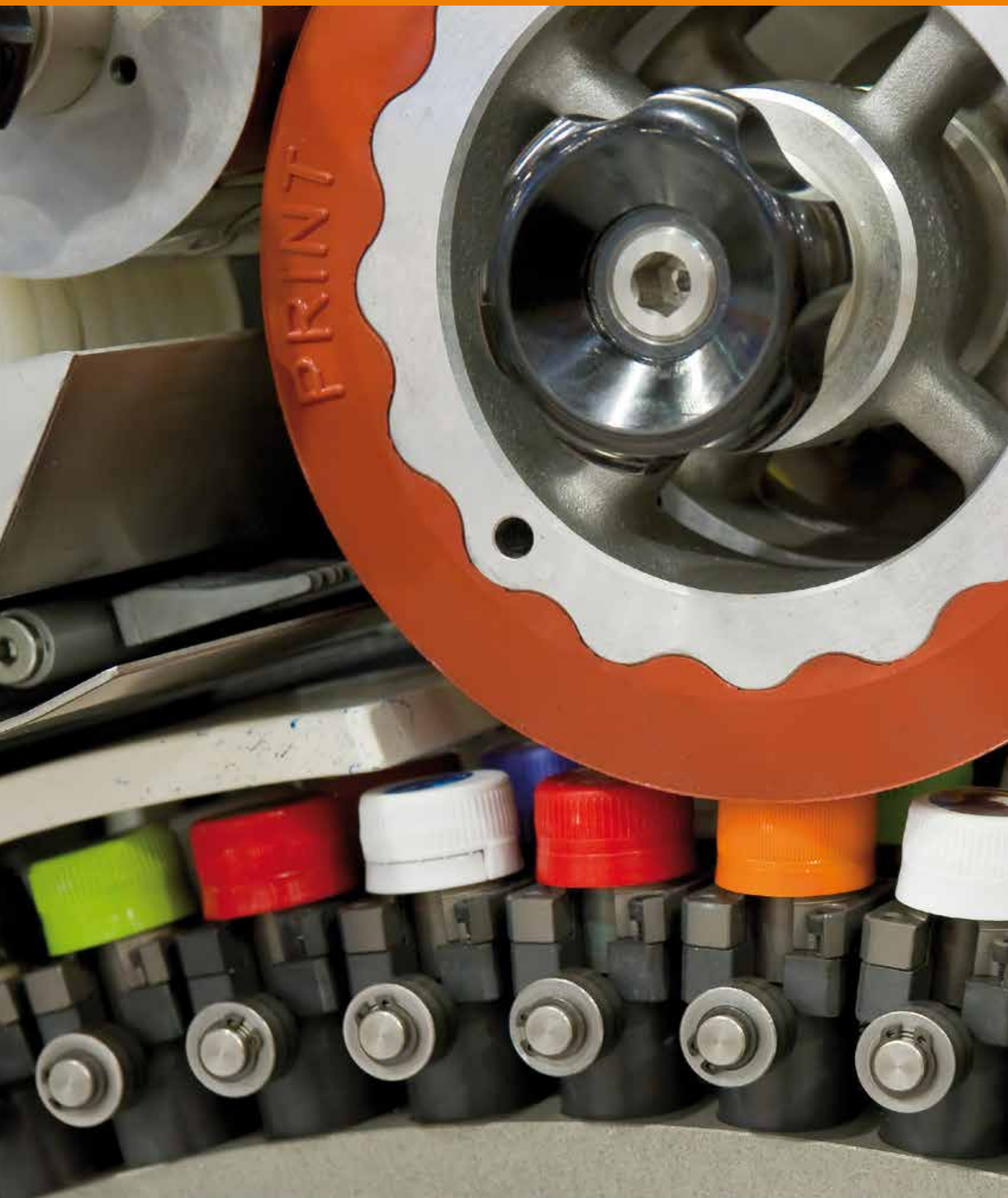
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Industrial Drives

