

FESTO

DCS Learning System – PCS neo

Overview of the learning solution

Date

Presenter

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01 Introduction to PA and DCS

02 Industry skills gaps

03 Intro to our DCS solution

04 Value proposition, USPs

05 Key user benefits

06 Courseware, learning objectives

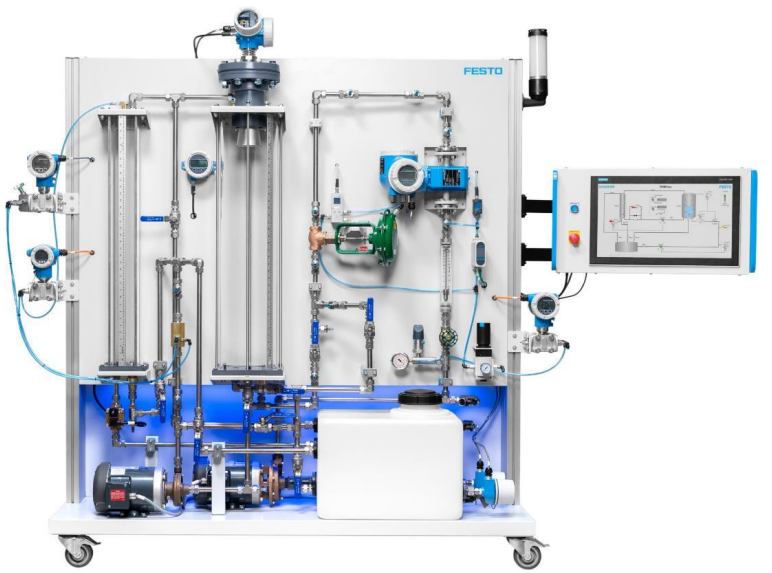
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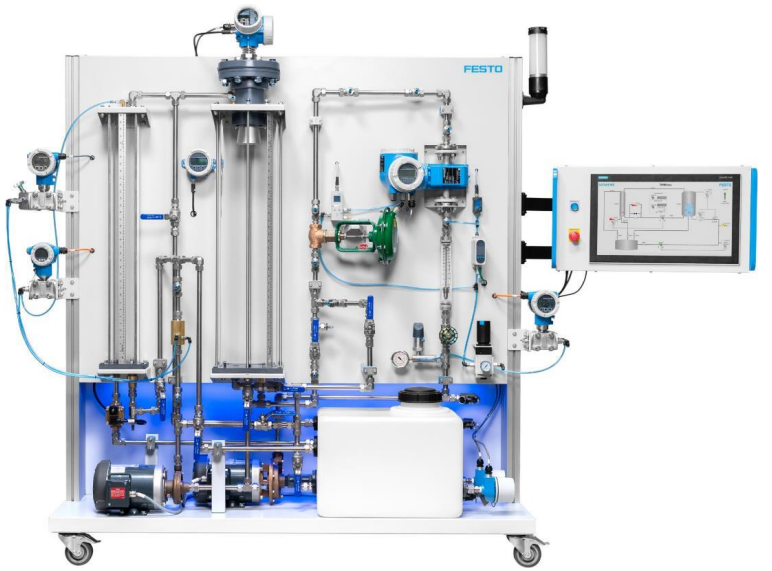
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Process automation

brings together process technology, instrumentation, and control systems to run batch or continuous processes safely, stably, and efficiently—24/7.


Process technology


Instrumentation


Process control

Continuous batch processes occur in a wide range of industry segments and hot topics.



Chemicals



Food & beverage



Water/wastewater



Pulp & paper



Oil & gas

LNG (liquified natural gas)



Battery manufacturing

Purified water



Energy & renewables

Green hydrogen



Pharmaceuticals



Mining



Semiconductor



How process automation is applied in the...

Hydrogen industry

- **Electrolyzer units** (water feed, hydrogen/oxygen outputs)
- **Water treatment system** (filters, pumps)
- **Gas separators** (for hydrogen and oxygen streams)
- **Compression units** (for hydrogen storage)
- **Storage tanks** (H_2 and O_2)
- **Safety valves and pressure relief systems**
- **Instrumentation** (flow, pressure, temperature, control valves)
- **Utility connections** (power supply, cooling water)



How process automation is applied in the...

Semiconductor industry

- **Specific industrial process** applications like ultrapure water, chemical delivery and gas handling .
- **Sensors**: temperature (thermocouples, RTDs), pressure transducers, mass flow controllers , flowmeters, level sensors
- **Final elements**: valves (solenoid, pneumatic, proportional), pumps
- **Process control**: PID tuning, cascade loop, recipes
- **Data skills**: using data historians, SPC tools, data extraction, interpreting process trends and alarms.
- **Communication and networking**: Fieldbuses and industrial networks (Ethernet APL, PROFINET, Modbus TCP, HART, Profibus PA).

https://youtu.be/WKHKy89QaV0?si=kuy40DiKkGVeYukd



How process automation is applied in the...

Mining and metal industry

- Rare earth metal and mining operations integrate specific industrial process applications such as:
- **Ore beneficiation and separation**: flotation cell level and air flow sensors
- **Hydrometallurgy and leaching**: flow meters, temperature, pressure level sensors. Cascade control for residence time and temperature
- **Solvent extraction and ion-exchange separation**: separate and purify individual rare earth elements using cascade control for residence time and temperature
- **Smelting, calcination and refining**: mass flow controllers for gas
- **Waste-water management**: flow meters



How process automation is applied in the...

Oil and gas industry

- Instrumentation & process control on an offshore drilling rig play a critical role in safety, efficiency, regulatory compliance, and uptime
- DCS performs PID control loops for pressure, flow, temperature, level and others essential to rig systems.
- DCS provides real-time telemetry and data logging for onshore/offshore collaboration—remote experts can analyze trends and advise in near real-time

Process automation relies on distributed control systems (DCS).

DCS: a networked control system that monitors sensors, regulates actuators, manages alarms, and coordinates multiple process loops

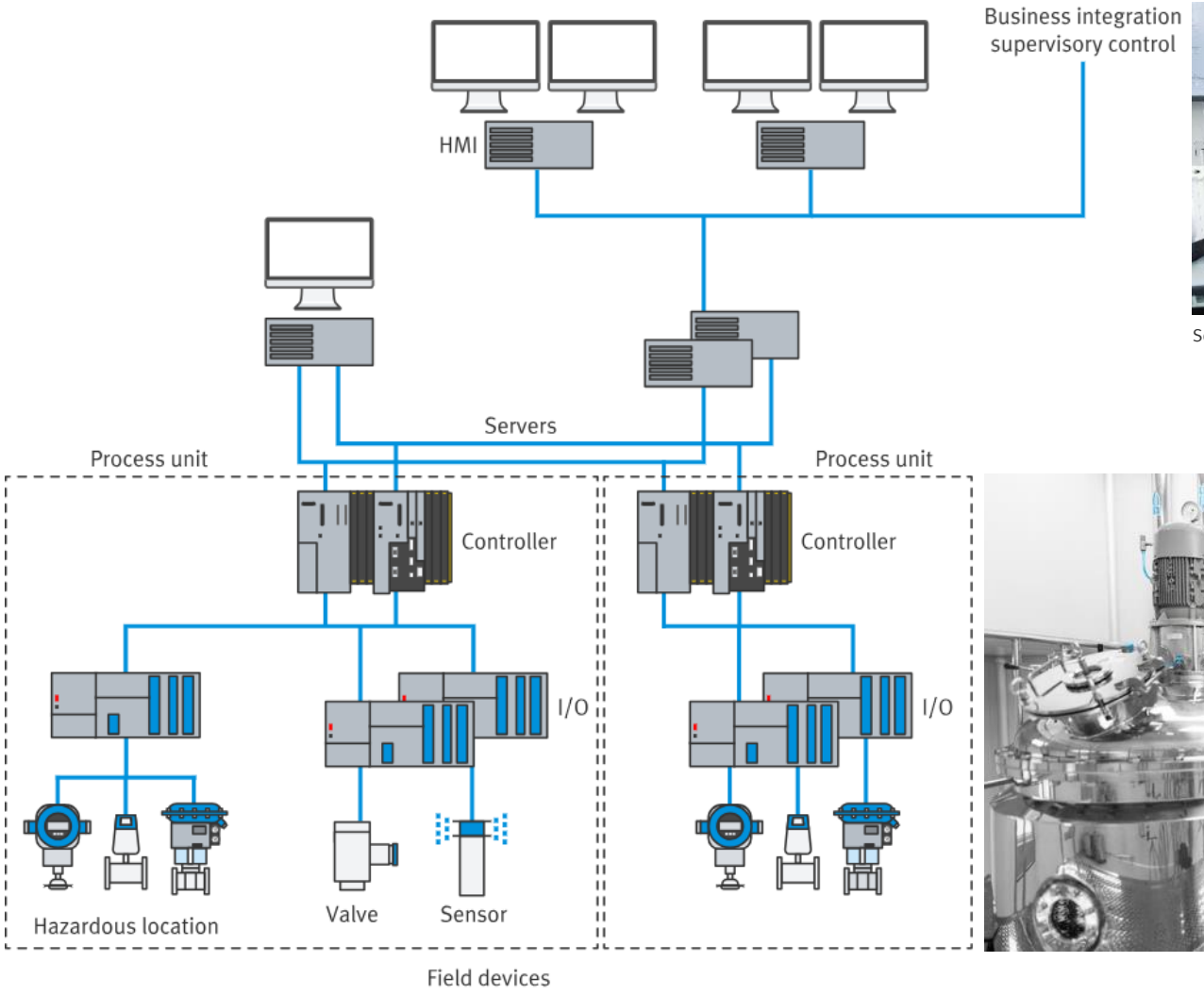
- **Monitoring:** Continuously collects data from sensors and instruments throughout the plant.
- **Control:** Automatically adjusts actuators (valves, pumps, motors) to maintain desired process conditions.
- **Alarm management:** Alerts operators to abnormal situations and prioritizes critical issues.
- **Data logging and analysis:** Stores process data for reporting, optimization, and regulatory compliance.
- **Coordination of complex processes:** Manages multiple loops and subsystems in a batch or continuous process.



