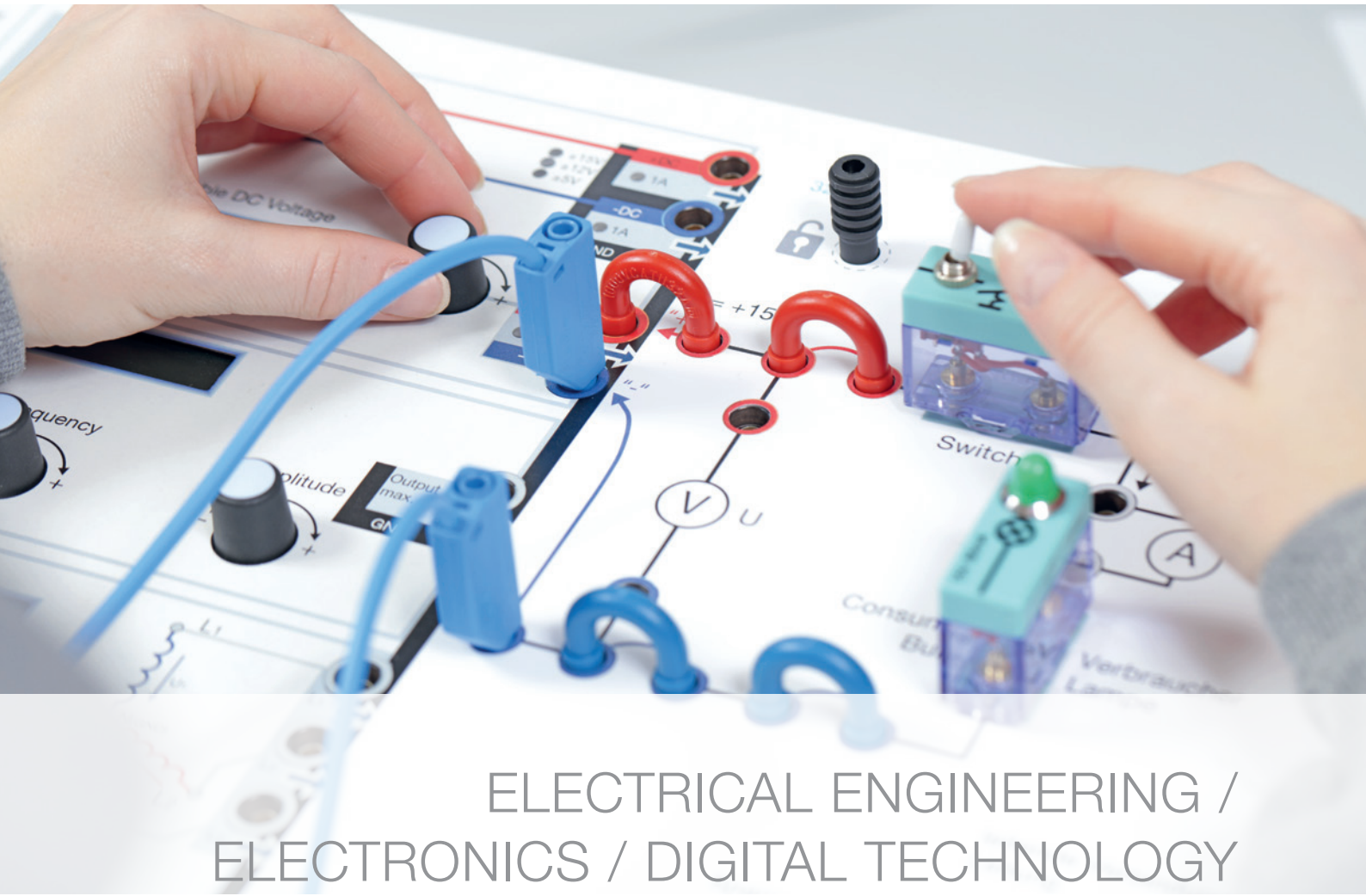
DIDACTIC GMBH

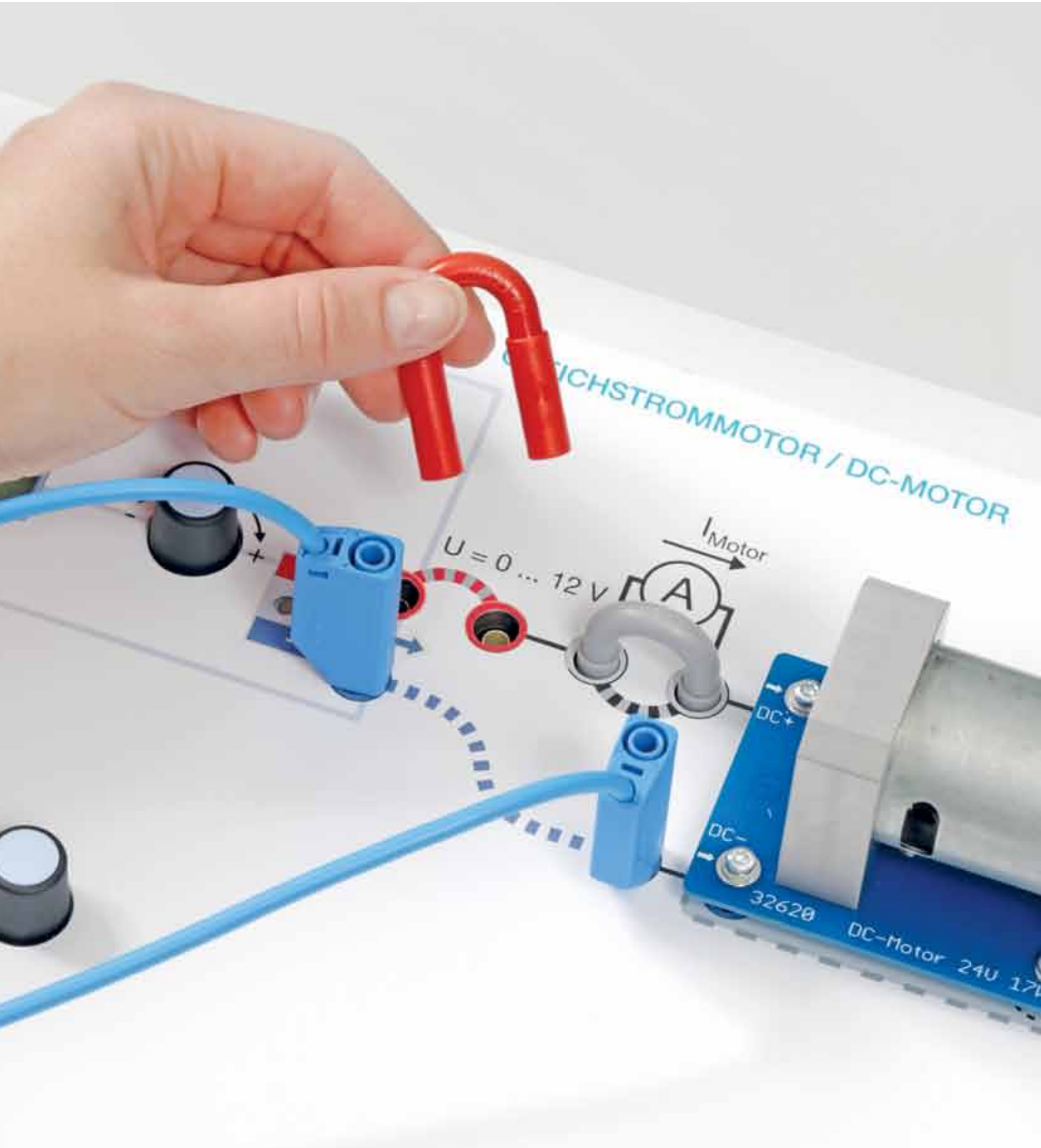


ELECTRICAL ENGINEERING / ELECTRONICS / DIGITAL TECHNOLOGY

The basics in detail

PRINCIPLES OF ELECTRICAL ENGINEERING

Analysis of electrical-engineering systems on component level



CONTENTS

Electrical engineering/Electronics/Digital technology