Parameterization of Industrial Components

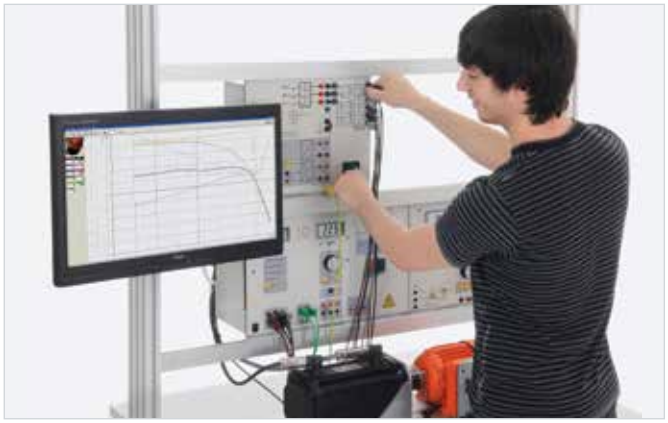
Today, the idea of a modern industrial world without controllable electrical drives is totally unthinkable. Their area of application ranges from high power performance to traction drives, machine tools and production machines up to and including applications in the automotive sector. As opposed to didactically designed drives, these training systems are equipped with industrial equipment. The training here focuses on how to handle and set the parameters of real industrial drive equipment.

Industrial components
The use of industrial components made by well-known manufacturers such as Lenze AG or Siemens puts us in a position to convey practical industrial know-how directly to the student. The designations of all of the terminals and connections correspond exactly to equipment used in industry. Standard industrial operating instructions and software are used in the projects and exercises.

Multi-disciplinary
Field-bus interfaces in connection with frequency converters, servo drives and motor management relays provide the basis for interdisciplinary applications together with automation technology. The drives can be controlled via PLC and operated using HMIs. This permits the visualisation of typical process control variables, disturbance variables and operating modules.

Training systems
Our training systems cover the following topics:

- Smooth starters
- Frequency converter drives
- Servo drives
- Motor management relays



Smooth starting Three-Phase Machines

Cutting high Switch-On Currents

Smooth starters use phase-angle control to reduce the motor's voltage during switch-on. The starting current drops proportionally to the terminal voltage. The power section of a smooth starter normally consists of two thyristors switched anti-parallel per phase. In order to be able to keep the power losses and the associated heat build-up as low as possible, the power semiconductors are shunted by a power circuit-breaker subsequent to the starting phase.

Experiment example: "Smooth starting three-phase machines EDT 17"