Source: Siemens SE

DCS typical architecture







Source: Siemens SE



Main commercial DCS's on the market

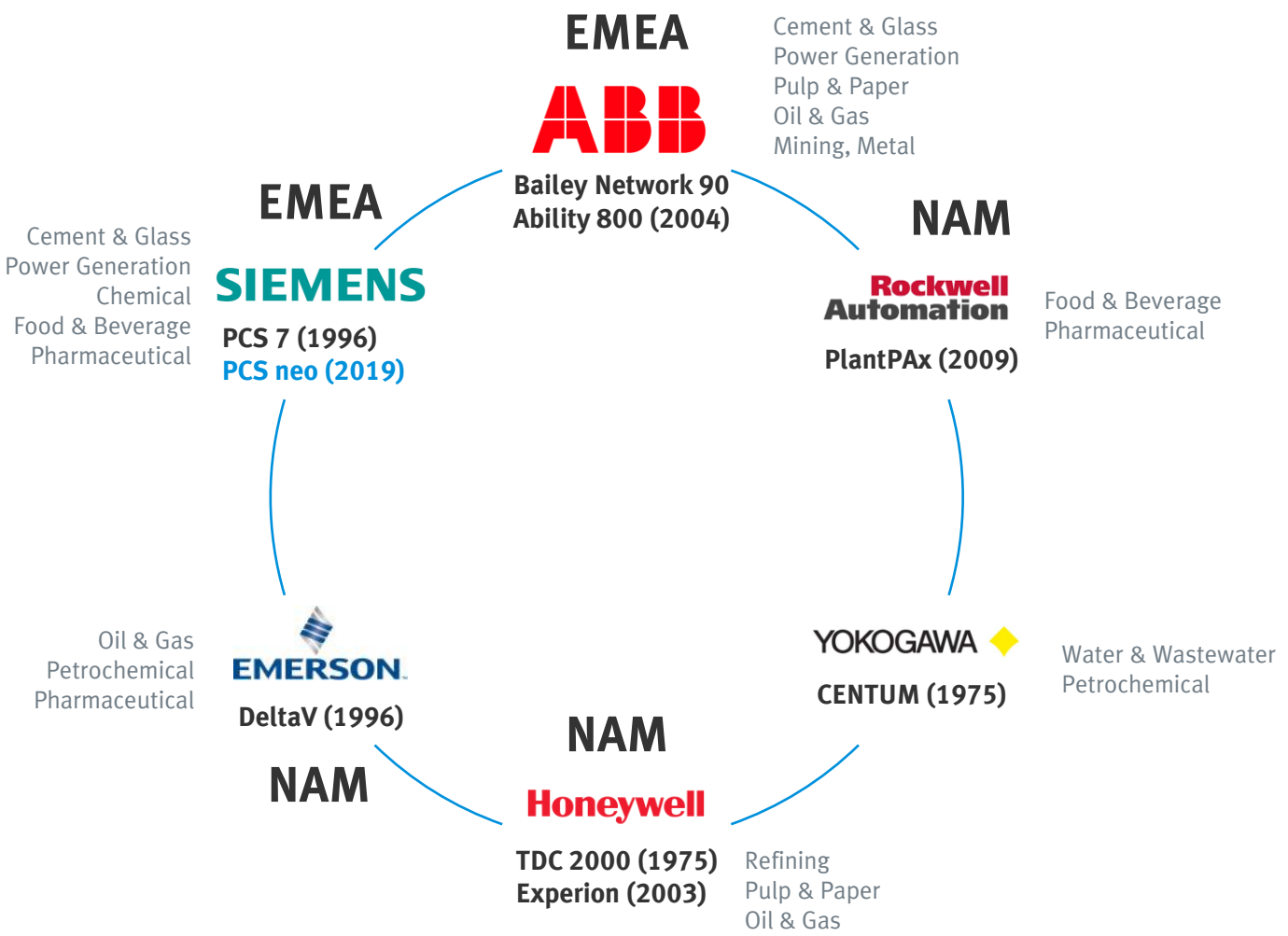


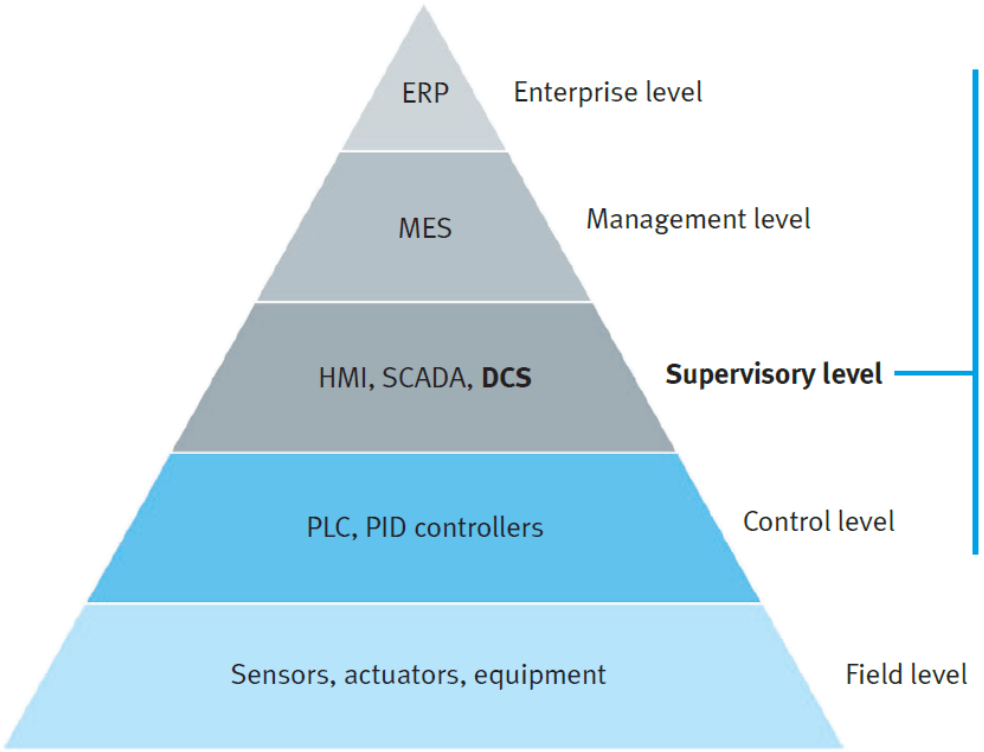


ABB Bailey Network 90 in a $NaClO_3/H_2$ plant (1991)

The global DCS market is expanding.

- Oil and gas, energy generation
- Growing infrastructures in Asia Pacific
- Digitalization and AI
- Cloud-based solutions
- Openness, interoperability and flexibility

How does a DCS connect to other systems?



SCADA systems centrally monitor, control, and acquire data in large-scale industrial processes. DCS and SCADA systems collaborate, with DCS managing local control tasks while SCADA provides supervisory functions. DCS systems typically include built-in HMIs, but they can also integrate with standalone HMI software for enhanced visualization and control.

