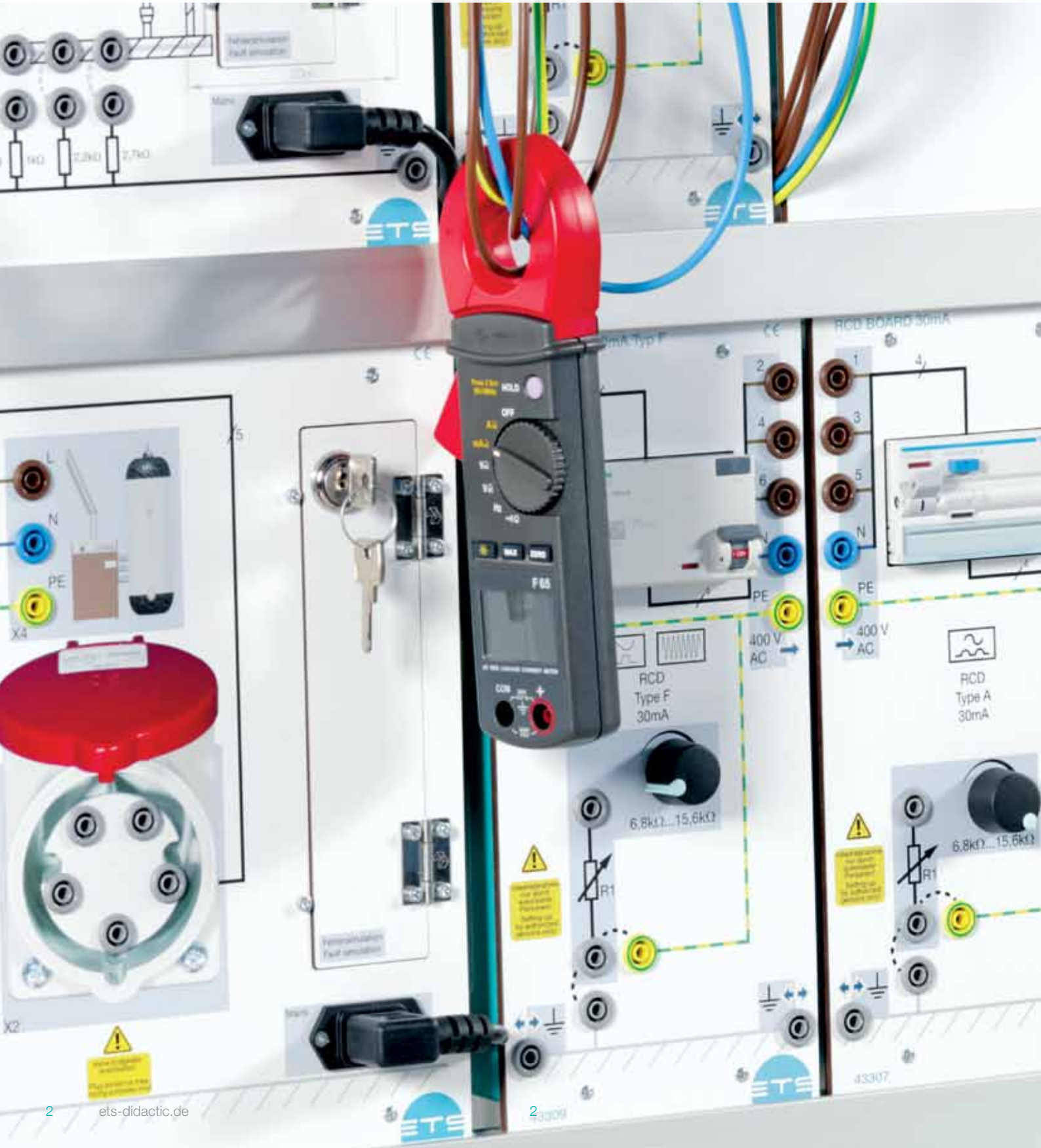
DIDACTIC GMBH

SAFETY OF ELECTRICAL INSTALLATIONS AND DEVICES

Mains Systems and Protective Measures

MAINS SYSTEMS AND PROTECIVE MEASURES

Testing Protective Measures



CONTENTS

Didactic Solutions

PEOPLE AND TECHNOLOGY – A PERFECT MATCH

Technology to inspire you: understanding – comprehending – applying

ETS DIDACTIC is your partner for in-house and institutional education and training in the professional fields of electrical engineering and metal technology.

Topics such as Industry 4.0, electrical engineering, power electronics, pneumatics, drive technology, automation technology, sensor technology, bus systems, mechatronics, transmission technology and the complete scope of building systems engineering including renewable energies are presented as a training system. With the help of well thought-out learning-oriended hardware and accompanying courseware, the specialist skills are quickly learned, grasped by hands and lead to didactic learning success in a goal-oriented manner.

The service spectrum of ETS DIDACTIC ranges from the provision of didactic hardware, courseware and software to the planning and equipping of the complete training rooms. ETS meets all requirements with practice-oriented workshops on the complete spectrum of technical professions for lecturers, trainers and instructors in a specially built modern training center or online.

Vocational schools, training centres of the ICC, Chamber of Crafts or the industry, polytechnics and universities are among the long-standing customers of ETS DIDACTIC.

Welcome to ETS DIDACTIC

ETS DIDACTIC is the pioneer and market leader in the development, manufacture and sales of electrical, automation and mechatronic workstations for training and instruction.

ETS DIDACTIC counts among the leading international manufacturers in the market environment. Located in Kinding, in the beautiful natural reserve of Altmühltal – high-quality products and solutions are developed and manufactured for you.

In the training centre in Kinding, the focus is on the practical application of the systems and fast learning of new technologies by the customers.

The knowledge, experience and the above-average personal involvement of the motivated employees of ETS DIDACTIC are vital factors for the company's efficiency.

Sven Urban
Managing Director

Udo Urban
Managing Director
(Founder)

MADE IN GERMANY

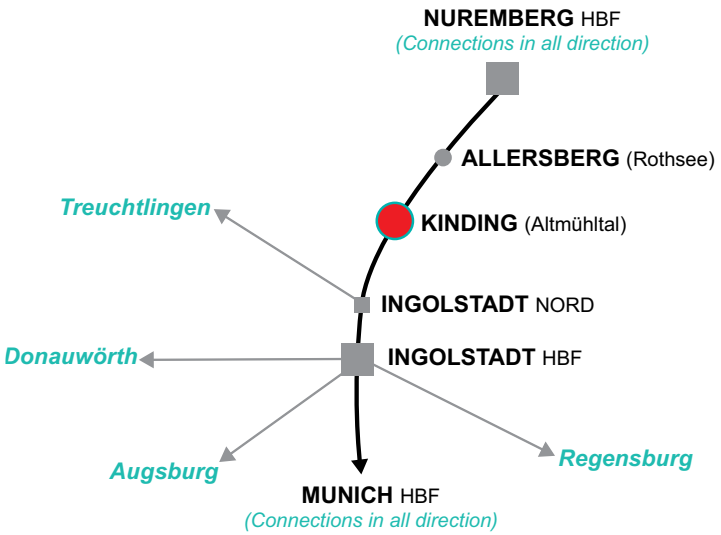
Visit ETS in the Valley of River Altmühl

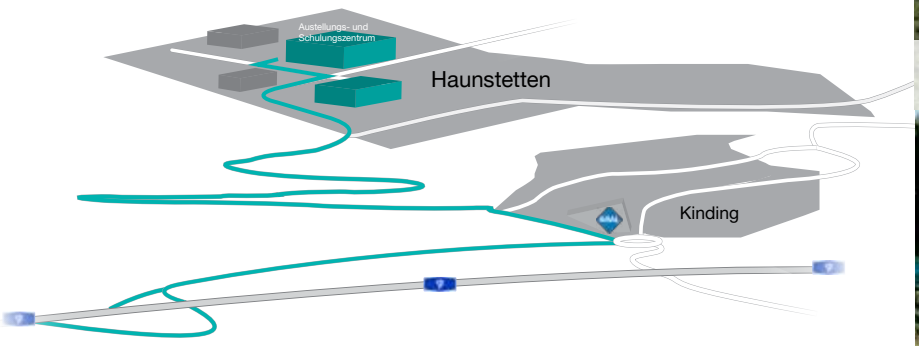
Welcome to Germany - Bavaria

The Altmühltal Nature Park is one of the largest in Germany and offers a thousand ideas for families, history fans, cultural discoverers and nature lovers.

You can travel to our workshop in Kinding-Haunstetten by train. The regional train station Kinging/Altmühltal is located directly on the ICE route between Nuremberg and Munich. The regional express trains of Deutsche Bahn stop every two hours. The journey from Kinding to Ingolstadt takes 17 minutes, to Munich 1 hour 15 minutes and to Nuremberg only 27 minutes.

Local cab companies are available to take you from Kinding to Haunstetten. We will be happy to assist you with the organization.





Kloster Weltenburg

Naturpark Altmühltal

APPROACH AND ROOM CONCEPT

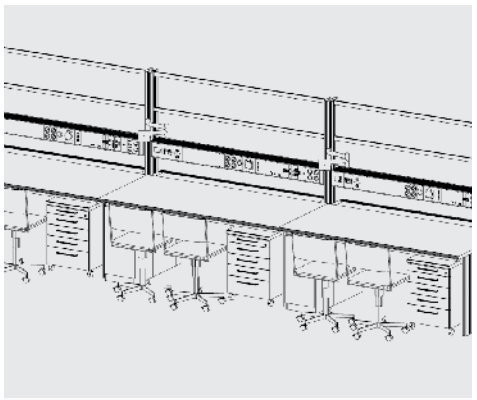
To plan a custom-made room concept with you, we proceed in the following steps:

⟩ 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.

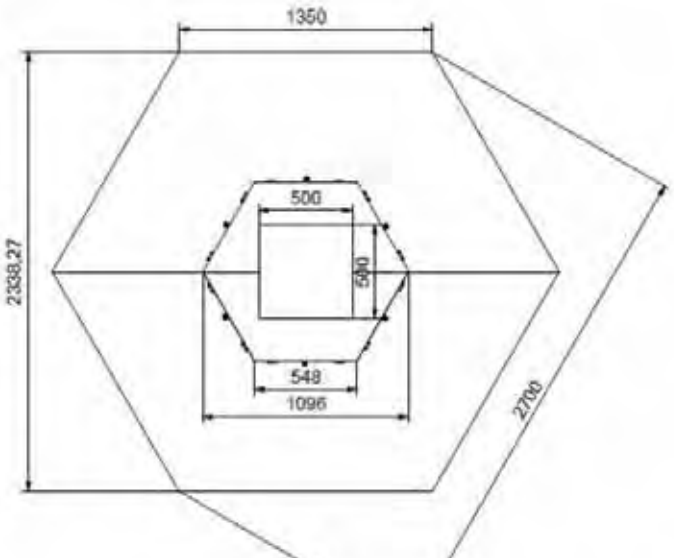
⟩ Taking into account the learning contents an equipment list can be set up. As soon as the extent is defined, the storage equipment is optimised and designed.

Analysis



Conception

Consulting / Planning



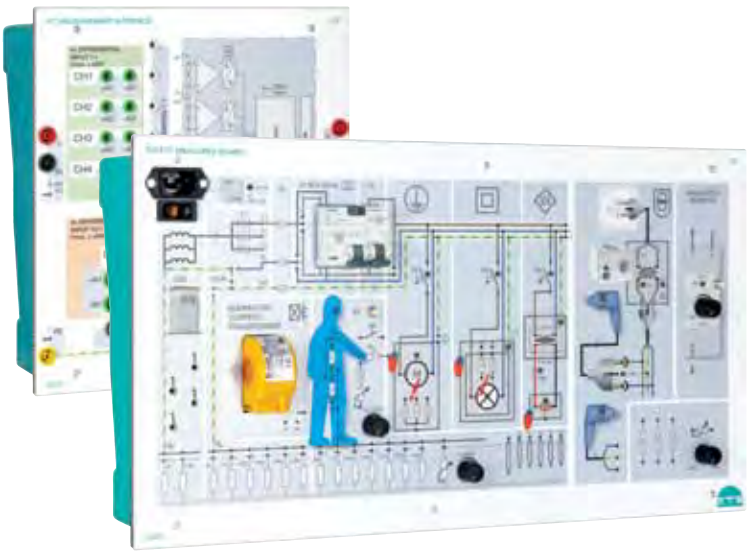
Design / Construction

Workshops

Application

PEOPLE AND TECHNOLOGY – A PERFECT MATCH

Didactic and Technology Result in the ETS-Concept



Compact Boards

- Their didactical 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. Due to the graphics, users comprehend and remember the technologies more easily.
- The systems can be mounted in an A4 frame or placed directly on a table.

Experimental Boxes

- Construct your own experiments. Beside the wiring, the arrangement of the components is focused. With the experimental boxes it's possible to practice basic circuits as well as 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 equiment 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 engergies, SmartBuilding and internet-of-things.

- Boards can also be integrated in the BuildingSystemsTrainer®

WORKSHOPS WITH ETS

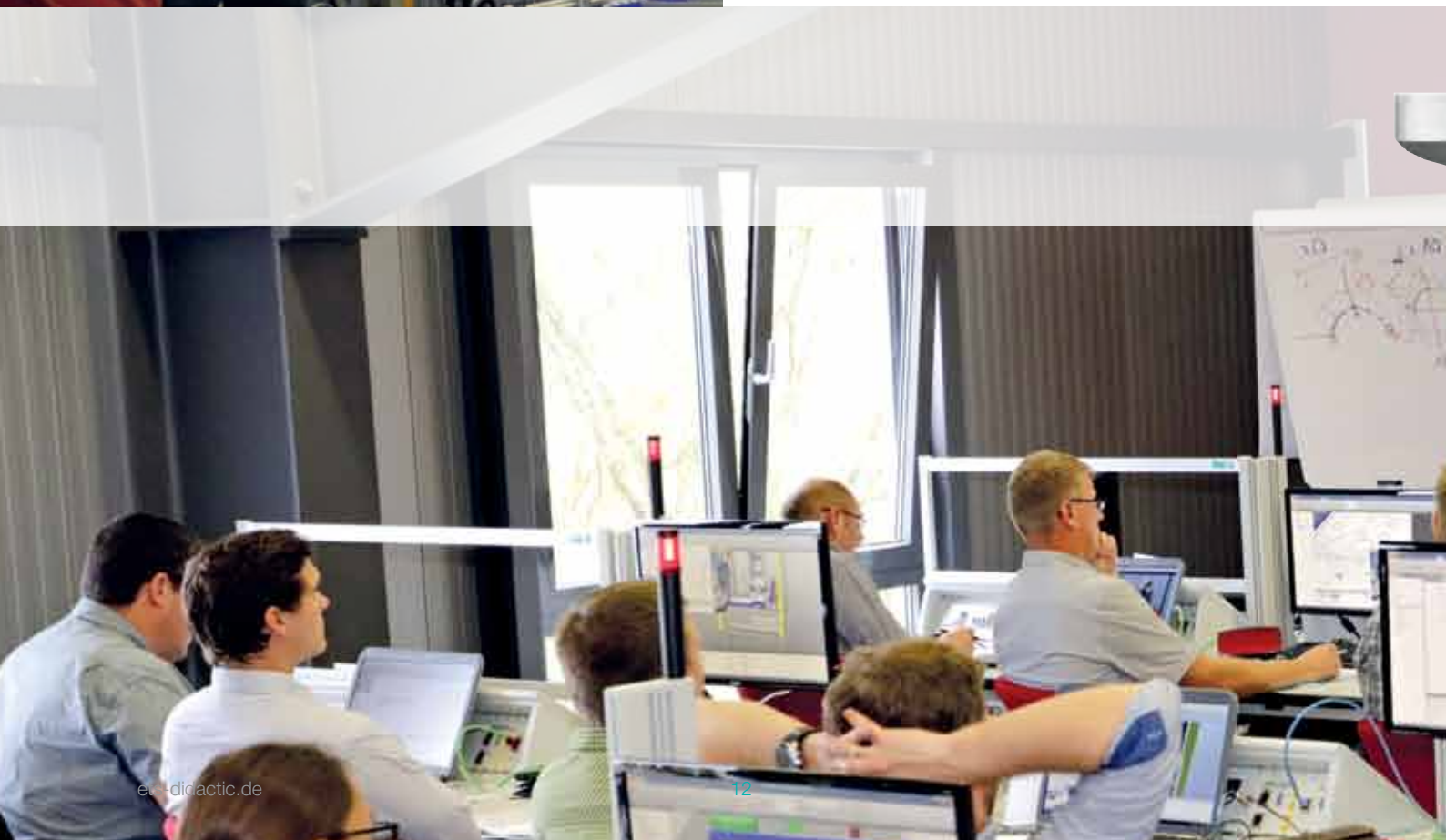
Always up to Date – Training at the Highest Level

⟩ Train the Trainer – workshops for teachers, trainers and lecturers in the field of electrical engineering, mechatronics and metal technology.

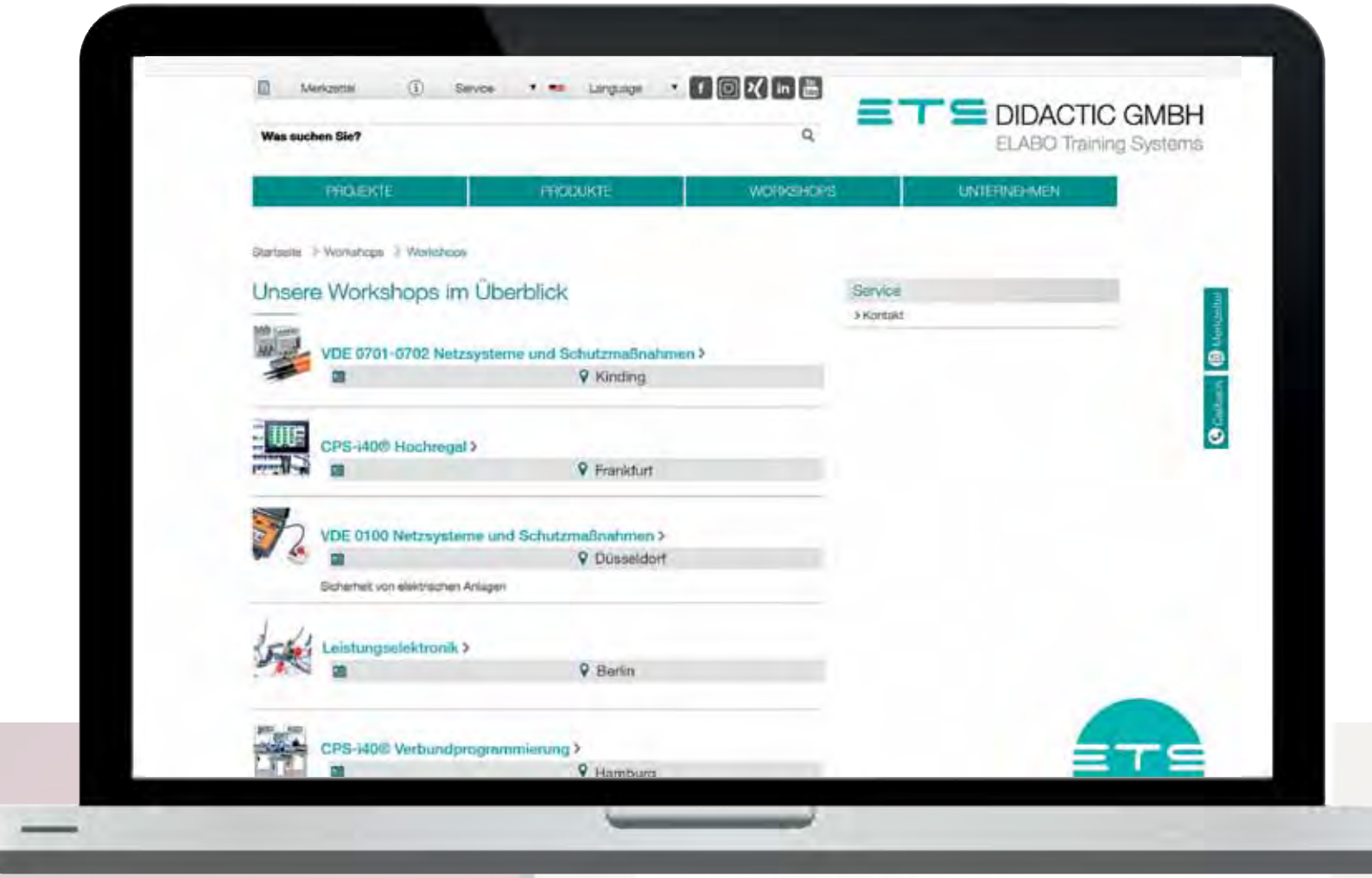
⟩ Learn more about the management and the application of various technologies with the support of the ETS trainers. Find out more about the didactic concept and learn to teach the material quickly and safe.

