becoming proficient in using, maintaining, and properly storing common hand-held measuring tools (including calipers, micrometers, tape measures, rulers, and gauges), as well as accurately interpreting technical drawings, are essential skills employers expect.

With our **dimensional metrology and quality training packages**, learners develop skills in:

- Measurement, error, precision, and accuracy
- Reading and applying SI and US customary units
- Understanding and interpreting drawings across standards
- Using and maintaining precision and semi-precision tools
- Performing basic inspection tasks on instruments
- Taking measurements and reliably reading results

Available training packages:

- Basic Dimensional Metrology TP 47220/21*
- Geometric Dimensioning and Tolerancing TP 47222/23 *
- Statistical Process Control TP 47224

* Available in two variants: with brand-name instruments (standard) or generic instruments (value)



Also of interest: Festo has developed a **series of specialized eLearning courses** on industrial dimensional metrology and ISO/GPS (Geometrical Product Specifications) in collaboration with Mahr GmbH.

Industrial Wiring



Developing proficiency in industrial wiring is especially important for panel builders, industrial electricians, and electrical and maintenance technicians. The **Industrial Wiring Learning System** imparts all wiring essential competencies in a compact and safe environment.

Learners gain wiring expertise to build, commission, modify, and troubleshoot a typical industrial electrical installation. The project approach allows for the development of soft skills, such as work organization and communication.

Key features
- Tabletop, compact solution
- Three-phase power
- Built-in safety components
- Rigid or flexible conduits
- Industry-standard electrical drawings

Included with the learning system:
- Electrical installation package
- Control component package
- Metalworking component package
- Wiring components package
- Wire marking component package
- Flexible conduit component package

Optional:
- Rigid conduit (EMT) package and bending tool kit

Industrial Pumping Circuits



→ Video

Single-Pump Systems
covers the operation and maintenance of a centrifugal pump in a circuit and troubleshooting of common failures.

Multiple-Pump Systems
covers pumps installed in parallel and in series, and compare their pressure and flow characteristics to single-pump setups.

Pump Performance
covers pump curves, efficiency, output control methods, and common issues such as cavitation and air ingestion.

Positive-Displacement Pumps
covers the basic operation and maintenance of external gear pumps.

Optional Pumps
Flexible impeller pump, peristaltic pump, magnetic-coupling centrifugal pump.

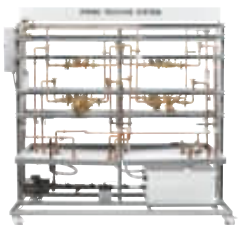
Optional Pumps
Progressive cavity pump, pneumatic diaphragm pump, multistage centrifugal pump, vane pump.

Proper selection, installation, commissioning, operation, maintenance, troubleshooting, and repair skills are necessary to ensure efficiency and safety of industrial operations.

The **Industrial Pumps Learning System** enables maintenance and process technicians, as well as industrial mechanics, to develop this expertise. Building circuits from the ground up helps learners gain a deep understanding of pumping systems.

Key features
- Practical, versatile work bench with storage
- Quick and easy circuit assembly / disassembly
- Industrial components and many optional pumps
- Fault-insertion capability

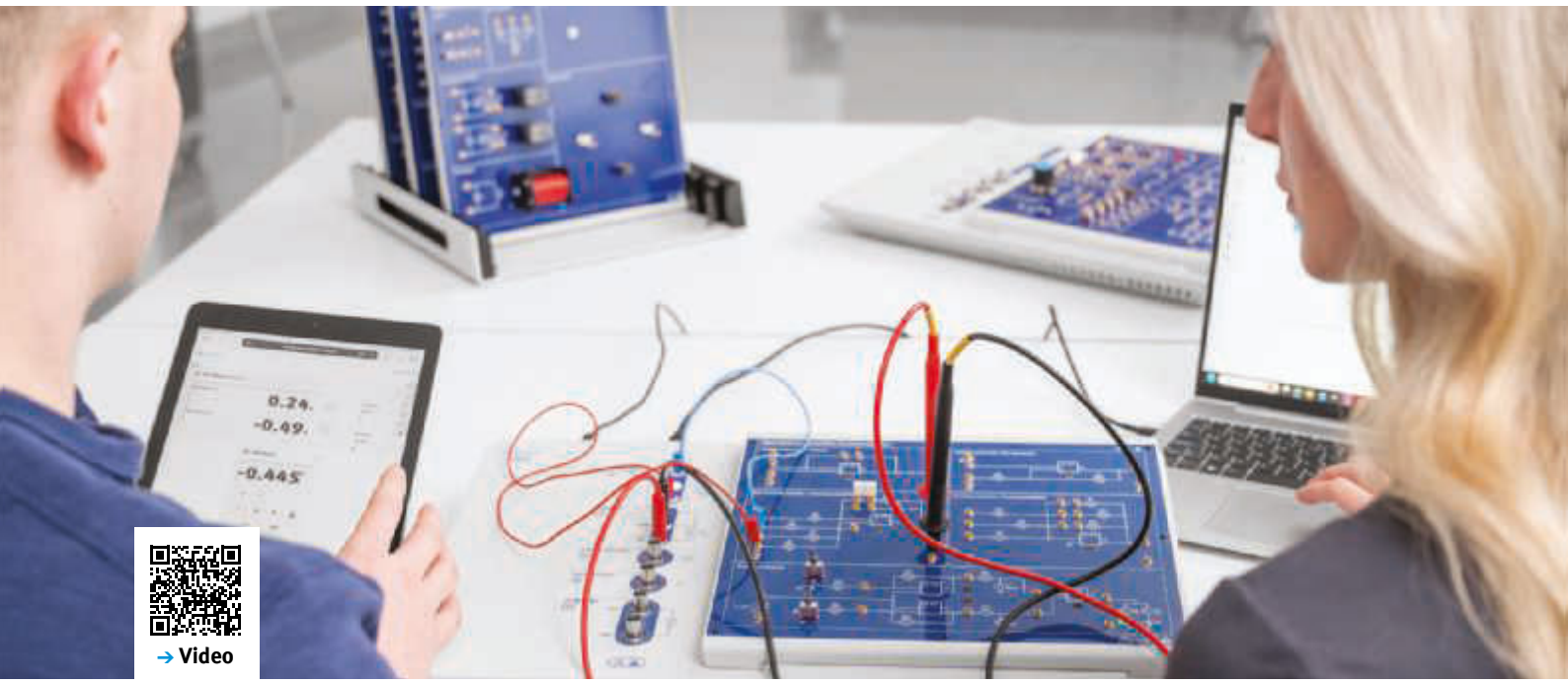
The basic package "Single-Pump Systems" includes the workbench, a motor and pump assembly, among others. It can then be extended with other packages and optional individual pumps.



Complementary skills: Prepare students to install and maintain pipes and hoses found in industrial installations that are essential to safely carry liquids and gase with the **Piping Learning System***.

* Note: This piping system cannot be ordered or delivered in countries that require compliance to CE regulations.

