



Trainer ingegneria del controllo

Fondamenti e applicazioni

ETS DIDACTIC

Control engineering

Fundamentals and Applications



Visita il nostro sito

another way to care

www.abintrax-didact.com



Abintrax
DIDACT

Controllo automatico

Combina teoria e pratica con ETS DIDACTIC



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Control engineering

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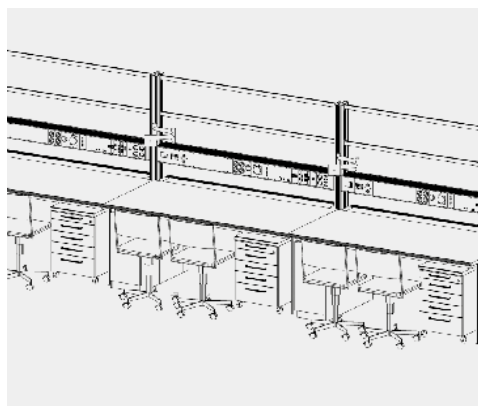
APPROACH AND ROOM CONCEPT

To plan a custom-made room concept with you,
we proceed in the following steps:

- A good room concept is based on professional advice. The technical consultants of ETS DIDACTIC are pleased to support you in the local planning phase. Benefit from their technical expertise and experience.
- Planning a room concept is more than selecting the furniture. Each room concept is adapted to and developed for the local requirements of the customer.
- Taking into account the learning contents an equipment list can be set up. As soon as the extent is defined, the storage equipment is optimized and designed.



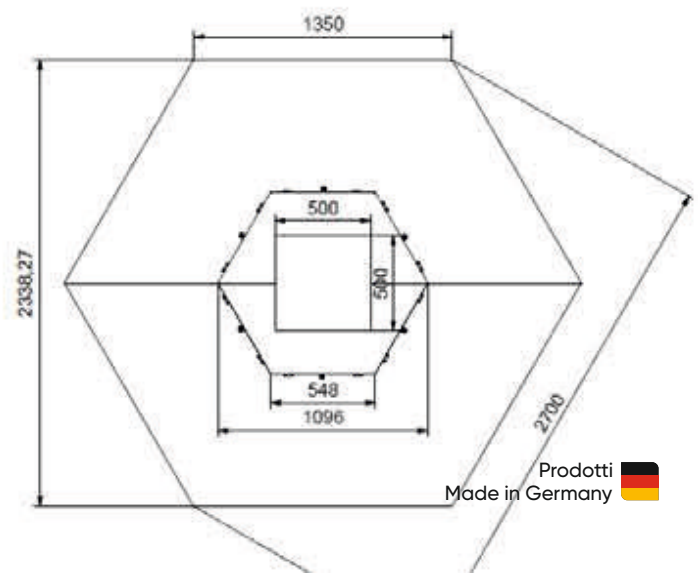
Analysis

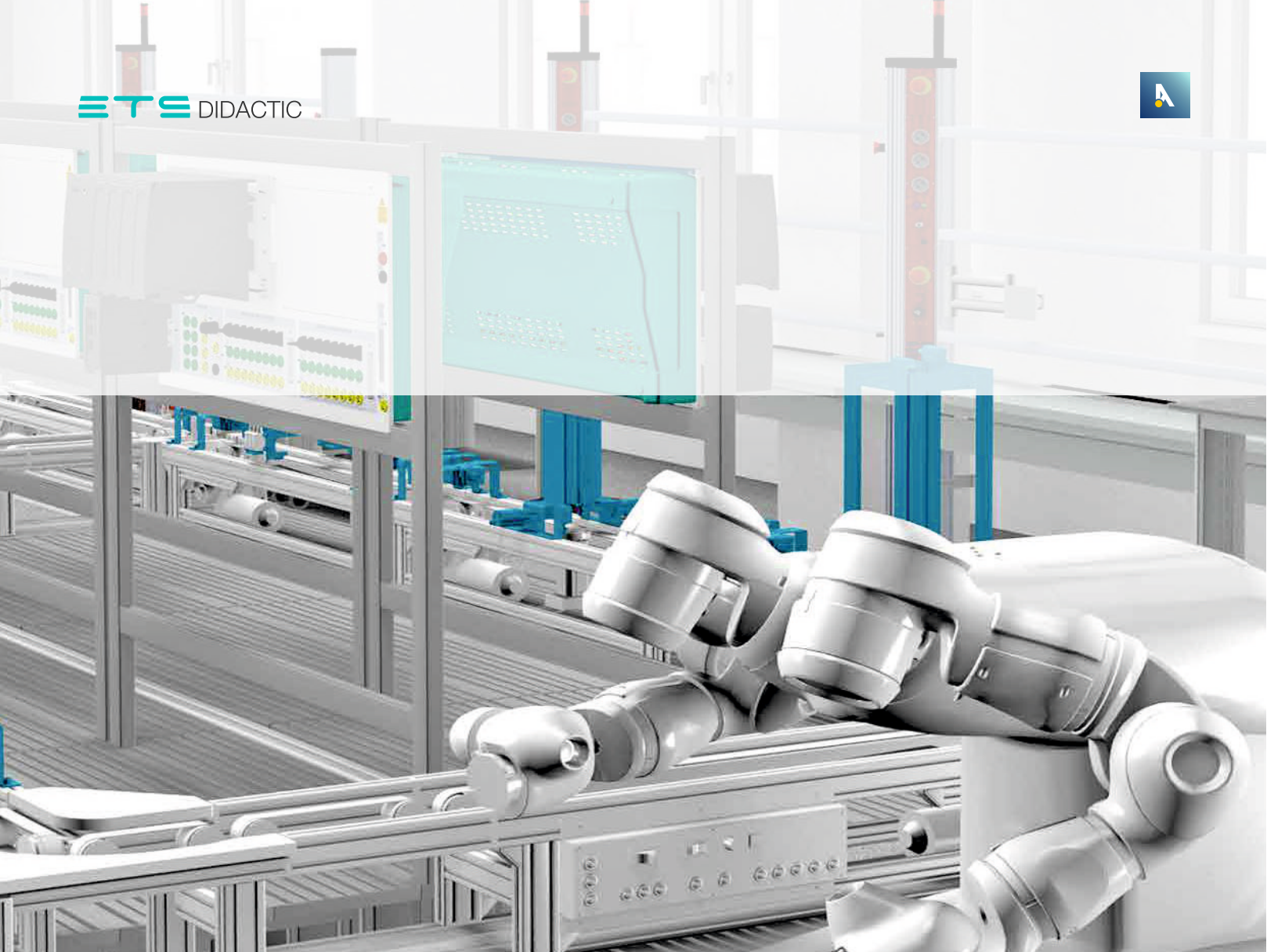


Conception



Consulting / Planing





Design / Construction



Workshops

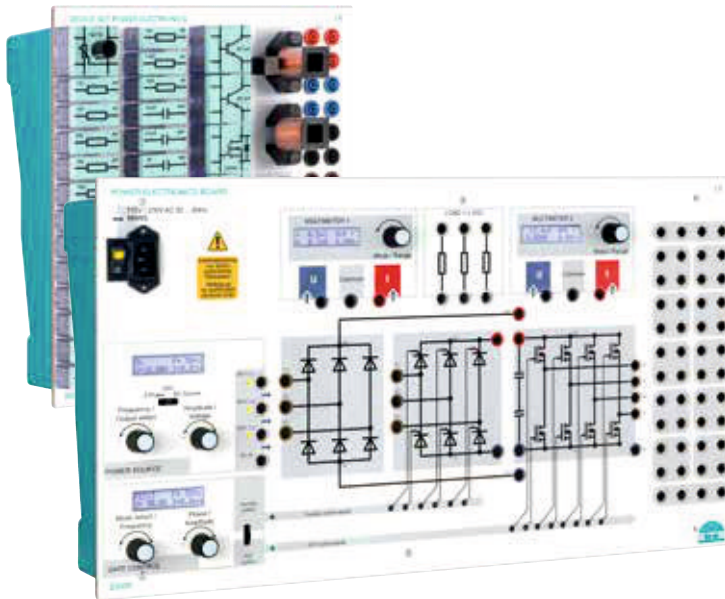


Application



PEOPLE AND TECHNOLOGY – A PERFECT MATCH

Didactic and Technology Result in the ETS Concept

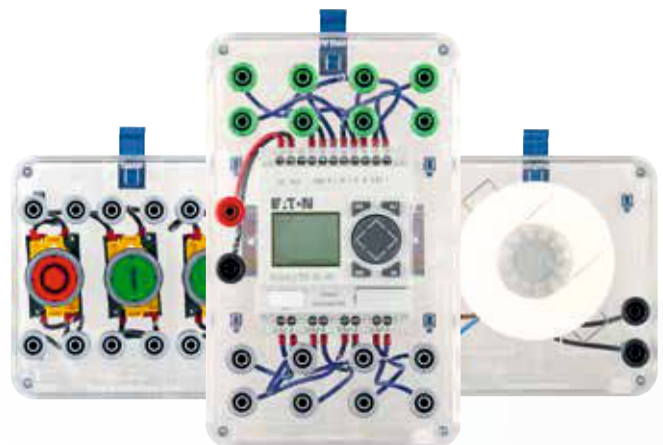


Compact Boards

- The didactic concept makes our training systems in A4 format outstanding.
- The photorealistic design of their front panels with graphics, pictures, connection details or warning messages assist and guide the experiments – cognitive didactics. Thanks to the graphics, users can understand and remember the technologies more easily.
- The systems can be mounted in an A4 frame or placed directly on

Experimental boxes

- Create your own experiments. In addition to the cabling the focus is also on the arrangement of the components. With the help of the experiment boxes, you can learn simple basic circuits up to complex installations.
- Always close to practice, fast and safe!
- Wide range of industrial components.



BST®-BuildingSystemsTrainer

- The BuildingSystemsTrainer® is a mobile training system that can be taken from one classroom to another and then is ready for use within some minutes.

- Beside our laboratory equipment with the experimental boards, these flexible training systems represent an independent product line covering many topics as e.g. the VDE protective measures according to VDE 0100 or the KNX building communication sector, communications technology and renewable energies, SmartBuilding and internet-of-things.

- Boards can also be integrated in the BuildingSystemsTrainer®.