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

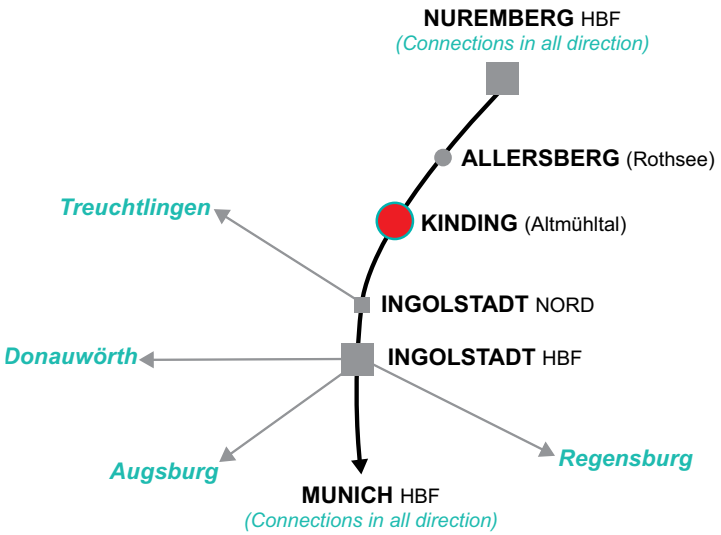
Visit ETS in the Valley of River Altmühl

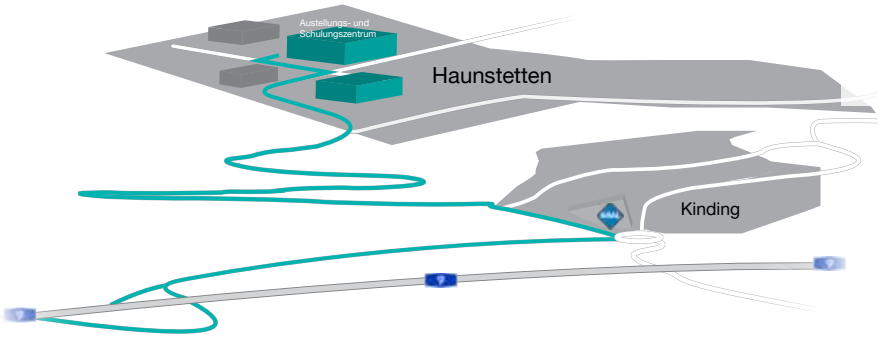
Welcome to Germany - Bavaria

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 avalible 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

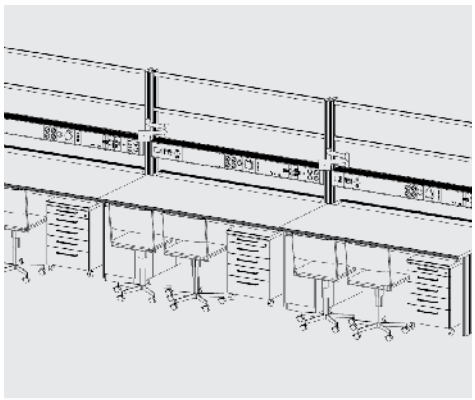