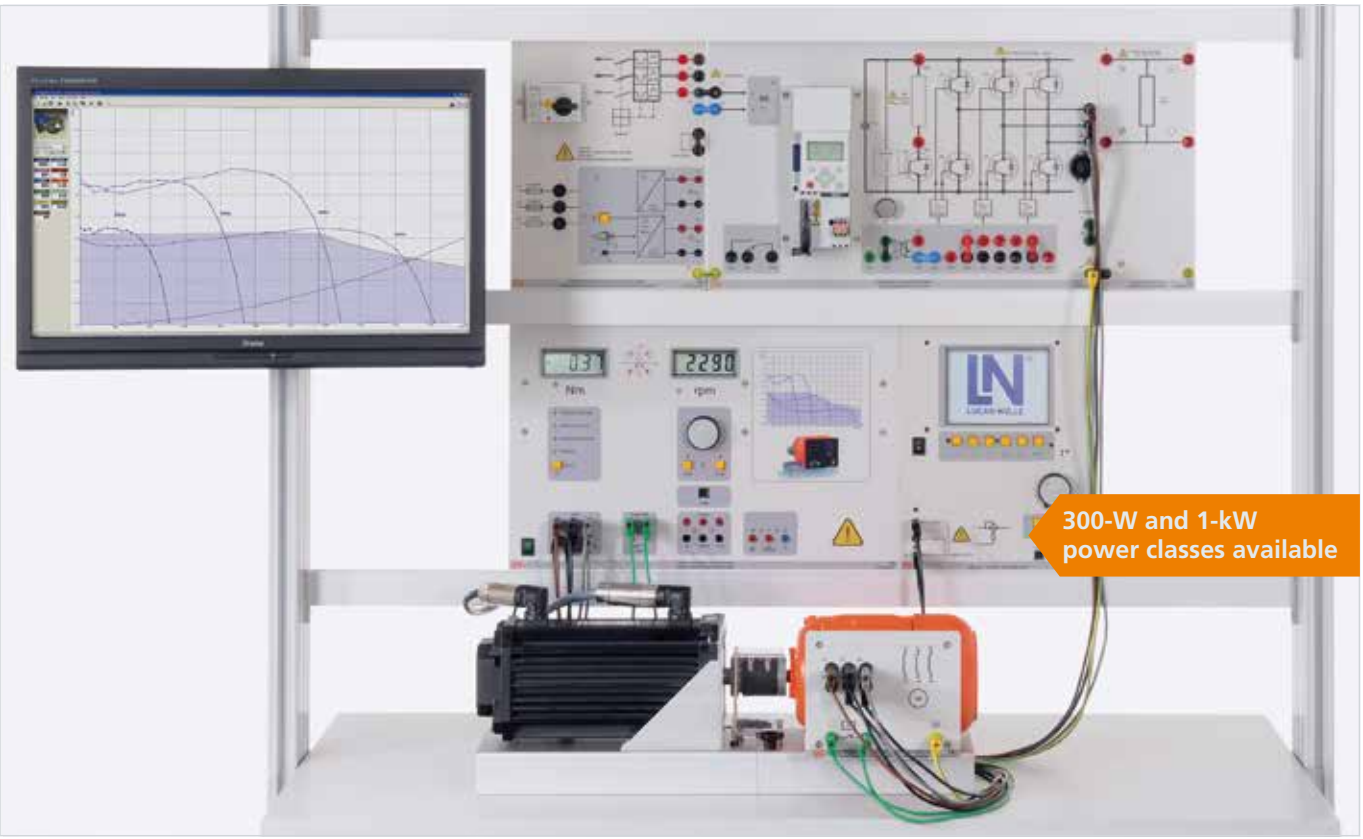
Training content

- Putting the circuit into operation
- Setting the parameters for run-up, run-down and starting voltage
- Examining the current and voltage levels during starting
- Starting under different load scenarios
- Comparing star and delta start-up

Frequency Converter Drives

The variable Speed Drive

Modern frequency converters transform any given three-phase standard motor into a drive with variable speed. The robust nature and popularity of three-phase standard motors have made a significant contribution to the huge success that electronic drive technology with frequency converters enjoys. The higher demands placed on drives due to developments in process automation means that more and more motors are being controlled by frequency converters. Thanks to customised open-loop speed control, today pumps and air-conditioning units are able to save a substantial amount of energy.



Experiment example: "Frequency converter drives EDT 25"

Training content

- Computer-assisted set-up and operation
- Parameterization of setpoint variables, rotation direction, starting operation, operating frequency, limiting values, nominal voltage, nominal current, rated frequency, power factor etc.
- Investigating the operating response under working machine loads
- Recording the speed and torque characteristics across all four quadrants
- Drive optimization
- Operation with a brake chopper
- Operation with vector control

Project Work: Industrial Wiring of Frequency-Converter Drives

Design – Industrial Wiring – Putting into Operation

Using the training system titled "Frequency Converter Project Work", trainees learn hands-on how to set up and wire the industrial components found in a control cabinet. By using frequency converters with compact controls, the ideal combination between drive and process control technology is found. The result is a system that allows different industrial projects to be designed, set up, parameterized and tested. By integrating servo and machine test stands, it is possible to subject the final projects to testing under realistic conditions.

Experiment example: "Project work: industrial wiring of frequency-converter drives EPL 25"