WORKSHOPS WITH ETS

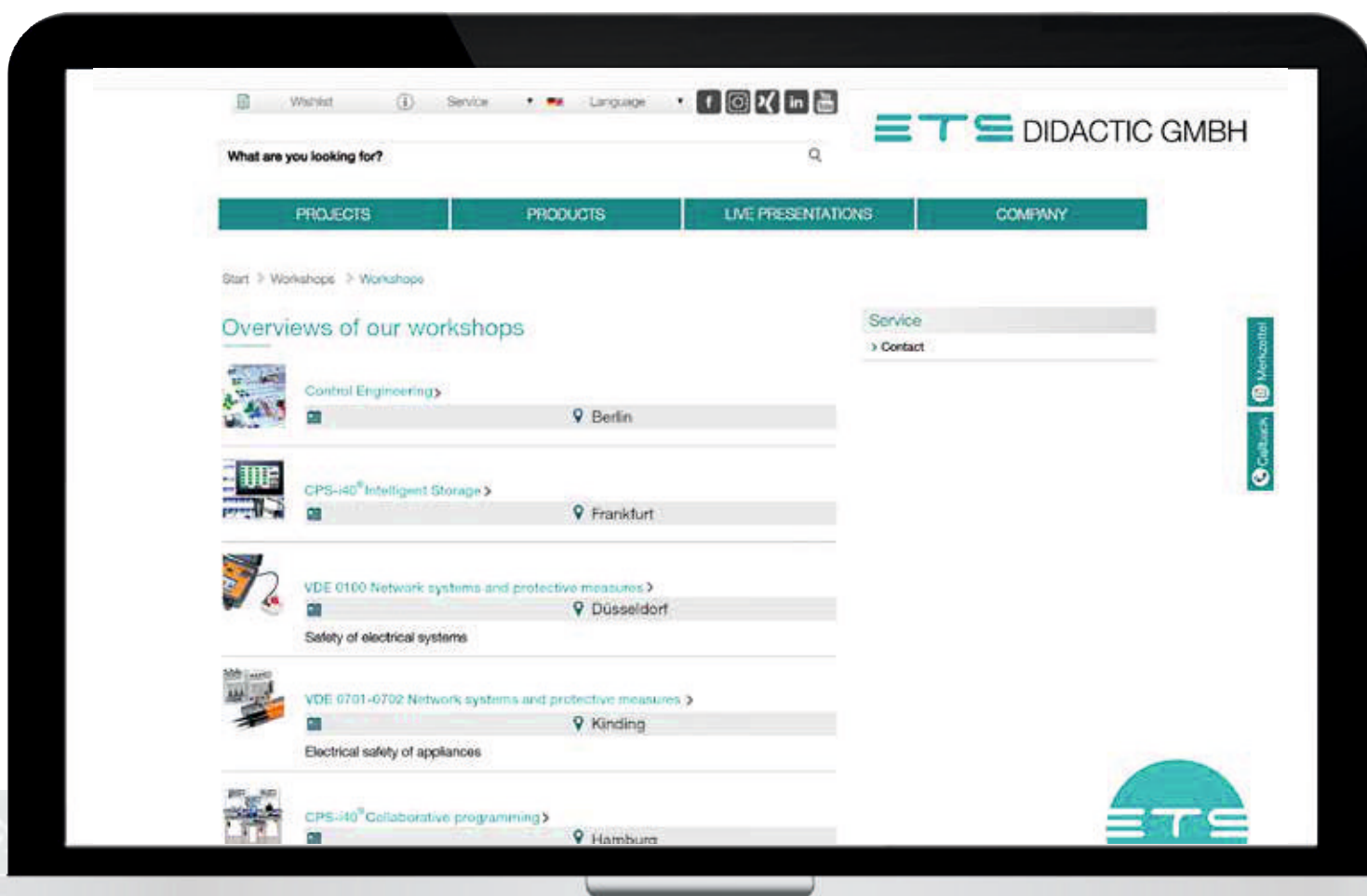
Always up to Date – Training at the Highest Level



- Train the Trainer – workshops for teachers, trainers and lecturers in the field of electrical engineering, mechatronics and metal technology.
- Learn more about the management and the application of various technologies with the support of the ETS trainers. Find out more about the didactic concept and learn to teach the material quickly and safe.
- ETS offers a perfect seminar for all groups of products and topics of technical education. Scan the QR code to subscribe in a workshop:



Fast and Safe into New Technologies



ETS TRAINING CONCEPT

Innovative Hardware / Perfect Courseware

tec2SKILL®

- Reality and virtuality combined for effective learning processes
- Augmented Reality (AR)
- Virtual Reality (VR)

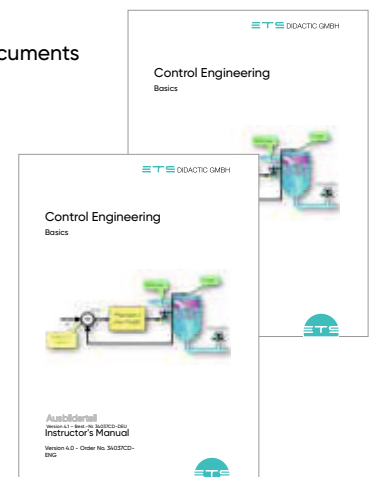
digital learning
assistant



Instructor's / Student Manuals

- 100 % function guarantee
- Integration of individual documents
- Original photographs with practical references
- High print quality
- Detailed work instructions
- Pyramid structure
- Digital and on paper

motivating



Learning Software

- Accompanying courseware
- Function simulation
- Combination of theory and practice

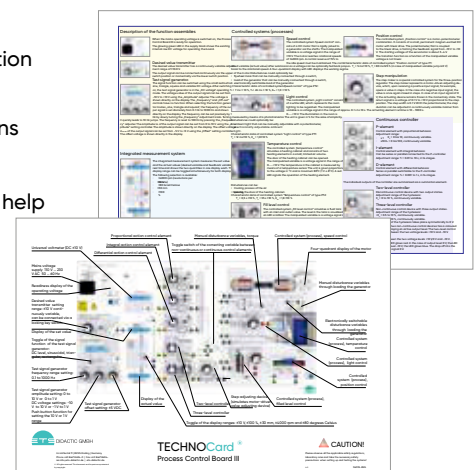
multimedia



TECHNOCards®

- Depiction of the parameters in function groups
- Start-up instructions
- Safety functions
- Individual learning help

practice-oriented



Application Masks

- Contents adapted to the relevant experiment
- Clear layout
- Basic function
- Various languages

efficient



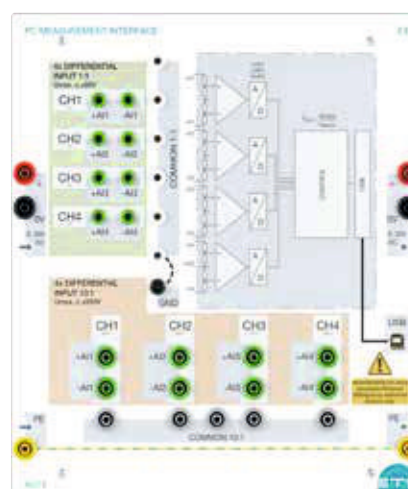
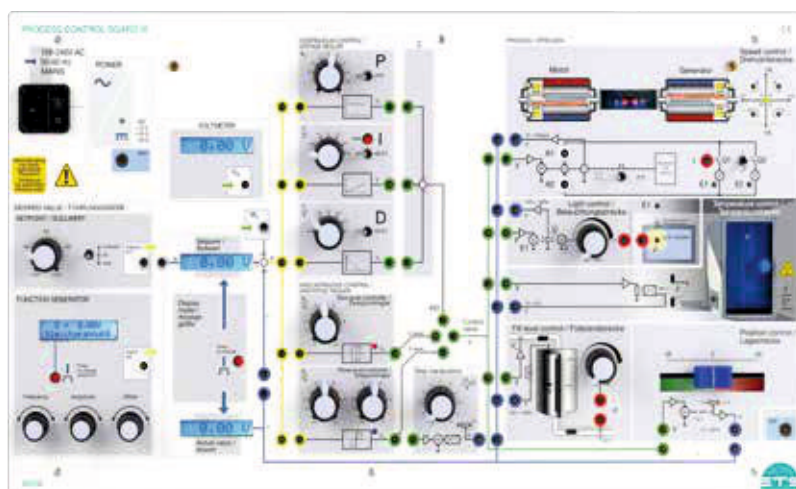
Furniture

- Technically matched conception
- Excellent functionality
- Ergonomics at the workplace
- Outstanding design

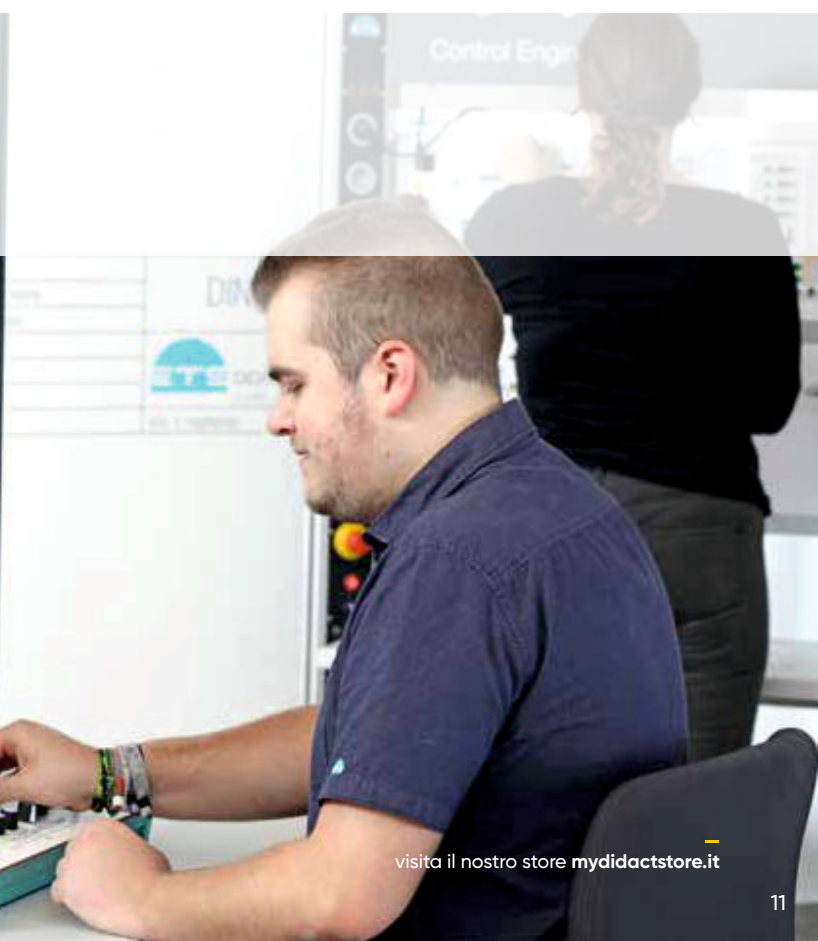
ergonomic



... the Automatic Control System



- Latest technology
- Easy to use
- Didactically prepared courseware
- Safety for people and machine
- Perfect, ergonomic workplaces