PLC vs SCADA vs DCS

Feature	PLC (Programmable Logic Controller)	SCADA (Supervisory Control & Data Acquisition)	DCS (Distributed Control System)
Main Purpose	Control of individual machines and equipment	Monitoring, visualization, and data collection	Continuous control of large process plants
Role in Automation	The **"muscles"** – executes fast actions	The **"eyes & dashboard"** – shows what's happening	The **"brain"** – runs the entire process automatically
Best For	**Fast, discrete automation**	**Supervising remote or distributed assets**	**Complex, continuous industrial processes**
How It Operates	Executes very fast logic (on/off, sequences)	Collects data, displays values, alarms, trends	Performs real-time closed-loop control across the plant
Typical Speed	**Very fast** (milliseconds)	**Slow** (seconds)	**Medium** (continuous loops)
Control Type	Discrete control (binary, fast actions)	Supervisory only (no direct control)	Continuous control (analog loops)
Reliability Needs	Standard industrial reliability	Depends on communication network	**Very high, with redundancy**
Architecture	Stand-alone or small network	Central server + remote field units	Distributed controllers + unified operator systems
Scale	One machine or small cell	One facility or spread-out systems	Whole plant or major production unit
Operator Interface	**Minimal**	Extensive **dashboards** and control screens	**Full control-room stations**
Examples	Packaging lines, conveyors, pump control, robot cells	Water systems, pipelines, substations, smart grid	Oil & gas plants, refineries, chemical reactors, power plants
Cost Level	**Low**	Medium	**High**

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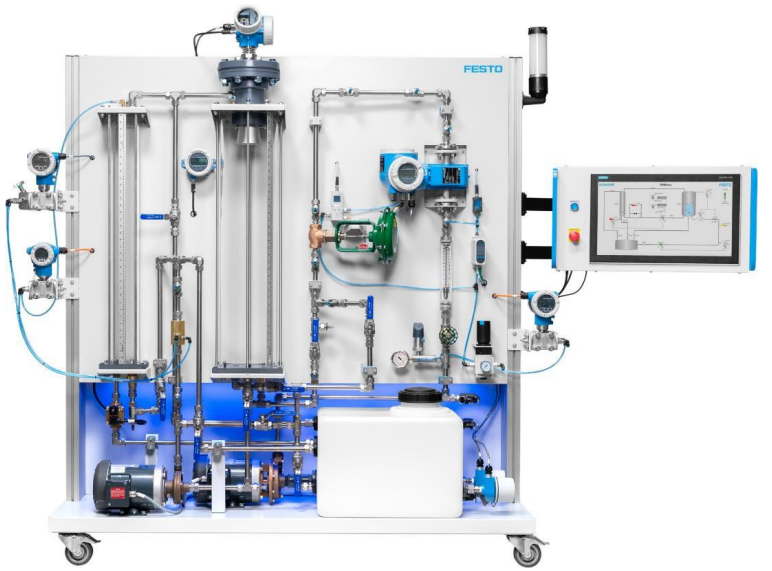
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Standard skill sets required for frontline staff



Electrical & Instrumentation (E&I) Technician

- Electrical basics
- Wiring and cabling
- Instrumentation fundamentals
- Control systems
- Calibration and commissioning
- Troubleshooting and fault diagnosis
- Documentation and reporting
- Mechanical basics
- Safety and compliance
- Soft skills
- Process documentation
- Soft skills



Process Technician/Operator

- Process operations fundamentals
- Instrument interpretation
- Process control
- Operation of plant systems
- Sampling and laboratory practices
- Process safety and compliance
- Mechanical / equipment operation
- Process documentation
- Soft skills

Common skills gaps on the production floor

- Weak troubleshooting and problem-solving skills
- Instrumentation calibration and commissioning
- System-level thinking, cross-system understanding
- Process safety awareness
- Industrial communication protocols and fieldbus configs
- Condition-based maintenance basics
- Soft skills for operations environments
- **Practical experience with DCS**



Overview of core DCS skills per occupation



Process Operators

Operate, respond

- Navigate DCS interfaces and monitor process variables
- Execute batch operations and process sequences
- Respond safely to alarms and abnormal situations

Process Technicians

Support, troubleshoot

- Diagnose common process and control issues
- Verify field device status and monitor batch execution
- Apply standard operating and maintenance procedures

Process/Control Engineers

Design, optimize

- Configure and optimize control loops and strategies
- Analyze process data and test batch sequences
- Manage configuration changes and support process improvement

E&I Technicians

Maintain, integrate

- Verify I/O and signal integrity, troubleshoot instruments
- Test interlocks, safety functions, and network communication
- Support DCS maintenance and coordinate with operations

How DCS training is usually addressed in schools?



- No coverage at all
- Minimal theoretical coverage
- Industry demos or guest lectures
- Simulated software only
- PLC-focused training
- Limited lab exercises with simple equipment
- Full DCS-driven laboratory

Situation in most schools.

Most students leave school with little or no experience with a real DCS, often only understanding basic concepts theoretically.

Lack of practical DCS skills: a real industry issue

This skill deficit of new hires has consequences for employers:

Increased training costs: Companies must invest more in onboarding and hands-on training.

Longer time to competency: New hires take longer to operate independently.

Operational inefficiencies: Inexperienced operators can put the people and plant safety and efficiency at great risk.



No DCS experience in school leaves students unprepared for the industry.

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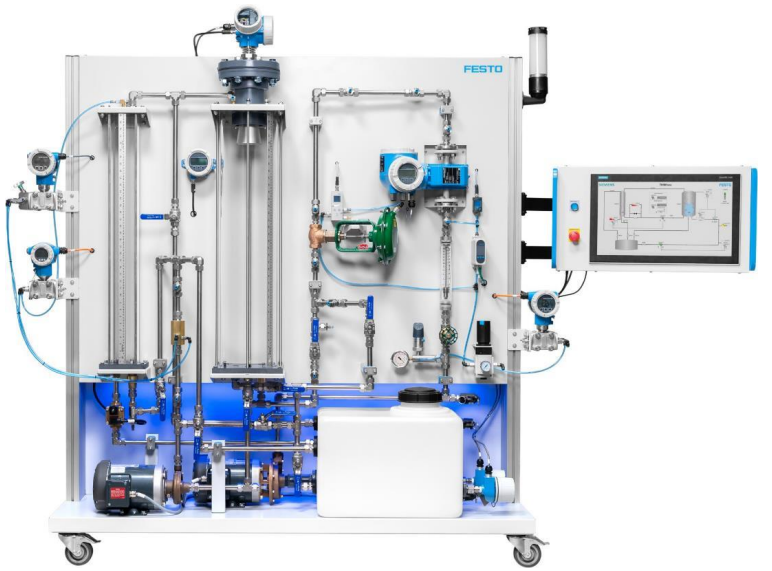
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Curriculum for E&I and process technicians

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Fundamental Skills | Basic Skills | Advanced Skills | Specialized Skills

Electrical safety

Festo LX

Basic electricity



Electeo

Motor control



TP 1211

PLC programming



EduTrainer

Sensors



Smart sensors TP 1311/ 1312

Electric Machines



TP1221

Advanced Electrical Motors and Drives



Edutrainer G120

Oil and gas



Three-Phase Separator

PA concepts



EduKit PA Advanced



MPS PA Compact Workstation

Measurement

Control



DCS Learning System (SIMATIC PCS neo)

IIoT, Networks

Pneumatics



Pneumatics - basic level TP 101

Mechanical drives



Mechanical drives

Ind. electrical installations



Industrial wiring

Fluid mechanics



Industrial pumps

Network



Networks and IT Security TP 1333

Water Management



EDS Water Management

Overview of the process automation portfolio

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Introduction > **Fundamentals** > **Industrial**



EduKit PA CE

Intro to manual measure-ment and open- and closed-loop control of level, flow, and pressure.



MPS PA Compact Workstation CE

Closed-loop control, level, flow, pressure, and temperature control loops, and automation (with instrumentation) based on continuous processes.



Process Control Training Systems

Industrial pressure, flow, level, temperature processes, heat exchanger, pH measurement, process dynamics, proportional/PID/cascade control... (LV Series 6090)



DCS Learning System – SIMATIC PCS neo CE

A mini IIoT process plant with smart devices, water and air as media, industrial instruments used to control or monitor industrial processes (temperature, pressure, flow, and level process variables). PID process control loops as well as different type of control strategies...



Industrial Process Learning Systems

A process plant in the lab! Industrial control systems for pressure, flow, level, temperature, pH, conductivity, air pressure/flow processes, fast heat exchanger, PID / proportional / cascade control... Fully configurable: lots of options, technologies, and brands. (LV Series 353X)

Applications



MPS PA 204 CE

Filtration, mixing, reactor, and bottling processes



EDS Water Management CE

Water and wastewater treatment, filtration, adsorption, and more



Three-phase separator CE

Fundamentals of crude oil separation (gravity, layer thickness, viscosity, retention time, oil/water/gas ratio...). Industrial-grade components.

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Discover our new connected, interactive process training plant

Distributed Control System (DCS)
Learning System – SIMATIC PCS neo

An interactive, connected process plant for your laboratory

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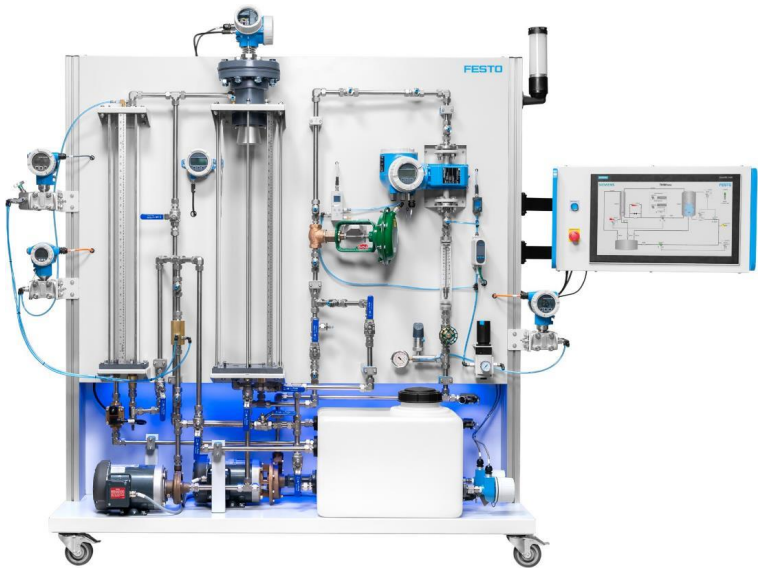
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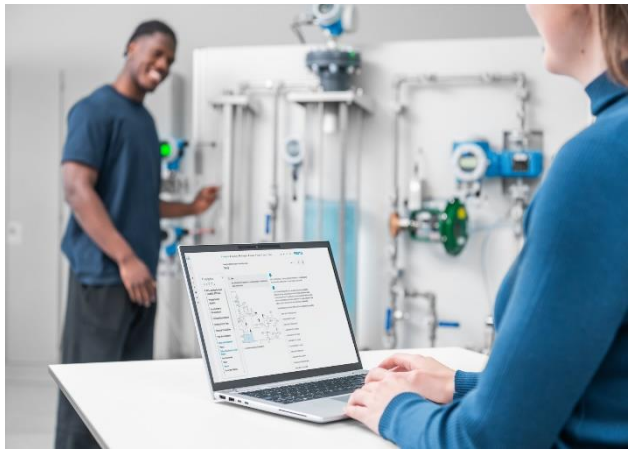
Value proposition

The DCS Learning System provides teachers with a **structured way to seamlessly integrate DCS training into instrumentation and process control courses—bringing real DCS experience into the classroom** and preparing students for the modern process industry.