Electeo
Modern Electronics Education



→ Video

Electeo is a blended learning solution that combines lab equipment, digital courseware, and virtual instruments to build professional electronics skills in vocational, technical, and engineering schools, as well as in industrial training centers.

Learners study, analyze, test, troubleshoot, and design analog and digital electronic circuits in a user-friendly environment designed for performance.

With its modular design and robust technological foundation, Electeo adapts to a wide range of teaching and learning scenarios – whether online, offline, in class, or remote. It integrates seamlessly into existing IT infrastructures, enabling a consistent, hands-on learning experience – all from a single, reliable platform.

Your benefits
- A reliable, high-productivity hands-on learning system.
- Easy integration into your IT infrastructure.
- Streamlined course preparation with easy customization.
- One flexible solution for multiple classes and programs.
- A future-proof investment aligned with evolving topics and needs.



Built-in digital data acquisition
The embedded virtual test and measurement instruments – DC sources, multimeter, function generator, clock generator, and oscilloscope – enable students to understand, test, and analyze electronic circuits with the accuracy, precision, and responsiveness of traditional benchtop equipment. This reduces costs, saves space, and streamlines data analysis.



AC/DC Fundamentals
Electricity basics: calculate voltage, current, resistance, power; identify components; use power supplies and multimeters.



Magnetism and Electromagnetism
Basics of magnetism and electromagnetism; operation of electromagnets, solenoids, and electromechanical relays.



Capacitors, Inductors, and Impedance
Inductance, capacitance, charging/discharging, RC and RL transients; component types, properties, and practical applications; impedance and circuit behavior.



Diodes, Rectifier Circuits
Diode structure and characteristics; forward/reverse bias; half-wave rectifier operation and applications; includes design of a dual-heat, dual-speed hair-dryer circuit.



Operational Amplifiers
Op amp packages, symbols, characteristics; ideal vs non-ideal behavior; feedback and comparator use; inverting/non-inverting and summing amplifiers; dual-level detector; troubleshooting techniques.

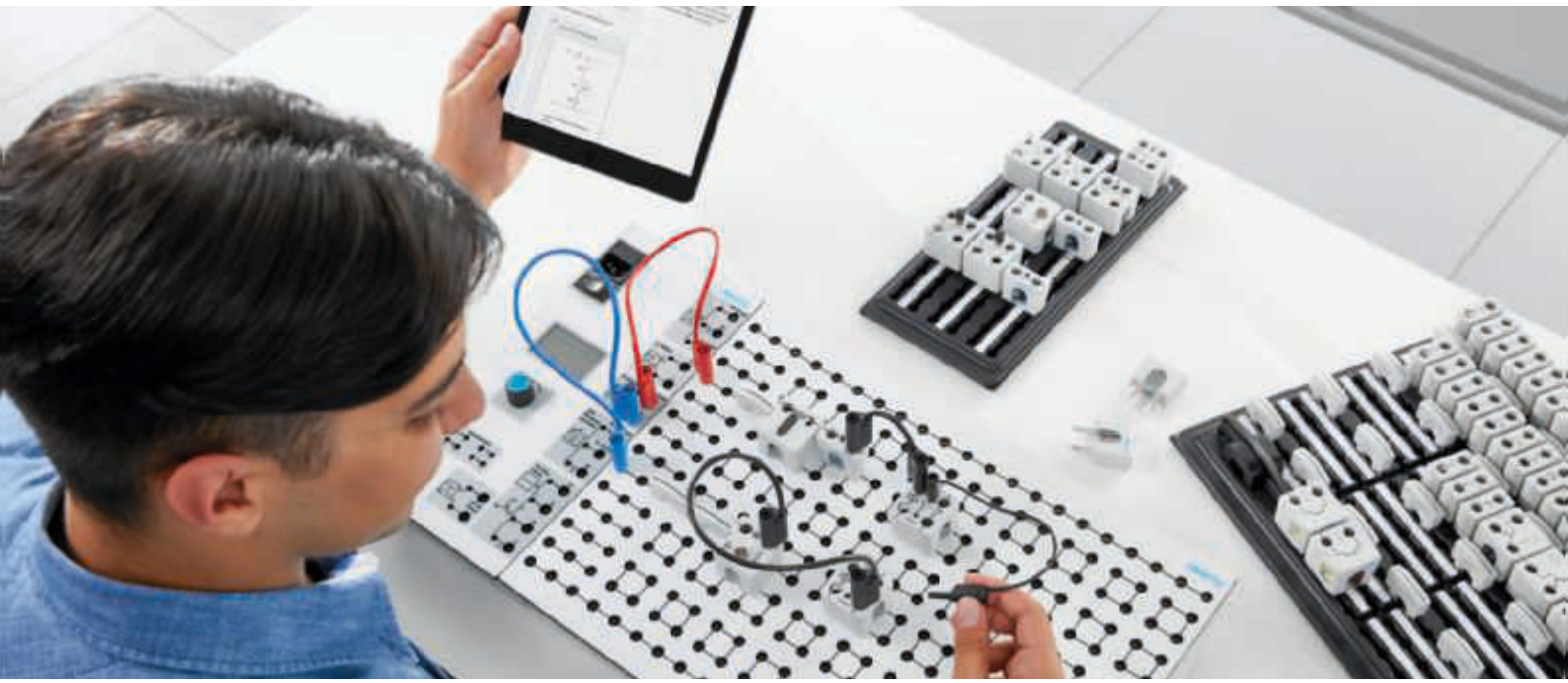


BJT Fundamentals
Construction, symbols, characteristics; biasing for current control; use as switch; voltage and current amplification.

... and more under development.

Electeo is the newest addition to our portfolio of learning solutions in electronics. Additional courses and learning boards are on the way to expand coverage into more topics – thyristors, filters, motors, digital electronics, and beyond. Stay tuned!

Fundamentals of Electrical Engineering/Electronics



With the fundamentals of electrical engineering and electronics, learners are introduced to the core concepts of the field. The content is taught and developed through practical, real-world project examples, ensuring strong relevance to industrial applications. The focus is on understanding basic physical quantities, system behavior, and interrelationships, as well as their measurement-based acquisition.

Topics include direct and alternating current, semiconductor technology, basic electronic circuits, analog electronics, and optoelectronics.

A transport and storage case is also available.

Example setup

- Equipment set TP 1011: Fundamentals of electrical engineering/electronics
- Extension component set analog technology TP 1024
- Extension component set optoelectronics TP 1023
- Set of safety laboratory leads
- 2x multimeter
- Digital storage oscilloscope

Expansion possibilities through component sets

Digital technology (see TP 1012)
Control technology (see TP 1013)
Installation and relay technology (see TP 1022)



Also available: AC/DC Learning System

The AC/DC Learning System * introduces students to the basic principles of electrical circuits, both in direct current (DC) and alternating current (AC). This convenient and cost-effective solution rapidly builds student knowledge in electricity.

* Note: This learning system cannot be ordered or delivered in countries that require compliance to CE regulations.