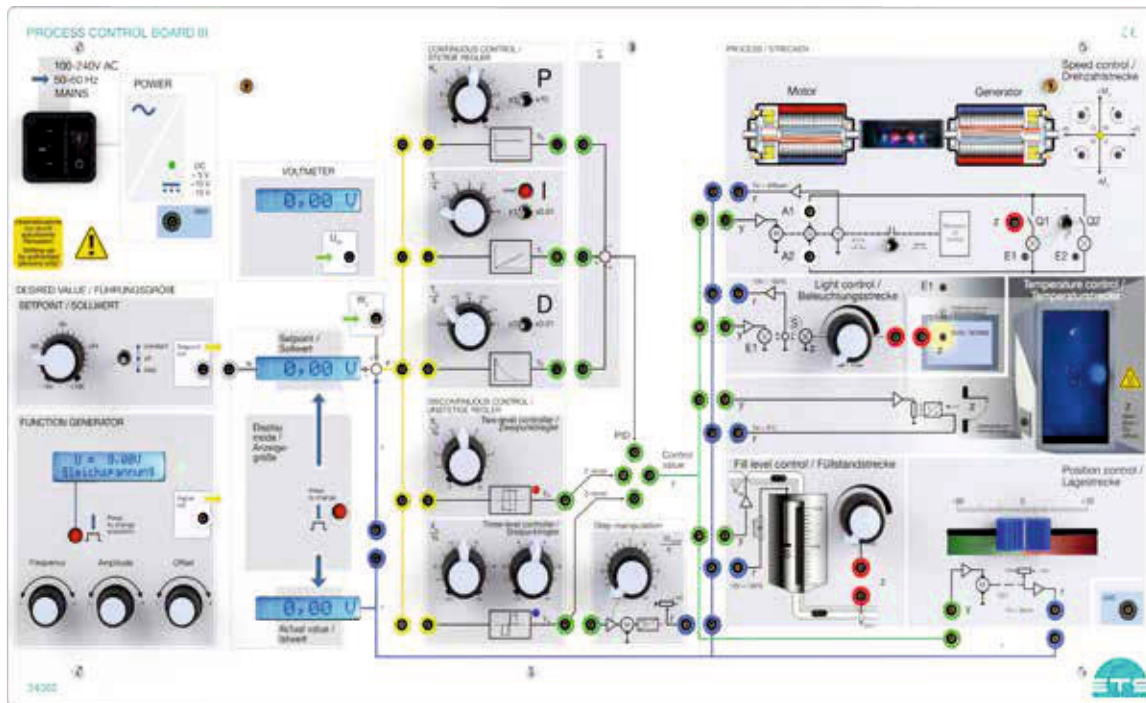






PROCESS CONTROL BOARD III

Hardware



1

Learning objectives

- Difference between continuous and discontinuous controllers
- Analyzing controlled systems with and without selfregulation and determining the system parameters
- Examining the time-dependent behavior of controllers and controlled systems
- Choosing and configuring controllers
- Examining control parameters and their correlations
- Explaining the function of control circuits and executing measurements

Technical data

Power supply

- Wide range input AC 110 V ... 230 V, 50 ... 60 Hz

Voltage range of all signal inputs and

- ± 10 V DC ± 10 %

Test signal generator

- Waveforms: DC, sine, triangle, square
- Frequency: 0.1 Hz to 1 kHz, setting via incremental encoder
- Amplitude $U_S = 0 \dots 10$ V, setting via incremental encoder
- Offset voltage $U_{Offset} = -5 \dots +5$ V DC, setting via incremental encoder

Integrated measurement system

- ... measures the set and actual values (reference input variable and feedback variable) in real time and shows the two quantities in one display each.
- The display range can be toggled
- The following selection is available:
 - ± 4000 rpm • ± 80 °C • ± 100 %
 - ± 10.0 V • ± 30 mm
 - Integrated voltmeter for individual voltage measurements in the range of ± 10 V.
 - Display language: English or German, selectable

No.	Designation	Order No.
1	Process Control Board III	34002



Regelungstechnik

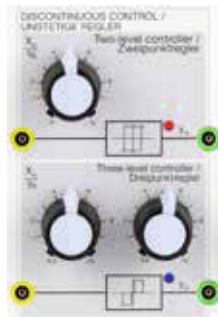
Control Engineering

EN 813

ACTIC GMB

FUNCTIONAL GROUPS

Controllers

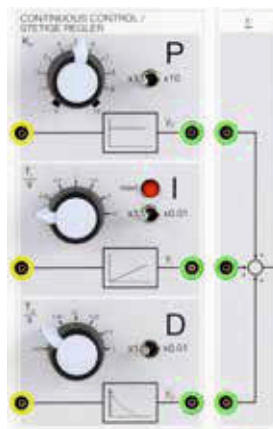


Two-level control

Adjustment range of the hysteresis:
XH = 0 to 10 %, continuously

Three-level control

Adjustment range of the hysteresis:
+ XH 0.5 to 10 %, continuously
- XH 0.5 to 10 %, continuously



P-element

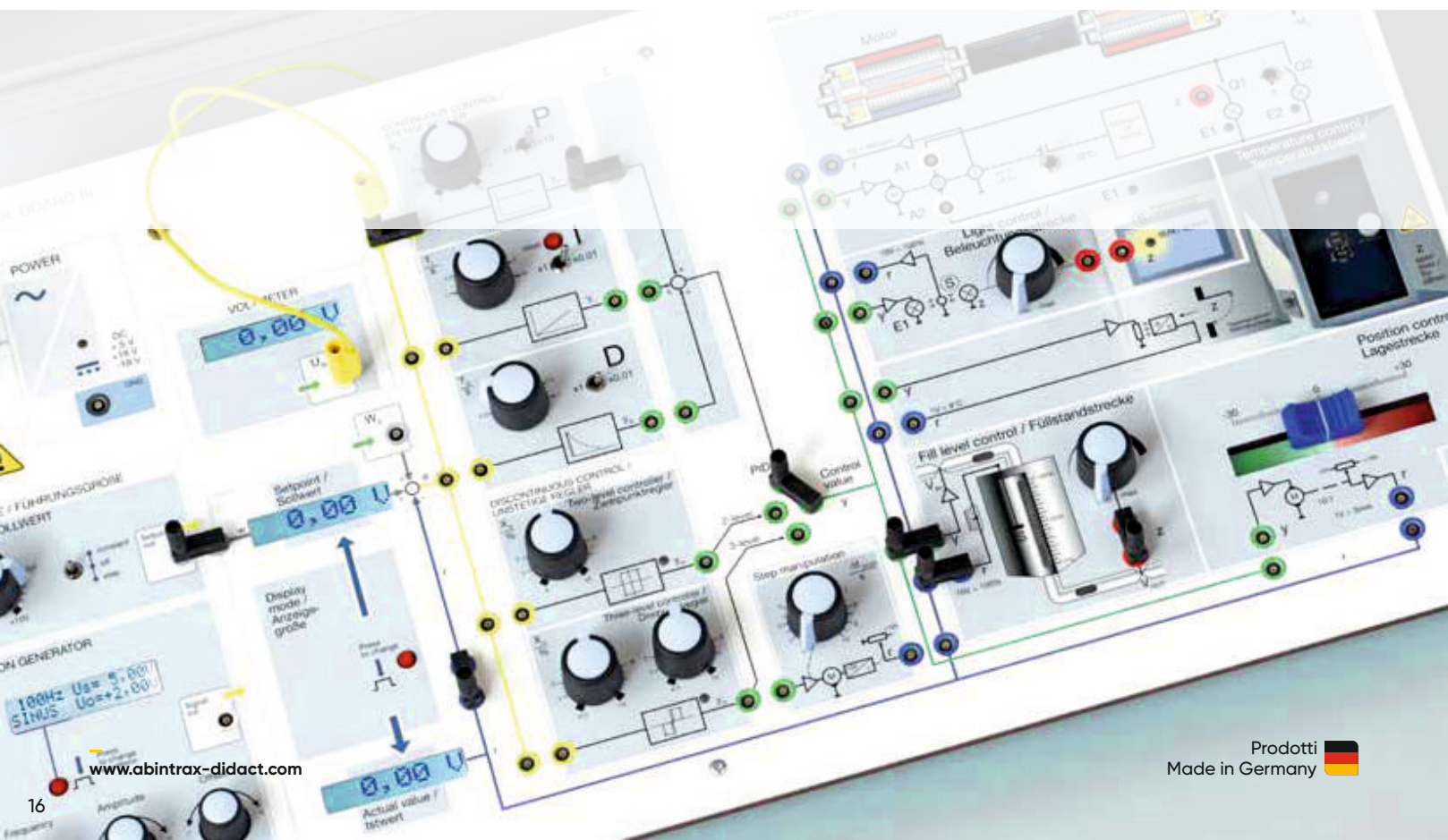
Adjustment range:
- x 1 KP = 0 to 10, continuously
- x 10 KP = 0 to 100, continuously

I-element

can be connected in series or parallel to the P controller
Adjustment range:
TI = 0.01 to 10 s, in 14 stages

D-element

can be connected in series or parallel to the P controller
Adjustment range:
TD = 0.001 to 1 s, in 14 stages



Controlled Systems



Rotational speed

... consists of a DC motor that is rigidly joined to a generator via the shafts. The manipulated variable is a voltage signal in the range of ± 10 V. The motor reaches rotational speeds of ± 4000 rpm.



Light

... consists of a white LED, which represents the room lighting to be regulated. The manipulated variable is a voltage signal in the range of $0 \dots +10$ V. The illumination in the room is measured by means of a photo-transistor.



Temperature

... simulates a heating cabinet and consists of two heating elements in a small limited air volume. The door of the heating cabinet can be opened. The manipulated variable is a voltage signal in the range of $0 \dots +10$ V. The temperature in the cabinet is measured by means of a temperature sensor.



Filling level

... simulates a fluid tank with an inlet and outlet valve. The level in

the tank is visualised by an LED scrollbar. The manipulated variable is a voltage signal in the range $0 \dots +10$ V and controls the inflow.

The level of the tank is given in %. The output value is a proportional voltage $0 \dots +10$ V. Two red LED elements in the inflow and outflow visually display the inflow and outflow behavior.



Position control

...is a linear axis. It consists of a small, permanent magnet-excited DC motor, a linear drive and a potentiometer for forming the feedback signal from -10 V to $+10$ V.



Stepmaker

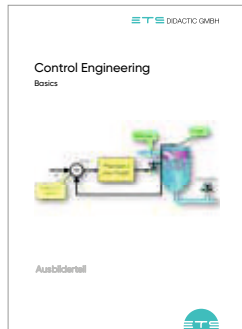
..., the stepmaker is a special control circuit system for the threeposition regulator. The stepmaker represents a motor-driven adjusting device, which upon receiving a positive input signal, for example, opens a valve in steps. In the case of a negative input signal, the valve is once again closed in steps. In case of an input signal of 0 V, the actuating device remains frozen in the momentary state.