Unique selling points

- One of the **very few learning systems with a DCS**
- The **only one** with SIMATIC PCS neo
- **Affordable** pricing for a cutting-edge training process plant
- Turnkey: **ready** to roll in the lab and start working
- Includes a varied assortment of smart, **IIoT-enabled** components
- **Remote** monitoring and operation possible
- **Liquid** (water) and **gas** (air) as **safe** training media
- Complete (**digital**) course with **hands-on** experiments
- **Network segmentation** → mirrors industry cybersecurity standards



Fault insertion for troubleshooting exercises

Response to alarms and various issues is critical for preparing the students



Instructor password protected screen to insert faults using the **touch panel or remotely** using their laptop, even while students are working on the system

Types of faults:

- Open circuit on magnetic flow transmitter output
- Open circuit on solenoid valve
- Open circuit on Profibus signal from dp transmitter
- Open circuit on pressure switch alarm
- Pump running in opposite direction
- Wrong I/P operation: control valve doesn’t close completely
- Wrong calibration on small column level dp transmitter

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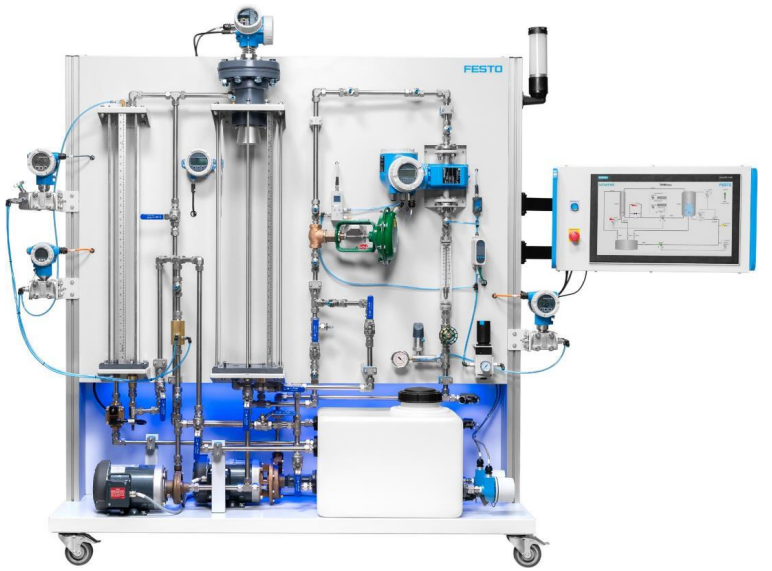
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Key benefits

- Reflect current industry practices and technologies in your teaching to boost learners' employability and motivation.
- Build system thinking, process-dynamics expertise, and strong problem-solving and troubleshooting skills.
- Deliver universal, hands-on training that prepares learners for multiple career pathways across various industries, maximizing your investment.

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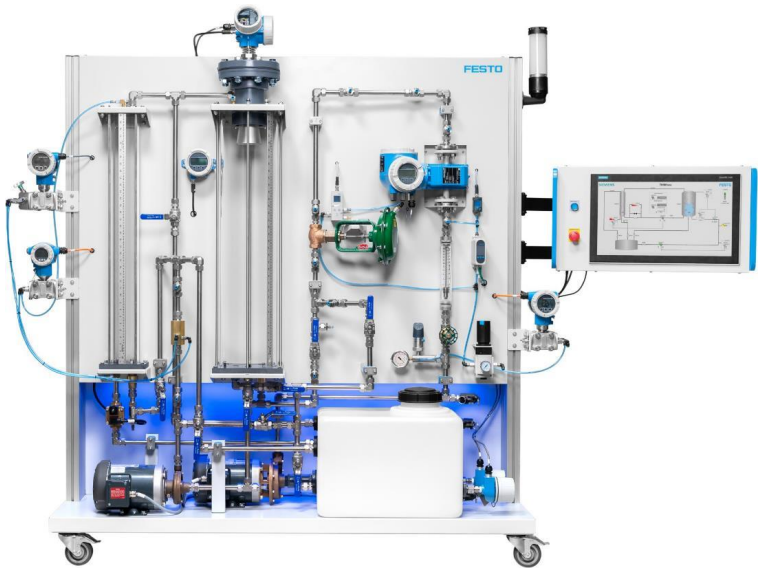
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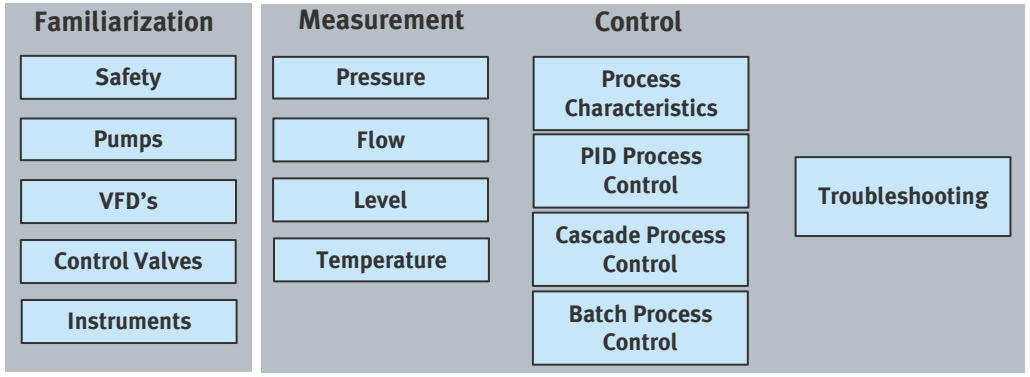


Learning content comes first



The course offers a customizable learning path.





Learning topics:

- Fundamentals of process variables
- Primary and final elements
- P&ID reading
- Smart instrumentation configuration
- Industrial communication protocols
- Process control loops tuning
- Troubleshooting

Soft skills:

- Problem-solving and decision-making skills; autonomy and communication.
- Analyze the advantages, disadvantages, requirements, and consequences for each solution to a problem.
- Monitor, define, prioritize, and complete tasks without direct oversight.

The course is structured around learning units.

1. **Process Control Systems** – DCS overview, P&ID, HMI, communication networks, sequencers, start-up & shutdown.
2. **Introduction to Measurement** – Fundamentals, units, instrument characteristics, dynamic behavior.
3. **Pressure Measurement** – Fluid properties, hydrostatic pressure, pressure devices, installation, measurement in systems.
4. **Introduction to Flow** – Volume & mass flow, flow measurement basics, rotameters.
5. **Pressure vs Flow** – Fluid dynamics, Bernoulli, Reynolds number, pumps, pressure loss, control valves.
6. **Flow Measurement** – Primary flow elements, differential pressure, Venturi & electromagnetic meters.
7. **Level Measurement** – Principles, differential pressure, radar level meters, vessel measurement.
8. **Temperature Measurement** & Heat Transfer – Temperature scales, thermodynamics, RTDs, thermocouples, heat transfer.
9. **Process Characteristics** – Open/closed-loop, dynamic systems, process gain, time constants.
10. **Feedback Control** – On/off & PID control, tuning, controller structures, cascade control.
11. **Batch Control** – Batch process concepts, standards, optimization, tuning batch loops.
12. **Troubleshooting** Process Control Systems – Systematic troubleshooting, guided/non-guided exercises, project work.

Main learning objectives

- Gain a solid understanding of key process variables and system dynamics.
- Explore centrifugal pumps and fluid mechanics basics.
- Identify and work with primary measuring devices and final control elements.
- Read and interpret Piping & Instrumentation Diagrams (P&IDs).
- Configure and calibrate smart field instrumentation.
- Set up industrial communication with common protocols.
- Tune and optimize process control loops.
- Manage alarms and troubleshoot the system.





Our DCS training unit bridges industry skill gaps.

[Reminder] **Common skills gaps in process automation new hires**

- Weak troubleshooting and problem-solving skills ✅
- Instrumentation calibration and commissioning ✅
- System-level thinking, cross-system understanding ✅
- Process safety awareness ✅
- Industrial communication protocols and fieldbus configuration ✅
- Condition-based maintenance basics ✅
- Soft skills for operations environments ✅
- Practical experience with DCS ✅



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Note

The course is not about learning PCS neo itself.