⟩ ETS offers a perfect seminar for all groups of products and topics of technical education. Scan the QR code to subscribe in a workshop:

ets-didactic.de/hp584/Workshops.htm



Fast and Safe into New Technologies



THE ETS TRAINING CONCEPT

Innovative Hardware / Perfect Courseware

compact

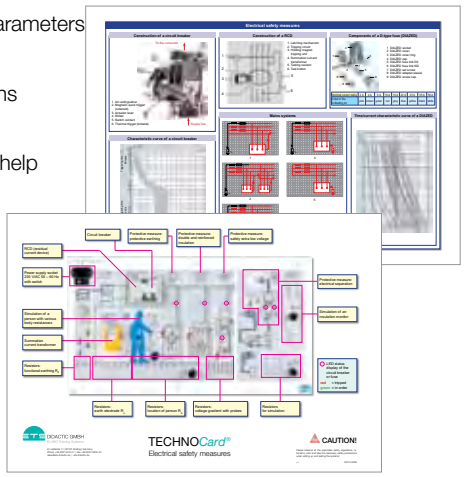
Structure of the Manuals

- Ringbinder principle
- Dividers
- Incorporation of personal documents

close to practice

TECHNO*Cards*®

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



motivating

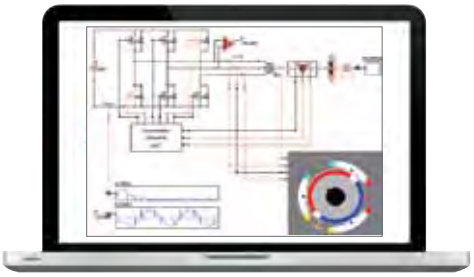
Instructor's Edition / Student Edition

- 100 % function guarantee
- High print quality
- Digital and on paper
- Original photographs with practical references
- Detailed work instructions

multimedia

Simulations Software

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



efficient

Front panel overlays

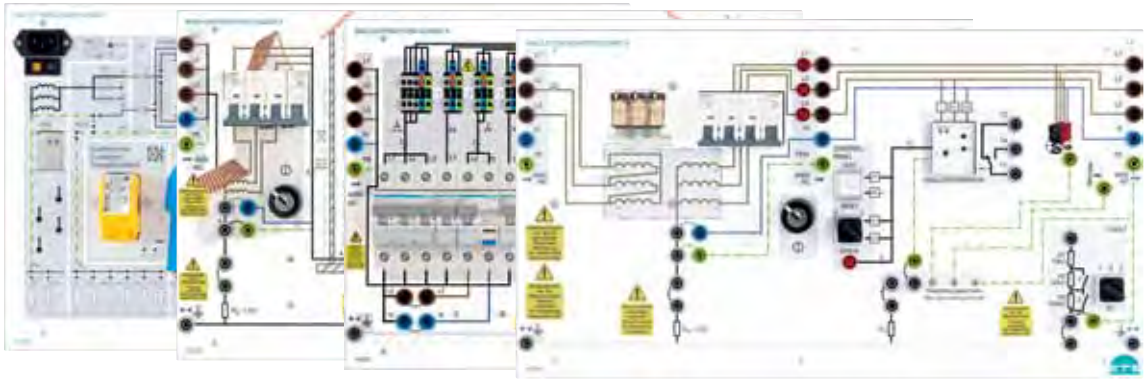
- Contents reduced to main focus of the experiment
- Clear layout
- Basic function
- Various languages

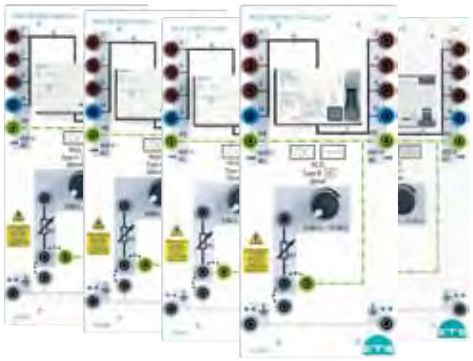
ergonomics

Furniture

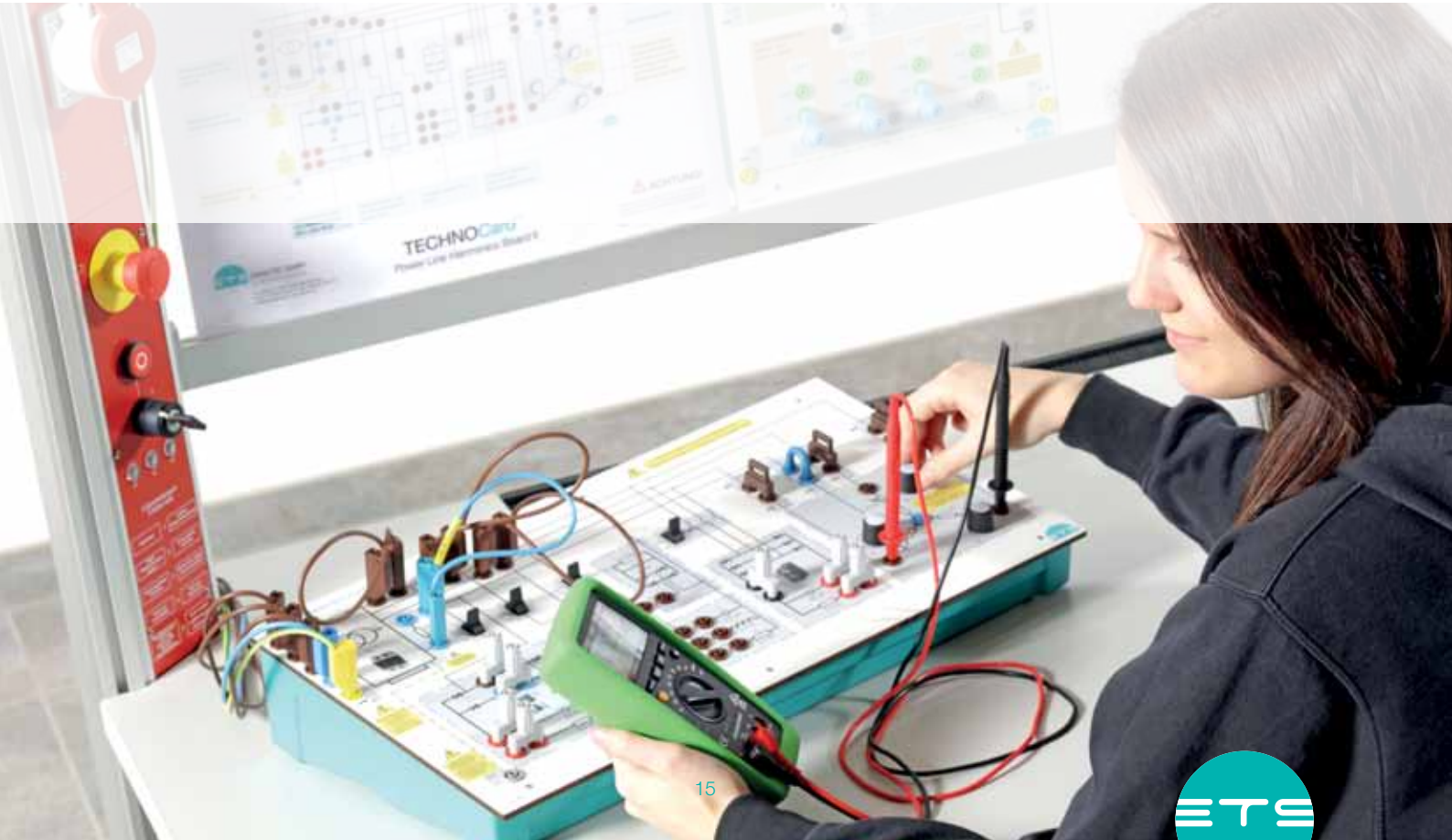
- Technically matched conception
- Excellent functionality
- Ergonomics at the workplace
- Outstanding design

... the System for Protective Measures





- State-of-the-art technology
- Easy to operate
- Didactically prepared courseware
- Safety for people and machine
- Perfect ergonomic workplaces

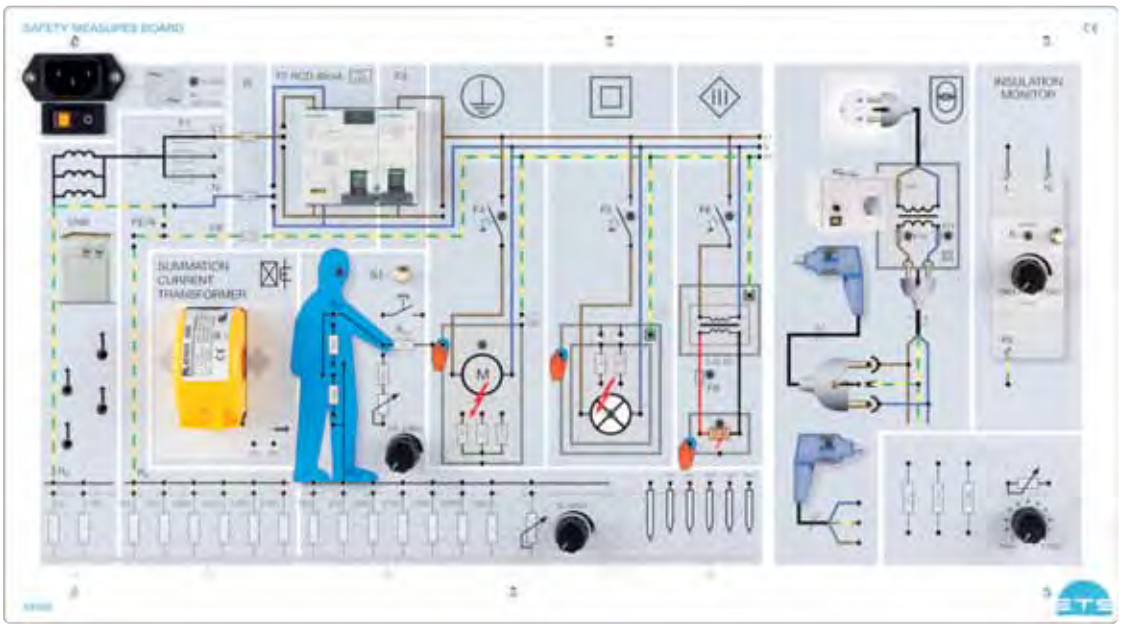


MAINS SYSTEMS | PROTECTIVE MEASURES

RESIDUAL CURRENT DEVICE

ELECTRICAL PROTECTIVE MEASURES

All at a glance



1

The Safety Measures Board is designed for experiments related to the subject of electrical measures. Safety extra-low voltage ensures optimum safety for the user.

The use of the devie is possible without any problems in any room due to the use of a protective contact plug. The TN-C, TN-C-S, TN-S, TT and IT systems can be represented.

You can perform the experiments with the listed learning objectives and topics using this training system.

Learning objectives

- Structure of electrical systems
- Hazards due to overload, short circuit and overvoltage, as well as calculation of the required protection elements
- Examination of different protective measures in TN-C, TN-C-S, TN-S, TT and IT systems
- Protective measures according to DIN VDE 0100
- Effect of current on the organism, safety rules, emergency measures in case of accidents
- Measures against dangerous body currents according to valid regulations
- Determination of the heart current factor

Performance features

- Simulation of an electrical system with transformer station, house connection, RCD circuit breaker, fuse and consumers
- Simulation of a foundation earth electrode with different earth resistances
- Simulation of main potential equalization
- Simulation of the house connection with formation of diferent mains systems by means of jumper plugs
- Built-in power supply, single-phase socket is sufficient

No.	Designation	Order No.
1	Safety Measures Board	43400
2	Digital multimeter	90600

Advantages

- Safe experimentation through the use of extra low voltage 1:10
- No special measuring equipment necessary
- Representation of the protection classes

2

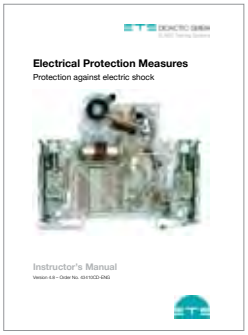
Experimental procedure with commercially available multimeters

(More information about the digital multimeter can be found on page 70).

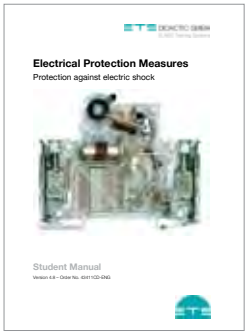
ELECTRICAL PROTECTIVE MEASURES

Courseware

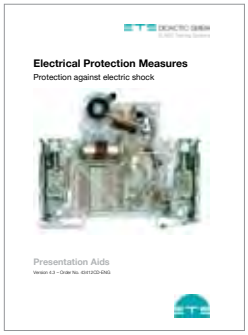
1



2



3



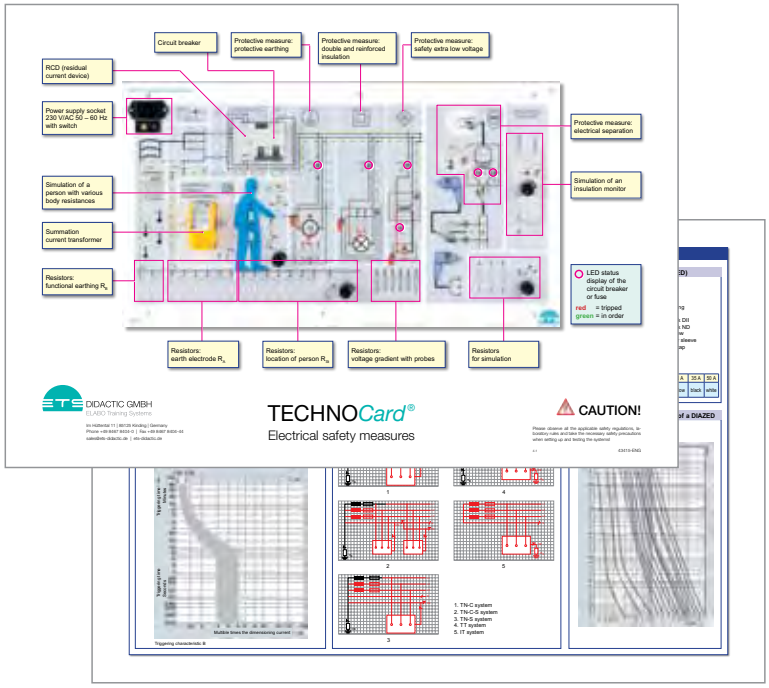
4

Printed and digital

Manual content

- Fundamentals
- Network systems
- Basic protection and fault protection
- Residual current devide
- Protective separation
- IT system
- Protection by double or reinforced insulation
- Protective extra-low voltage and functional extra-low voltage
- Step voltage

TECHNOCard®



The TECHNOCards® are a practical supplement to the training system. On them, the trainee finds a kind of knowledge store in concentrated, clear form for constant reference during practical work.

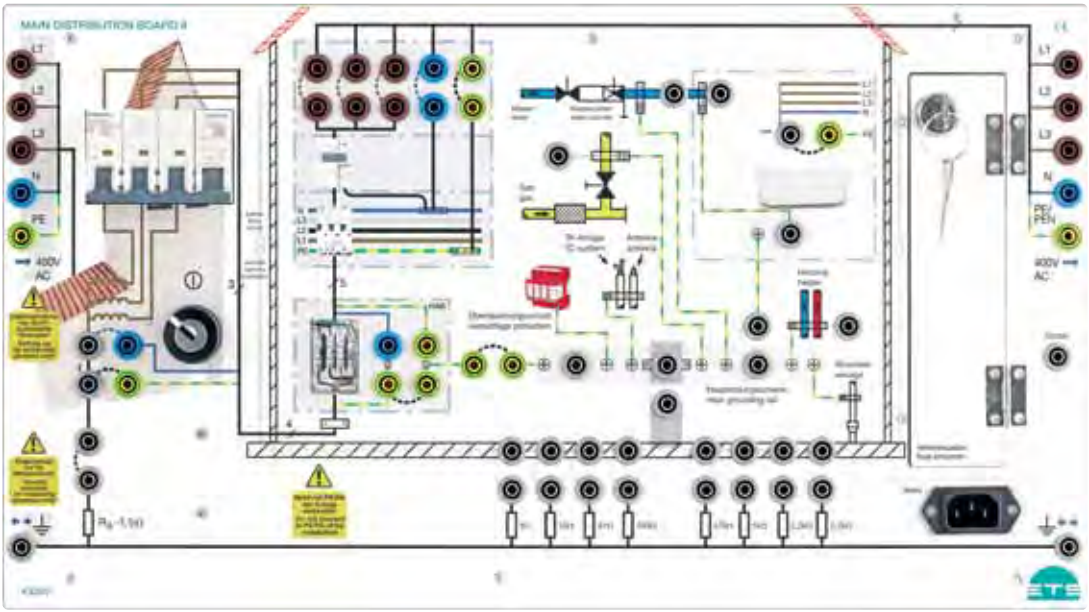
- Display board in 303mm x 426mm format
- Double-sided color design
- Robust, hard-wearing quality

5

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Electrical protective measures – Instructor´s Manual	43410CD-ENG
3	Electrical protective measures – Student Manual	43411CD-ENG
4	Electrical protective measures – Presentation Aids	43412CD-ENG
5	TECHNOCard® - Electrical protective measures	43415-ENG

MAINS SYSTEMS AND PROTECTIVE MEASURES

House connection of the customer plant



1

Learning objectives

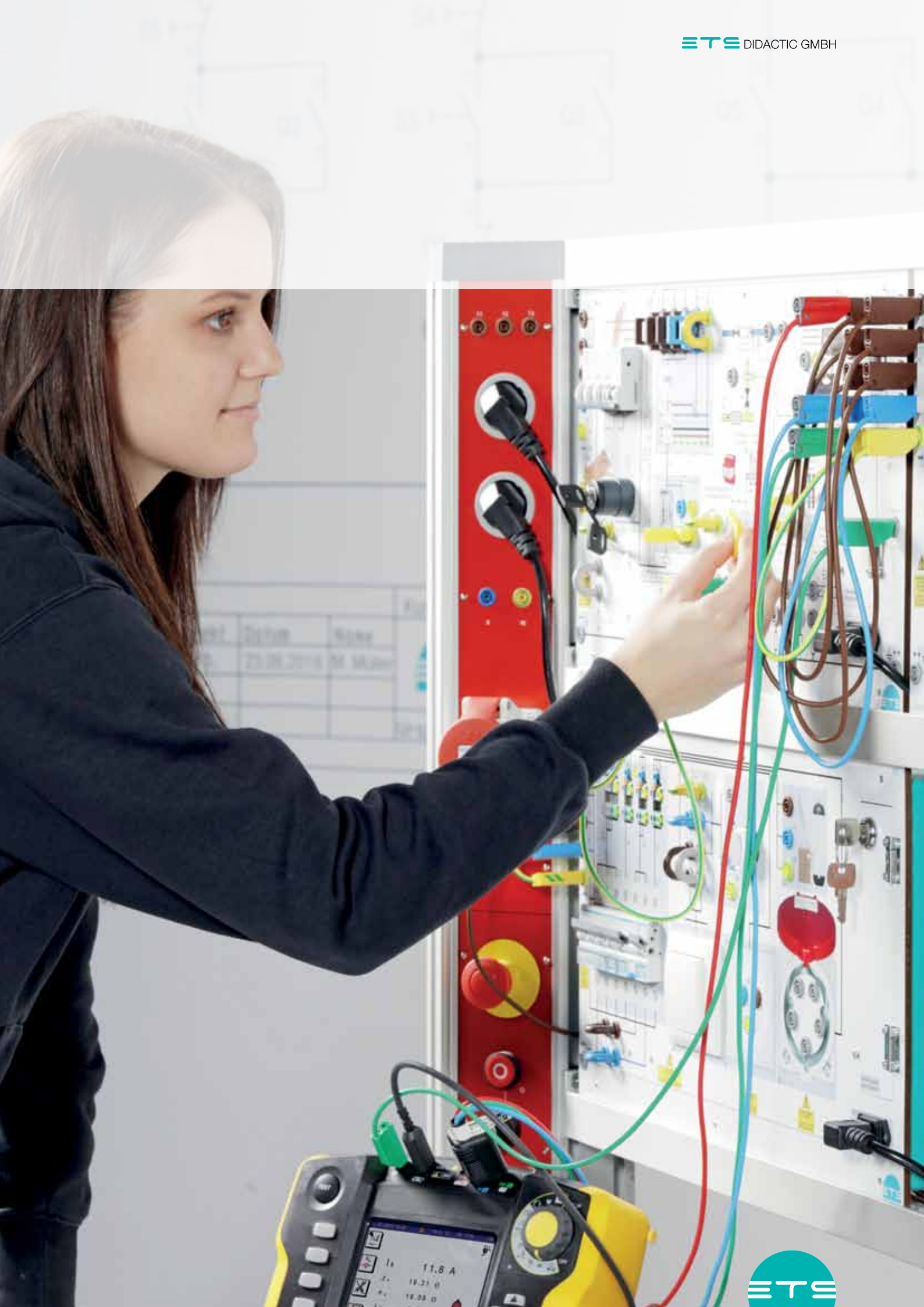
- ⟩ Structure of the public network/network system of the feeding network
- ⟩ Network system of the consumer installation
- ⟩ Selection of protective measures for a consumer installation
- ⟩ Selecting and applying measuring and test equipment for measurements according to:
  - DIN VDE 0100-410
  - DIN VDE 0100-600
  - Accident Prevention Regulations DGUV

  Interpreting measuring results
- ⟩ Apply regulations for initial and repeat tests and create a schedule/flowchart of required measurements
- ⟩ Carry out and describe the commissioning of low-voltage switchgear assemblies and create test report
- ⟩ Carry out and describe initial and repeat tests of electrical systems and create test reports