Courseware

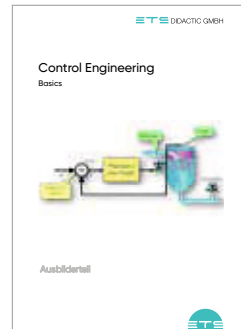


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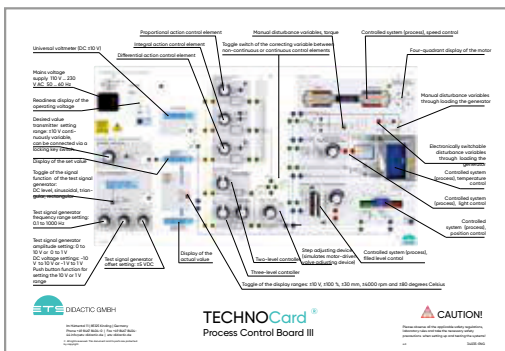
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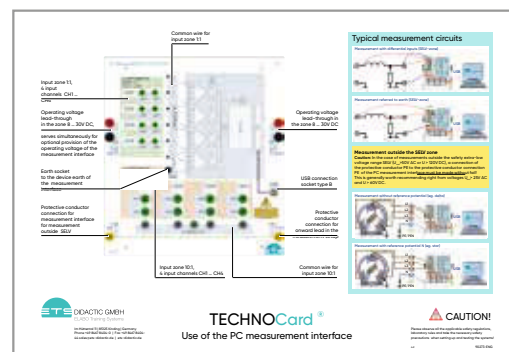
3

Handbuchinhalt

- Introduction to control engineering
- Determining the parameters of the controlled system
- Controller type selection
- Speed control with continuous controller
- Temperature control with P, PI und PID-Controller
- Temperature control with two-point controller
- Level control with PI controller



4



5

No.	Designation	Order No.
1	ETS ring binder with dividers	91903
2	Control Engineering Basics – Instructor's Manual incl. CD-ROM	34037CD-ENG
3	Control Engineering Basics – Practical Experiments incl. CD-ROM	34036CD-ENG
4	TECHNOCard®- Use of the Process Control Board II	34035-ENG
5	TECHNOCard®- Use of the PC measurement interface	90273-ENG
6	Control Engineering Projects – Instructor's Manual incl. CD-ROM	34034CD-ENG
7	Control Engineering Projects – Practical Experiments incl. CD-ROM	34033CD-ENG



1

Printed and digital



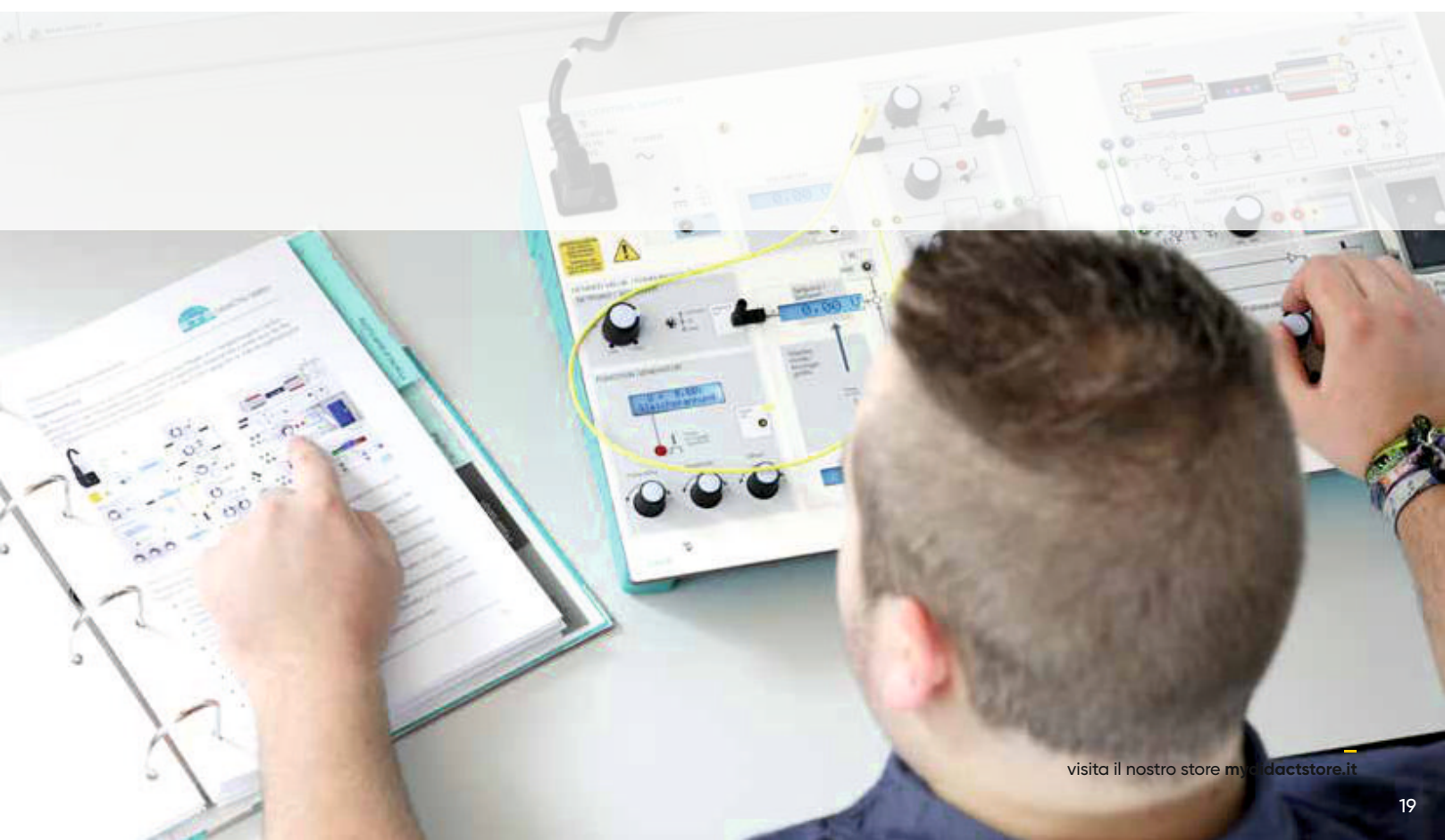
6



7

Contents

- Introduction to control engineering
- Temperature control with twolevel controller
- Steuern / Regeln / Positionieren
- Level control with two-levelcontroller
- Level control with PI controller
- Rotational speed follower control with PID controller
- Rotational speed fixed value control
- Light regulation with PI controller
- Light regulation with wo-level controller
- Three-level control, three-point step controller



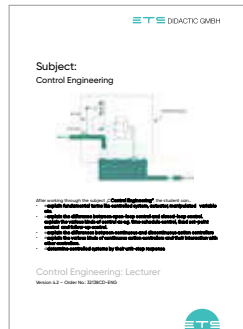
CONTROL ENGINEERING

Manual from 9-piece MEDIA-T3BoxX "Basics of Electrical Engineering"



Printed and digital

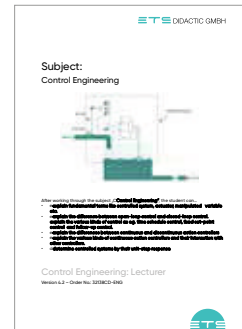
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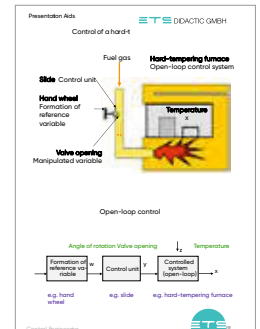
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Contents

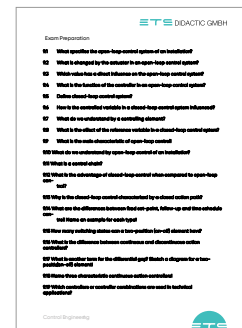
- Instructor's Manual
- Presentation Aids
- Preparation for examination
- Preparation for examination and solutions
- Examination
- Examination and solutions



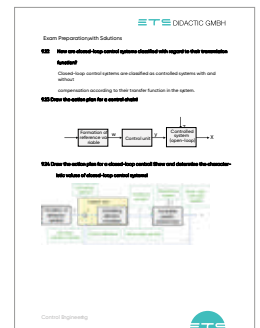
Instructor's Manual



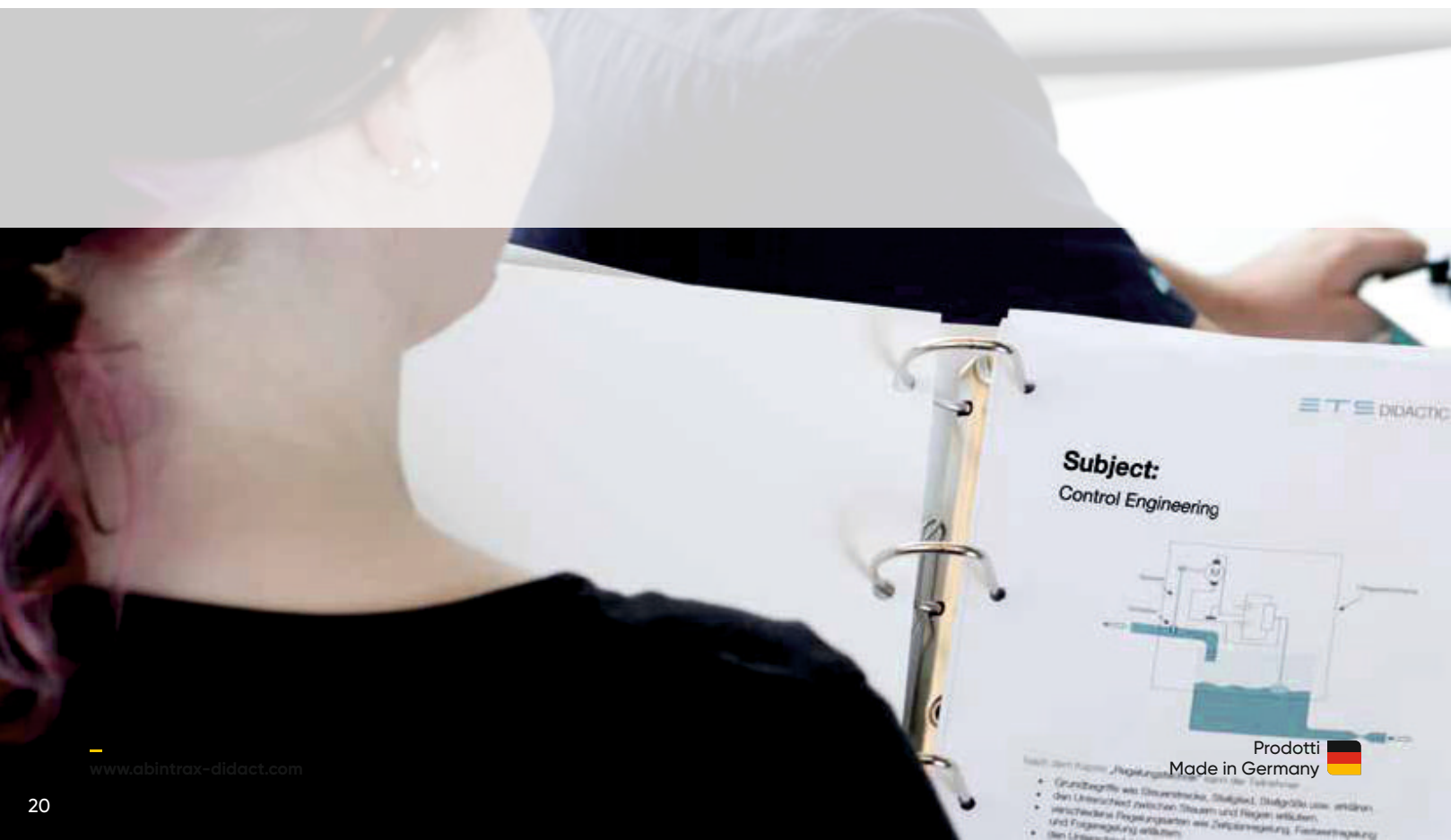
Presentation Aids



Preparation for examination

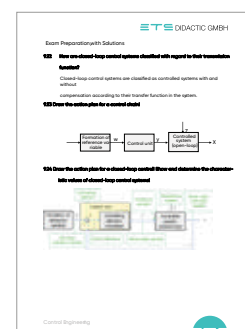
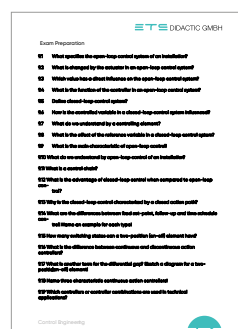


Preparation for examination and solutions



The manual explains...