Operating elements

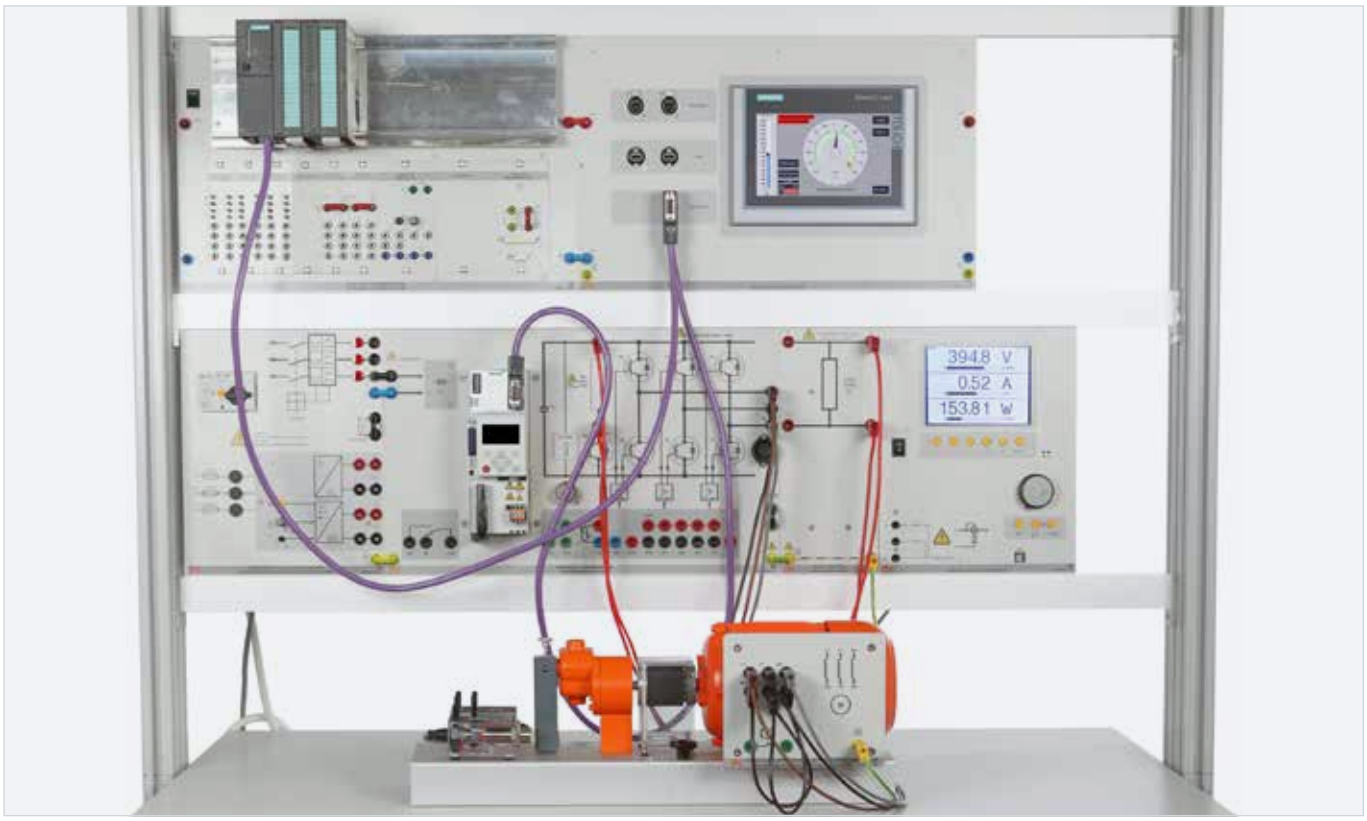
Training content

- Drafting, implementing and analysing circuit diagrams
- EMC-approved set-up and wiring of the control cabinet equipped with industrial components
- Putting the system into operation
- Approval and acceptance according to DIN EN
- Protective conductor measurement
- Insulation measurement
- Parameterization of the frequency converter
- Programming the LOGO!® compact control unit

PLC controlled Drive Systems

Link between Drive and Automation Engineering

This training system features project planning and programming of the PLC unit and the operator panel. It also covers putting the frequency converter into operation and setting its parameters using PROFIBUS-DP. The training system uses a servo brake in order to put the frequency converter-controlled drive machine under load. Overall an array of controllable working machines like ventilators, winding drives, calanders, compressors or flywheels can be simulated in this system.



Experiment example: "PLC controlled drive systems CLP 20"