Performance features

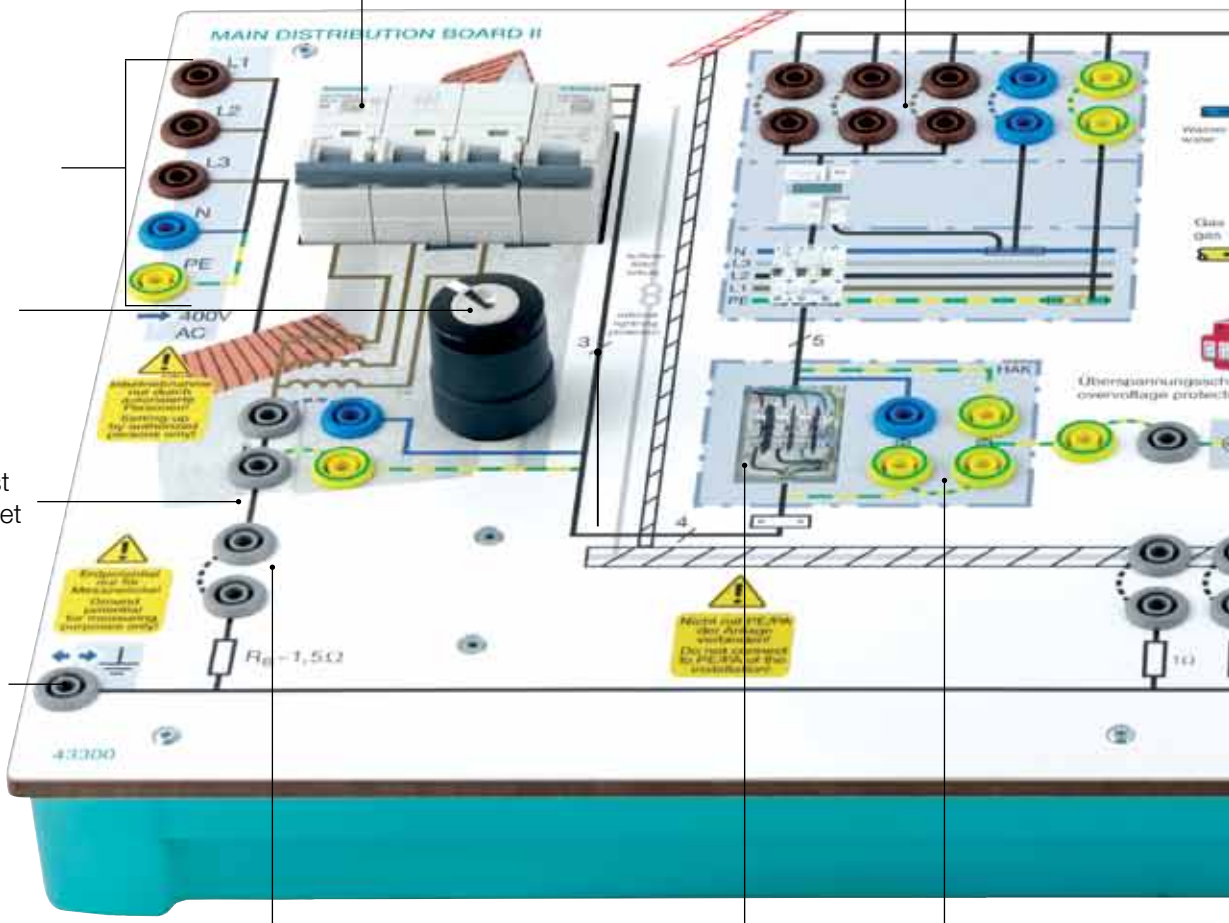
- ⟩ Circuit breaker (I_N = 6 A)
- ⟩ Key switch for enabling
- ⟩ Easy change of the mains form via jumper plug
- ⟩ Silumation of a foundation earth electrode with different earth resistances
- ⟩ Simulation of the external lightning protection
- ⟩ Possibility to connect a probe for earth measurement
- ⟩ Reproduction of main equipotential bonding
- ⟩ Simulatinon of additional potential equalization in the bathroom
- ⟩ Replication of the house connection with the formation of the different network systems using jumper plugs
- ⟩ Replication of the counter space
- ⟩ Connection panel for sub-distribution boards
- ⟩ Simple fault simulation by rotary switches for:
  - Loop and mains internal resistance measurement
  - Low-resistance connection of protective and equipotential bonding conductors
  - Insulation fault for insulation resistance measurement

No.	Designation	Order No.
1	Main Distrubution Board II	43300


11.6 A

MAIN DISTRIBUTION BOARD

House connection of the customer plant



Circuit breaker 6 A,
3-pole with undervoltage release

Main line tap terminal

Input
Power supply
400 V AC 3/N/PE

Key switch for
voltage release

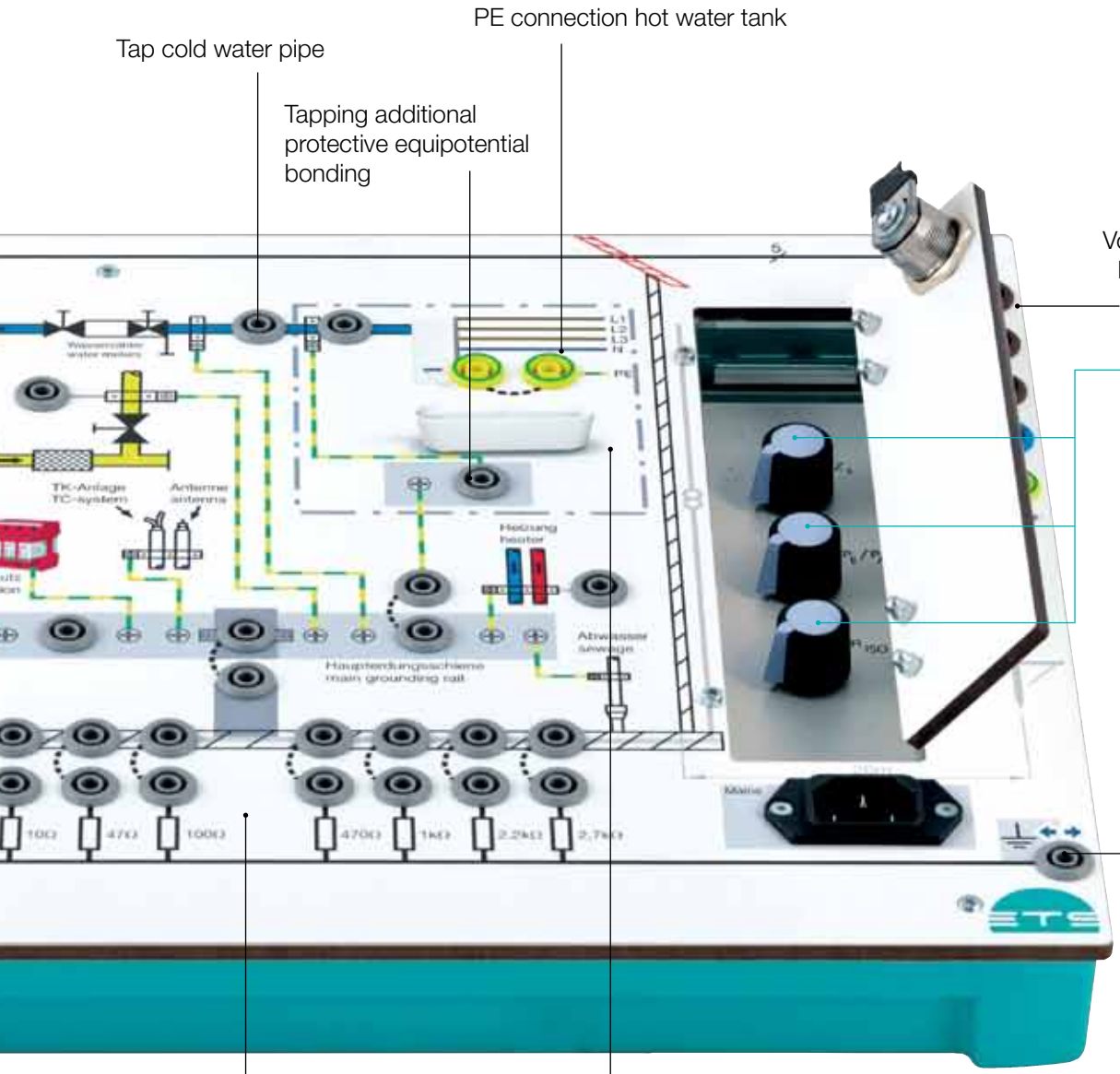
Possibility to adjust
the shape of the net
via jumper plug

Earth potential; is
connected to the
star point of the
transformer
connected R_B
(TT/TN system).

Operating earth electrode
approx. ca. 1.5 Ω

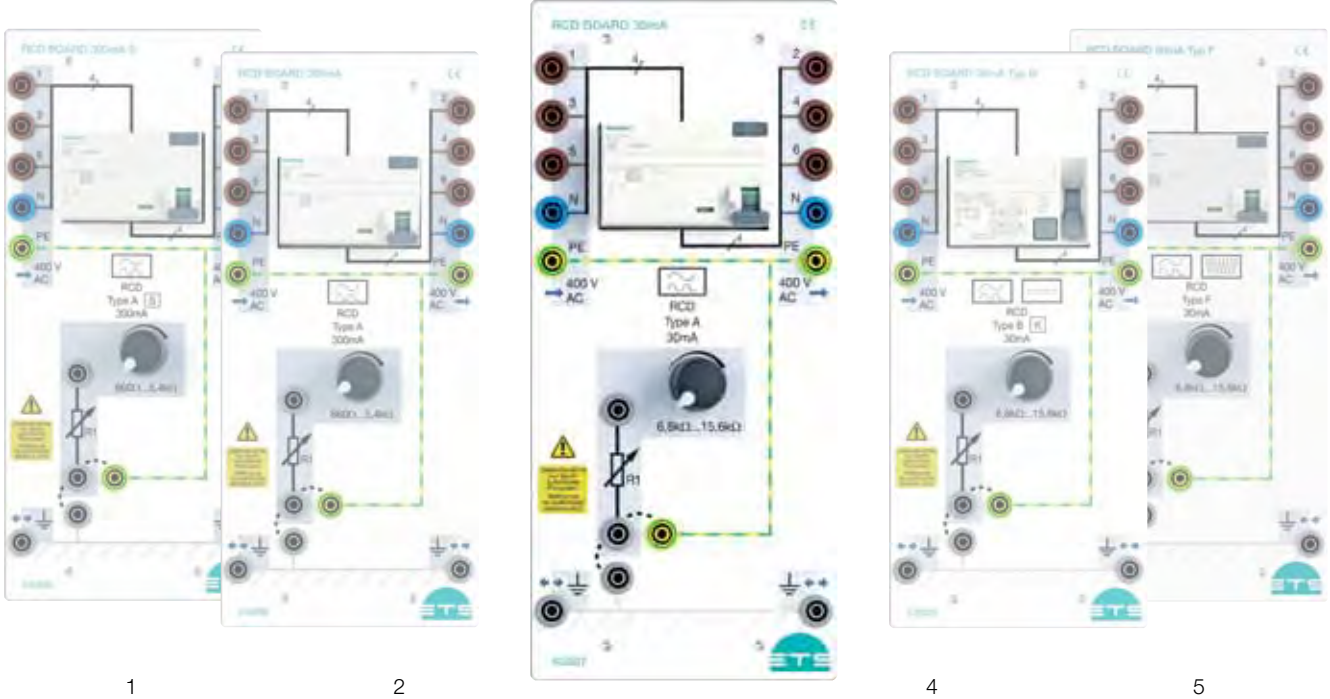
House connection box

Bridge for TN network


Tap cold water pipe
PE connection hot water tank
Tapping additional protective equipotential bonding
Voltage output to the RCD board or Sub-Distribution Board
Error switch for:
• Loop resistance error
• Protective conductor or equipotential bounding fault
• Insulation fault
Tap for ground potential
Setting the earthing resistance 1 Ω ... 2.7 k Ω using bridging plugs
Room with additional equipment bonding (bathroom)

RCD CIRCUIT BREAKER

RCD types



1 2 3 4 5

Learning objectives

- ⟩ Selection of protective measures for a consumer installation
- ⟩ Selecting and applying measuring and test equipment for measurements according to:
  - DIN VDE 0100-410
  - DIN VDE 0100-600
  - Accident Prevention Regulations DGUV

  Interpreting measuring results
- ⟩ Apply regulations for initial and repeat tests and create a schedule/flowchart of required measurements
- ⟩ Carry out and describe the commissioning of low-voltage switchgear assemblies and create test report
- ⟩ Carry out and describe initial and repeat tests of electrical systems and create test reports

Performance features (1)

- ⟩ Residual current circuit breaker $I_{\Delta N}$ 300 mA/selctive
- ⟩ Potentiometer for simulation of residual currents

Performance features (2)

- ⟩ Residual current circuit breaker $I_{\Delta N}$ 300 mA
- ⟩ Potentiometer for simulation of residual currents

Performance features (3)

- ⟩ Residual current circuit breaker $I_{\Delta N}$ 30 mA
- ⟩ Potentiometer for simulation of residual currents

Performance features (4)

- ⟩ Residual current circuit breaker $I_{\Delta N}$ 30 mA Type B
- ⟩ Potentiometer for simulation of residual currents

Performance features (5)

- ⟩ Residual current circuit breaker $I_{\Delta N}$ 30 mA Type F
- ⟩ Potentiometer for simulation of residual currents

No.	Designation	Order No.
1	RCD Board 300mA S	43305
2	RCD Board 300mA	43306
3	RCD Board 30mA Type A	43307
4	RCD Board 30mA Type B	43308
5	RCD Board 30mA Type F	43309


FAULT
RCD

RCD CIRCUIT BREAKER

RCD Circuit Breaker – Overview

RCD Board 300 mA S

RCD Board 300 mA

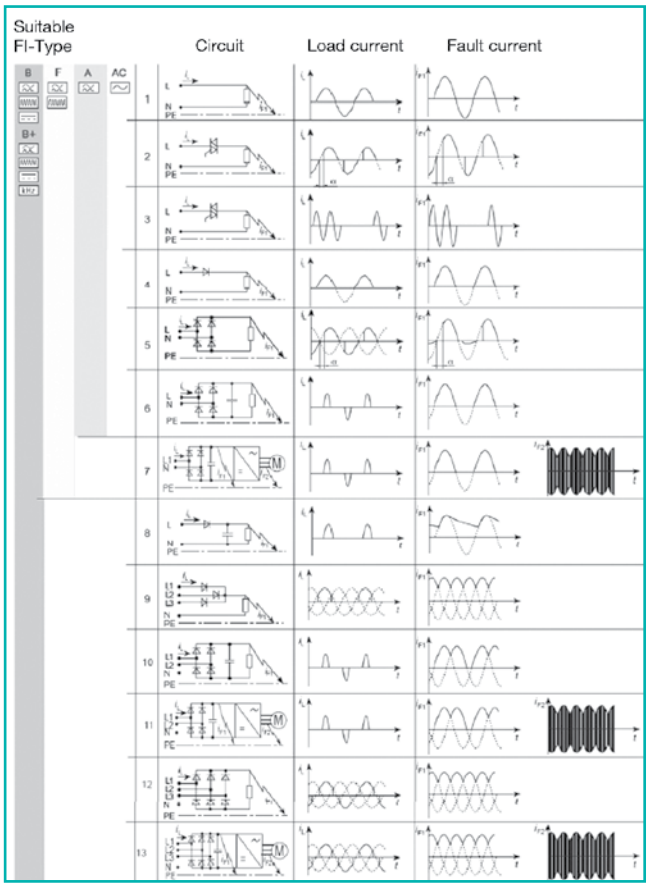
RCD Board 30 mA Type A

RCD Board 30 mA Type B

RCD Board 30 mA Type F

Proper function of the residual current circuit breaker

Current form	Type AC	Type A	Type F	Type B	Type B+	Tripping current
~	+	+	+	+	+	0,5 – 1,0 $I_{\Delta n}$
		+	+	+	+	0,35 – 1,4 $I_{\Delta n}$
		+	+	+	+	Bleed ange 135° 0,11 – 1,4 $I_{\Delta n}$
		+	+	+	+	max. 1,4 $I_{\Delta n}$ • 6 mA (Typ A) • 10 mA (Typ F) • 0,4 $I_{\Delta n}$ (Typ B/B+)
			+	+	+	0,5 – 1,4 $I_{\Delta n}$
				+	+	0,5 – 2,0 $I_{\Delta n}$



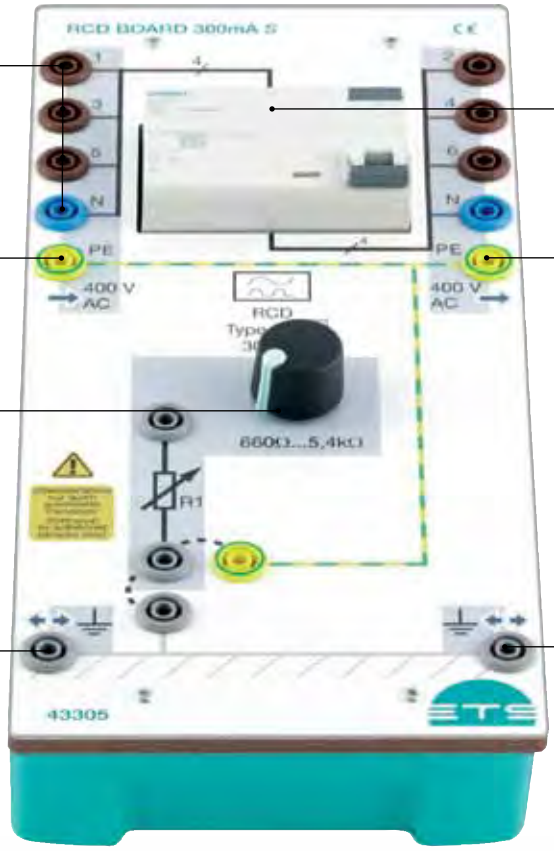
RCD Circuit Breaker – in detail

Feed from Main Distribution Board

Input protective earth, supply from Main Distribution Board

Potentiometer for generation of fault currents

Input ground potential, supply from Main Distribution Board



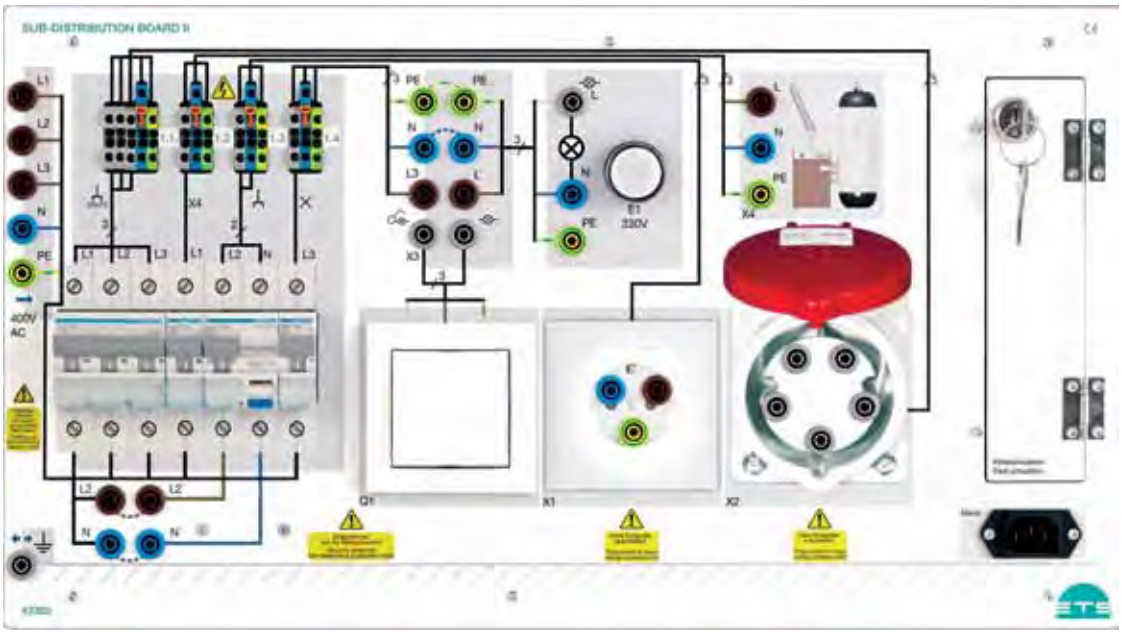
RCD circuit breaker type A for for sinusoidal and pulsating fault currents I_N = 40 $I_{\Delta N}$ = 0.3 A, selectives

Tap for protective conductor

Tap for earth potential

CUSTOMER PLANT

Sub-distributon of the customer plant



1

Learning objectives

- Selection of protective measures for a consumer installation
- Selecting and applying measuring and test equipment for measurements according to:
  - DIN VDE 0100-410
  - DIN VDE 0100-600
  - Accidient Prevention Regulations DGUV

  Interpreting measuring results
- Apply regulations for initial and repeat tests and create a schedule/flowchart of required measurements
- Carry out and describe the commissioning of low-voltage switchgear assemblies and create test report
- Carry out and describe initial and repeat tests of electrical systems and create test reports