- the terms controlled system, actuating element, manipulated variable etc.
- the difference between open loop and closed loop control
- the various kinds of control such as time dependent, fixed value control and sequential control
- the difference between continuous and discontinuous controllers
- the continuous controller elements and their interaction with other controller elements
- the determination of controlled systems by their unit-step response



MEDIA-T³ BoxX
teaching training technology



No.	Designation	Order No.
1	ETS ring binder with dividers	91903
2	Control Engineering - with the MEDIA-T3BoxX	32138CD-ENG



THE NEW TRAINING SYSTEM FOR CONTROL ENGINEERING

Easy - Safe - Complete - Mobile

Control and test signals

- Setpoint device
- Test signal generator



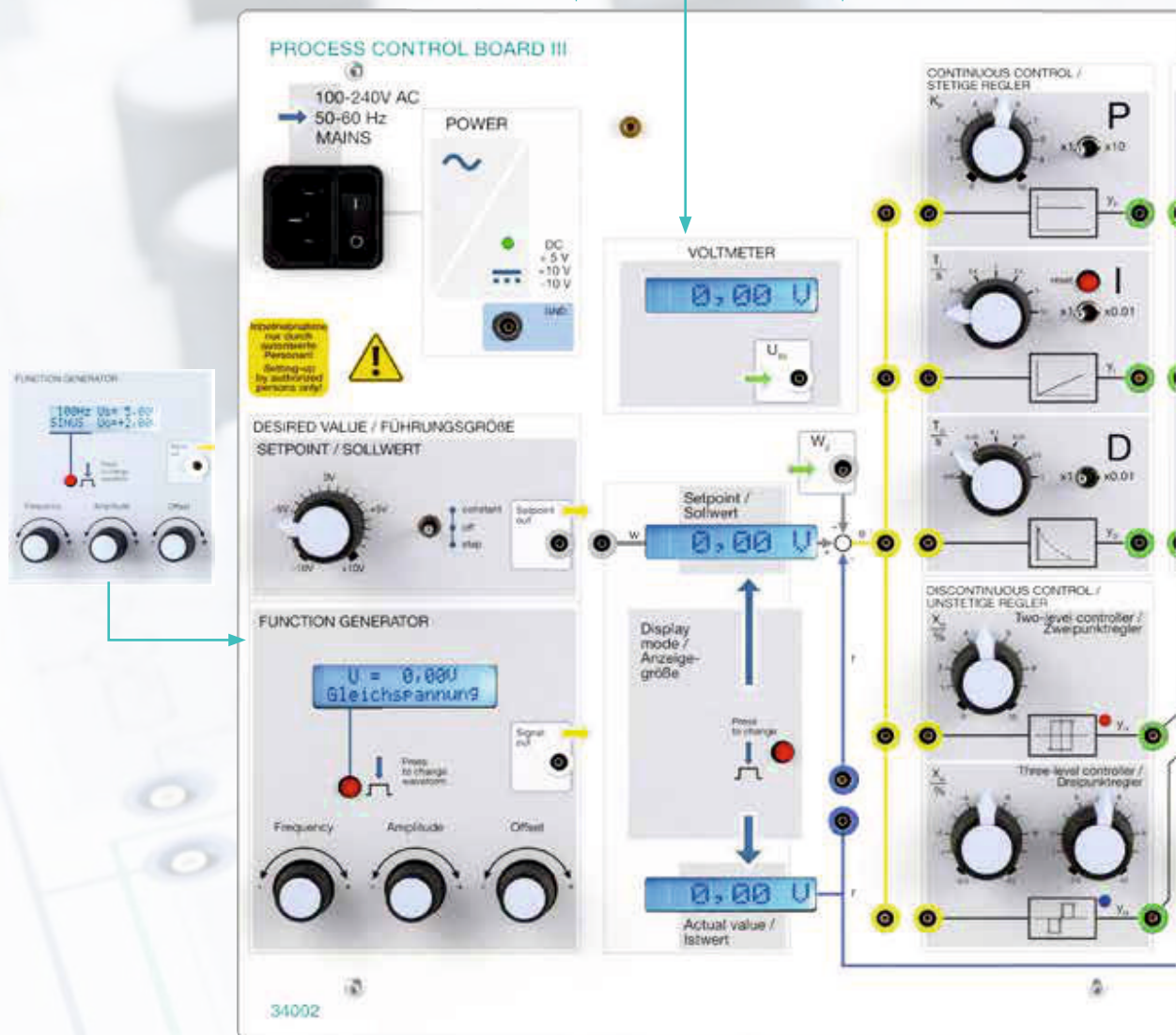
Measurement system

- Units:
V, mm, %, °C, rpm
- Target value
- Actual value
- Voltmeter



Control loop elements

- Proportional element
- Integral element
- Differential element
- Two-level controller
- Three-level controller
- Stepcontroller

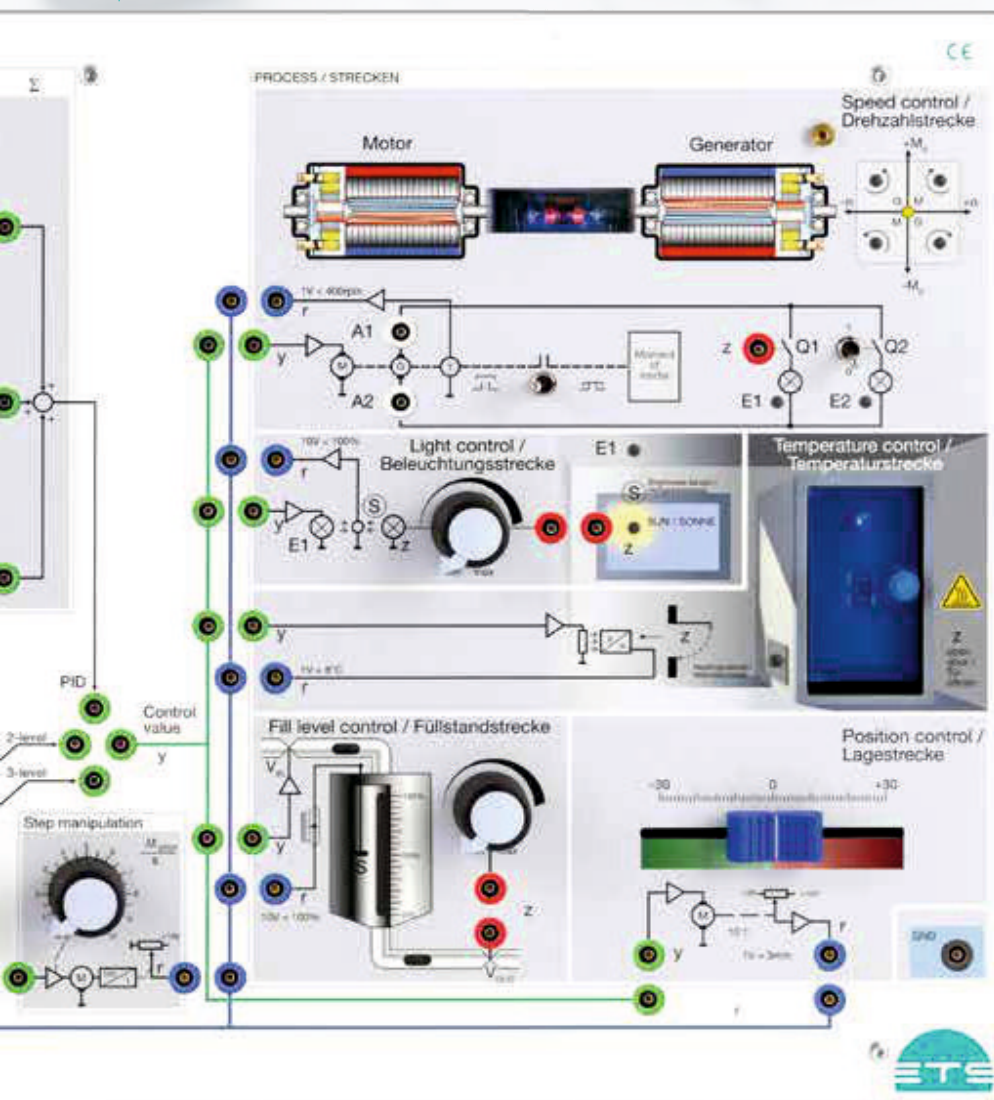


Processes

- Speed
- Light
- Temperature
- Fill level
- Position control

with self-regulation

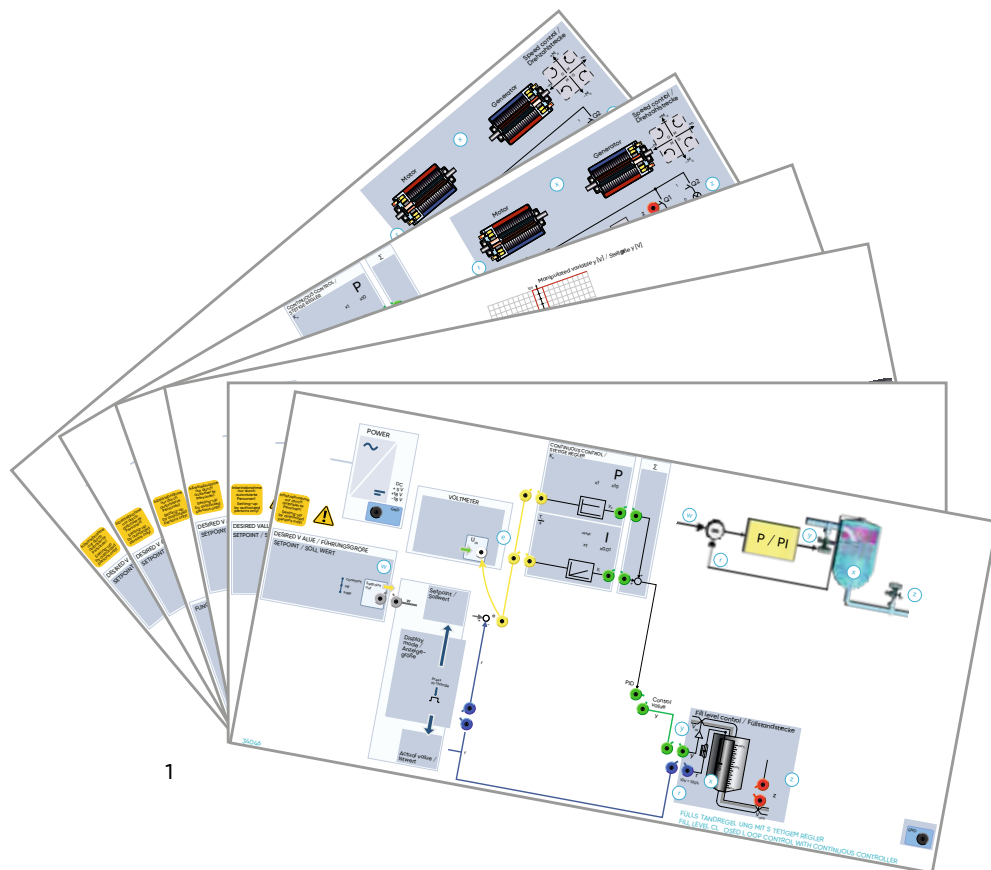
without self-regulation



34002 Process Control Board III

APPLICATION MASKS

Didactic Reduction to Essentials



Application masks

Application masks simplify the test setup and draw the trainee's attention to the relevant assemblies and connections.

The multi-colored, graphically designed application masks for didactic reduction are coordinated with the experiments described in the manual.