The course is about learning process automation while interacting with a DCS.

The use of the DCS is woven into the learning exercises.

The skills students develop are transferrable to other DCS brands.

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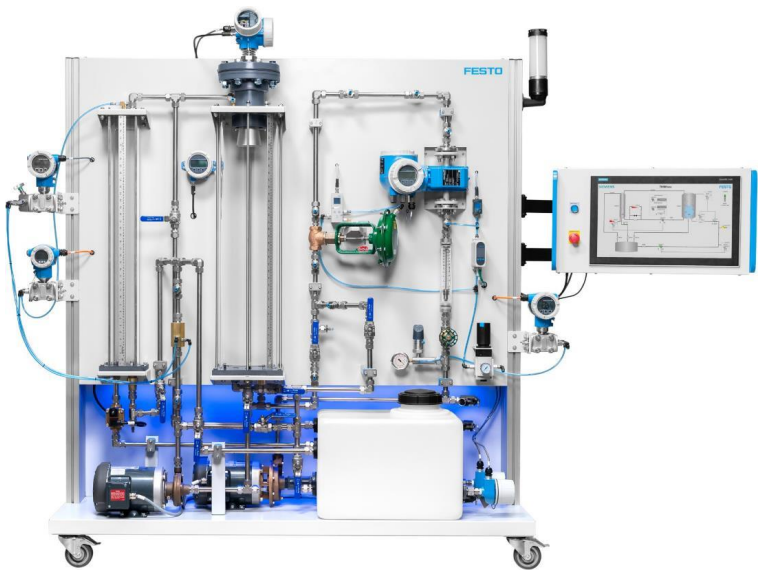
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Target users

Technical and vocational schools process automation, instrumentation, or chemical engineering

University engineering departments that teach process control, instrumentation, or industrial automation.

Corporate training centers in industries for upskilling/reskilling purposes

The DCS learning system is most useful for:

- Process operators and technicians
- Electrical and instrumentation technicians
- Process and control engineers

Also: maintenance and mechanical technicians



Typical job profiles in a green H2, iron and steel plant

Stegra – Boden, Sweden



Ongoing and upcoming courses



Kickstart your career as a process operator

This 20-week training program, offered by the municipalities in Norrbotten, equips you with the skills needed to launch your career as a process operator at our plant. The program starts in February 2025 and will continue with four intakes annually.

Read more



Process technician with hydrogen expertise

At Lapplands Lärcentra, you can prepare for a unique and relatively new professional role with expertise essential for the green transition. At Stegra, will have a significant need for process technicians with hydrogen competence. After only 64 weeks of mostly remote learning, you can become an important player in the green transition!

Read more



Industrial electrician

Complete a 75-week training program to become an industrial electrician, provided through the municipalities in Norrbotten. You will have excellent potential with us at Stegra, as we have a significant and ongoing need for this role!

Read more

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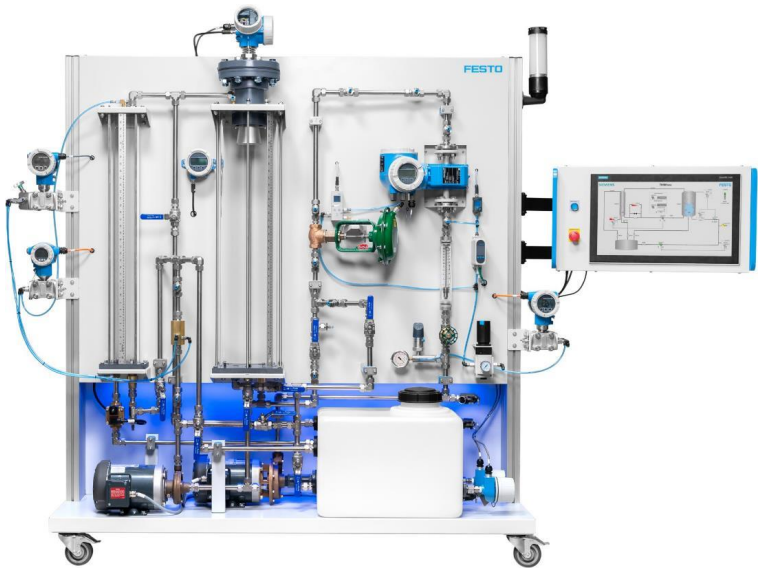
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Process loops

Process variables and media

- Monitoring and control of water pressure, flow, level
- Monitoring of water temperature
- Monitoring and control of air pressure and flow

Control strategies:

- PID (single-loop), cascade (multi-loop), batch
- Interacting loops
- Various ways to insert disturbances

A versatile training unit for teaching basic to advanced process control and instrumentation

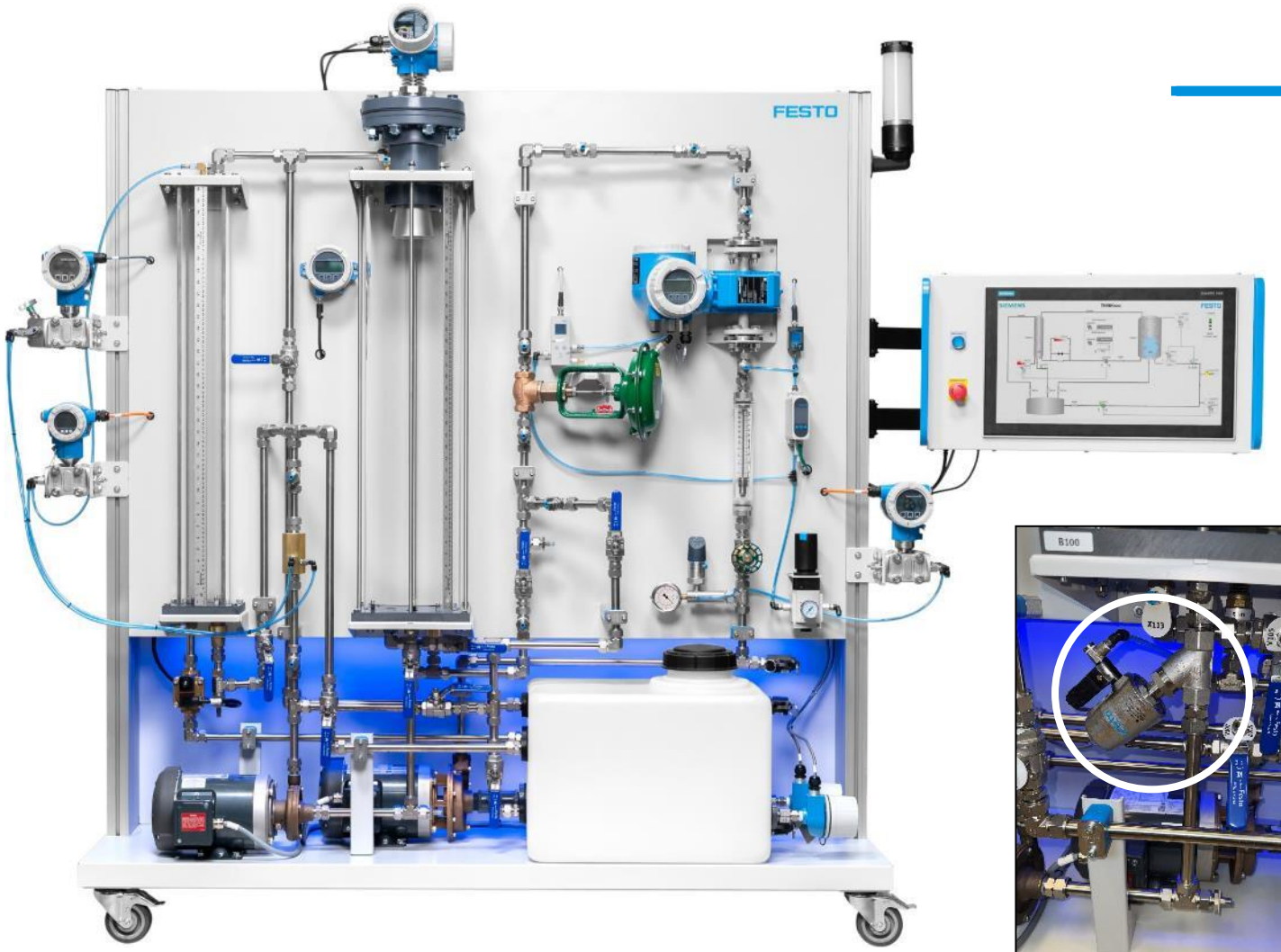


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Main characteristics

- Sleek look
- Rugged frame
- Mobile unit
- Fits through a standard door
- Concealed wiring
- Fixed layout
- Stainless steel piping
- Pressure measurement points
- Rear electrical and control cabinet