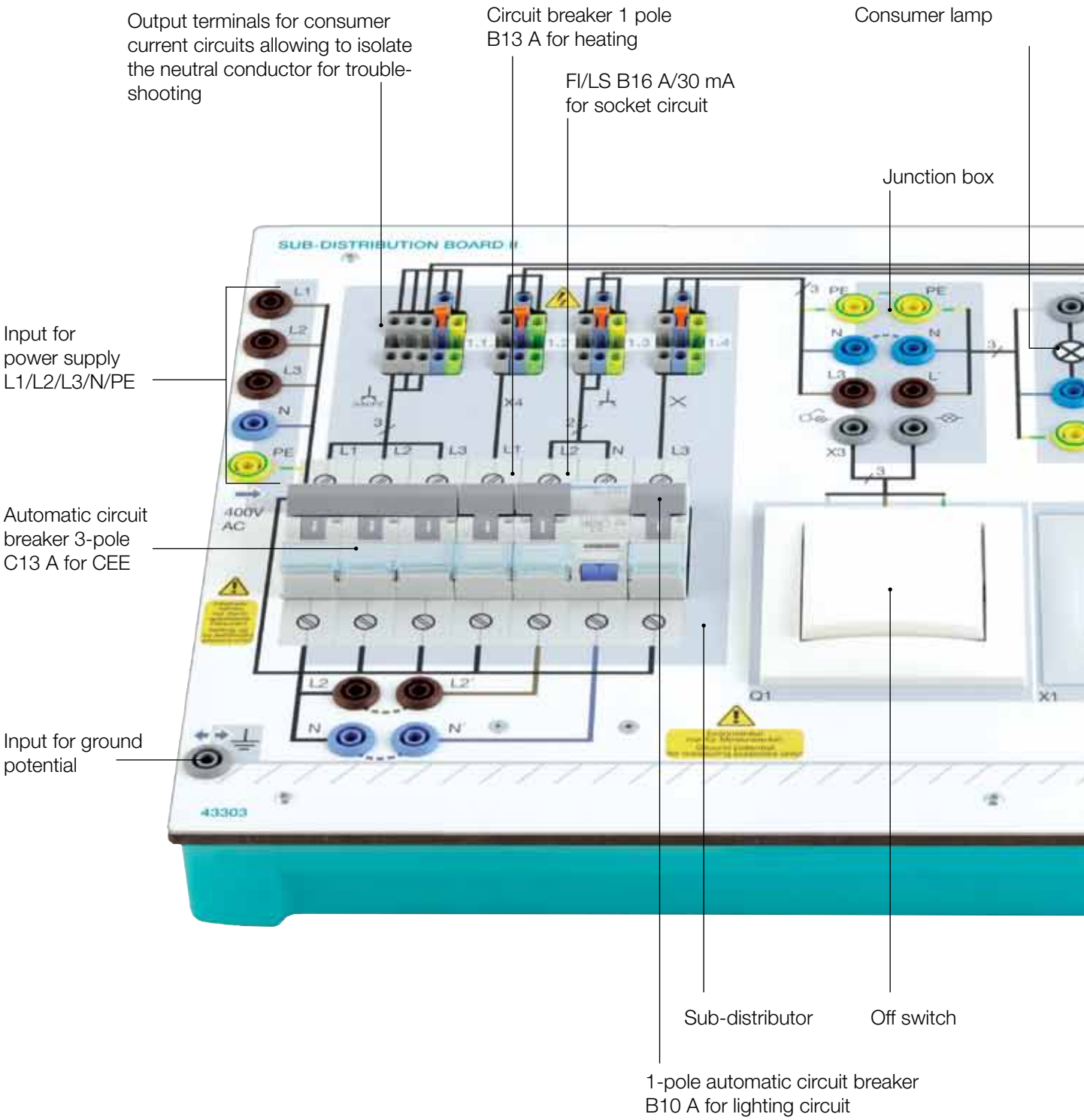
Performance features

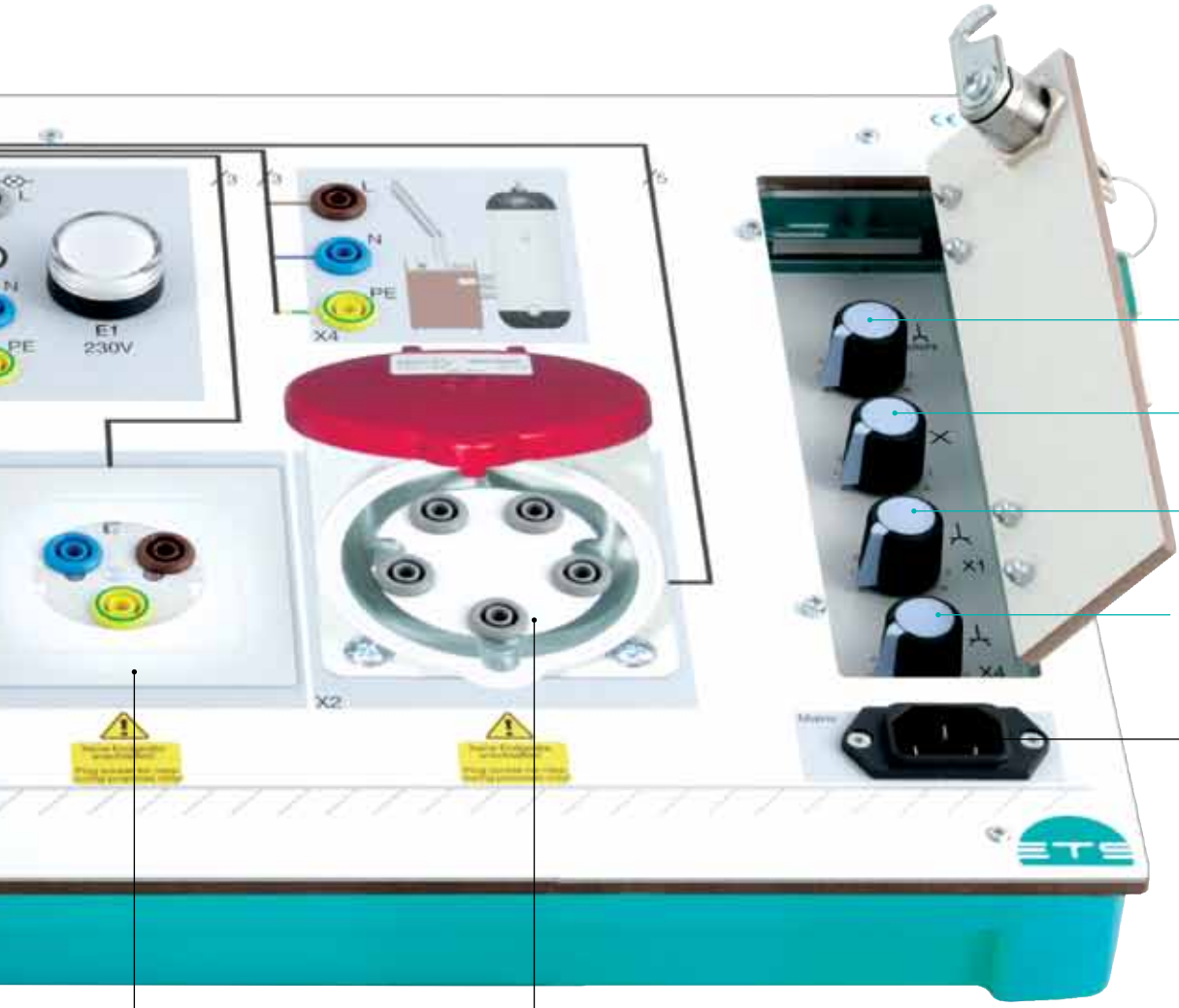
- Sub-distribution board with:
  - Circuit breaker: C13 A; 3-pole
  - Circuit breaker: B13 A; 1-pole
  - FI/LS circuit breaker (RCBO): B16 A/30 mA
  - Circuit breaker: B10 A; 1-pole
  - Measuring points led out via commercially available terminal blocks
- Consumers:
  - Three-phase consumer: indication of a CEE sockets 5-pin with SI sockets
- Alternating current consumer:
  - Luminaire switched via a switch junction box
  - Schuko socket imitation 3-pin with SI sockets
  - Heating connection indication of heating connection 3-pin with SI sockets

No.	Designation	Order No.
1	Sub-Distribution Board II	43303

CUSTOMER PLANT

Sub-distribution of the customer plant




Switch for error simulation:
CEE socket
Lighting circuit
Protective contact socket
Heating circuit
Mains connection for error simulation
Protective contact sockets
CEE socket
E1
230V
X4
X2
X1

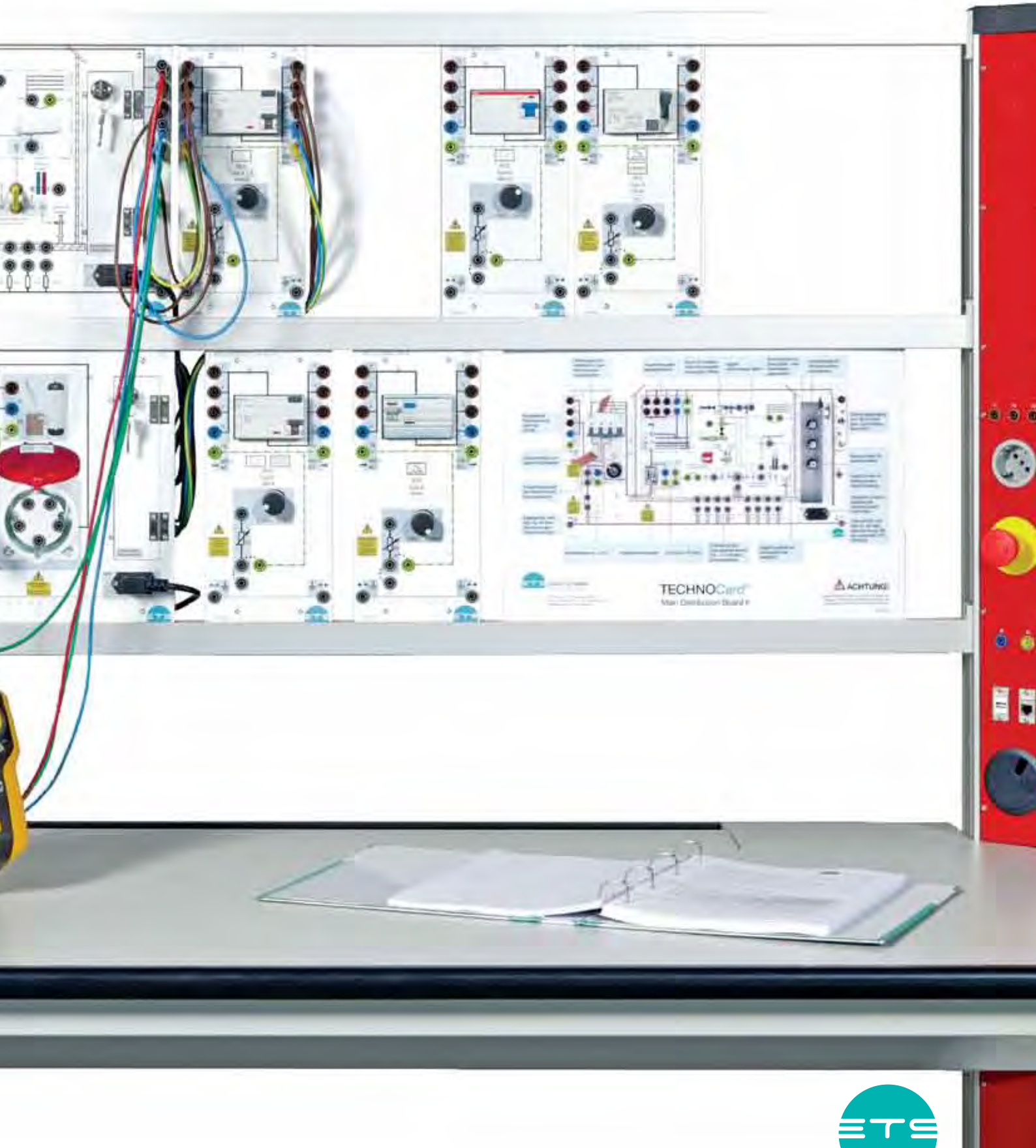
TRAINING PACKAGE TP 26.1.2

Main System and Protective Measures

Learning objectives

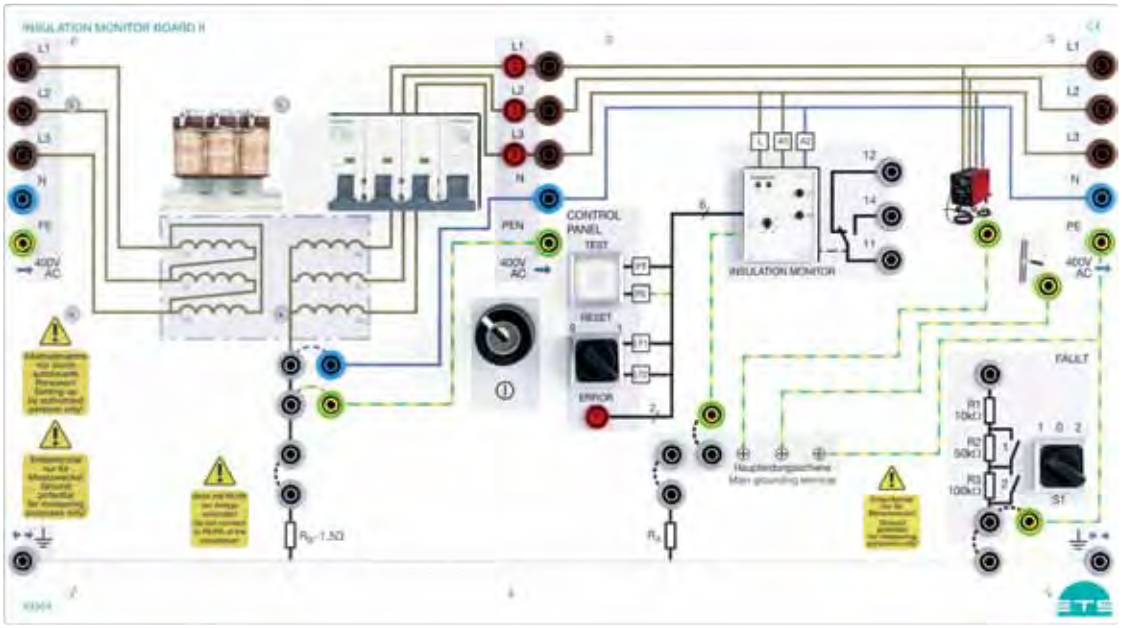
- ⟩ Structure of the public supply main/incoming main system
- ⟩ Customer installation of the main system
- ⟩ Selection of protective measures according to the requirements of the customer´s system
- ⟩ Selecting and applying measuring instruments according to
  - DIN VDE 0100-410
  - DIN VDE 0100-600
  - DIN VDE 0105-100
  - DGUV regulation 3

  Interpreting measurement results
- ⟩ Applying the provision for the initial and repeated tests and drawing up a flow chart of the required measurements
- ⟩ Carrying out and describing initial and repeated tests of electrical installationsand writing test protocols


TECHNOCard
ACHTUNG!

MAINS SYSTEMS AND PROTECTIVE MEASURES

IT system: Insulation Monitoring



1

Learning objectives

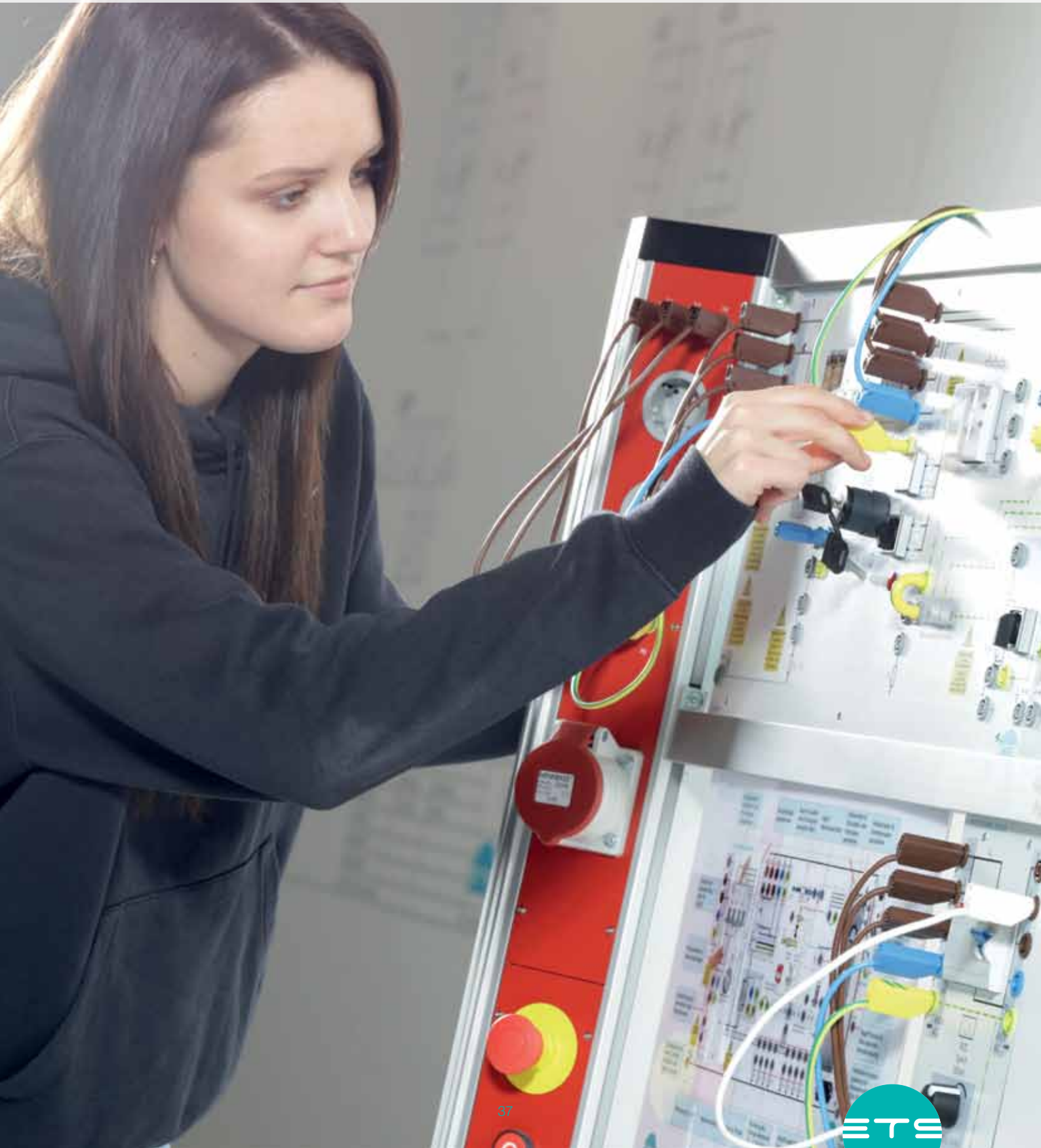
- Selection of protective measures for a consumer installation
- Selecting and applying measuring and test equipment for measurements according to:
  - DIN VDE 0100-410
  - DIN VDE 0100-600
  - Accident Prevention Regulations DGUV

  Interpreting measuring results
- Apply regulations for initial and repeat tests and create a schedule/flowchart of required measurements
- Carry out and describe the commissioning of low-voltage switchgear assemblies and create test report
- Carry out and describe initial and repeat tests of electrical systems and create test reports

Consisting of

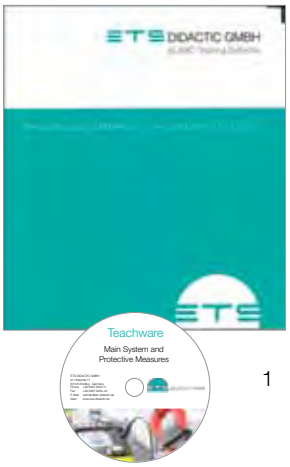
- Three-phase transformer (400/400 V/200 VA)
- Line circuit breakers (I_N: 1A)
- Key-operated switch
- Phase control lamps: L1, L2, L3
- Easy change of main form via jumper plug
- Isulation monitoring device for insulation monitoring of unearthed AC systems (IT system) with one or three phases
  - Supply voltage: AC 115/230 V
  - Measuring voltage: up to AC 500 V
  - Measuring range: 10 - 110 kΩ
- Button for resetting the stored alarm
- Button for fault simulation (external test button)
- Indicator light as an alarm signal generator
- Indication of the building potential equalization
- Switchable measuring resistors for generation of insulation fault/earth fault

No.	Designation	Order No.
1	Insulation Monitor Board II	43304



MAIN SYSTEMS AND PROTECTIVE MEASURES

Courseware



1

2

3

4

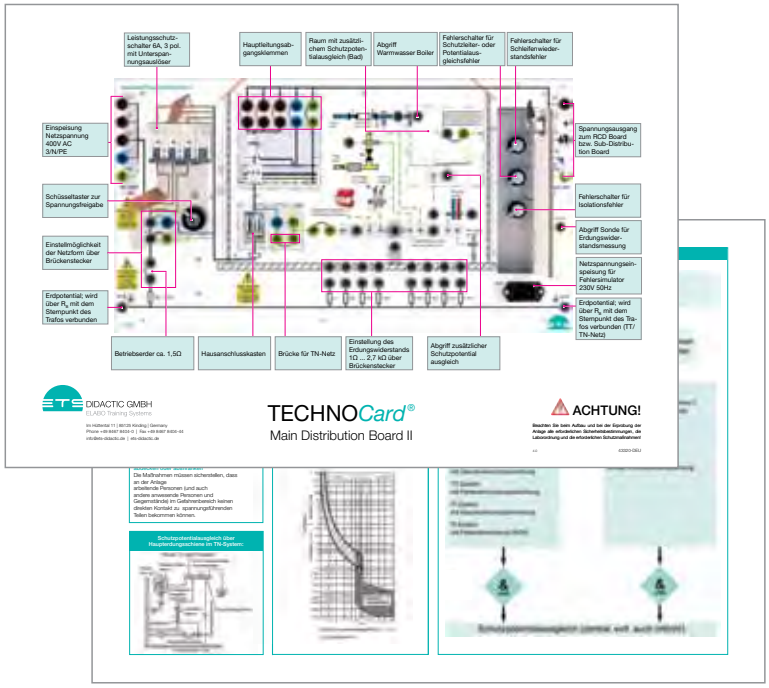
Printed and digital

Manual content

- Basics of network systems and their protective measures
- Electrical power supply and safety of equipment
- Testing of electrical equipment
- Initial test in TT systems
- IT system

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Main Systems & Protective Measures – Instructor´s Manual	43315CD-ENG
3	Main Systems & Protective Measures – Student Manual	43316CD-ENG
4	Main Systems & Protective Measures – Presentation Aids	43317CD-ENG

TECHNOCard®



The TECHNOCards® are a practical supplement to the training system. On them, the trainee finds a kind of knowledge store in concentrated, clear form for constant reference during practical work.