Concept for Automotive Mechatronics Technicians



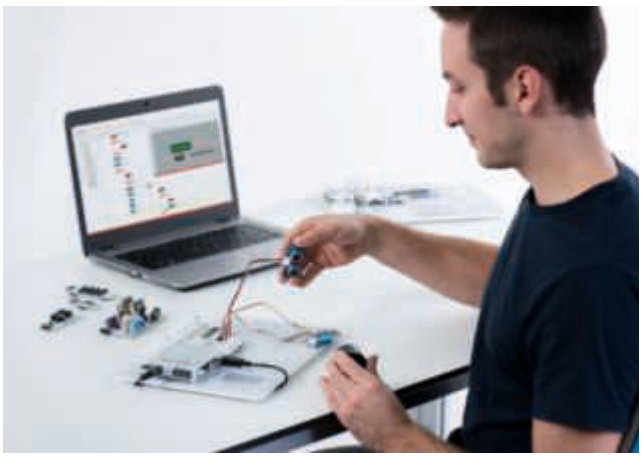
Using the plug-in components of the **Automotive Mechatronics** extension set, learners build simple automotive-specific basic circuits. Guided by action-oriented learning scenarios, they develop the ability to identify and correct malfunctions. The built-in fault switches allow targeted manipulation of components for realistic troubleshooting practice.

All components are included in the FluidSIM electrical engineering library, which also provides extensive teaching materials aligned with the first year of training for automotive mechatronics technicians.

- Fault finding: rear fog light, reversing light, instrument panel lighting, trailer lighting, low beam, tail and brake lights
- Diagnosis: instrument and dashboard illumination, fog lights, low beam, high beam and fog lights, right tail light, turn signal system

Example setup
- Equipment set Fundamentals of electrical engineering /electronics TP 1011
- Extension set Automotive Mechatronics TP 1024
- Set of safety laboratory leads
- 2x multimeter
- Digital storage oscilloscope

Microcontroller Programming



Our **Microcontroller Programming Training Packages** allow students to assemble a wide range of digital electronic circuits using real-life components and code, test, and troubleshoot microcontroller programs to control them.

They provide rewarding learning experiences while boosting learner engagement and motivation. They help develop creativity, problem-solving, and computer skills.

The Microcontroller Development System TP 1515 (PIC) or TP 1516 (Arduino) consists of:
- 8-bit PIC or Arduino programmer board
- Combo board
- Mounting panel
- Power supply and USB cable
- Storage tray

Expansion possibilities
Several **optional boards** are available (prototype, actuators, Bluetooth, Wi-Fi, LED, keypad, relay, etc.)
The **MecLab Interface** is an optional component that connects the microcontroller to a MecLab station.

Basic Motor Control Technology



→ Video

Whether they use the modular system or the suitcase system, students build control circuits by connecting power components – such as relays and contactors – to a motor and a mechanical load, along with the required control and protection devices. Through this hands-on approach, they learn to install, test, and troubleshoot the most common types of motor controllers.

Learning topics
- Lockout/tagout procedures
- Symbols and schematics
- Troubleshooting components and circuits
- Control and pilot devices
- Protections (breakers, overloads)
- Manual and reversing starters
- Two- and three-wire control
- Jogging control
- Time-delay relays
- Primary resistors and star-delta starters
- Motor testing and troubleshooting

TP 1221 (A4 modules) or TP 1221-P (suitcase)



The online simulator features digital twins of the equipment, allowing students to perform practical experiments remotely. Try it for free at
→ **bmcsim.festo.com**



Expansion possibilities
By combining TP 1221 or TP 1221-P with the SkillsConveyor, students gain a deeper understanding of how basic motor controls integrate into modern automated processes.

Electrical Drive Technology



Modern drives are characterized by the integration of electrical and mechanical components into complete, cohesive systems. In the field of rotating electrical machines, not only is knowledge of the individual components essential, but a system-level perspective and strong practical relevance also play a decisive role.

Learning topics: operating principle of the squirrel-cage motor, the star and delta connections of three-phase asynchronous motors, and the starting, speed control, and regulation of three-phase asynchronous machines using frequency converters.

Example setup

- Servo brake and drive system TP 1410
- Three-phase asynchronous motor 400/690 V EMC
- Sinamics G120 PN-F with encoder connection
- Motor starter EduTrainer
- Safety laboratory leads
- Phase sequence indicator
- Power meter AM3000



Expansion possibility

Package Fundamentals of Frequency Converters with IGBT

Combine TP 1410 with the new IGBT package to give students hands-on experience with modern power electronics and motor control. Teach how AC power is converted, filtered, and inverted using IGBT technology, and how variable-frequency drives control motor speed and torque.

Electrical Drive Technology with Frequency Converter



- The next generation of SINAMICS G120 frequency converters has been further optimized for training. Featuring a completely redesigned, EMC-compliant housing, it is ideal for use in laboratory environments.
- Commissioning, functions, applications, energy optimization, and programming are taught through 12 application-oriented project tasks.

Example setup
- Servo brake and drive system TP 1410
- Three-phase asynchronous motor 400/690 V EMC
- Sinamics G120 PN-F with encoder connection
- Safety laboratory leads



Also available: The Variable-Frequency Drives Learning System *
provides a convenient and cost-effective solution to rapidly build student knowledge in VFDs and their motor applications. It is designed for portability and powered using a standard single-phase AC outlet.

* Note: This learning system cannot be ordered or delivered in countries that require compliance to CE regulations.

Control and Visualize with PLC, HMI, Frequency Converter and Asynchronous Motor



Learning objectives, package 1
With this package, you will learn the fundamentals of process visualization and the use of a SIMATIC HMI panel together with the SIMATIC S7 controller and the TIA Portal programming tool. The module explains the configuration of a SIMATIC HMI panel, the creation of the connection to the SIMATIC S7, and read and write access to CPU data.

Learning package 1:
- 1x EduTrainer Universal A4 Rack
- Siemens controller: S7-1512C-1PN
- 1x HMI EduTrainer MTP700C
- 1x learning materials
- Incl. accessories

Learning objectives, package 2
With this package, you will learn how a SINAMICS G120 frequency converter is commissioned with a SIMATIC S7 controller. The module explains the commissioning of the SINAMICS G120 frequency converter with the SINAMICS Startdrive software in the TIA Portal, as well as control and monitoring by the SIMATIC S7 controller.

Learning package 2:
- 1x EduTrainer Universal A4 rack
- Siemens controller: S7-1512C-1PN
- 1x Sinamics G120 EduTrainer
- 1x three-phase asynchronous motor 400/690 V IE3
- 1x learning materials
- Incl. accessories

Servo and Stepper Motor Technology



Position, torque, and speed control fundamentals

Automation and robotics specialists, as well as industrial electricians and electrical and maintenance technicians, work extensively with stepper and servo motors.

With **TP 1423** learners gain comprehensive skills and theoretical knowledge that prepare them for tasks such as motor installation, commissioning, maintenance, and troubleshooting.