To plan a custom-made room concept with you, we proceed in the following steps:

⟩ 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.

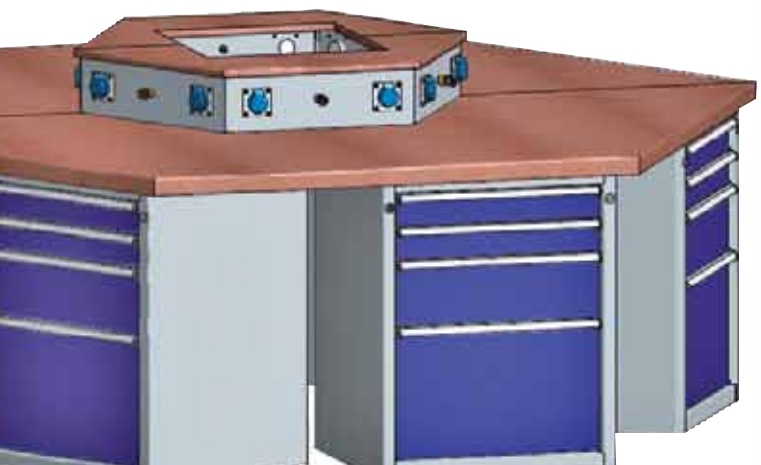
⟩ Taking into account the learning contents an equipment list can be set up. As soon as the extent is defined, the storage equipment is optimised and designed.