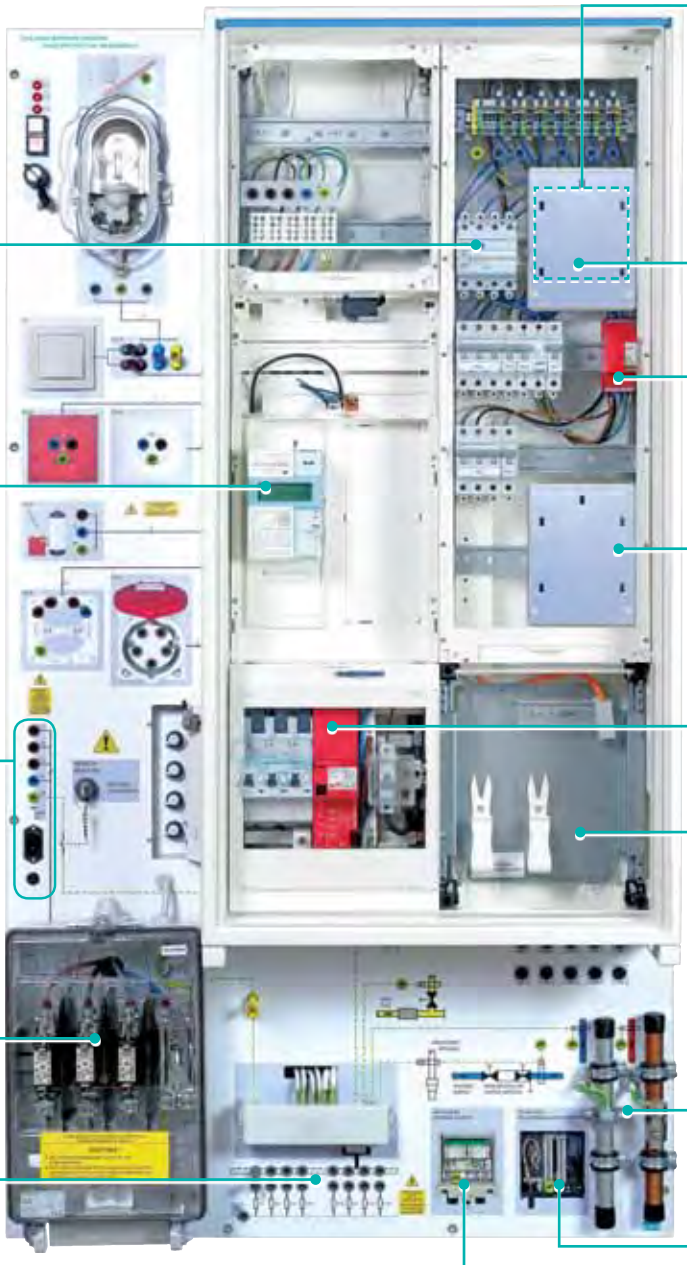
- Display board in 303mm x 426mm format
- Double-sided color design
- Robust, hard-wearing quality

5

No.	Designation	Order No.
5	TECHNOCard® - Main Distribution Board II	43320-ENG
n.ill.	TECHNOCard® - Sub Distribution Board II	43321-ENG
n.ill.	TECHNOCard® - Insulation Monitor Board II	43322-ENG
n.ill.	TECHNOCard® - RCD Board Type A S 300 mA	43323-ENG
n.ill.	TECHNOCard® - RCD Board Type A 300 mA	43324-ENG
n.ill.	TECHNOCard® - RCD Board Type A 30 mA	43325-ENG
n.ill.	TECHNOCard® - RCD Board Type B 30 mA	43326-ENG
n.ill.	TECHNOCard® - RCD Board Type F 30 mA	43327-ENG

VDE 0100 / ELECTRIC MAIN CONNECTION

BST®–BuildingSystemsTrainer



No.	Designation	Order No.
1	BST® Protective Measures (mobile trolley optional)	43506
2	BST® Installation Technologies (mobile trolley optional)	43504
3	Experiment boxes for different RCDs	on request

Learning objectives

- Structure of the public grid/grid system of the feeding grid
- Mains of the consumer installation
- Selection of protective measures for a consumer installation
- Selecting and using measuring and test equipment for measurement according to DIN VDE 0100-600 and interpreting measurement results
- Carry out and describe initial and repeat tests of electrical systems and create test reports
- Design of a meter system according to VDE AR-N 4100

1

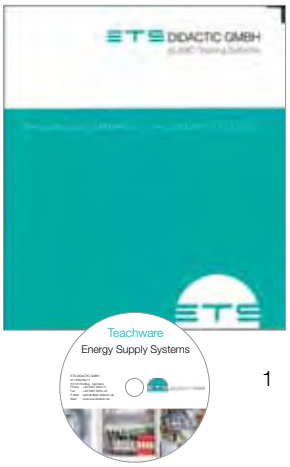
2

The flexible training system for building systems engineering with real components from ETS DIDACTIC.

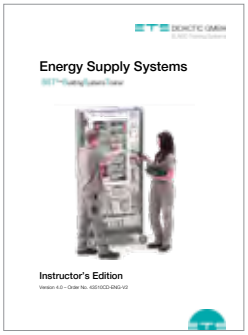
The system is characterized by the holistic approach to knowledge transfer. It is mobile and the workplace can be fitted individually from two sides. The trainee can work and make measurements under real conditions and at the highest possible safety. Apart from troubleshooting, the training concept comprises flush-mounted installation, replacement of NH-fuses and much more.

ENERGY SUPPLY SYSTEMS

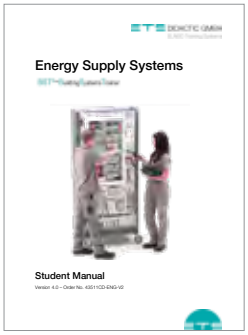
Courseware



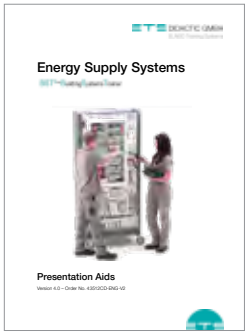
1



2



3



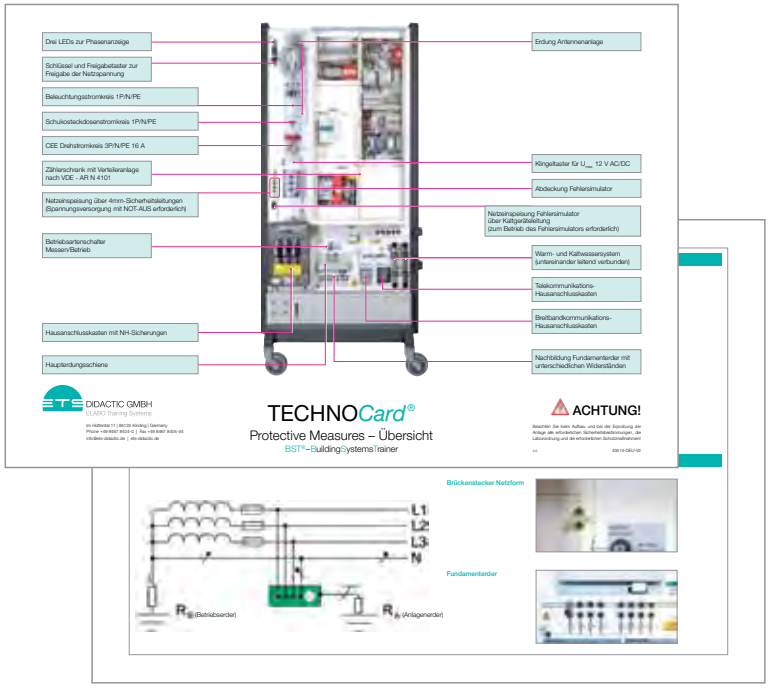
4

Printed and digital

Manual content

- Basics of network systems and their protective measures
- Electric power supply and safety of equipment
- TN system
- TN system (recurring test)
- TT system

TECHNOCard®



The TECHNOCards® are a practical supplement to the training system. On them, the trainee finds a kind of knowledge store in concentrated, clear form for constant reference during practical work.

- Display board in 303mm x 426mm format
- Double-sided color design
- Robust, hard-wearing quality

5

No.	Designation	Order No.
1	Set of ETS ring bindres	91903
2	Energy supply systems BST® – Instructor´s Manual	43510CD-ENG
3	Energy supply systems BST® – Student Manual	43511CD-ENG
4	Energy supply systems BST® – Presentation Aids	43512CD-ENG
5	TECHNOCard® - Overview	43514-ENG
n.ill.	Set of TECHNOCard® - Building System Trainer	43513-ENG
n.ill.	TECHNOCard® - Meter cabinet	43515-ENG
n.ill.	TECHNOCard® - Fault loop impedance	43516-ENG
n.ill.	TECHNOCard® - Protective equipotential bonding via main earthing rail	43517-ENG
n.ill.	TECHNOCard® - Measurements for testing	43518-ENG
n.ill.	TECHNOCard® - Test report according to DIN	43519-ENG

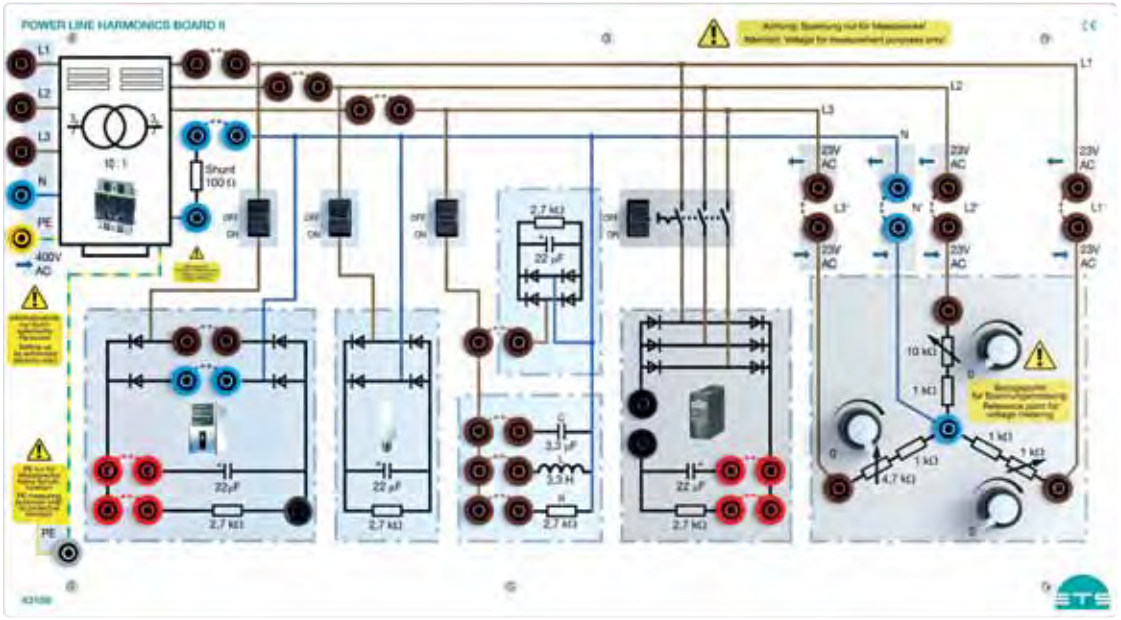

DIDACTIC GMBH

LOADS ON THE NEUTRAL CONDUCTOR

SYMMETRICAL | UNSYMMETRICAL LOAD

LOADS ON THE NEUTRAL CONDUCTOR

Symmetrical and unsymmetrical loads



1

Learning objectives

- Understand the concatenation of voltages and currents of three-phase current systems through measurements, calculations, and plotting of line diagrams
- Determining currents, voltage and power in star circuits for symmetrical and unsymmetrical loads
- Investigate effects of faults, e.g. failure of neutral conductor, outer conductor or load resistance
- Recognize the function of the neutral conductor in star connection and determine the cross-section
- Demonstrate the generation of harmonics by non-linear loads, such as PCs, motor control units or energy-savings lamps, using measurent techniques
- Recognize and measure overload of the neutral conductor by 3rd harmonic
- Examine the design and function of the M1, B2, B6U and M3U rectifier circuits
- Measurement of voltages and currents at the rectigier circuits
- Isolating transformer 10:1
- Test circuit of a three-phase consumer in star connection
- Investigation of R, L and C loads
- Test circuits of AC loads with and without rectifier

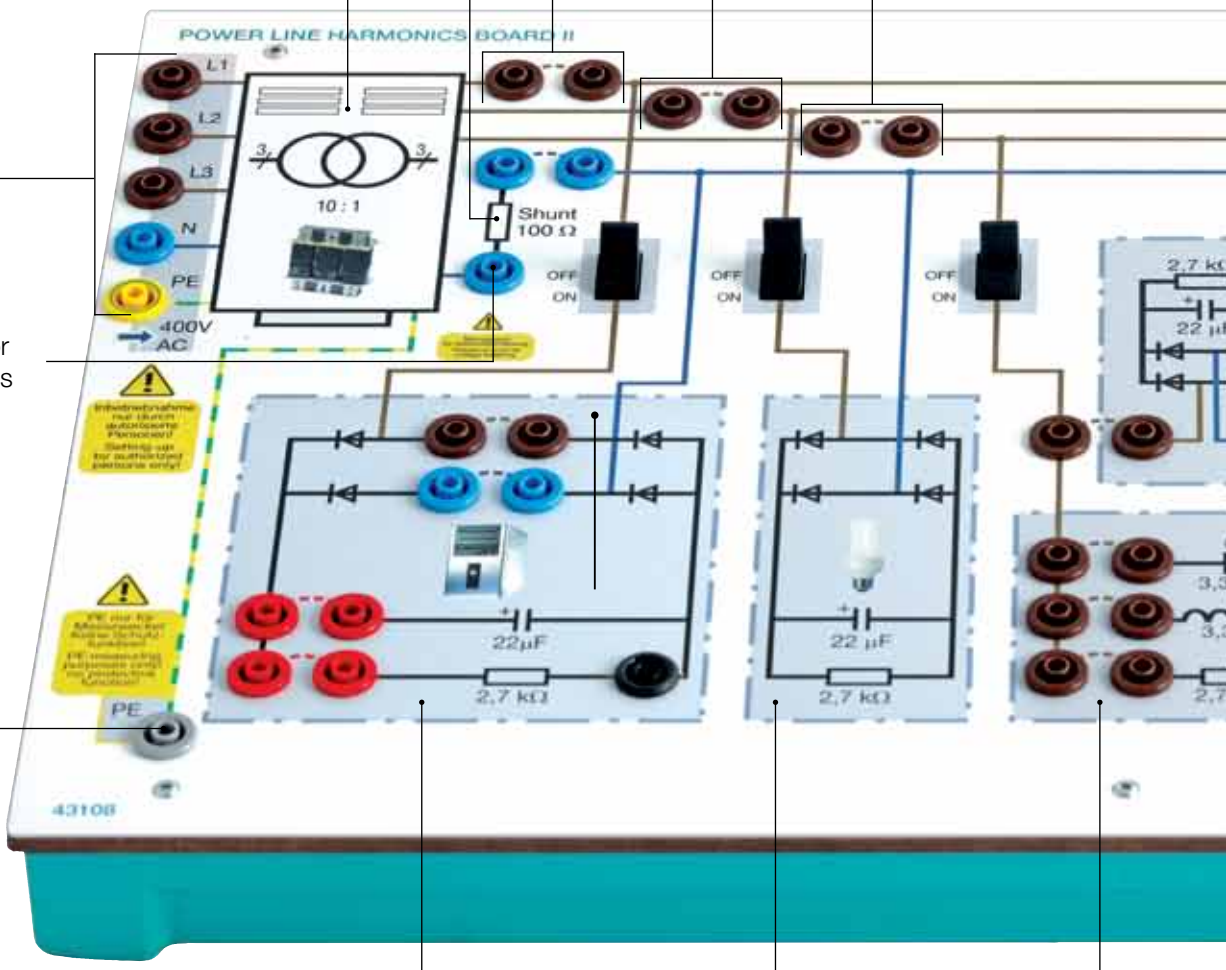
Technical data

- Isolating transformer 10:1 3-phase
- 3 linear loads in star connection
- R, L and C load
- 3 electronic consumers with rectifier
- Three-phase loads with B6U or M3U rectifier
- Measuring shunt in the neutral conductor

No.	Designation	Order No.
1	Power Line Harmonics Board II	43108

POWER LINE HARMONICS BOARD II

Symmetrical and unsymmetrical loads



Transformer 3P/N, 10:1

Shunt 100 Ω for measuring the current in the neutral conductor

Jumper plugs for L1, L2 and L3 or test lead bridges for the use of the current clamps

Input for power supply 400 V AC, 3/N/PE

Reference point for voltage measurings

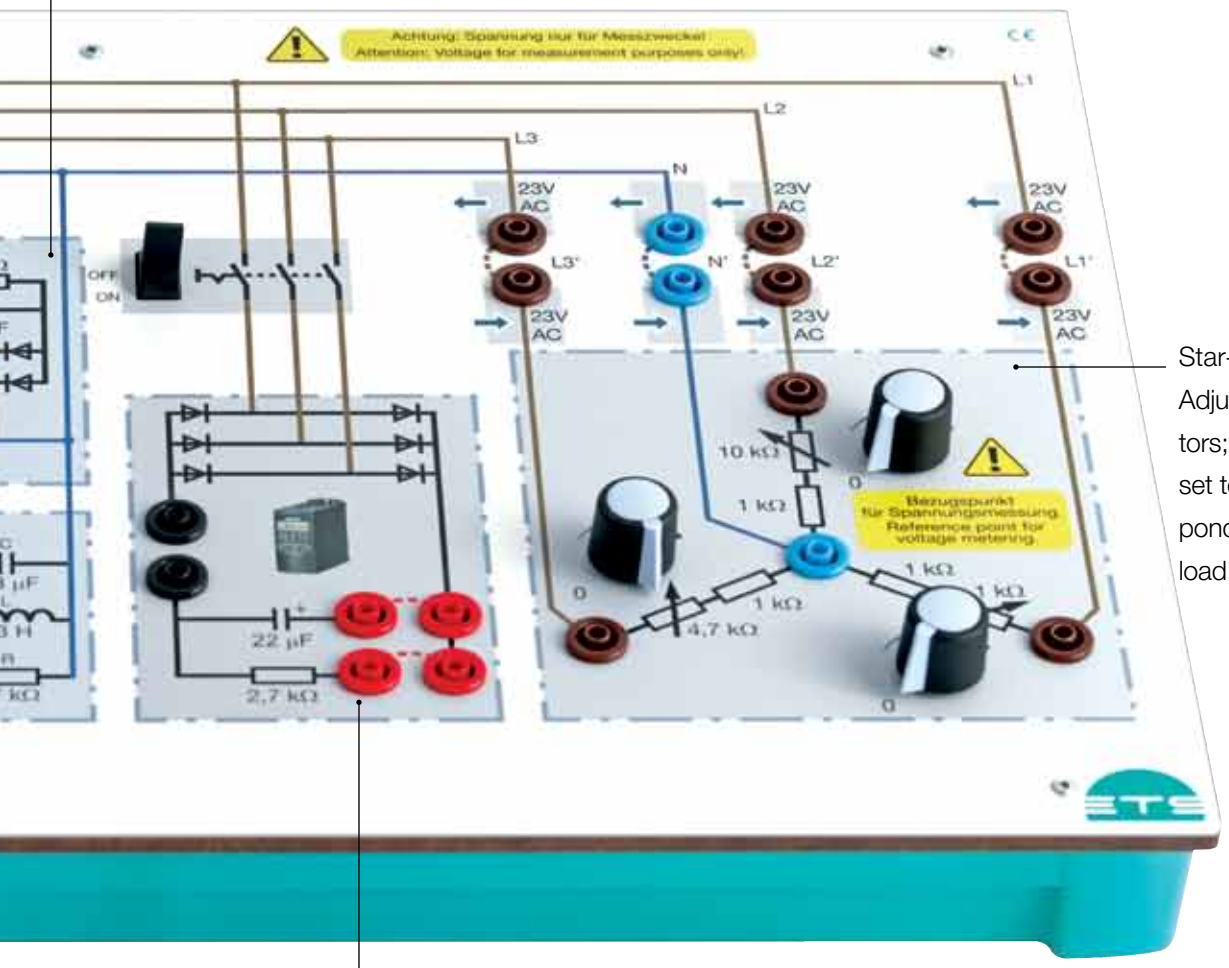
Reference point PE for measuring purposes only