Highlights
- Modern, industrial components from Festo
- One controller for both motors
- Linear- and angular-axis, and gantry applications
- Free, professional configuration software
- Focus on troubleshooting and diagnosis

Equipment set TP 1423 consists of:
- Stepper and servo motor controller
- Rotative-axis application
- Linear-axis application
- Stepper motor kit
- Servo motor kit

Expansion possibilities
- Adapter Kit for Servo Brake and Drive System TP 1410
- Gantry Application Update Kit
- EduTrainer Universal with S7-1500

Project Kits in Drive Technology



Power Supply
- Power supply with 100–240 V, 3.1 A input
- 24 V, 10 A output current
- For DIN rail mounting



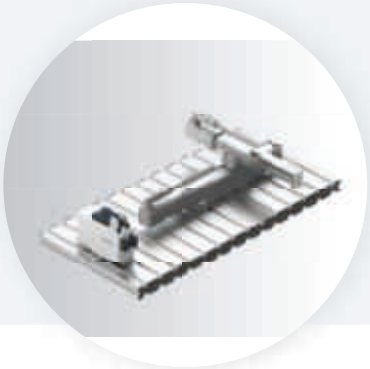
Drive Project Kit
- CMMT Drive with EMMT 42 Stepper Motor, including connection cable



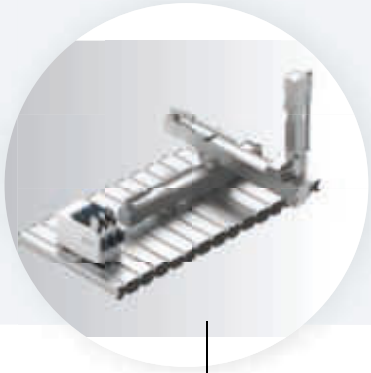
Spindle Axis Project Kit
- Spindle Axis ELGCBS-KF-45-200 with mounting adapters



Linear Slide Project Kit
- Mini Slide EGSCBS-KF-32-100 with mounting adapters







State-of-the-art components for exciting projects

Vocational education should be as hands-on as possible and therefore include project work. Such projects are characterized by open-ended results and require learners to plan, execute, and monitor their work independently.

To complement our learning systems, the new project kits incorporate the latest industrial technology. They give learners almost unlimited creative freedom, as the kits can be easily combined and controlled with all standard industrial controllers.

For their projects, learners can access extensive original documentation and a wide range of tutorial videos – such as YouTube videos explaining drive parameterization. This allows them to practice in the same way tasks are carried out in industry.

Example configuration: 3-axis handling:
- 1x Power supply
- 3x Drive Kit
- 2x Spindle Axis Kit
- 1x Linear Slide Kit
- And a profile plate, if necessary

Training Packages in Electric Power Technology
Mix and Match Training Packages and Courses

→ Video



Standard training packages

- Introduction to Wind Power TP 8012-0
- Wind Power Systems TP 8012-1
- Wind Power, Complete TP 8012-2
- Introduction to Solar Power TP 8012-3
- Photovoltaic Systems TP 8012-4
- Solar Power, Complete TP 8012-5
- AC/DC Power Circuits TP 8015-1
- Transformers TP 8015-2
- AC/DC Power Circuits and Transformers TP 8015-3
- IGBT Power Conversion Circuits TP 8015-4 **NEW**
- Thyristor Power Conversion Circuits TP 8015-5 **NEW**
- AC Variable-Speed Drives TP 8015-6 **NEW**
- DC Variable-Speed Drives TP 8015-7 **NEW**
- Three-Phase Motor Starters TP 8015-8 **NEW**
- Three-Phase Rotating Machines TP 8016-1 **NEW**
- Permanent Magnet DC Motors TP 8016-2 **NEW**
- Power Factor Correction TP 8016-3 **NEW**

Training packages can be customized to create a perfectly tailored setup for training or research.

New courses, modules, and training packages are continually being developed – all designed to work together as building blocks to expand your lab.

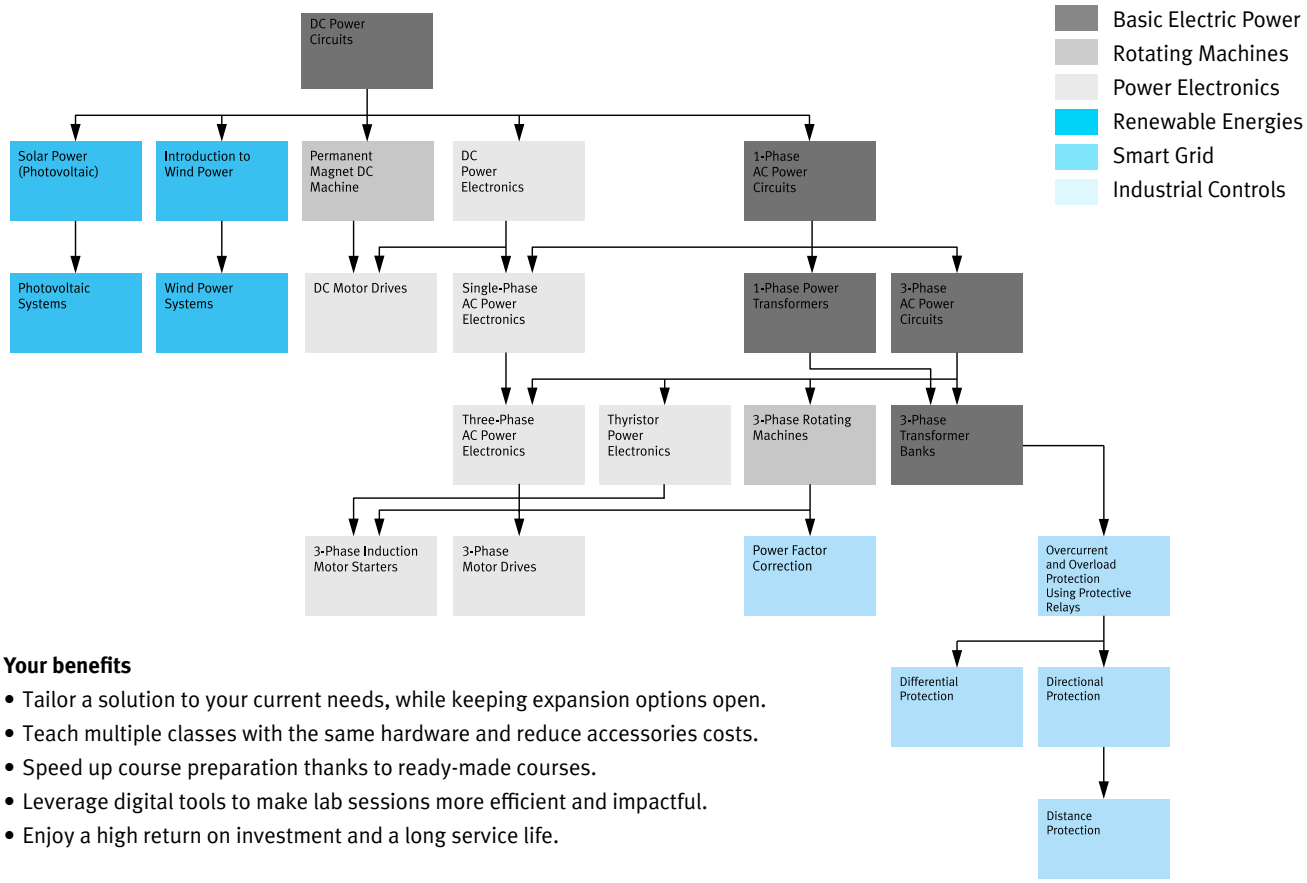
The **Electric Power Technology Training Packages** combine courses, training equipment, and software tools to teach and learn a wide range of topics in the wide field of electrical energy. Mix and match packages, expand or customize with electrical modules, software functions, and ready-to-use course material, and create your electrical engineering lab.