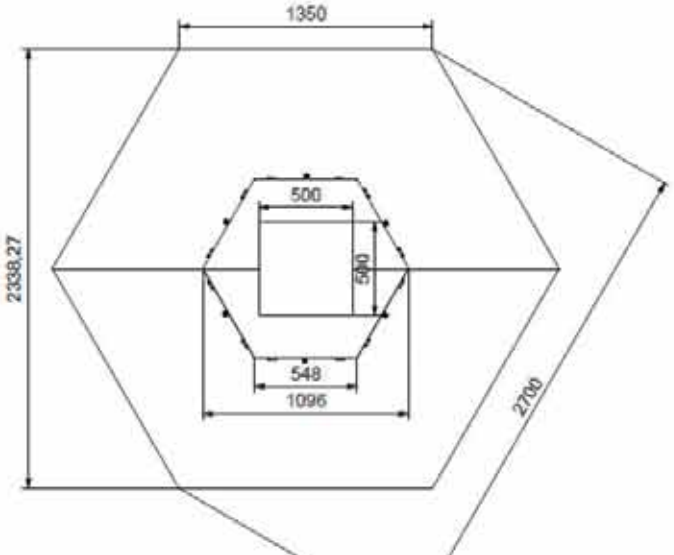
Analysis



Conception

Consulting / Planning





Design / Construction

Workshops

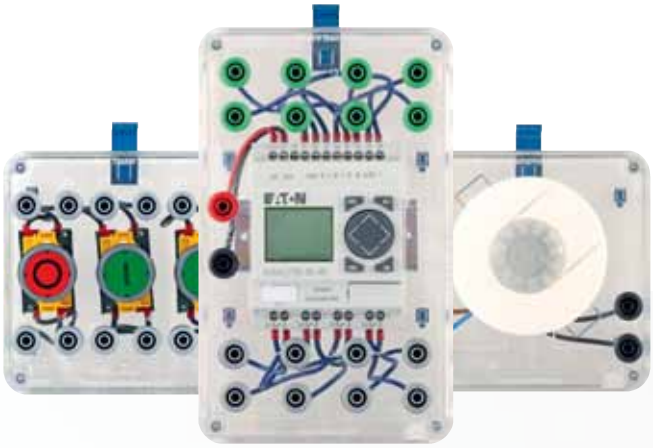
Application

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

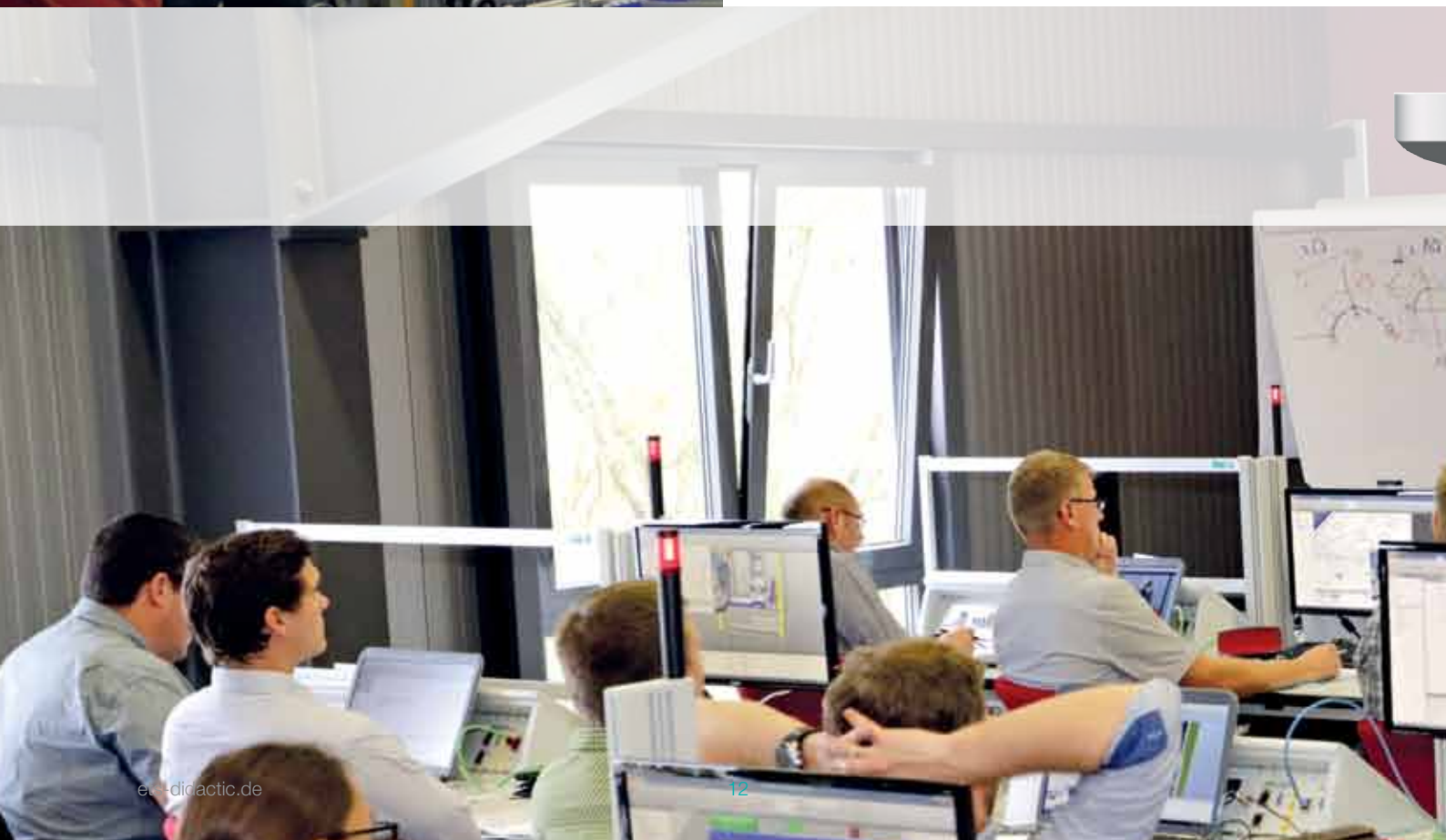
Always up to Date – Training at the Highest Level