Electronic load with rectification B2U or M1U

Electronic load with rectification B2U

Linear loads R, L and C

Electronic load with
bridge rectifier B2U

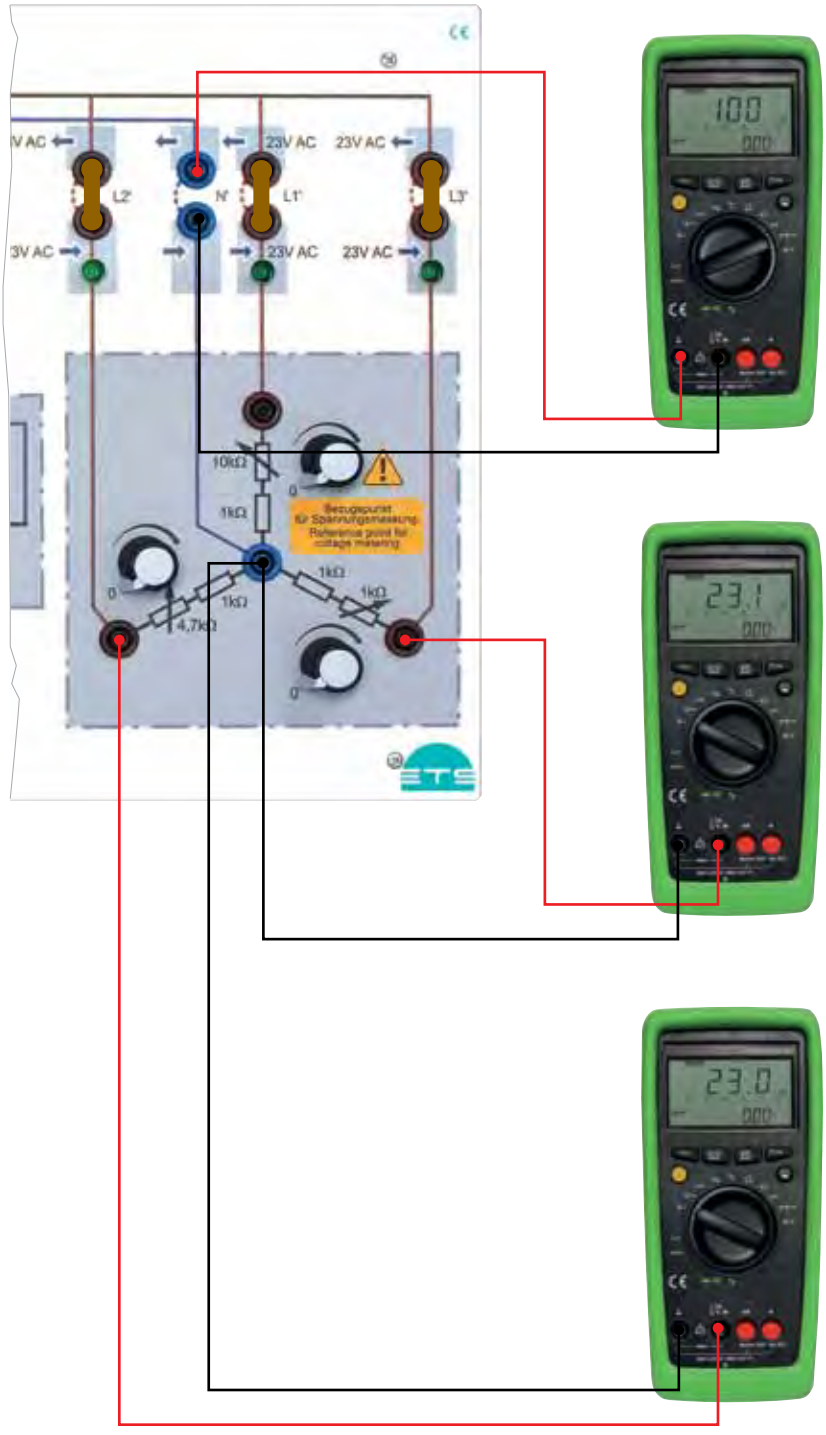


Star-shaped network
Adjustable load resistors; all potentiometers set to left stop corresponds to symmetrical load of the network

3-phase consumer with B6U
or M3U bridge rectifier

LOADS ON THE NEUTRAL CONDUCTOR

Symmetrical and unsymmetrical loads



Current in the neutral conductor

Voltage
Outer conductor L3

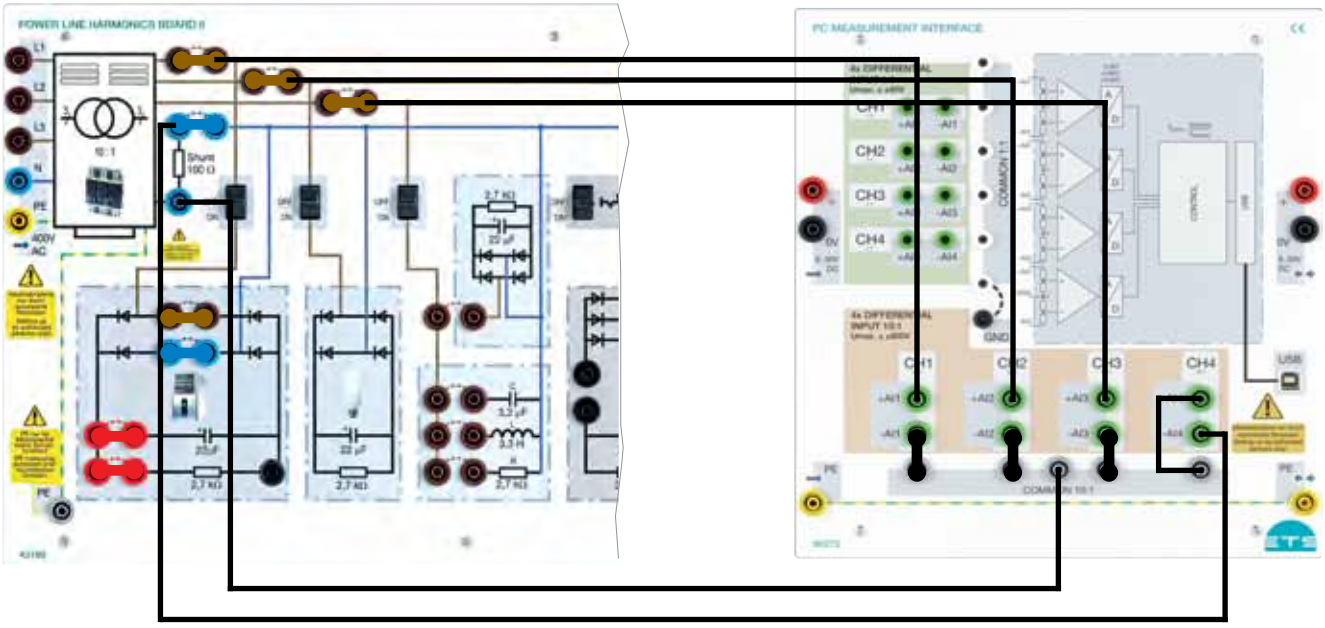
Voltage
Outer conductor L2

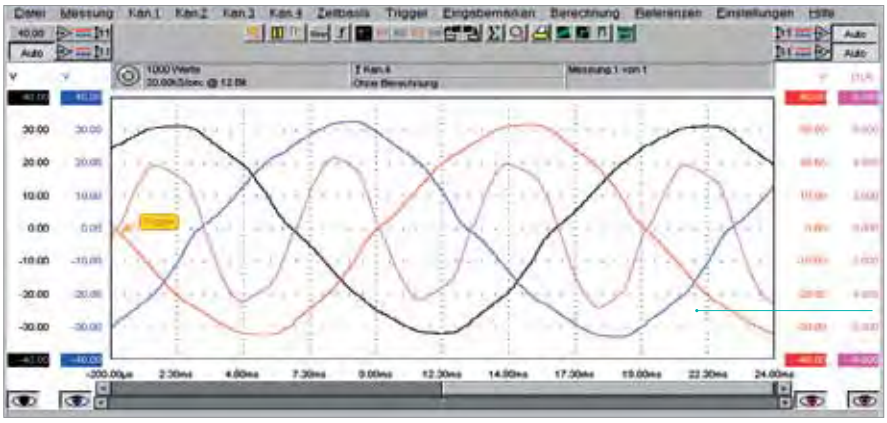
⟩ Current in the neutral conductor with symmetrical load approx. 0 mA;
Current in the neutral conductor with unsymmetrical load higher than 0 mA.

⟩ With connected neutral conductor, the voltages in the outer conducts are approximately equal

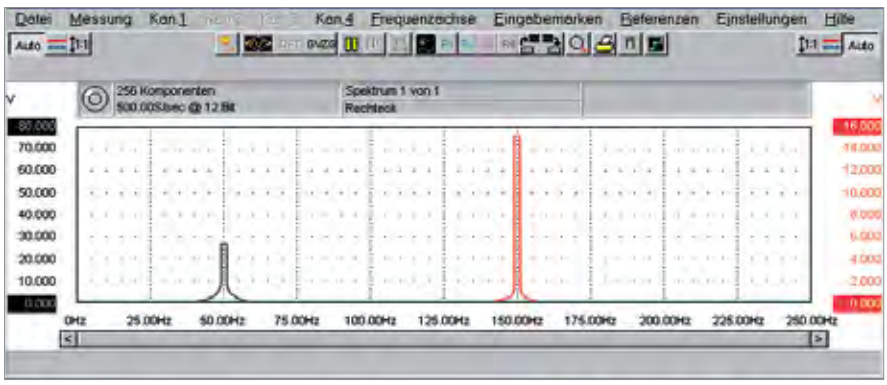
⟩ Voltage offsets occur when the neutral conductor is not connected, with the lowest voltage drop on the wire with the lowest resistance and the highest voltage drop on the wire with the highest resistance.

Non-linear load





Current in neutral conductor:
Display of the three outer conductors and the neutral conductor current with a load from three non-linear consumers.
It shows a current with triple frequency flowing through the neutral conductor!

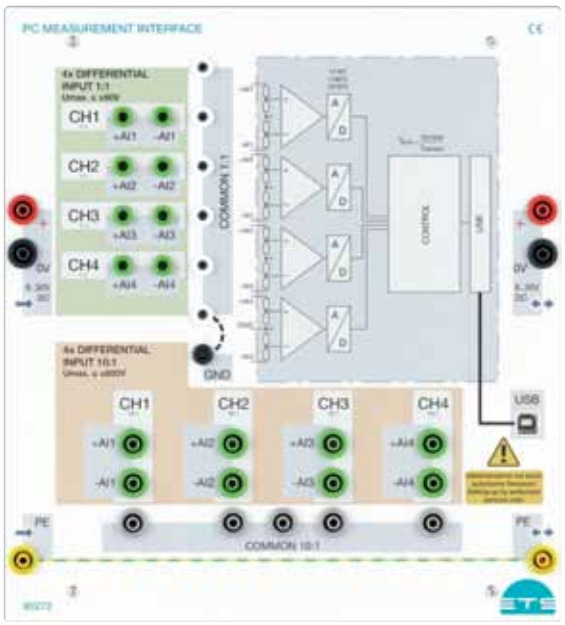


3rd harmonics 150 Hz:
Each of the outer conductors, L1, L2 and L3 is loaded with one non-linear consumer.
This results in a three times higher current!

LOADS ON THE NEUTRAL CONDUCTOR

Measurements with the PC Measurement Interface

up tp 600 V AC / 4-channel



1

The PC Measurement Interface is a four-channel measuring intrument with differential inputs. It allows safe measuring of voltages and deduced magnitudes of up to 600 V AC.
Display and evaluation of the measuring results by means of a software on a connected PC.

Learning objectives

⟩ Plotting and interpreting measuring charts
⟩ Getting to knoe the utilization of an oscilloscope in the region of power lines
⟩ Carrying out spectrum analyses

Technical data

⟩ 4 analog input channels with different input
⟩ 5 MHz band width (5.000.000 samples/s)
⟩ Sample rate of up to 5 MHz per channel
- 16 bits up to 195 kHz
- 14 bits up tp 3,125 MHz
- 12 bits up to 5 MHz

⟩ Input 1:1
- Measuring rances from ± 200 mV up to ± 80 V (peak value)
- Maximum input voltage ≤ 200 V AC
- 2mm safety sockets

⟩ Input 10:1
- Measuring ranges from ± 2 V up to ± 800 V (peak value)
- maximum input voltage ≤ 600 V AC
- 4mm safety sockets

⟩ All inputs touch-safe 600 V, CATIII
⟩ All inputs allow clear and easy configuration with 19mm bridging plugs
⟩ 4 measuring instruments in one unit
- 12 … 16 Bit 4-channel-oscilloscope
- Spectrum analyzer
- Transient recorder
- Voltmeter (average, true rms)

⟩ Spectrum analyzer with distortion factor calculation
⟩ Comprehesive trigger function
⟩ Rapid transient recorder with 0,01 s - 500 s sampling time
⟩ USB 2.0 High Speed (480 MBit/s)
⟩ Optional operating voltage: 8 … 30 V DC
⟩ Dimensions: 266 x 297 x 85mm
⟩ Front panel design

No.	Designation	Order No.
1	PC Measurement Interface	90272

Unsymmetrical load, L1 low-resistance, neutral conductor closed

Symmetrical load, neutral conductor closed

Consumer connected to L1, L2 and L3 with current in neutral conductor

Unsymmetrical load, L1 low-resistance, neutral conductor open

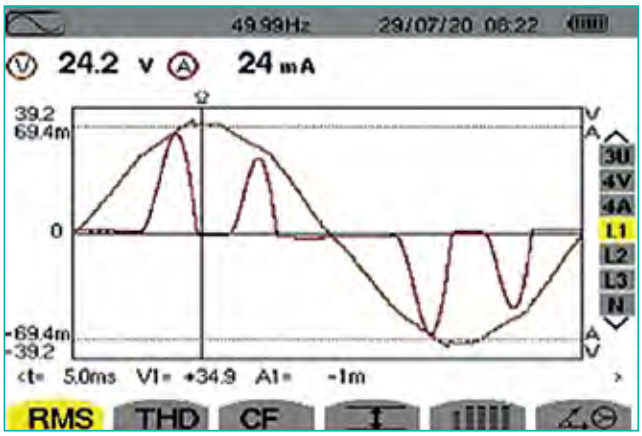
LOADS ON THE NEUTRAL CONDUCTOR

Measurements with the 3-phase mains and power supply analyzer

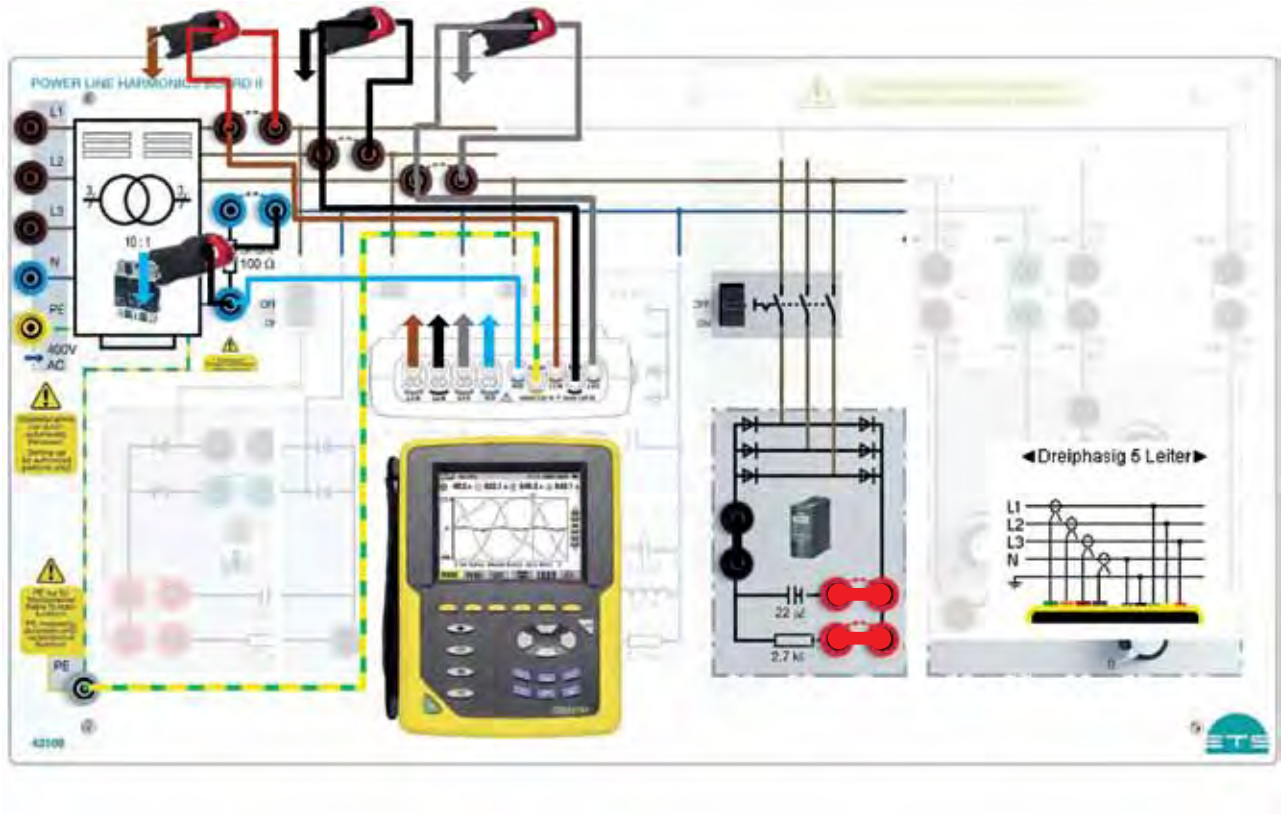
Investigation: B6U bridge rectifier circuit

In industrial plants, many 3-phase equipment can be found. The figure shows the typical waveforms of the current (L1) of one phase at the input of a frequency converter with 6-pulse rectification.

Here the pulse-like charging currents of the DC link capacitor can be seen. However, their maxima lie shortly before and after the maximum of the voltage sine (reffered to neutral) and therefore do not lead to a flattening but to a "spiking" of the voltage curve.



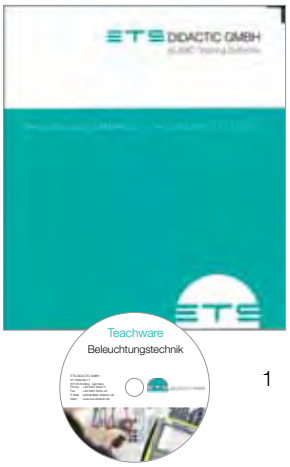
Set-up plan with the main analyzer from the manual "Neutal conductor load"




24.2 V
24 mA
RMS
THD
CF

LOADS ON THE NEUTRAL CONDUCTOR

Courseware



1

2

3

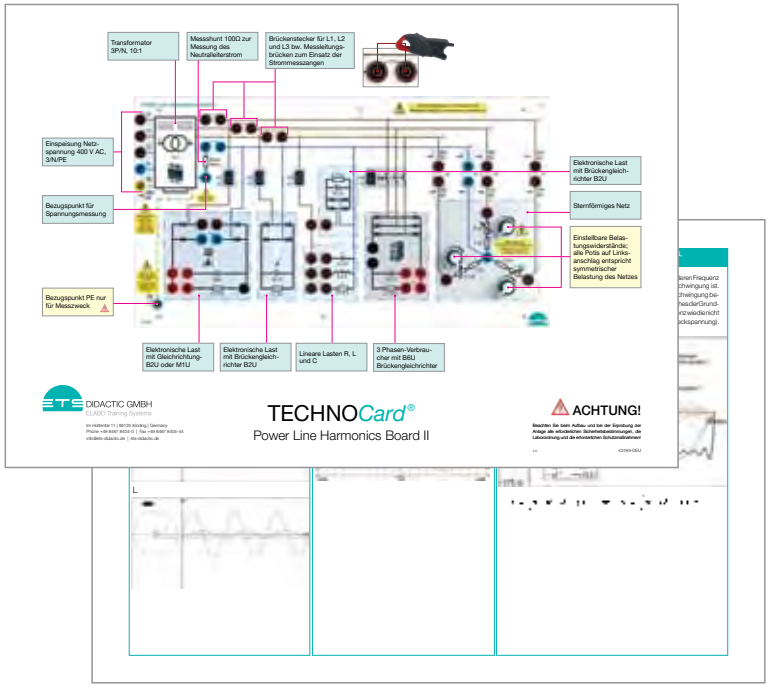
4

Printed and digital

Manual content

- Important technical terms of the three-phase system
- Interconnection for three-phase current
- Network analysis
- Formation of harmonics, metrological investigation

TECHNOCard®



The TECHNOCards® are a practical supplement to the training system. On them, the trainee finds a kind of knowledge store in concentrated, clear form for constant reference during practical work.

- Display board in 303mm x 426mm format
- Double-sided color design
- Robust, hard-wearing quality

5

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Neutral Conductor Load – Instructor´s Manual	43140CD-ENG
3	Neutral Conductor Load – Student Manual	43141CD-ENG
4	Neutral Conductor Load – Presentation Aids	43142CD-ENG
5	TECHNOCard® - Power Line Harmonics Board II	43169-ENG


Bügeleisen
42130
electric iron

ETS DIDACTIC GMBH

TESTING ELECTRICAL DEVICES

SAFETY OF ELECTRICAL EQUIPMENT

TESTING ELECTRICAL DEVICES

Safety of Electrical Equipment | Simulator Boxes for DIN VDE 0701-0702

5

Repeat testing of electrical appliances/equipment in accordance with DIN VDE 0701-0702 can be taught with the help of the new appliance simulations under safe and realistic condition.