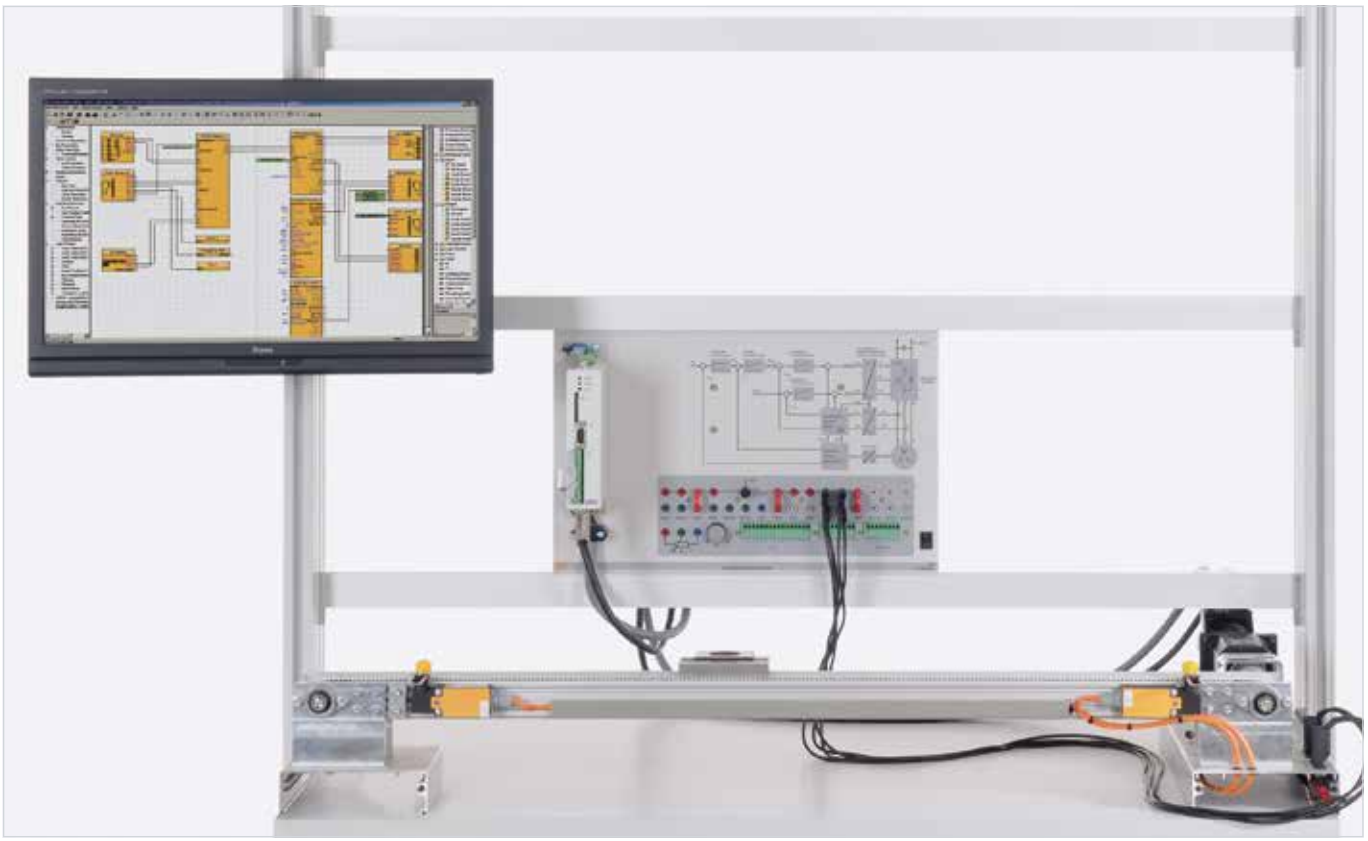
Training content

- Parameterization, programming and putting into operation of a programmable logic controller
- Project planning and putting into operation of an operator panel
- Parameterization and putting into operation of a frequency converter
- Project planning and putting into operation of a field-bus system
- Parameter optimization on different adjustable working machines

Positioning with Synchronous Servo Drives

Always the right Position

When people talk about servo drives today, they generally mean highly dynamic three-phase drives. Servo drives primarily perform positioning tasks in tooling machines, manipulators or robots. But these devices are increasingly finding their way into printing machines, conveyor belts and cutting machinery where precise positioning or angular synchronism are required.
Here, servo converters, motors with sensor technology and mechanical transfer elements form an extremely integrated system whose components have to be seen as a single entity.



Experiment example: "Positioning with synchronous servo drives EDT 32"

Training content

- Computer-assisted set-up, putting into operation and parameterization of a servo drive with linear axis
- Positioning and sequential control
- Parameterization of position and speed controller using a simple industrial parameter-setting software
- Reference travel function
- Investigating the effects of different controller settings on different loads

Motor Management Relays

Effective Motor Protection – Preventive Maintenance

Motor management systems are put into action in modern automation systems and make it possible to provide drives and processing systems with the optimum protection, control and monitoring system. These systems permit the detection of, for example, the motor temperature, voltage or current. The transparency of the motor and its functions is enhanced thanks to the field-bus system (e.g. PROFIBUS) that connects it to the primary process automation system. Consequently, the motor's operating capacity and energy consumption can be determined without having to perform measurements on site.

Experiment example: "Motor management relays EDT 51"

Training content

- Computer-assisted set-up and putting into operation
- Programming such operations as direct start-up, star and delta starting, starting pole-switchable motors, motor protection
- Parameterization of the overload variables and switch-off response under different loads
- Measuring dynamic processes during start-up
- Preventive maintenance