This versatility is what makes this lab equipment concept the backbone of countless laboratories in technical schools, colleges, universities, research centers, and utility and industrial companies worldwide, adapting to various requirements.

Highlights
- Modular concept that gives teachers flexibility
- Expanding topic coverage and selection of hardware modules
- Digital data acquisition and control/emulation functions
- Real-time measurement and display of electrical and mechanical values with a free virtual instrumentation suite.
- Rugged hardware designed to endure decades of lab work
- Safe grounding methods and embedded electrical protections against overcurrent, overheating, and/or overvoltage.

The Course Program in Electric Power Technology

Carefully elaborated courses around core technology topics combine theory with hands-on exercises to be performed on standard or customized training packages. They are organized in a general gradual learning path: from the basics to advanced topics. Teachers can create their own learning paths. Each course is available as an eLab course on Festo LX or in PDF/print workbook to speed up course preparation and build relevant skills for each topic.



Your benefits

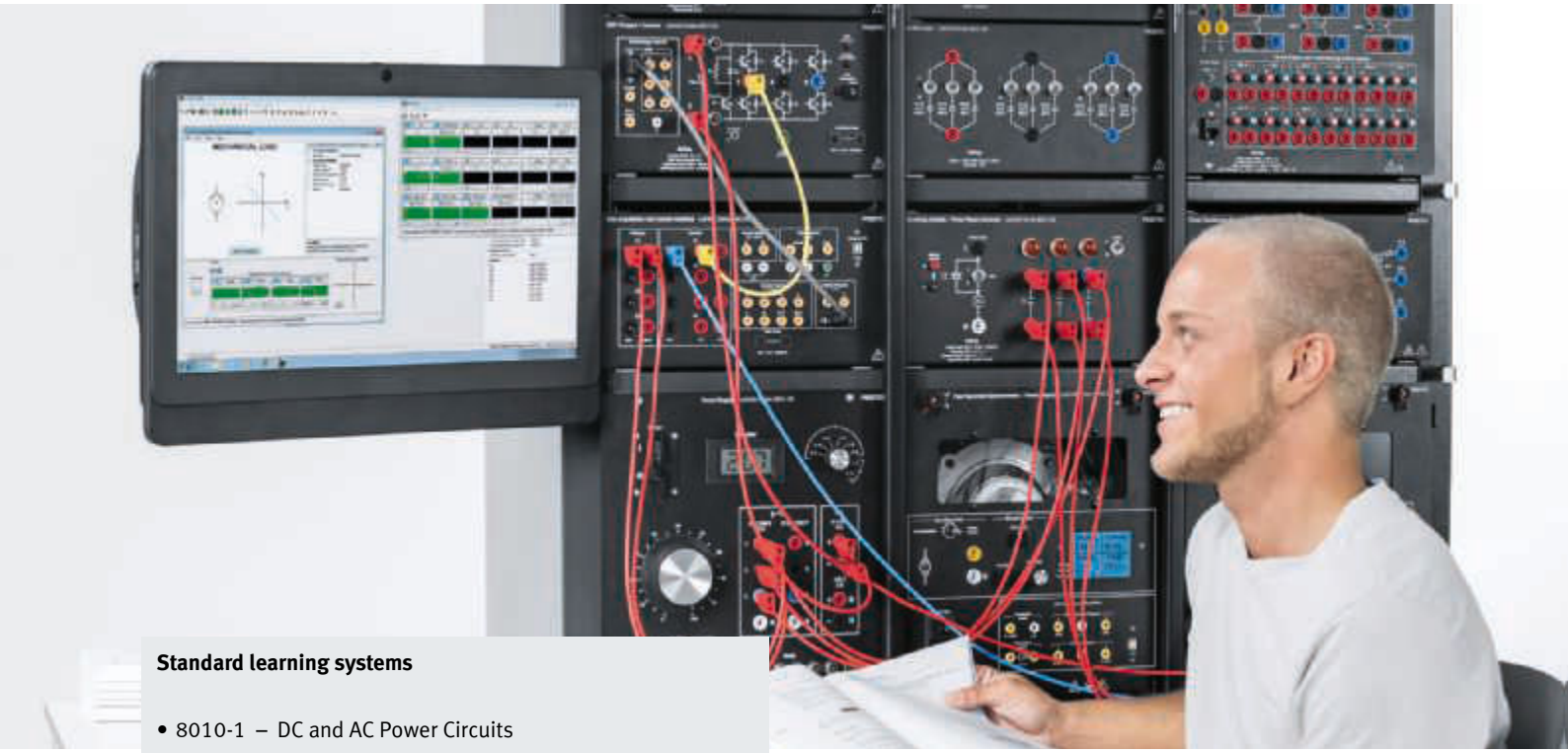
- Tailor a solution to your current needs, while keeping expansion options open.
- Teach multiple classes with the same hardware and reduce accessories costs.
- Speed up course preparation thanks to ready-made courses.
- Leverage digital tools to make lab sessions more efficient and impactful.
- Enjoy a high return on investment and a long service life.

Learners' gains:

- Deeper understanding of complex systems and concepts.
- Real-time data acquisition and analysis.
- Hands-on experimentation with motors, drives, and energy systems.
- Full-range testing of motor and generator performance in all four quadrants.
- Exploration of reactive power, synchronization, and stability.
- Deeper insight into control strategies and energy efficiency.
- Experience with converters, PWM, and power system integration.
- Industry-relevant skills in diagnostics, tuning, and optimization.

Please note that these training packages are targeted at customers located in CE-compliant countries. If you are located outside CE, have a look at our EMS Classic learning systems (next page).

Workstations in Electric Power Technology
From AC/DC Basics to Smart Grid – All in One Platform



Standard learning systems

- 8010-1 – DC and AC Power Circuits
- 8010-2 – Solar Power
- 8010-3 – Small-Scale Wind Power Electricity Generation
- 8010-4 – Lead-Acid Batteries
- 8010-5 – Basic Renewable Energy
- 8010-6 – DC Power Electronics
- 8010-7 – Home Energy Production
- 8010-8 – Hydrogen Fuel Cell
- 8010-9 – Electromechanics
- 8010-A – Power Electronics
- 8010-B – AC Power Transmission
- 8010-D – DFIG Principles Training System
- 8010-C – Smart Grid Technologies
- 8010-E – Power Transmission Smart Grid Technologies
- 8010-F – Smart Grid Training System
- 8010-G – Electric Power Generation
- 8010-H – Power Factor Correction
- 8010-J – BLDC Motors & PMSM Drives
- 8010-K – Electric Power Substations
- 8010-L – Numerical Protective Relays
- 8010-M – Microgrid **NEW**
- 8010-N – Lithium-Ion Batteries **NEW**

Pre-set systems can be customized to create a perfectly tailored setup for training or research.