Basics of Control Engineering

- Speed control
- Speed regulation
- Hysteresis of a two-level control
- Temperature control with two-level control
- Filling level control
- Filling level regulation with continuous control

No.	Designation	Order No.
1	Set of Application masks „Control Engineering – Basics“	34040





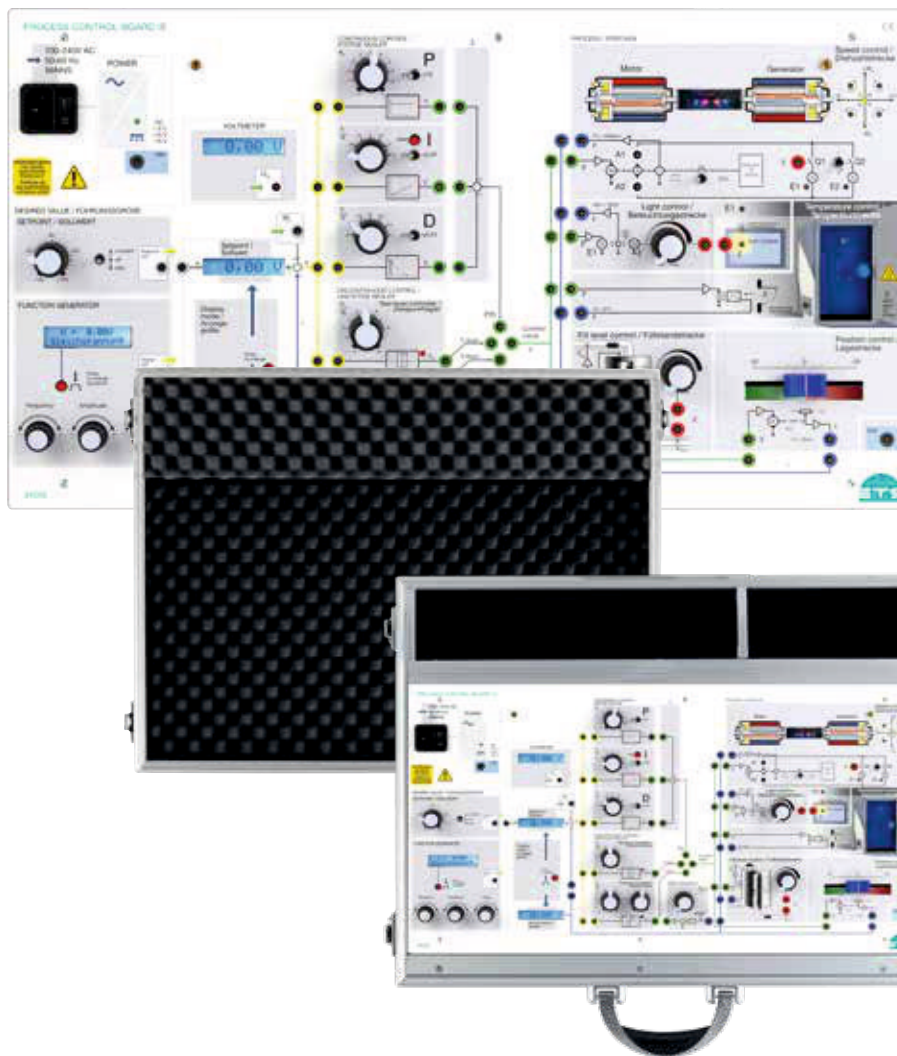


EXPERIMENTAL CASE

with the Control Engineering System

Our Boards are available in a lockable experimental case with removable lid and space for the set of accessories.

Its rugged, but still lightweight aluminium shell makes it suitable for transportation and guarantees safe and dust-free storage of the training systems.



No.	Designation	Order No.
1	Experimental case	91801





Abt./depart.

Gez./DWN

Gepr./CHK

Bearb./WRK

Genehm./APP

Aehn. Zeichn./s

uma

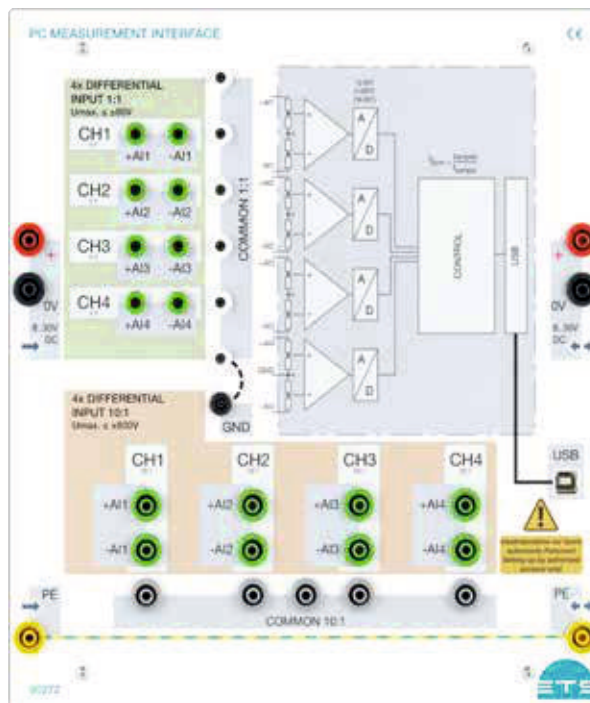
Zeichn

Ae.-M



MEASUREMENT EQUIPMENT

4-Channel Measurement Interface



1

The "PC Measurement Interface" is a four-channel measuring instrument with differential inputs that allows safe measurement of voltages and derived quantities up to 600 V AC.

The included software allows the display and evaluation of the measurement results on the PC. The measurement results can be stored or directly printed.

Technical Data

Minimum PC requirements:

Processor: Pentium processor or faster

Memory: 16 MB RAM

Hard disk: 18 MB

Operating system:

XP / Vista / Windows 7 / Windows 8

(32 or 64 Bit)

CD-ROM drive

- 4 analog input channels with differential input

- 5 MHz bandwidth (5 000 000 Samples/s)

- Sampling rate of up to 5 MHz per channel

- 16 bits up to 195 kHz

- 14 bits up to 3.125 MHz

- 12 bits up to 5 MHz

- Input 1:1

- Measuring range from ± 200 mV to ± 80 V (peak value)

- Overvoltage protection up to 200 V AC

- 2 mm safety sockets

- Input 10:1

- Measuring ranges from ± 2 V to ± 800 V (peak value)

- Overvoltage protection up to 600 V AC

- 4 mm safety sockets

- All inputs touch-safe 600 V, CAT III

- All inputs allow clear and easy configuring with 19 mm bridge plugs

- 4 measuring instruments in one unit

- 12 ... 16 bit 4-channel oscilloscope

- Spectrum analyser

- Transient recorder

- Voltmeter (average, true RMS)

- Comprehensive trigger function - Rapid transient recorder with 0.01 s - 500 s sampling time

- USB 2.0 High Speed (480 MBit/s)

- Optional operation voltage: 8 ... 30 V DC

No.	Designation	Order No.
1	PC Measurement Interface	90272

ungstechnik

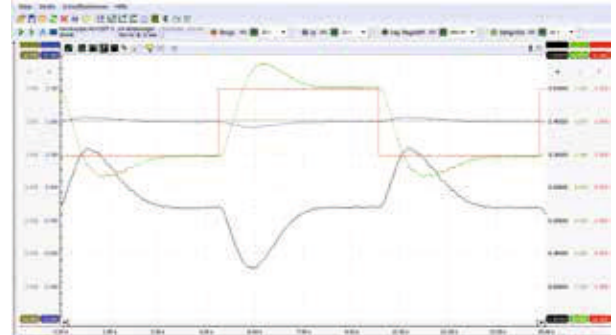
engineering



4-CHANNEL-OSCILLOSCOPE | MEASUREMENT INTERFACE

Universal Application beyond Control Engineering

- 4-channel measurement of the control parameters
- Data recorder for evaluation of slow processes
- Use of predefined measurement profiles
- Clearly arranged wiring
- Simple print-out of the measurement results for evaluation



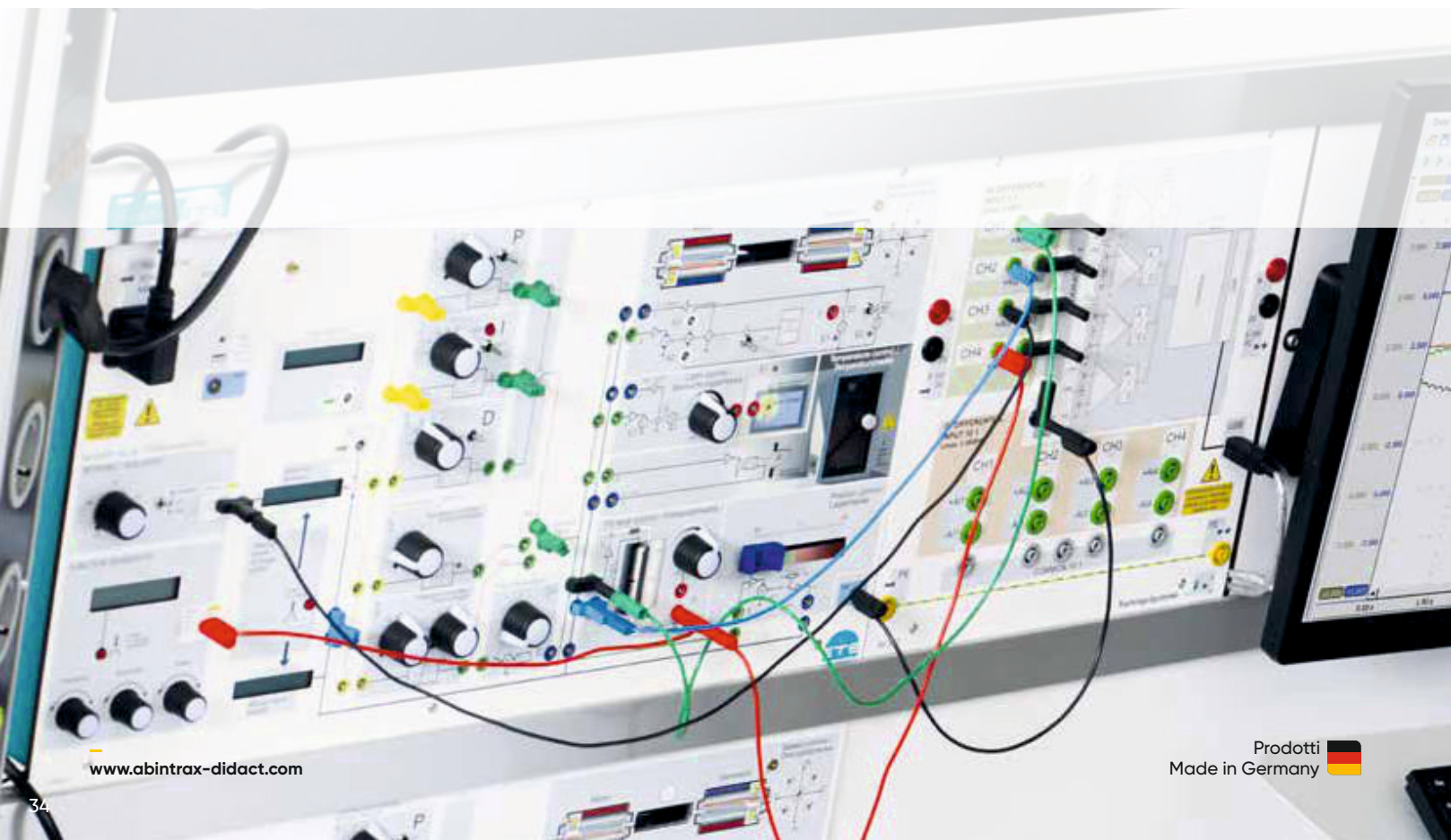
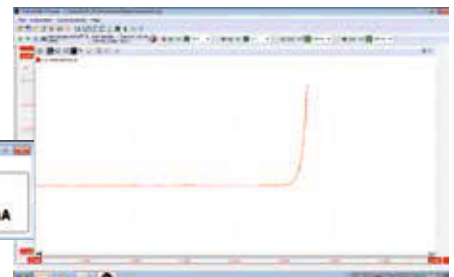
Filling level control with PI controller