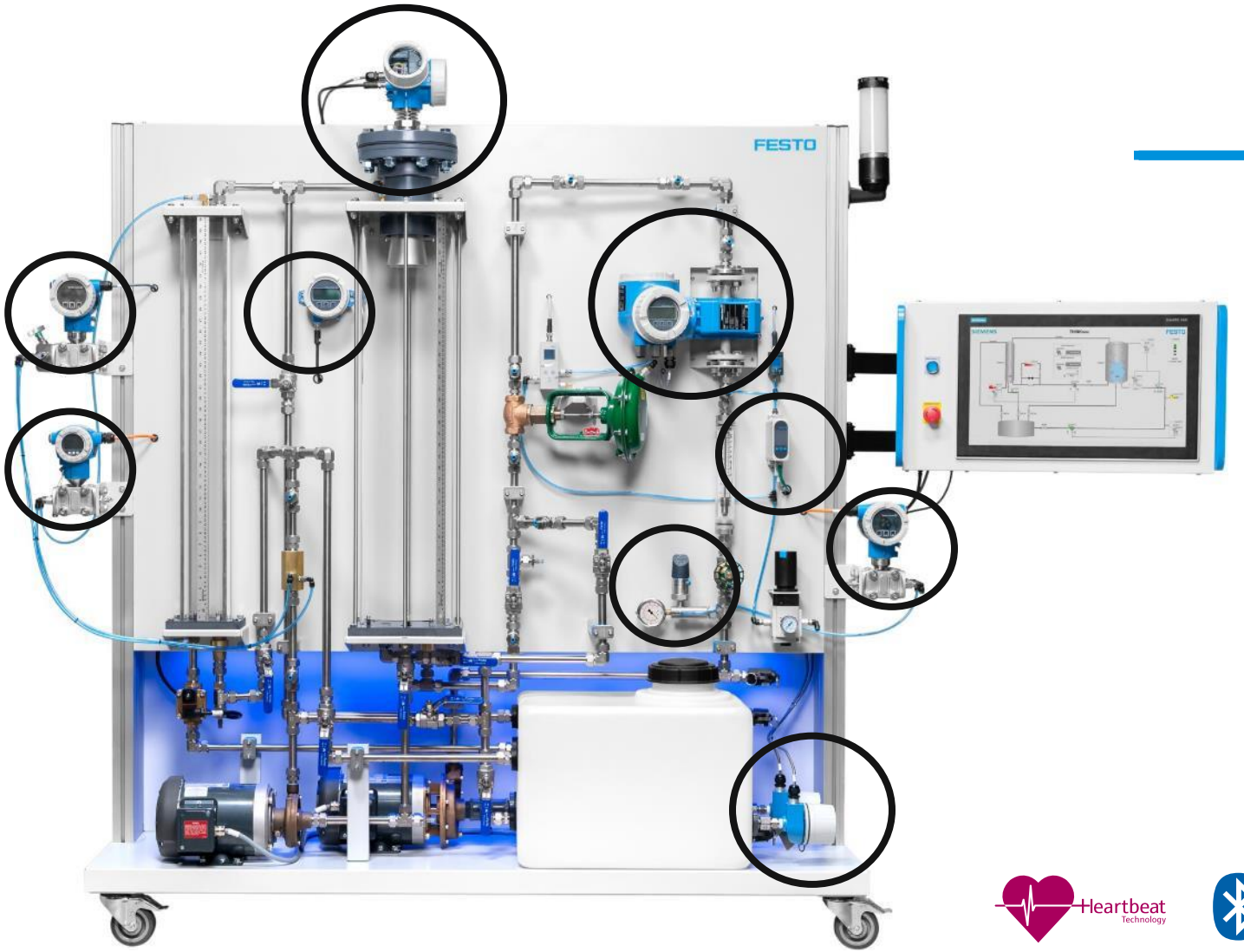
Ready to endure years of hands-on experimentation!



Main components

- Large touch panel
- Two columns, bubbler tube
- Water tank,
- 2 centrifugal pumps with VF drives
- Rotameter, manometer
- Ball valves
- Valves: a globe valve, a check valve, a pneumatic actuator, globe valve, a proportional, pressure control valve, a solenoid, valve, an angle-seat control valve with a pneumatic actuator...

Industrial equipment from leading manufacturers



Smart field devices

- Pressure switch
- Differential pressure transmitter
- Temperature transmitters
- Magnetic flow transmitter
- Radar level transmitter with remote display
- Differential pressure transmitter with 3-valve manifold (flow, Venturi)
- Differential pressure transmitter (level, low-range)

Provide relevant IIoT and industrial networking learning experiences

Festo components

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Gas flow and pressure control



Pressure sensor
SPAU



Mass flow controller
VEMD



Precision pressure regulator
MS6N-LRP



Proportional pressure control valve
VPPM



Pilot valve
VOFX



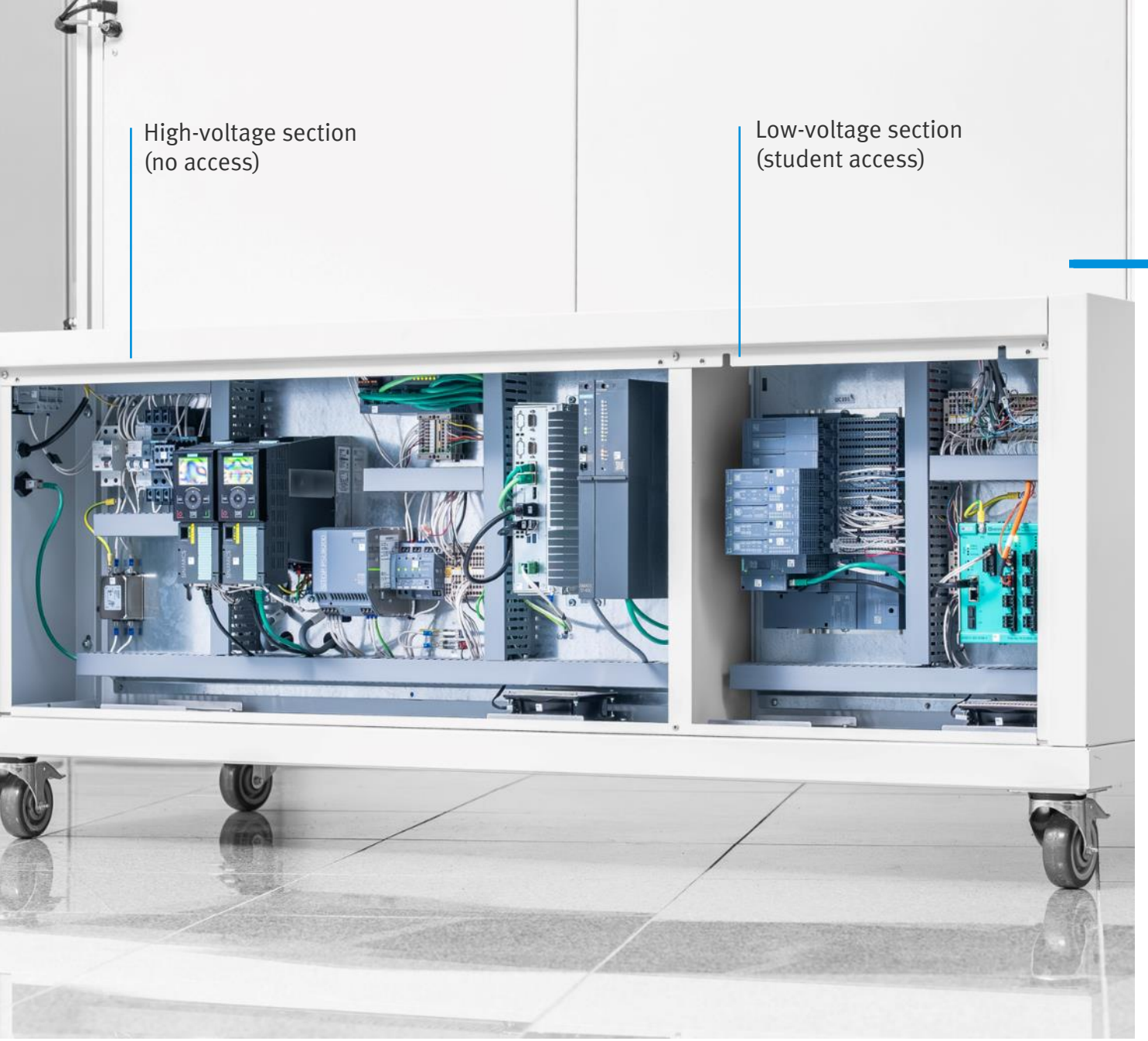
Solenoid valve
VZWF



Angle seat valve
VZXA



IO-Link Master USB
CDSU (optional)



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Electrical & control components

- Siemens variable-frequency drives
- Siemens DCS CPU
- Remote I/Os
- Siemens PC box
- P+F Ethernet APL Switch (PPA)

Provides hands-on experience with real industrial DCS hardware and networking



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Overall hardware benefits

- Industrial realism with modern technologies
- Cross-industry relevance
- Complete **interacting** process loops in action
- Exposure to multi-variable processes
- Basic to advanced control strategies
- The workstation can be used for teaching several topics and classes
- Safe