The **Electric Power Technology Training Systems** combine courses, training equipment, and software tools to teach and learn a wide range of topics in the wide field of electrical energy. Mix and match electrical modules, software functions, and ready-to-use course material, and create your electrical engineering lab.

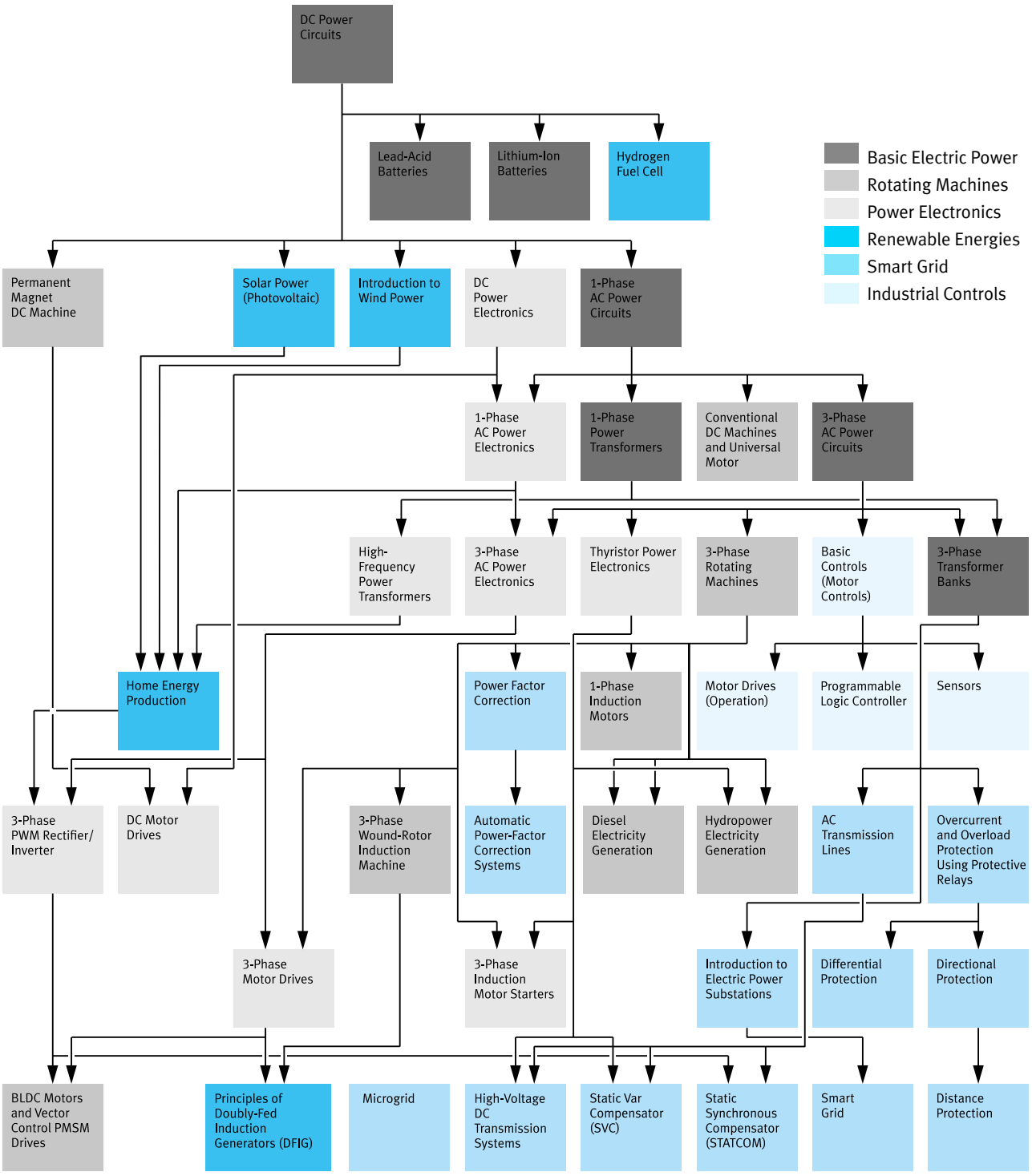
This versatility is what makes our electric power technology training systems the backbone of countless laboratories in technical schools, colleges, universities, research centers, and utility and industrial companies worldwide, adapting to various requirements.

Highlights
- Modular concept able to evolve with your needs and budget
- Large topic coverage and selection of hardware modules
- Digital data acquisition and control/emulation functions
- Free virtual instrumentation suite
- Rugged hardware designed to endure decades of lab work

Please note that the classic EMS learning systems cannot be sold or shipped to countries where CE compliance is required. If you are located in a CE-regulated country, please refer instead to the EMS A4 series (previous page).

The Curriculum Program in Electric Power Technology

Carefully elaborated courses around core technology topics combine theory with hands-on exercises to be performed on standard or customized EMS learning systems. They are organized in a general gradual learning path: from the basics to advanced topics. Teachers can create their own learning paths. Each course is available as an eLab course on Festo LX or in PDF/print workbook to speed up course preparation and build relevant skills for each topic.



Basic Electrical Safety Measures



The risk posed to humans by electric current is primarily determined by the magnitude of the current flowing through the body.

The Fundamental **Electrical Protective Measures EduTrainer** demonstrates the difference between circuit breakers used to protect electrical installations and residual current devices (RCDs) used to protect people.

Electrical Installation Technology



The **Basic Principles of Electrical Installations TP 1121** conveys the fundamentals of electrical installation through practical, real-world projects that include planning, assembly, and testing of various basic circuits.

Planning and regulatory fundamentals, circuit diagrams and symbols, basic circuits, and instruction through hands-on project-based tasks.

DALI Lighting Control

Intelligent and flexible digital control of lighting systems in commercial or industrial environments. With the **DALI Lighting Control TP 1145**, topics such as lighting control with DALI, lighting scenes, and color mixing can be taught in a compact and clearly understandable manner.

Learning objectives
- Understand and implement the DALI bus system
- Design lighting scenes
- Set up scene controls
- Control lighting scenes with presence and light sensor
- RGBW color control





Recommended accessory
- KNX/DALI Gateway
  The connection from DALI to KNX/EIB bus learning systems

Power Supply Systems and Protective Measures



Protecting people is paramount when working with electrical energy, as it is invisible and can only be perceived through its effects. Potential hazards must therefore be minimized through appropriate protective measures.