Learning objectives

- Gathering legal provisions
- Understanding the data on the type plate
- Describing the protection classes of the devices and assigning symbols
- Testing the suitability of the selected devices for the location
- Apply the provisions for initial and repeated tests and drawing up a flow chart of the required measurements
- Selecting and using measuring and test instruments according to DIN VDE 0701-0702 and Accident Prevention Regulations DGUV and interpretingthe measuring results
- Planning, executing and describing repeated tests of electrical equipment according to DIN VDE 0701-0702 and Accident Prevention Regulations DGUV and writing test protocols
- Systematic troubleshooting of devices

Technical data

- The set consists of 10 appliance simulators
- The devices correspond to consumers of protection classes I, II and III
- Active components in someof the consumers allow demonstating the difference between active and passive measurements
- Faults can be simulated with toggle switches for:
  - protective conductor resistance
  - insulation resistance
  - leakage current/equivalent
  - touch current

Application Simlators:

- Electric Iron
- Immersion Heater
- Drill Machine
- Computer
- Cable Reel
- Coffee Machine
- Cooker
- Radio
- Power Supply
- Washing Machine

- Connecting line with appliancecoupler 2 m
- Connecting line with European coupler 2 m

Set of Appliance Simulators

1

2

3

4

5

6

7

8

9

10

12

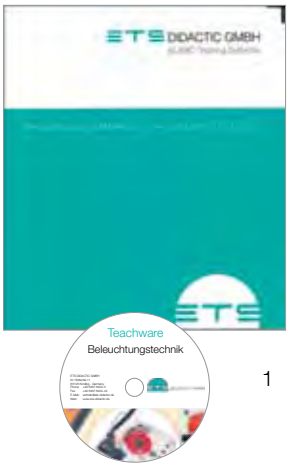
13

11

No.	Designation	Order No.
n.ill.	Set of Appliace Simulators	42140
1	Appliance Simulator – Electric Iron	42130
2	Appliance Simulator – Immersion Heater	42131
3	Appliance Simulator – Drill Machine	42132
4	Appliance Simulator – Computer	42133
5	Appliance Simulator – Cable Reel	42134
6	Appliance Simulator – Coffee Machine	42135
7	Appliance Simulator – Cooker	42136
8	Appliance Simulator – Radio	42137
9	Appliance Simulator – Power Supply	42138
10	Appliance Simulator – Wasching Machine	42139
11	Test case with appliance tester	90227
12	Case – storage device simulators	42145-Z01
13	Plate for Holding the Modules	20999

PROTECTIVE MEASURES

Courseware



1

2

3

4

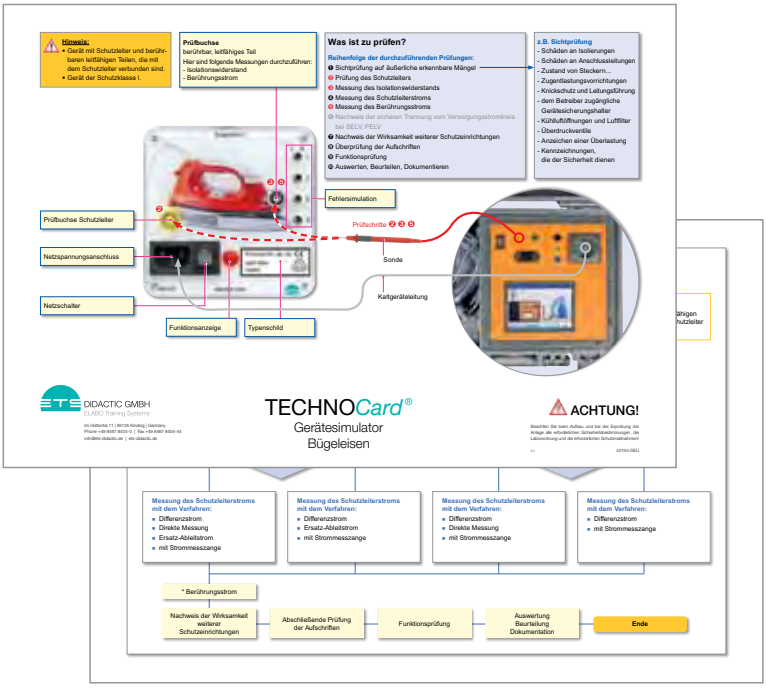
Printed and digital

Manual content

- Introduction
- Test procedure
- Definitions
- Tasks
- Fault tables

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Testing Electrical Devices – Instructor´s Manual	42150CD-ENG
3	Testing Electrical Devices – Student Manual	42151CD-ENG
4	Testing Electrical Devices – Presentation Aids	42153CD-ENG

TECHNOCard®



5

The TECHNOCards® are a practical supplement to the training system. On them, the trainee finds a kind of knowledge store in concentrated, clear form for constant reference during practical work.

- Display board in 303mm x 426mm format
- Double-sided color design
- Robust, hard-wearing quality

No.	Designation	Order No.
5	TECHNOCard® - Applicance Simulator Electric Iron	42155-ENG
n.ill.	Set of TECHNOCards® - Applicance Simulator	42154-ENG
n.ill.	TECHNOCard® - Applicance Simulator Immersion Heater	42156-ENG
n.ill.	TECHNOCard® - Applicance Simulator Drill Machine	42157-ENG
n.ill.	TECHNOCard® - Applicance Simulator Computer	42158-ENG
n.ill.	TECHNOCard® - Applicance Simulator Cable Reel	42159-ENG
n.ill.	TECHNOCard® - Applicance Simulator Coffe Machine	42160-ENG
n.ill.	TECHNOCard® - Applicance Simulator Cooker	42161-ENG
n.ill.	TECHNOCard® - Applicance Simulator Radio	42162-ENG
n.ill.	TECHNOCard® - Applicance Simulator Power Supply	42163-ENG
n.ill.	TECHNOCard® - Applicance Simulator Wasching Machine	42164-ENG

TESTING ELECTRICAL DEVICES

Projects

1

Learning objectives

- Setup and commissioning of cross and two-way circuits
- Mounting of meter cabinet and sub-distribution
- Inspection according to DIN VDE 0100-600

Project 1:

- The company does not want to use the basement room from project 1 for storage any longer, but to rent it to another company. For this purpose, the electrical installations have to be modified. The room installations are planned for control via a meter cabinet with T-N-C-S system and subdistribution. The cross circuit established in project 1 is laid idle and replaced by a pushbutton circuit. Furthermore a 16 A CEE socket has to be installed and connected. The electrical installation has to be made in IPX4 and the subdistribution in IP30. Calculation and drawing of the distribution plan is made by means of a planning software. Mounting of the installations has be effected in compliance with the provisions for protective areas.

Project 2:

- A company wants to use an empty basement room for storage. For this purpose, a lighting shall be installed consisting of two fluorescent lamps which are to be actuated from three access doors. The room can be ventilated, but not heated. As the room is only intended for storage use, the electrical installations are mounted on the surface. The installation material to be selected should be suitable for damp locations.

Project 3:

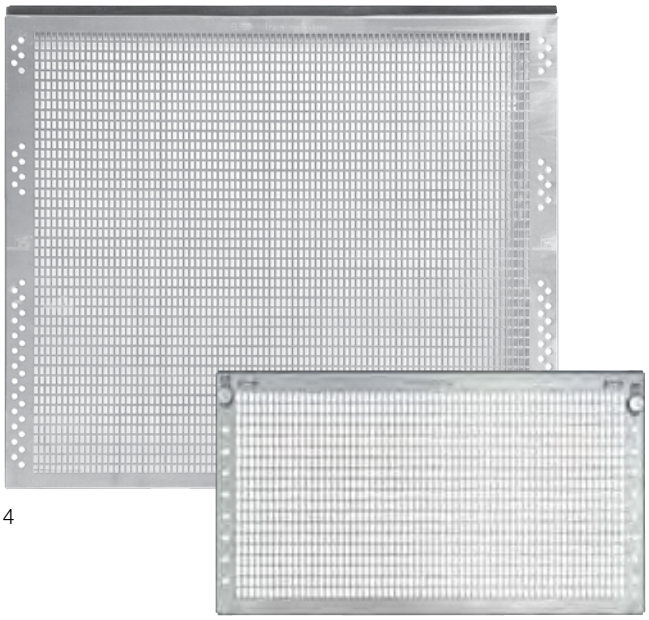
- The system mounted in Project 2 has to be inspected according to the DIN VDE regulations with submission of a measuring and inspection protocol.

Installation material sets

2 and 3

6

Grid Plates/Screws/Dowels



4

5

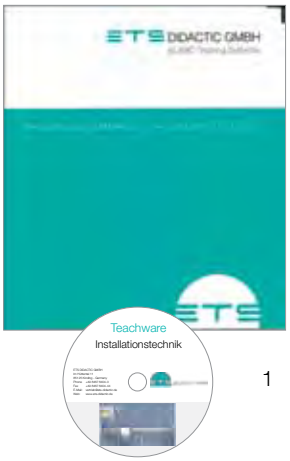
Components and equipment set consisting of:

- 2 x off and changeover switches
- 1 x cross switch
- 1 x light strip
- 1 x fluorescent tube
- 1 x junction box
- 3 x push button
- 1 x socket
- 1 x CEE socket
- 1 x small distribution box AP, 3-row
- 1 x residual, current circuit breaker
- 1 x LSS B16A, 3-pole
- 1 x LSS B16A ,1-pole
- 1 x LSS B10A, 1-pole
- 1 x remote switch
- 1 x phase bar
- 1 x main line branch terminals
- 1 x busbar with terminals
- 1 x set of accessories

No.	Designation	Order No.
1	Mobile Learn Trainer (MLT) as a double workstation for project work (accessories)	89200
2	Installation and material set: components and equipment set	42213
3	Installation and material set: cable and wiring set	42214
4	Interchangeable perforated plate wall for hanging in front of experiment frames of the MLT (766 x 687 x 45 mm)	89217
5	DIN A4 interchangeable perforated sheet wall for hanging up experiment frame (540 x 297 mm)	89214
n.ill.	Set of dowels 5/10 (100 Stk./set)	0D90203
n.ill.	Set of dowels 5/5 (250 Stk./set)	0D90204-01
6	Set of assembly accessories, consisting of: - Special dowels 5 x 5 mm, 100 St. - Special dowels 5 x 10 mm, 100 St. - Screws 3,5 x 12 mm, 100 St. - Screws 3,5 x 20 mm, 100 St. - Screws 3,5 x 30 mm, 100 St.	90055

INSTALLATION TECHNOLOGY

Courseware



1

Printed and digital

2

3

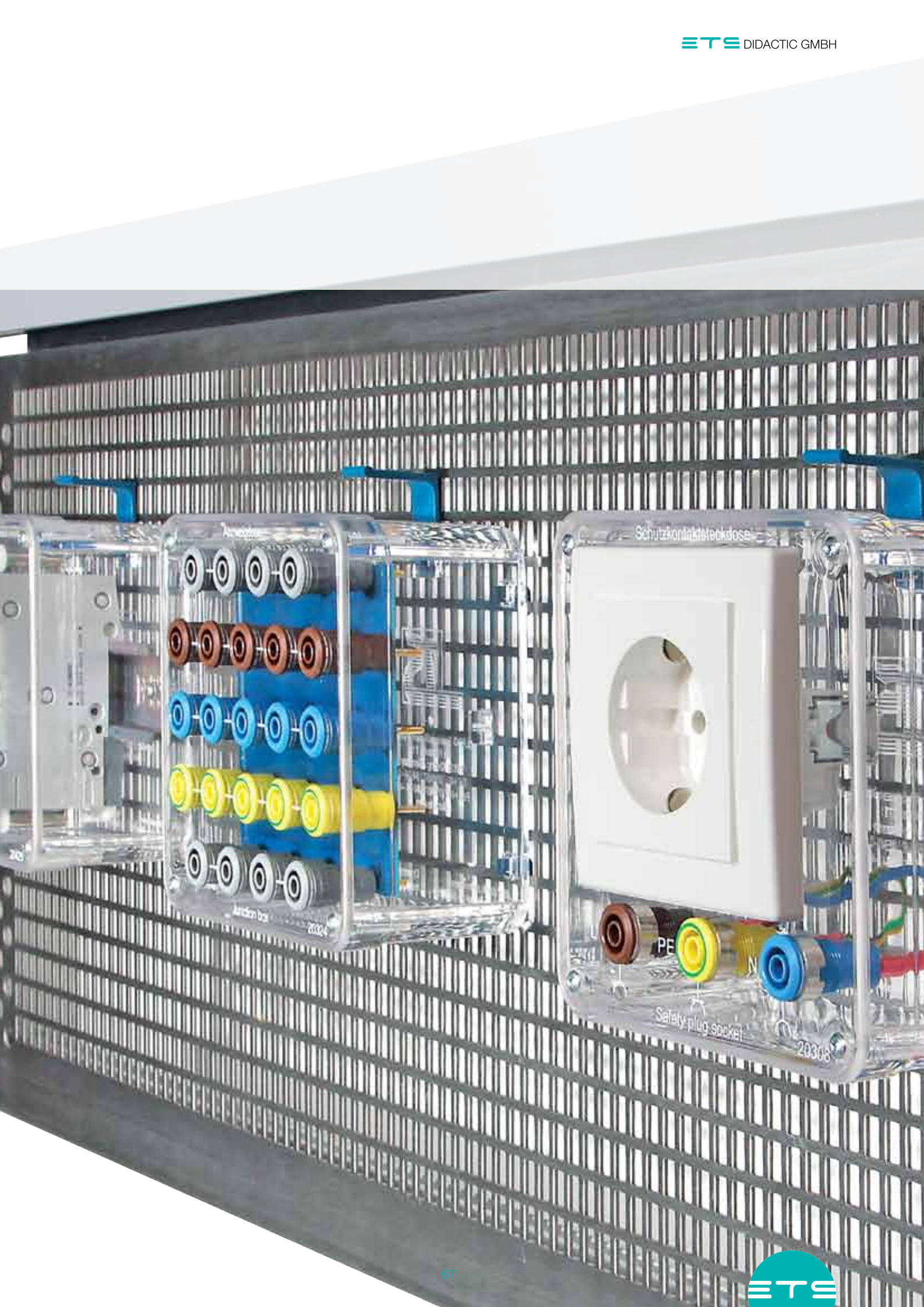
4

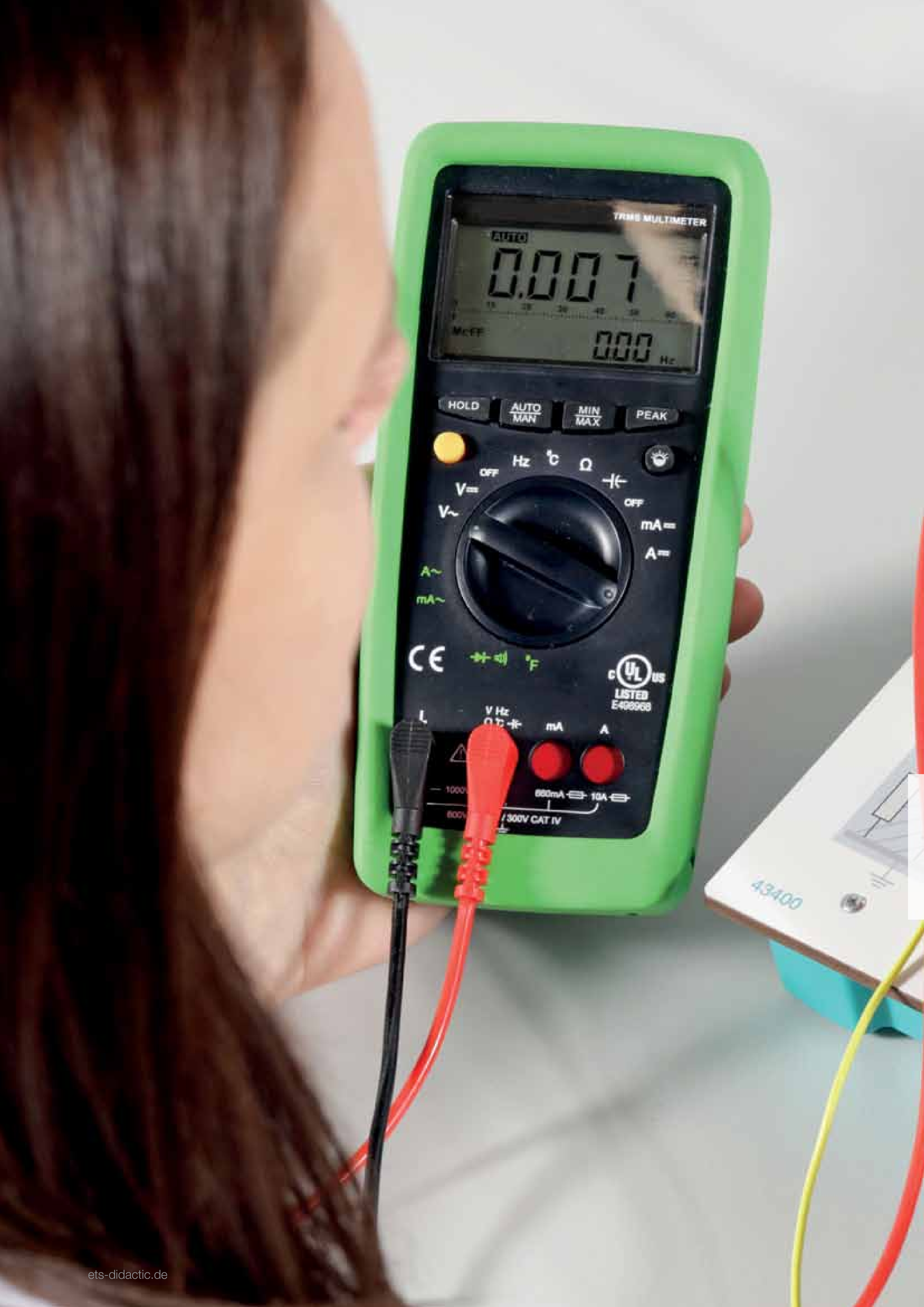
5

Manual content

- ⟩ Installation of basement room
- ⟩ Installation of a distributor
- ⟩ Testing of the installation and creation of an acceptance protocol

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	LF 2 – Installation Technology – Instructor´s Manual	42201CD-ENG
3	LF 2 – Installation Technology – Student Manual	42200CD-ENG
4	LF 2 – Installation Technology – Commissioning and Troubleshooting	42202CD-ENG
5	LF 2 – Installation Technology – Presentation Aids	42203CD-ENG


Schutzkontaktsteckdose
PE
Safety plug socket
20308


TRMS MULTIMETER
AUTO
0.007
0.00
HOLD
AUTO MAN
MIN MAX
PEAK
Hz
Ω
OFF
V
mA
A
LISTED
E496968
mA
A
300V CAT IV
43400

MEASURING AND TEST INSTRUMENTS

MEASURING AND TESTING

MEASURING AND TEST INSTRUMENTS

Digital multimeter, analog multimeter

1

2

3

Professional digital multimeter

The multimeter for training

The professional multimeter is designed to safely measure DC & AC voltages up to1000 V in the measurement category CAT III 600 V or CAT IV 300 V, according to the specifications of IEC/EN61010-1.

The multimeter, equipped with a mechanical protection against incorrect operation, has a large, high-resolution display with bar graph and an AutoPowerOff function to save batteries.

Ideal for laboratory use in school and training.

Functions

- Mechanical safeguard against faulty operation
- AC and DC voltage up to 1000 V
- AC and DC current values up to 10 A
- Resistance tests with 60 MΩ and continuity tester
- Frequency and capacitance
- Temperature with PT-1000 sensor
- Diode test and duty cycle
- Auto-ranging
- MAX/MIN and Data HOLD
- AutoPowerOFF

Analog multimeter for training

The multimeter meets the requirementd on didactic as well as professional training and for balancing and service work as well.

Functions

- Voltages measuring ranges 0...100/300 mV/1 V – 0 ... 3/10/30/100/300 V – /~
- AC current range 0 ... 100 mA/1/10/100 mA/1/3 A – ~
- Oprional settings: zero left/centre
- Excellent overload capacity, automatic battery switch-off
- Accessories

No.	Designation	Order No.
1	Digital multimeter	90600
2	Storage case "Universal" for eight measuring instruments	90275
3	Analog multimeter	90200


METRA max 2
CE
V~
3
10
30
100
300
300
100
30
10
3
1
300 m
100 m
(Shunt)
100

MEASURING AND TEST INSTRUMENTS

Voltage tester

1

Technical data

- DC voltage: 12 - 690 V
- AC voltage: 12 - 690 V
- Continuity test: 0 - 400 kΩ
- Phase rotation: 100 - 690 V

Direction of rotation tester

2

Technical data

Direction of rotation tester for three-phase networks and for non-contact testing of motor direction of rotation.