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

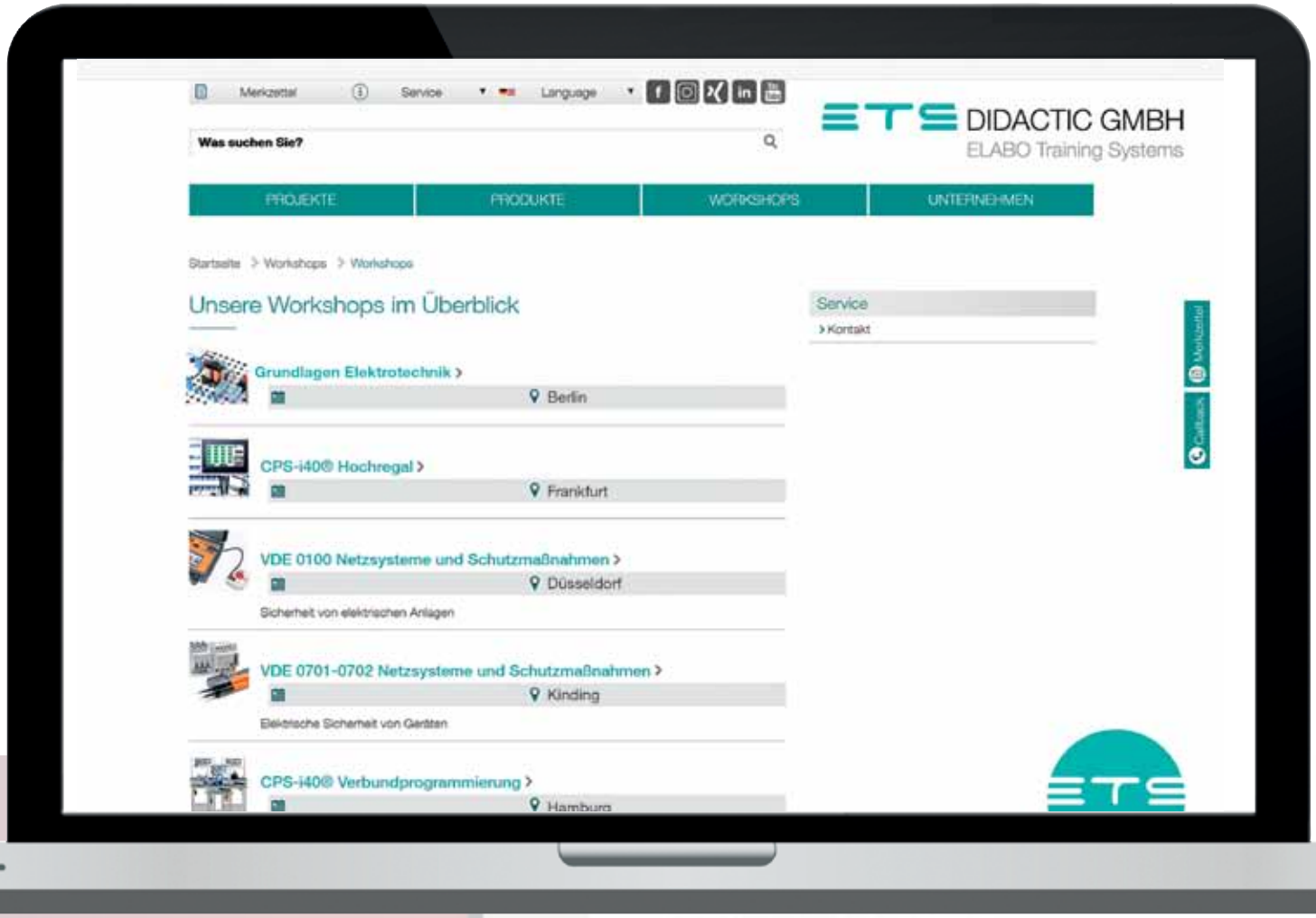
⟩ Learn more about the management and the application of various technologies with the support of the ETS trainers. Find out more about the didactic concept and learn to teach the material quickly and safe.