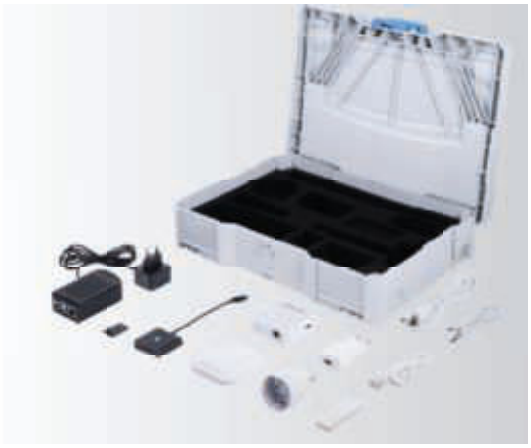
Using **TP 1111** and practical examples, learners are introduced to the principles of electrical protection. Existing conditions are examined, and the hazards inherent in each situation are demonstrated through targeted measurements. Analyzing and interpreting these measurement results helps clarify the underlying relationships and identifies the appropriate protective measures.

Example setup

- Equipment set TP 1111
  Network systems and protective measures
- RCD A/B EduTrainer
- RCD selective EduTrainer
- Installation tester according to VDE 0100/0413
- Phase sequence indicator
- Safety bridging plug
- RCD type F EduTrainer

KNX/Smart Home





The **KNX / Smart Home Training Case** combines three learning areas in a single system – making it an ideal tool for KNX specialist training, smart home applications, and foundational network technology education.

Learning goals
- Program and configure KNX / EIB systems
- Understand the fundamentals of network technology
- Learn the basics of smart home automation
- Conduct and document a professional system handover

Extension: KNX applications

- KNX heating actuator EduTrainer
- KNX line coupler EduTrainer
- KNX universal experiment board EduTrainer
- KNX IP/WLAN function package
- KNX logic/time function package
- KNX room climate function package
- KNX energy function package
- KNX visualization via touch panel
- KNX weather station
- DALI KNX Gateway EduTrainer



The **Smart Home TP 1135** provides cross-technology training in the interconnection of intelligent devices to enhance energy efficiency and comfort in buildings.

This comprehensive training package covers all key aspects of smart home systems. Starting with the analysis of the building and desired functions, learners select suitable devices, program processes, and design the user interface. Data from multiple sources is captured and processed throughout the system. Its deliberately open architecture allows easy integration of existing solutions as well as future topics and concepts within the laboratory environment.

Learning goals
- Understand the basic structure and functionality of smart home systems
- Design data acquisition, transmission, and processing using smart home components
- Select and integrate appropriate smart home devices
- Install a smart home system and interconnect different technologies
- Perform data backup and system restoration

Building HVAC Control



Most commercial buildings are equipped with heating, ventilation, and air conditioning (HVAC) systems that are automatically controlled to ensure the comfort and health of occupants while keeping energy consumption low.

HVAC control systems regulate airflow, temperature, humidity, and carbon dioxide levels in response to changing indoor and outdoor conditions.

The **Building HVAC Control Learning System** replicates the structure of an HVAC system in a typical commercial building. It covers Direct Digital Control (DDC), an introduction to network architecture (BACnet MS/TP), field controllers, supervisory control and management systems (MMS), temperature and humidity control using constant air volume (CAV) systems, and both pressure-dependent and pressure-independent variable air volume (VAV) systems.

Example setup
- Building management technology learning system with BACnet
- Multimeter
- Safety laboratory leads

Electric Vehicle Charging Station



The **EV Charging Station Learning System** is designed to train future Electric Vehicle Supply Equipment (EVSE) technicians and electricians. It helps them develop skills in commissioning, troubleshooting, and maintaining charging stations through hands-on practice using industry-standard procedures and tools.

Highlights
- State-of-the-art charge controller
- Advanced EV simulator
- Multi-station connectivity
- Fault-injection capability

Benefits
- Industry-relevant training focused on problem solving.
- Study of the EV-EVSE interactions for a system understanding
- Visual insights into a charging systems' inner workings
- Builds confidence to work with any brand of charging station

Example setup
- AC charging station for electric vehicles:
  - Type 1 (Level 2 AC charging stations)
  - Type 2 (Mode 3 charging stations)
- Safety laboratory leads
- Oscilloscope
- Multimeter
- EVSE tester

Introduction to Process Technology



EduKit PA provides a simple yet realistic setup that enables students to explore the measurement and control of flow, pressure, and level, along with the hardware required for open- and closed-loop control. Visualization tools make abstract control concepts easy to understand, as learners can see in real time how their adjustments influence the system. A project-based curriculum and intuitive software reinforce skill development.

The **EduKit PA Basic** teaches the essential principles of project work and the fundamentals of process technology – such as manual measurement and open-loop control – without the need for a PC or advanced control technology.

The **EduKit PA Advanced** supplements the EduKit PA Basic with components for automated measurement, closed-loop control, sensors, and electrical interfaces, enabling deeper engagement with modern process automation topics.

Fundamentals of Closed-Loop Control



→ Video

Closed-loop control increases the efficiency, quality, and safety of modern process plants. To understand and approach complex control loops with confidence, future process operators and technicians need prerequisite foundational knowledge.

The **MPS PA Compact Workstation** is a hands-on training system for process automation. It provides a compact, safe, and fully functional environment where learners can practice controlling and monitoring typical industrial process variables such as level, flow, pressure, and temperature.

- Three workstation variants:
  Basic, Process Instrumentation, Energy
- Control options using Siemens, Rockwell Automation or Festo technology

Expansion possibilities for EduKit and MPS PA

- IoT Kit
- AirCS equipment set
- EduTrainer PLC

Process Automation in Real-World Applications



The MPS PA 204 system introduce students to four typical industrial process automation applications, combined in one system.

- System setup, wiring, and commissioning
- Measurement of electrical and process engineering variables: level, flow rate, pressure, temperature
- Setup and commissioning of control loops
- Evaluation of control performance
- Networking of process engineering systems
- Process operation and monitoring, plant operation
- Selection, use, and actuation of process valves
- Analysis of controlled systems and control loops
- Parameterization and optimization of P, PI, or PID controllers
- Design of control and regulation programs
- Inspection, servicing, and maintenance

The complete system consists of:

- Filtering station
- Mixing station
- Reactor station
- Filling station
- 4x EasyPort and FluidLab-PA

Extension Package IoT Kit



As IT integration in business operations continues to grow, so does the demand for interdisciplinary expertise. **The IoT Kit for MPS PA** and EduKit address this need by enabling networked industrial processes in a compact, tabletop format.

A bottling plant model serves as a practical application example. Networked via the internet with suppliers and customers, it clearly demonstrates how IT-based connectivity transforms industrial business processes. For example, sensor signals monitoring tank levels can automatically trigger ordering processes, illustrating data-driven production and supply chain control.

Topics covered:

- Networking of communication systems for order and production control
- Management of order and production data using a MySQL server
- Database administration with phpMyAdmin
- Design and application of augmented reality solutions
- Web-based shopping cart implementation using an Apache web server and PHP

Industrial Process Control Loops



→ **Video**

Our **Industrial Process Learning Systems (LabVolt 353X)** are a cost- and space-savvy way to build universal skills in device and piping installation, as well as measurement, operation, control, optimization, and troubleshooting of industrial process control loops.