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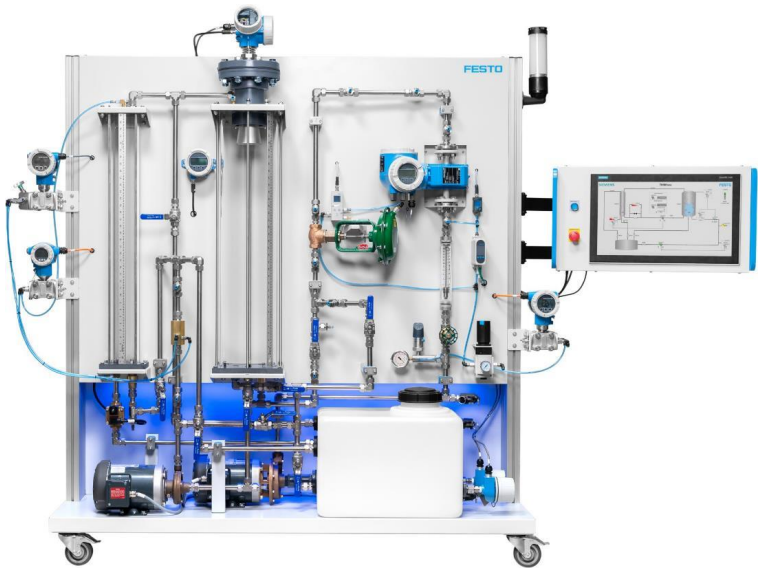
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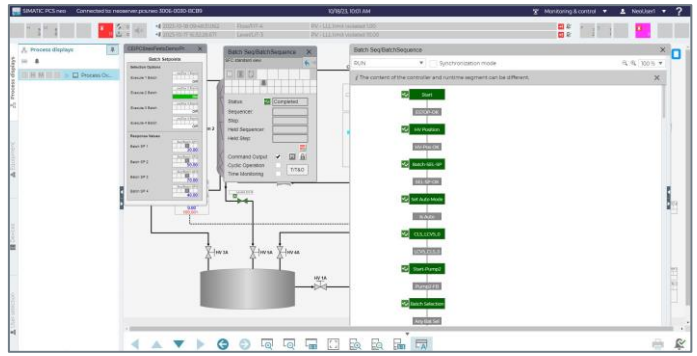


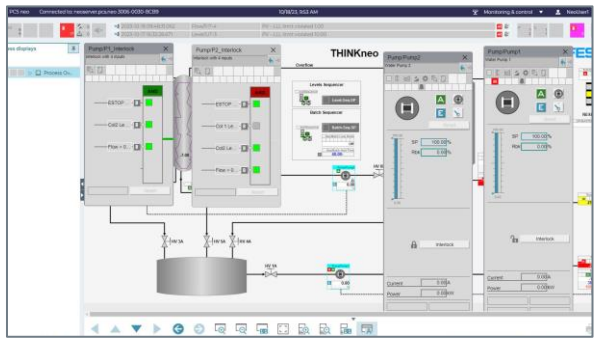
We picked PCS neo as the system backbone.

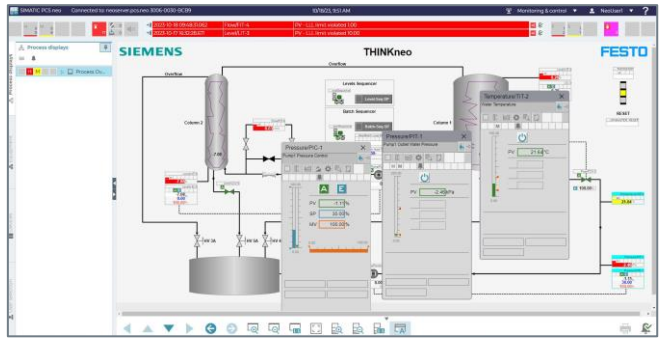


Why PCS neo?

- Next-gen Siemens DCS → future-proof
- Cloud-based system → remote system access
- Web browser access → no software installation or updates required
- User-friendly interface → for all users
- Data visualization tools → reinforce learning
- Preprogrammed flow paths and batch sequences → speed up lab sessions