Measurements in electronic circuits

- Direct measurement of the values via differential inputs
- Display of the wave-form or values
- XY-depiction
- Use of predefined measurement profiles

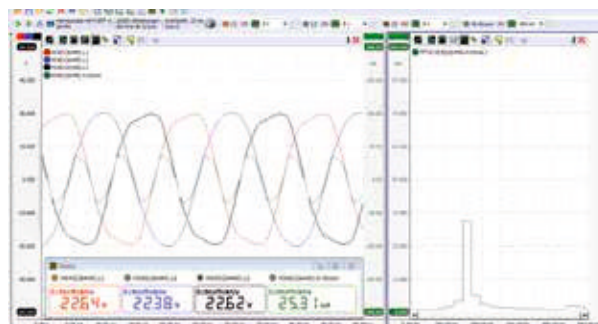


Measurement of a diode characteristic



Measurement in supply grids

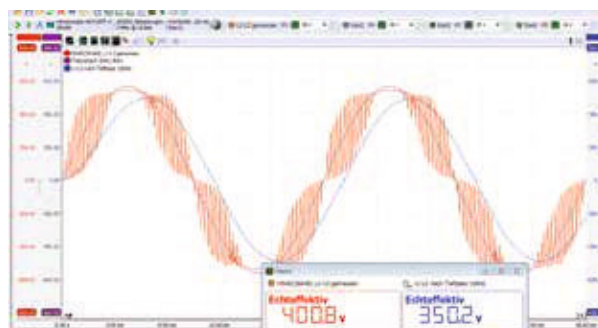
- Direct measurement of three phase voltages in star or delta circuits
- Direct measurement of voltages up to 600 V AC
- Display of the wave-form or values
- Spectrum analysis



Three phase voltages and neutral current as a result of nonlinear loads

Measurement on the load side of frequency converter

- Direct measurement of three phase voltages in star or delta load circuits
- Direct measurement of voltages up to 600 V AC
- Display of the wave-form or values
- Spectrum analysis
- Depiction of calculated values



Measurement of the phase voltage U_{U-L2} at the load of a frequency converter



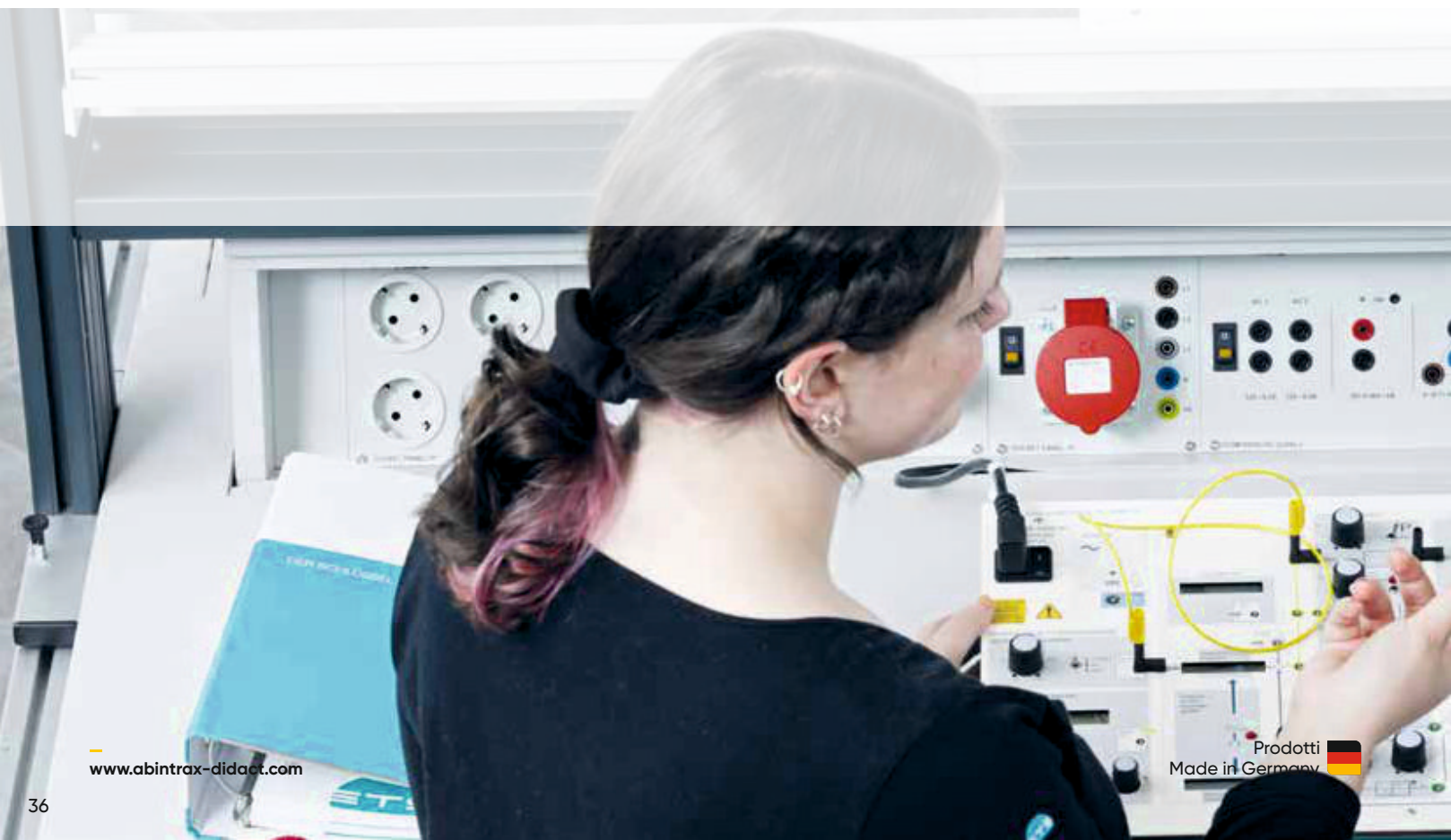
ACCESSORIES



1

Functions

- 125 MSamples/s per channel
- Sample memory 10,000 x 8 bits per channel
- 2 channels
- Sensitivity 2 mV/Div ... 10 V/Div, time base 5 ns/Div ... 100 s/Div
- USB interface incl. software and drivers
- Color display





2

Connection technology

for Process Control Board III

- Si-lab measuring lead 2mm, 30 cm, black
- Si-lab measuring lead 2mm, 30 cm, red
- Si-lab measuring lead 2mm, 30 cm, blue
- Si-lab measuring lead 2mm, 30 cm, yellow
- Si-lab measuring lead 2mm, 30 cm, green

- Si-lab measuring lead 2mm, 60 cm, black
- Si-lab measuring lead 2mm, 60 cm, red
- Si-lab measuring lead 2mm, 60 cm, blue
- Si-lab measuring lead 2mm, 60 cm, yellow
- Si-lab measuring lead 2mm, 60 cm, green
- 15 Si connector 2mm*12mm, black



3

- 5 safety bridge plugs 2 mm, with tap, 19 mm wide, black

- 5 safety bridge plugs 4 mm, with handle, 19 mm wide, black

No.	Designation	Order No.
1	Digital Oscilloscope 30 MHz with color display	90266
2	Set of accessories	90104
3	Set of safety bridge plugs	90024