Topic coverage
- Fluid mechanics, chemistry, and industrial safety
- P&ID interpretation and documentation
- Measurement and control of pressure, flow, level, temperature, pH, and conductivity
- Real-time energy calculations and four types of heat exchangers
- Smart transmitters and instrumentation
- Industrial communication protocols
- PID and cascade control
- First- and second-order processes (interacting/non-interacting)
- Control loop tuning
- Advanced control strategies (ratio, feed-forward, split-range)
- Three-element boiler control loops
- System troubleshooting

You can choose:
- Types of process variables
- Communication protocols
- Controllers and HMI
- Optional transmitters and control valves
- Programming/configuration software
- Calibration kits

Contact a sales representative for guidance.

Note that the learning systems (LV 353X) cannot be sold or delivered in countries that require compliance to CE regulations.

Highlights
- Fully customizable system design
- Measurement and control of pressure, flow, level, temperature, pH, and conductivity
- Boiler simulation with fast-response temperature control
- Selection of optional IIoT-enabled field devices
- Extensive hands-on learning materials, from foundational concepts to advanced control strategies
- Configurable systems tailored to specific industry sectors

Three-Phase Oil Separation



→ Video

The **Three-Phase Separator** demonstrates the fundamentals of crude oil separation, such as the effect of gravity, the effect of layer thickness, viscosity, retention time, density difference, vessel pressure, and oil/water/gas ratio.

The vessel features standard zones of three-phase separators: inlet, flow distribution, gravity separation, and outlet. An inline mixer emulates crude oil by creating an emulsion with water, air, and oil.

Highlights
- Interactive measurement and control experience
- Industrial components and smart instrumentation
- Build system operation/maintenance/troubleshooting skills

Two systems are available:
- Basic Three-Phase Separator*
- Three-Phase Separator with Instrumentation
- The basic system supports flexible future expansion with an optional add-on instrumentation package.

Custom Process Loops in a Compact System



The P**rocess Control Learning Systems (LabVolt 6090)** demonstrates pressure, flow, level, temperature, and pH control using affordable components. When paired with a controller that supports advanced features, it also enables hands-on exploration of feed-forward, second-order, and cascade control techniques. Ideal for practical classroom training that balances depth and budget.

Highlights
- Cost-effective, compact industrial system with turnkey courses
- Flexible components layout
- Wide range of equipment options
- Fault switches for developing troubleshooting skills
- Data acquisition interface compatible with LVProSim, MATLAB, NI LabVIEW, and Linux

The learning solution is available in several variants with multiple configuration options. Contact your Festo representative for guidance in selecting the most suitable setup.

Note that the learning systems (LV 6090) cannot be sold or delivered in countries that require compliance to CE regulations.

Distributed Control System (DCS)



Get the tools to bring your courses and lab up to Industry 4.0 standards. The **DCS Learning System with SIMATIC PCS neo** is a unique training unit that helps you deliver all the essentials of instrumentation and process control, from fundamentals to advanced concepts, using modern, connected technologies and smart devices for hands-on, high-impact learning.

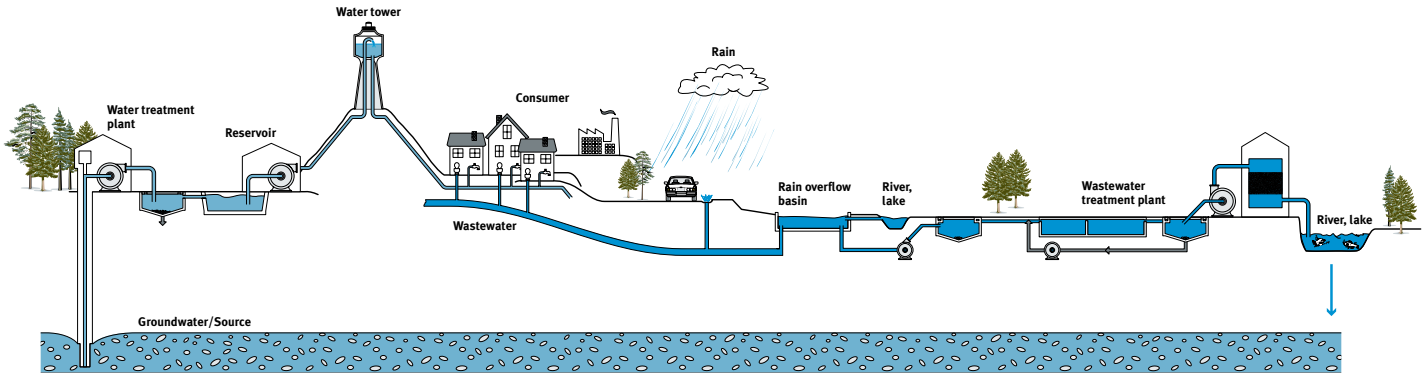
Highlights
- Turnkey training unit with ready-to-use instructional material
- Suitable for operator, technician, and engineer training
- Industrial components and software tools from leading manufacturers
- Dual-media process unit (liquid and gas)
- Supports standard industrial networks and smart field devices

Smart instrumentation:
- Pressure switch
- Differential pressure transmitter (high-range)
- Temperature transmitter (Pt100 RTD)
- Temperature transmitter (J-type thermocouple)
- Magnetic flow transmitter
- Radar level transmitter with remote display
- Differential pressure transmitter with 3-valve manifold (flow, Venturi)
- Differential pressure transmitter (level, low-range)

Industrial networks and communication technologies: Heartbeat, PROFINET, PROFIBUS, IO-Link, HART, WLAN, Bluetooth, Modbus TCP, Ethernet-APL



A Complete Water Circuit in Your Laboratory





Basic Water Circuit System – four stations fully equipped and assembled

The basic system water cycle consists of:
1x Water treatment station
1x Water supply station
1x Wastewater transport station
1x Wastewater treatment station
1x Water supply tank/groundwater including cable
1x Additional package chlorine measurement
1x Additional package oxygen measurement
1x Digital/analog simulation box, including cable
4x EasyPort
4x Control software FluidLab-EDS Water Management
4x DC wattmeter

EDS Water Management
Scalable system for education and research

Clean water for everyone – enabled by modern technology. From system planning and operation to maintenance, repair, and optimization, water management demands broad, interdisciplinary expertise. The modular stations of the EDS Water Management system prepare learners effectively for these varied tasks and real-world applications through hands-on, practice-oriented training.

Training content overview
- Control, regulation, and monitoring of physical variables such as level, flow, and pressure
- Technical and physical principles of sensors and actuators, including wiring, adjustment, and parameterization
- System analysis and configuration and optimization of controllers
- Operation, maintenance, troubleshooting, and repair of systems
- Fundamentals of plant engineering
- System optimization and energy monitoring
- Electronic data processing (EDP)

Optional stations for extension:
Sand filtration
Membrane filtration
Adsorption
Mechanical treatment



Also of interest: Festo LX features **a series of specialized eLearning courses** on water management, complementary to the learning system.

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CE

Some learning solutions included in this document do not have a CE mark and cannot be ordered for delivery to Europe.

If you are located in a country where this marking is required, please contact your Festo sales representative before placing an order.

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