- Voltage range 40 - 600 V
- Frequency range: 15 - 400 Hz
- Operating time: continuous
- Power supply: over 9 V battery

No.	Designation	Order No.
1	Voltage tester	90285
2	Direction of rotation tester	90276

MEASURING AND TEST INSTRUMENTS

Leakage current clamp meter

1

Technical data

- Resolution of 10 µA
- Current unbalanced between the phases
- One disengageable harmonic filter
- Current up to 100 A

Measuring ranges

- Current AC: 10 µA – 100 A
- Voltage AC: 0.1 V – 600 V
- Voltage DC: 0.1 V – 600 V
- Resistance: 0.1 Ω – 1k Ω
- Frequency: 0.1 Hz – 1 kHz

No.	Designation	Order No.
1	Leakage current clamp meter	90605


HOLD
OFF
MAX
ZERO
11.0
COM
PE
N
L
230V
X1
X2
X4

MEASURING AND TEST INSTRUMENTS

Installation tester

1

2

Installation tester for DIN VDE0100 multifunctional device for initial and repeat testing

- AC voltage: measuring range 500 V
- Low resistance measurement: 0.01....39.9 Ω
- Insulation resistance measurements: test voltage: 50 - 100 - 250 - 500 - 1000 V Insulation: 10 kΩ - 2 GΩ
- Live circuit detection: prevents test if extraneous voltage before test starts
- Loop impedance measurement: phase to ground
- Line impedance: phase to neutral
- RCD circuit breaker test: A, AC, F, B, B+ and EV type
- Tripping time test (ΔT): Current settings 10, 30, 100, 300, 500 mA tripping current
- Earth resistance (R_E): measuring range 0…40 kΩ. Selective earth measurement with current clamp.
- Harmonic analysis up to 50th order, with current clamp 90228
- Rotary field direction
- Internal memory
- Documentation via software
- Transport bag
- Batteries, charger, test lead set, probe for remote control, software

Optional current clamp for installation tester

- For selective earth measurement
- Current measurement for network analysis
- 5 mA – 200 A

No.	Designation	Order No.
1	Installation tester for DIN VDE 0100 multifunction device	90226
2	Current clamp for installation tester	90228


OK

MEASURING AND TEST INSTRUMENTS

Installation tester

1

2

Technical data MTECH (1)

- AC voltage:
  measuring range: 500 V
- Low impedance measurement:
  measuring range: 0.01....99.9 Ω
- Insulation resistance measurements: Test voltage:
  50 – 100 – 250 – 500 – 1000 V
  Isolation: 10 kΩ – 300 MΩ
- Live circuit detection
- Loop impedance measurement
- Line impedance: phase to neutral
- RCD circuit breaker test:
  Type A, AC, F, B, B+
- Tripping time test (ΔT):
  current settings:
  10, 30, 100, 300, 500 mA
- Earth resistance test (R_E):
  measuring range 0...10 kΩ.
- Phase sequence
- Internal memory function
- Documantation of software
- Visualisation of the device via PC

Technische Daten MXTRA (2)

- AC voltage:
  measuring range 500 V
- Low impedance measurement:
  measuring range: 0.01....99.9 Ω
- Insulation resistance measurements: test voltage:
  50 – 100 – 250 – 500 – 1000 V
  Isolation: 10 kΩ – 300 MΩ
- Live circuit detection
- Loop impedance measurement: phase to earth
- Line impedance: phase to neutral
- RCD circuit breaker test:
  Types A, AC, F, B, B+
- Tripping time test (ΔT):
  current setting:
  10, 30, 100, 300, 500 mA
- Earthing resistance measurements (R_E):
  measuring range 0...10 kΩ.
- Phase sequence measurements
- Tests in IT systems: insulation monitoring devices
- Testing of residual current monitoring devices
- Documentation of software
- Visualisation of the device via PC

3

Technical data

Profitest INTRO (3)

- Measurement of R_{LO}, Z_{L-PE}, Z_{L-N}, R_{ISO}, R_E, ΔU, rotating field and voltage
- OFFSET management R_{L-PE} / R_{N-PE} / R_{L-N}
- Direct selection of measuring functions via rotary switches
- RCD measurement type A, AC, F, B, B+, EV, MI, G/R, SRCDs, PRCDs
- Display of allowable standardized fuse types for elctrical installations
- Measuring the phase sequence (phase sequence: highest interlinked voltage)
- Measurement of the touch voltage via finger contact
- Connection of RFID or barcode scanners
- Individual measurement data memory and generation of a memory structure
- Help function with circuit diagrams
- Bidirectional data exchange per USB, DDS-CAD, epINSTROM
- Measurement category CAT I II 600 V / CAT IV 300 V
- International control guidance (12 languages)
- ETC software (Electrical Testing Center), among other things, for creating tree structures and documentation according to ZVEH

No.	Designation	Order No.
1	Installation tester for DIN VDE 0100 Profitest MTECH	90221
2	Installation tester for DIN VDE 0100 Profitest MXTRA	90222
3	Profitest INTRO – Test instrument for DIN VDE 0100-600/ IEC 60364-6	90223

VDE MEASURING INSTRUMENTS

Appliance Tester in Protective Case for Testing according to DIN VDE 0701-0702 and Accident Prevention Regulations DGUV

1

Learning objectives

- Selecting and applying measuring and test equipment for measurements according to: DIN VDE 0701-0702 and accident prevention regulations DGUV
  Interpreting measurement results
- Apply the regulations for initial and repeat testing and draw up a flow chart for the required measurements

Technical data

- Accident Prevention Regulations DGUV, DIN VDE 0701-0702: Testing of electrical appliances/ equipment, DIN VDE 0751 (EN 62353): testing of medical electrical devices, such as hospitals beds etc.
- Features: Indication and operation via large color touch screen (14,1cm), direct test sample/customer entry via touchscreen keypad, one tester for testing devices acc. to VDE 0701-702 and VDE 0751 Type B, BF, CF tests
- Individual – easy setup of individual test procedures as template, automatic manual and auto-configurable testing procedure, measuring result with "pass/fail" indication, help function and schematic connecting diagrams, 2 x USB interface for data exchange, RFID reader/ writer and external keyboard, 1 x RS 232 interface for barcode scanner, priner/writer and SD-card slot
- Measurements: Measuring the protective conductor resistance, measuring the insulation resistance, protective conductor current/contact current, leakage current, load current

No.	Designation	Order No.
1	Appliance tester in protective case for testing according to DIN VDE 0701-0702 and Accident Prevention Regulations DGUV	90227


immersion heater
42131

MEASURING AND TEST INSTRUMENTS

3-phase mains and power supply analyzer

1

Set consisting of power analyzer and 4 current clamps with current measuring range starting at small currents (from 5 mA)

Technical data

- Measurements: voltage: 2 V - 1000 V
- Power: 5 mA - 100 A with the supplied current clamp (max. 10 kA)
- Frequency: 40 Hz - 69 Hz
- Crest factor: 1.0 - 99,0
- Power: Watt, var, VA, PF, cos φ, tan,
- Harmonics voltage: - 50 order
- Harmonics current: - 50 order
- Phase diagram
- Flicker
- Transient detection
- Inrush current
- Oscilloscope functions: DC, AC, AC+DC, peak-to-peak, Hz, duty cycle, phase
- Pulse width, crest factor:
- Recodring: V/A/HZ, power, harmonics, oscilloscope function

Features

- Measured value display in real time
- Voltage and current inputs with color markings
- Connection via PC interface
- Automatic recognition of the used current transformers
- Energy measurement P, Q1, S and total and per phase
- Simultaneous operation in multiple modes
- Viewing the data during recording
- Measurement according to EN50160 directly adjustable in the software

No.	Designation	Order No.
1	Power analyzer 3-phase incl. current clamps	90291


5.38
6.12
6.31
248
0
-248
5.0ms A1= +27.3 A2=-200.0 A3= -1.5
RMS
THD
CF

MEASUREMENT AND TEST INSTRUMENTS

Thermal Imager

1

Technical data

⟩ Image performance:
- Field of view 20° x 20°
- Thermal sensitivity: 80 mK, 30 °C
- Frame rate: 9 Hz
- Focus: auto/manual

⟩ Infrared sensor features:
- Detector type UFPA microbolometer, 8 - 14 µm
- Sensor size: 160 x 120

⟩ Measurement and image display:
- IR / true image/image in image (320 x 240 pixels)
- Temperatur range: -20 °C bis +250 °C
- Display: 2.8 "

⟩ Image storage:
- External memory: 2 GB SD card
- File format: png
- Storage capacity: max. 4000 images

⟩ Data transmission:
- PC Connection: USB 2.0

Included in delivery:
Thermal imaging camera, carrying case, battery pack, charger, SD card, USB cable, Bluetooth headset, protocol software, user manual.

Features

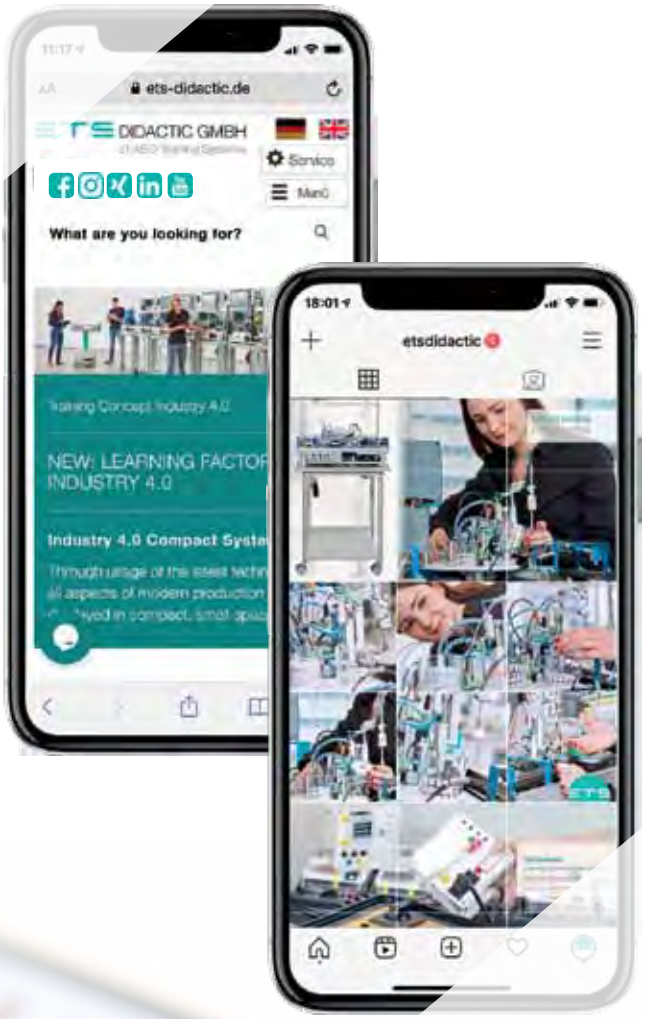
⟩ Large 2.8 inch screen
⟩ Roller shutter
⟩ Bluetooth connection to other measuring devices
⟩ Standard AA batteries
⟩ CAmReport Software

No.	Designation	Order No.
1	Thermal Imager	90302

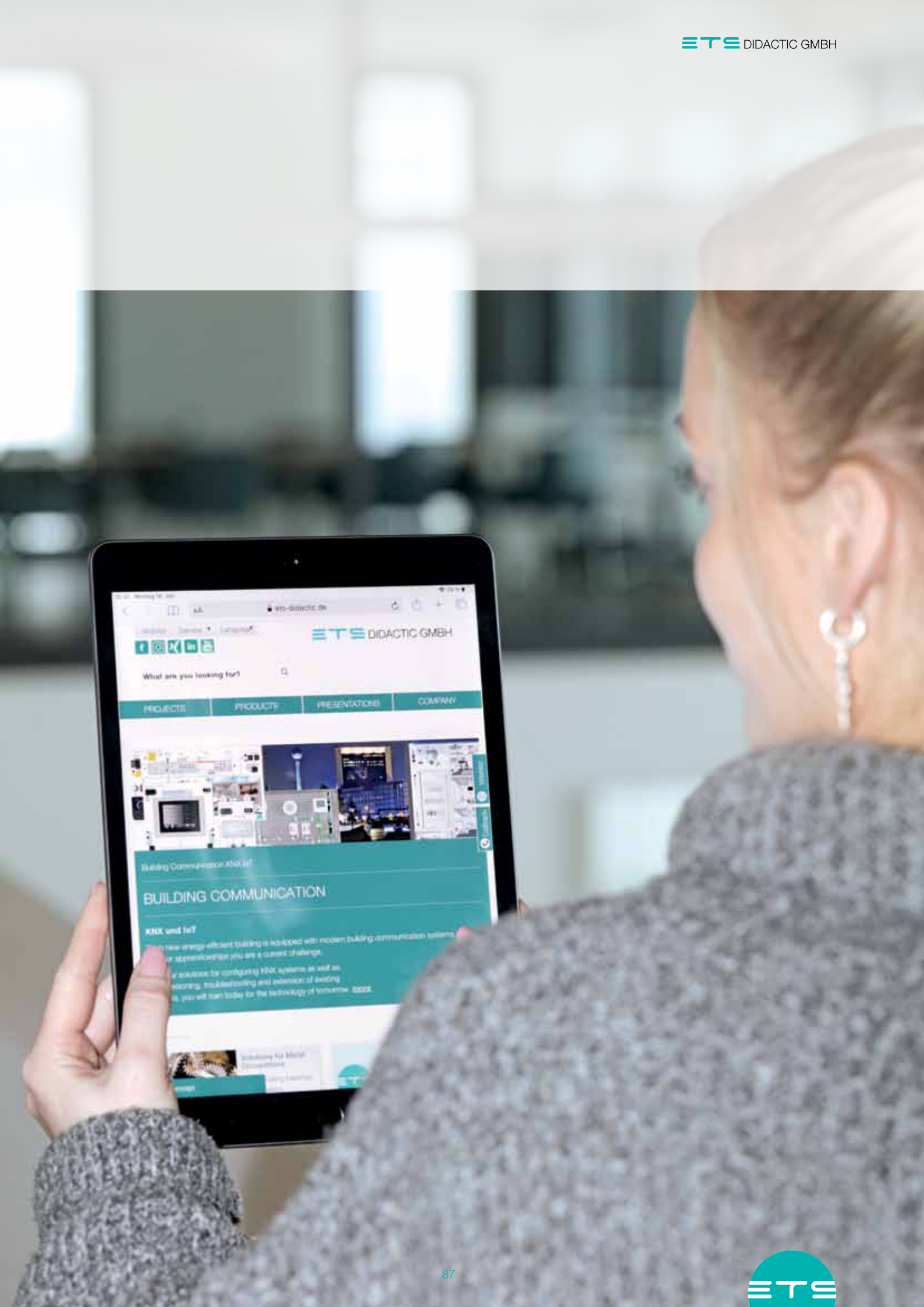

F1
F2
F3

STAY CONNECTED

with us on Social Media

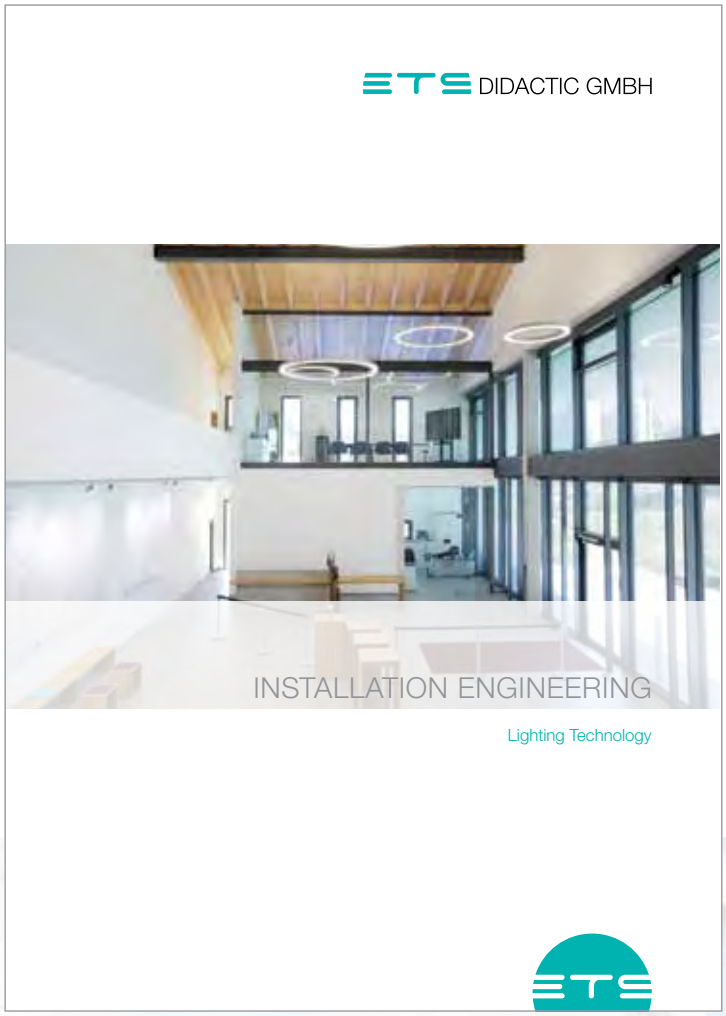


Your plus for Information


ETS DIDACTIC GMBH
What are you looking for?
PROJECTS
PRODUCTS
PRESENTATIONS
COMPANY
BUILDING COMMUNICATION
KNX und IoT

DIDACTIC SOLUTIONS FROM ETS

Catalog „Installation Technology"



Catalog „Building Communication“

DIDACTIC GMBH

BUILDING COMMUNICATION

Commissioning of VOIP and classic call systems

QUALITY IS THE MEASURE OF ALL SUCCESS

Inspiring Technologies

ETS DIDACTIC GMBH 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.


QUALIT

PLEASE CONTACT US

We are always ready to assist you

Katharina Gietl
Service Center

Service-Center

Monday to Friday from 7.45h to 16.30h
Phone: +49 8467 / 8404-0
email: sales@ets-didactic.de

We accompany you and are at your side with active advice.
Whether you need information, or some advice in advance of making an investment, or have questions regarding the daily use of the products:

Contact us –
we are ready to assist:

ETS DIDACTIC GMBH
Service-Center
Im Hüttental 11
85125 Kinding / Germany

Phone +49 8467 8404-0
Fax +49 8467 8404-44

sales@ets-didactic.de
www.ets-didactic.de

Customer-oriented solutions

- Presentation, product demonstrations and on-site consultancy
- Support in the selection of educational systems according to the syllabus requirements
- Matching of the training systems to customer requirements
- Working out room concepts
- Designing ergonomic workstations

Experience

- Comprehensive range of innovative products
- Systems and solutions from our own (in-house) production
- Development and design, technical training systems
- Quality right from the consultancy up to delivery and onward
- Trainer workshops / In-house training / Webinars
- References world-wide
  - Industrial educational institutions
  - Vocational schools / technical schools
  - Chambers of crafts
  - Technical colleges / Universities

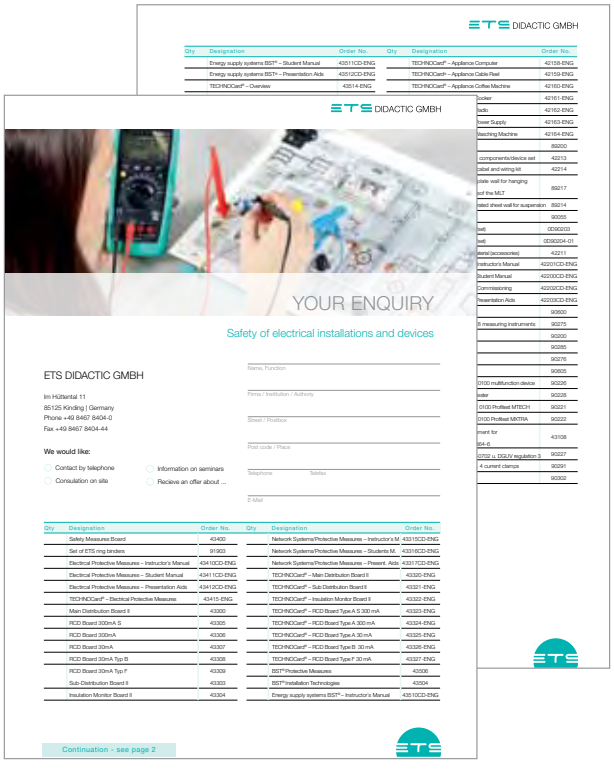
We support you

- Installation and commissioning of the systems on-site
- Technical support
- Warranty and repairs
- Instruction and training
- Further education, training, seminars
- Comprehensive product docmentation
- Courseware for instructors and trainees

YOUR ENQUIRY

We are always ready to assist you

Via the following QR code you are welcome to download the enquiry form and send it filled out via e-mail or fax to ETS.



ETS DIDACTIC GMBH

YOUR ENQUIRY

Safety of electrical installations and devices

ETS DIDACTIC GMBH

Im Hüttental 11
85125 Kinding | Germany
Phone +49 8467 8404-0
Fax +49 8467 8404-44

We would like:

- Contact by telephone
- Consulation on site
- Information on seminars
- Recieve an offer about ...

Name, Function

Firma / Institution / Authority

Street / Postbox

Post code / Place

Telephone Telefax

E-Mail

Qty	Designation	Order No.
	Safety Measures Board	43400
	Set of ETS ring binders	91903
	Electrical Protective Measures – Instructor's Manual	43410CD-ENG
	Electrical Protective Measures – Student Manual	43411CD-ENG
	Electrical Protective Measures – Presentation Aids	43412CD-ENG
	TECHNOCard® – Electrical Protective Measures	43415-ENG
	Main Distribution Board II	43300
	RCD Board 300mA S	43305
	RCD Board 300mA	43306
	RCD Board 30mA	43307
	RCD Board 30mA Typ B	43308
	RCD Board 30mA Typ F	43309
	Sub-Distribution Board II	43303
	Insulation Monitor Board II	43304

Qty	Designation	Order No.
	Network Systems/Protective Measures – Instructor's M.	43315CD-ENG
	Network Systems/Protective Measures – Students M.	43316CD-ENG
	Network Systems/Protective Measures – Present. Aids	43317CD-ENG
	TECHNOCard® – Main Distribution Board II	43320-ENG
	TECHNOCard® – Sub-Distribution Board II	43321-ENG
	TECHNOCard® – Insulation Monitor Board II	43322-ENG
	TECHNOCard® – RCD Board Type A S 300 mA	43323-ENG
	TECHNOCard® – RCD Board Type A 300 mA	43324-ENG
	TECHNOCard® – RCD Board Type A 30 mA	43325-ENG
	TECHNOCard® – RCD Board Type B 30 mA	43326-ENG
	TECHNOCard® – RCD Board Type F 30 mA	43327-ENG
	BST® Protective Measures	43506
	BST® Installation Technologies	43504
	Energy supply systems BST® – Instructor's Manual	43510CD-ENG

Continuation - see page 2

EXCELLENCE
IN TRAINING AND INNOVATION

03 2021

ETS DIDACTIC GMBH

Im Hüttental 11 | 85125 Kinding | Germany
Phone +49 8467 8404-0 | Fax +49 8467 8404-44
sales@ets-didactic.de | ets-didactic.de