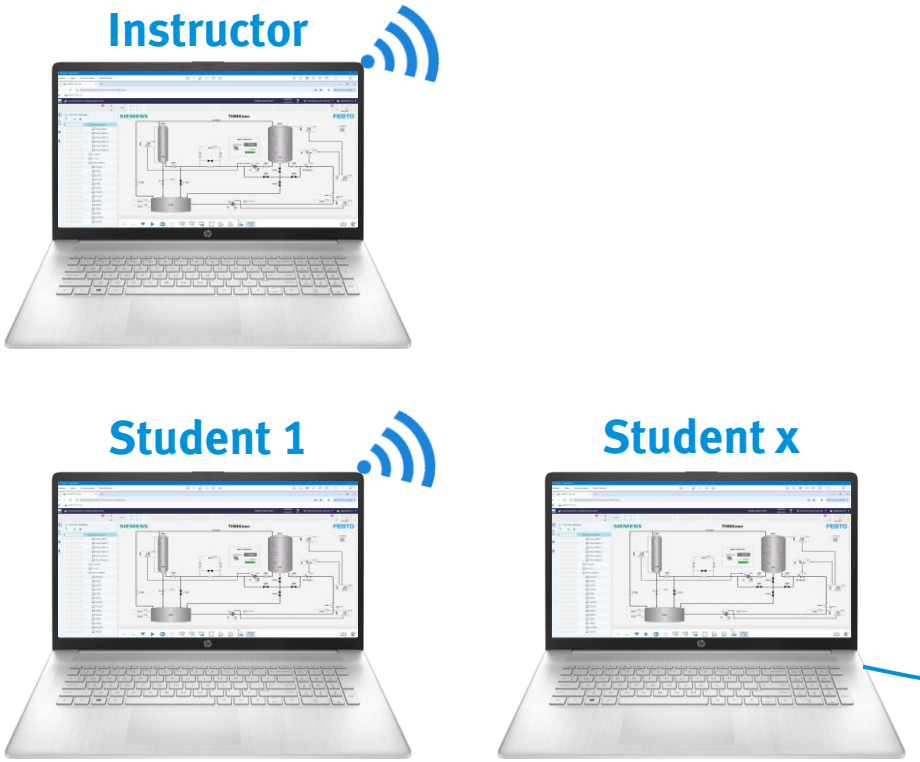


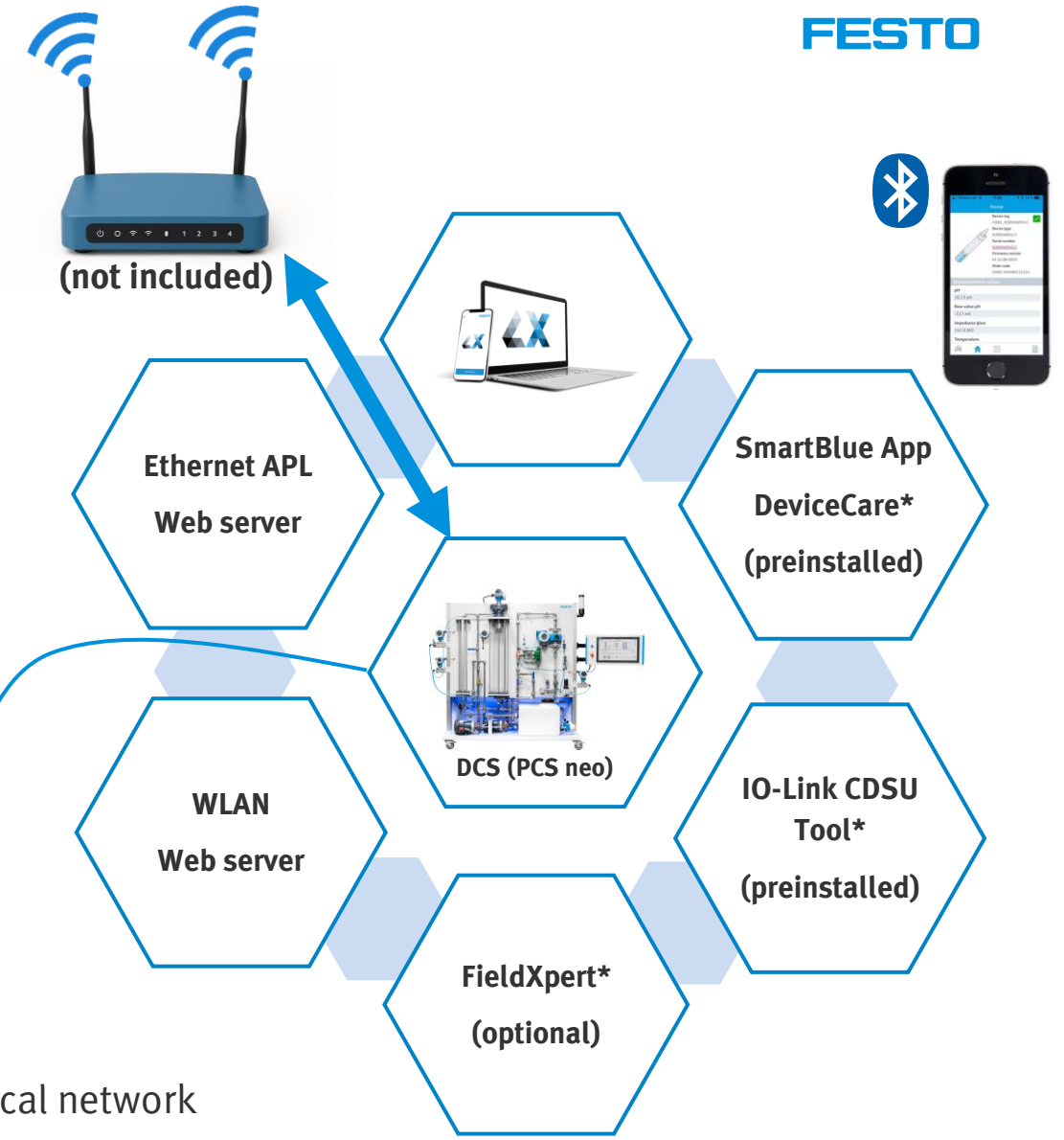






Digital Environment



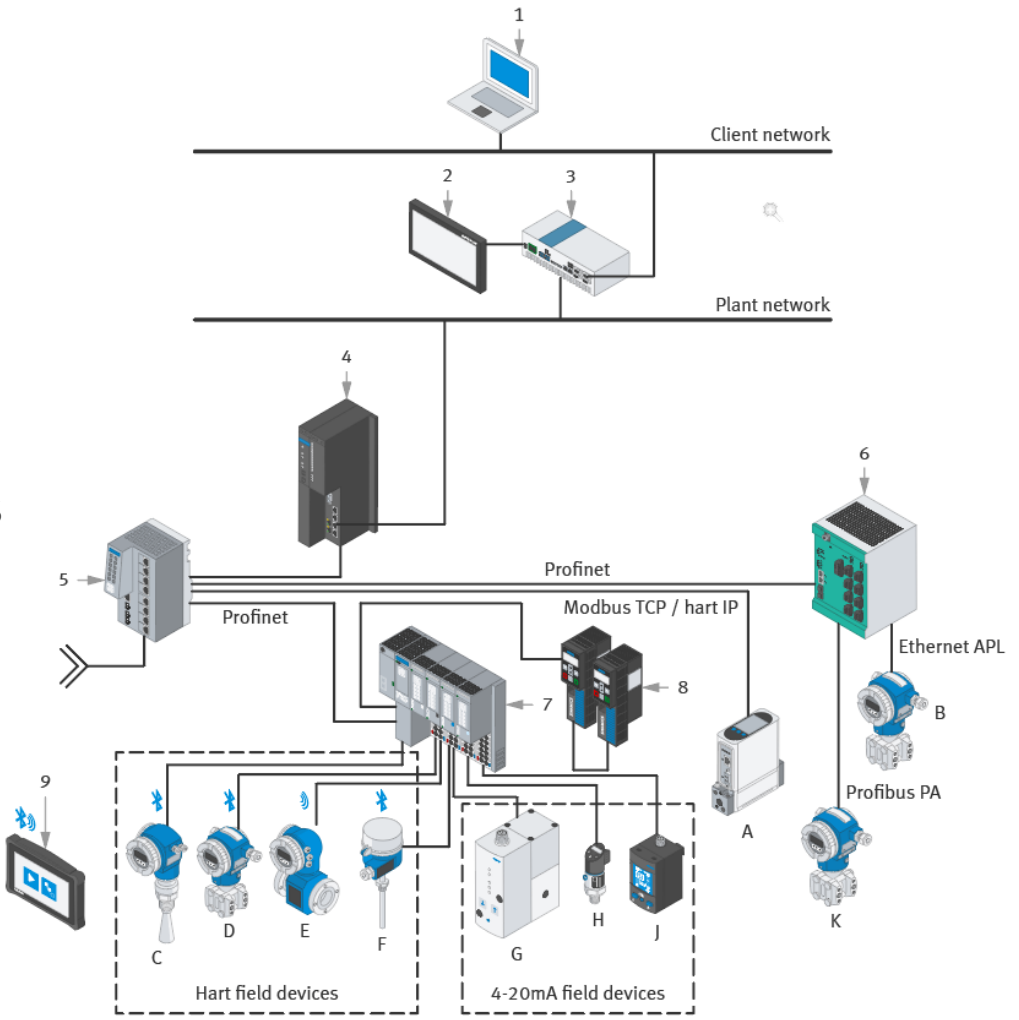


- Communication over Internet, Wifi (local access point) Wired local network

* Optional interface required

Network segmentation for cybersecurity reinforcement

- Realistic industrial network, hands-on labs safely
- Protecting the control systems and minimizing disruptions
- Simplifies class management and reduces interruptions
- Supports compliance and institutional policies



Agenda

01 Introduction to PA and DCS

02 Industry skills gaps

03 Intro to our DCS solution

04 Value proposition, USPs

05 Key customer benefits

06 Courseware, learning objectives

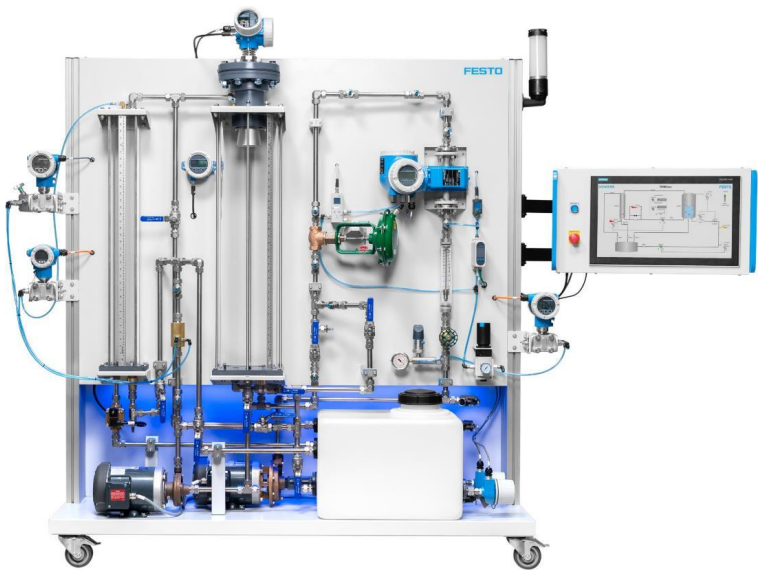
07 Target users

08 Hardware features

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Optional components

Depending on the configuration method selected for smart devices and customer requirements (budget, technology choices, and existing/owned equipment), additional components may be required:



- HART/Profibus PA Bluetooth Interface (Softing) – for DeviceCare and FieldXpert
- HART Interface (Microlink) – for DeviceCare and FieldXpert
- FieldXpert SMT70B (Endress+Hauser) – Bluetooth & WLAN
- IO-Link Master USB CDSU (Festo)
- Calibration packages

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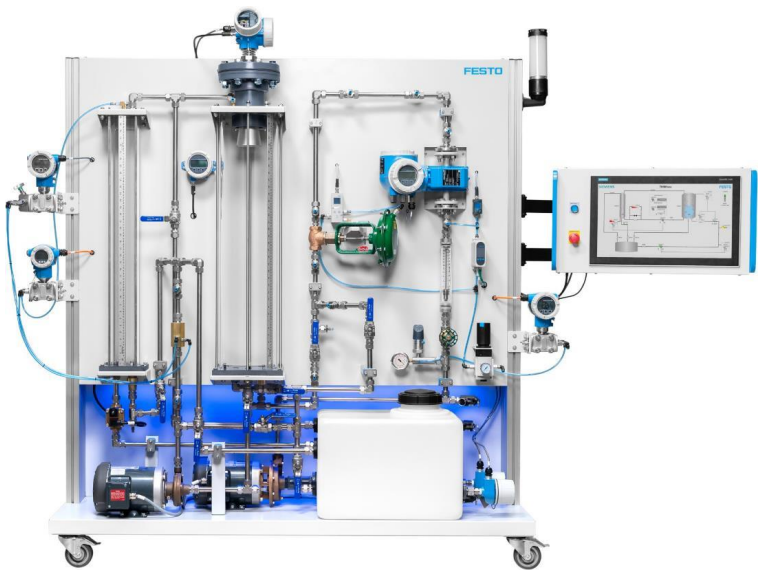
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Order information

optional

	120 V, 60 Hz	230 V, 50/60 Hz	Comments
Learning system	8232217	8232218	Not language sensitive
Campus license (EN)	8251321		Other languages will follow
HART/Profibus PA Bluetooth Interface	8251323		Used with DeviceCare or FieldXpert
HART Interface	8251324		Used with DeviceCare or FieldXpert
Festo IO-Link Master USB CDSU	8091509		Used for configuring the IO-Link pressure sensor
Field Xpert SMT70B (E+H) Bluetooth, WLAN	8251322		Used for configuring HART, Profibus PA, WLAN, and Bluetooth instruments
Basic Calibration Kit (Fluke 725)	588416		One calibration kit is **required** if the instructor does not already own calibration devices.
Basic Calibration Kit (Fluke 725) with Pressure Modules	588417		
Process Calibration Kit (Fluke 754 HART)	588418		
Process Calibration Kit (AMS TREX HART)	588419		

Assembly and commissioning

Quick setup: The workstation arrives ready to roll into the lab!

Fully assembled and wired, with all programs pre-installed

Electrical / air requirements:

- Power supply: 120 V AC / 15 A or 230 V AC / 10 A, single-phase
- Compressed air: 28 L/min (1 SCFM) at 6.2 bar (90 PSI)

Train-the-trainer sessions – on-site or virtual – can be booked to familiarize teachers with the hardware, courseware, and software and reduce their learning curve.

Thank you for your attention!