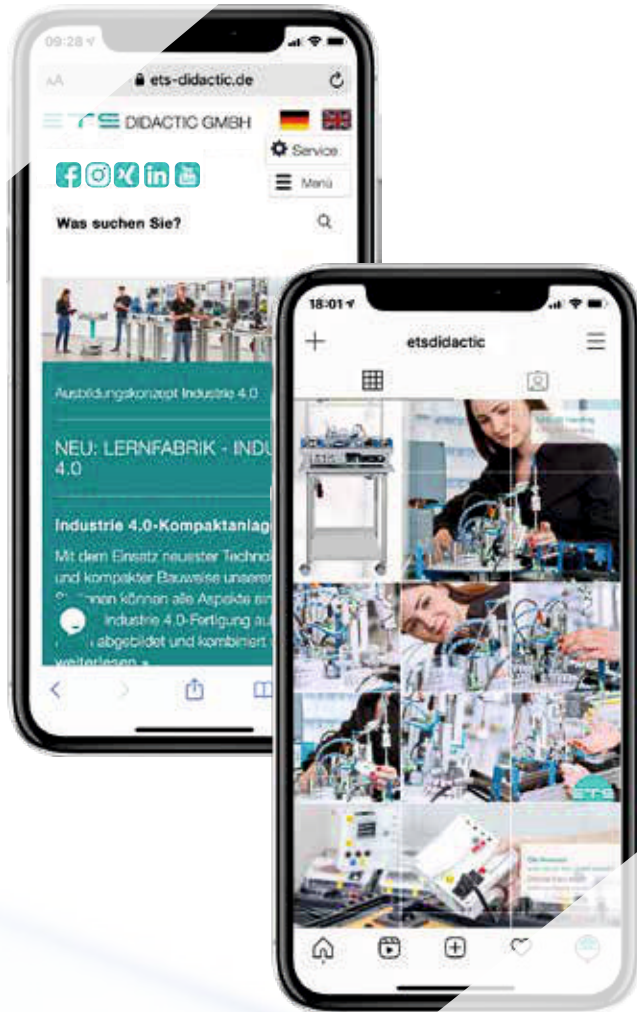


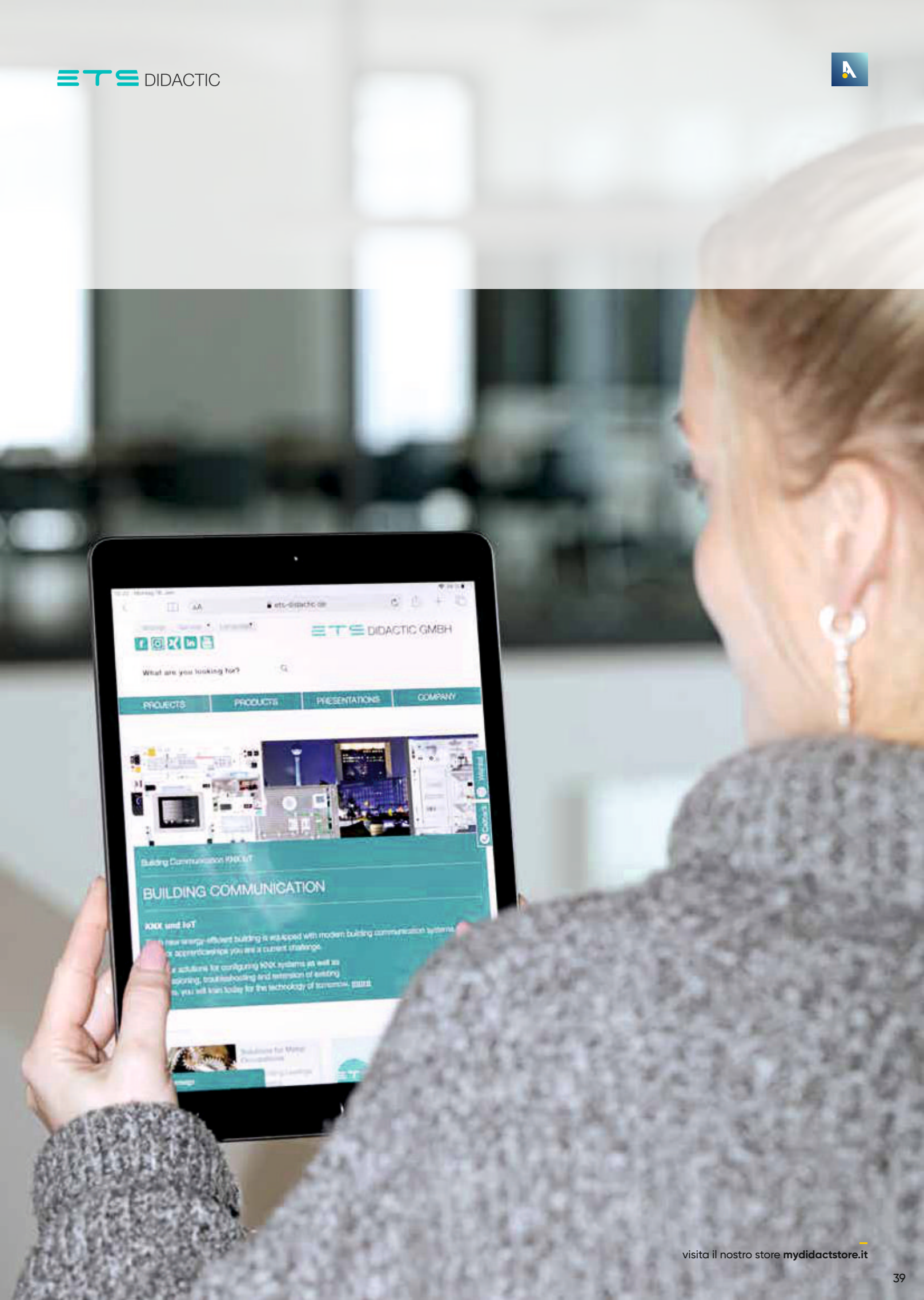
STAY CONNECTED

Always on the Pulse of Modern Education – We look forward to seeing You!



Your plus for
information

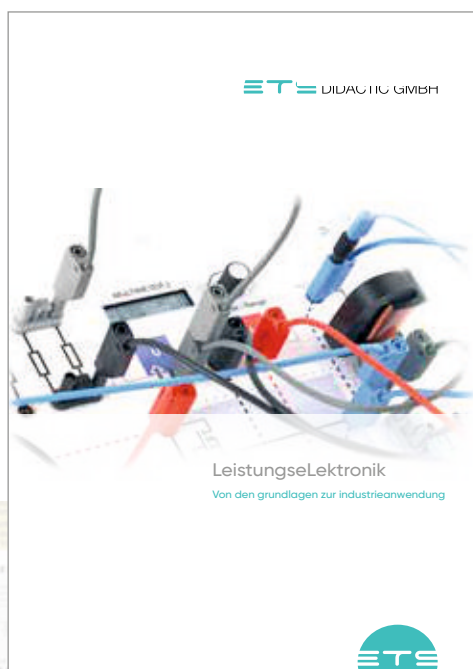




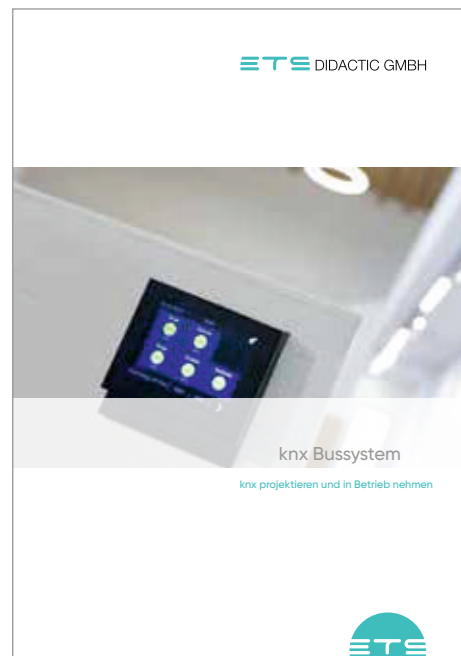
DIDACTIC SOLUTIONS FROM ETS

More Information about the ETS Trainingssysteme for your technical education

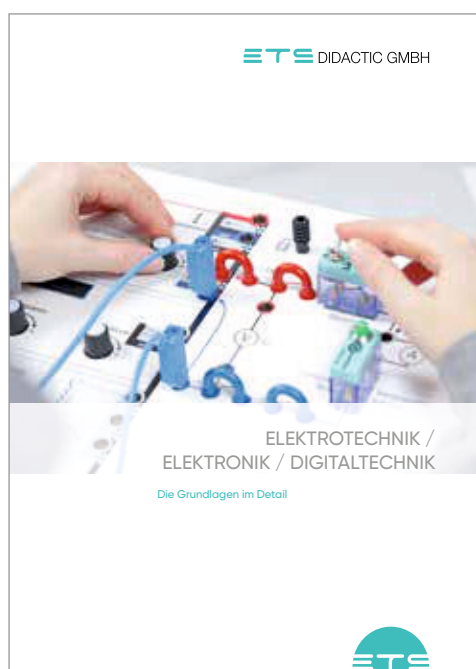
Power Electronics



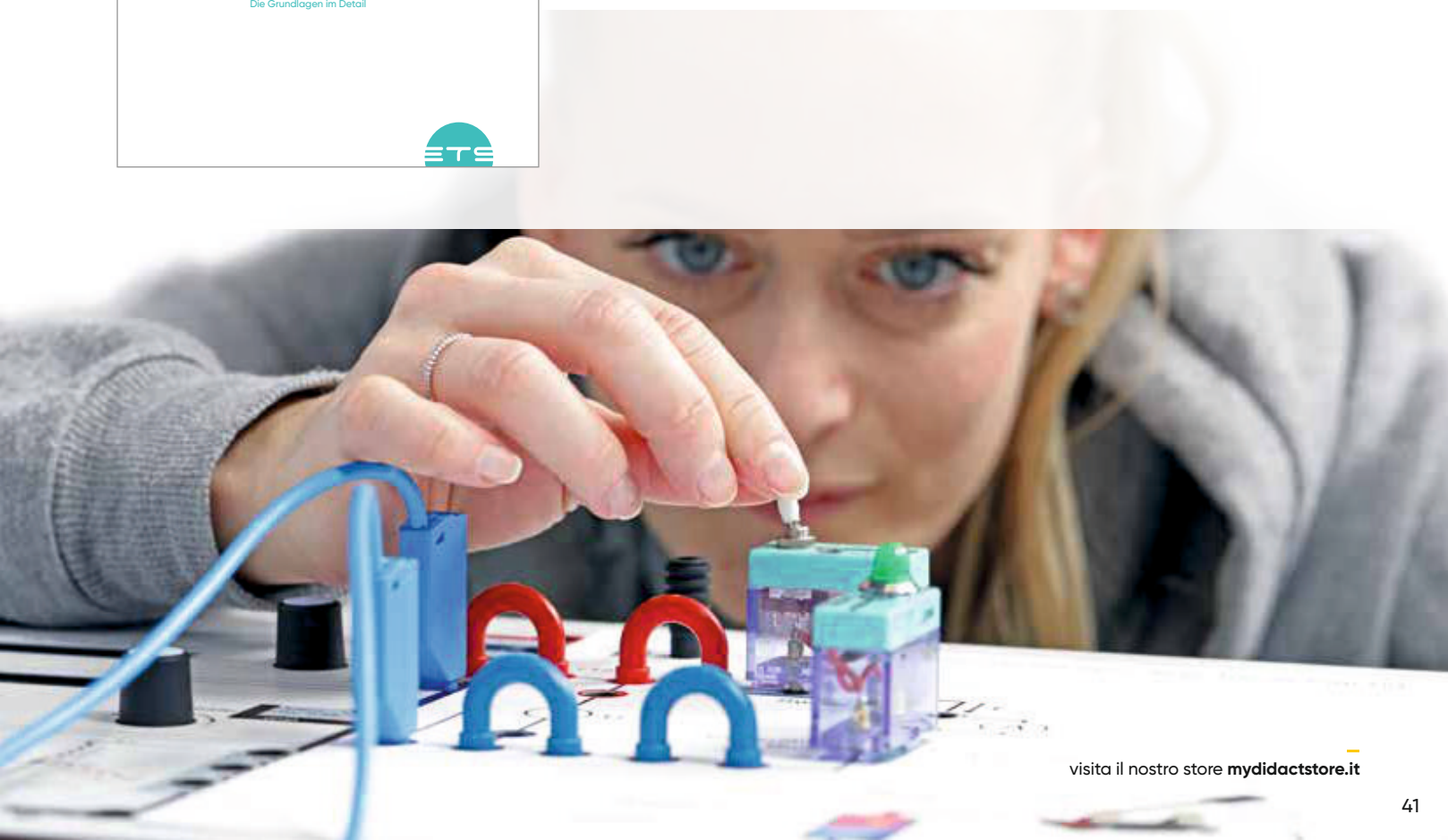
KNX Bus System



Electrical Engineering / Electronics/ Digital Technology



Sensorics Basics



QUALITY IS THE MEASURE OF ALL SUCCESS

Inspiring Technologies

ETS DIDACTIC is a symbol of high quality and outstanding flexibility. This means that ETS DIDACTIC products are convertible, they can – thanks to the modular conception and the versatile range of accessories – be quickly and efficiently matched to changed requirements and extended nearly without limits.

Our high quality standards refer not only to the products from ETS DIDACTIC, but especially also to the quality of the training that customers achieve thanks to the use of ETS DIDACTIC products. And in this, we also include the process quality:

ETS DIDACTIC supports procedures during the training that are as problem-free as possible.

The solutions offered by ETS DIDACTIC can be matched to individual customer requirements to a great extent. Customers of ETS DIDACTIC are supported and accompanied in the successful implementation of their training objectives by a comprehensive range of services.





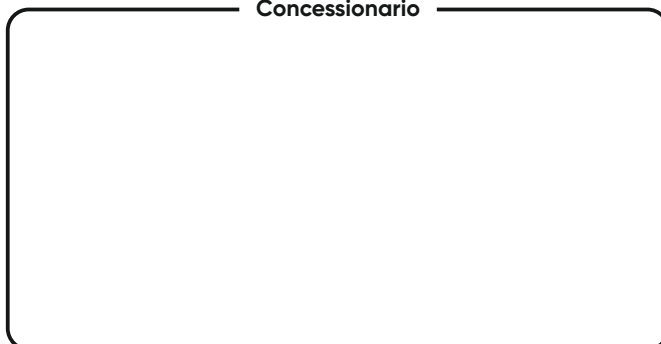


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