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

https://ets-didactic.de/hp584/Workshops.htm



Fast and Safe into New Technologies



THE ETS TRAINING CONCEPT

Innovative Hardware / Perfect Courseware

compact

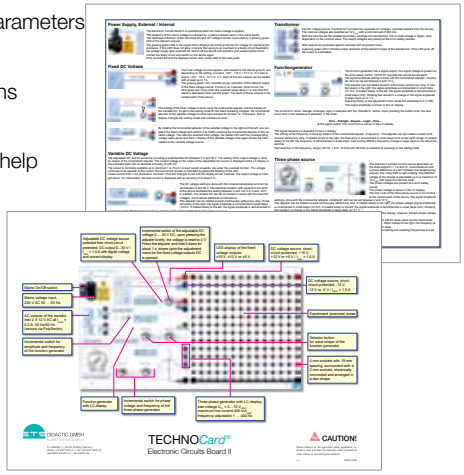
Structure of the Manuals

- Ringbinder principle
- Dividers
- Incorporation of personal documents

close to practice

TECHNO*Cards*®

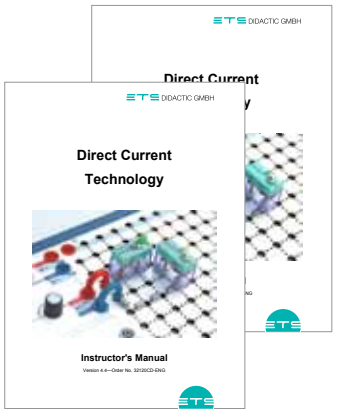
- Depiction of the parameters in function groups
- Start-up instructions
- Safety functions
- Individual learning help



motivating

Instructor's Edition / Student Edition

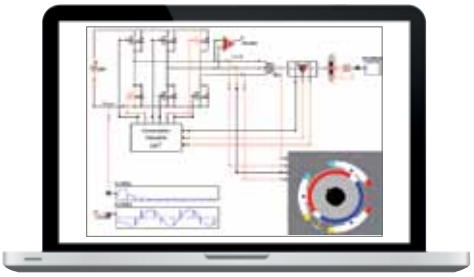
- 100 % function guarantee
- High print quality
- Digital and on paper
- Original photographs with practical references
- Detailed work instructions



multimedia

Simulations Software

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



efficient

Front panel overlays

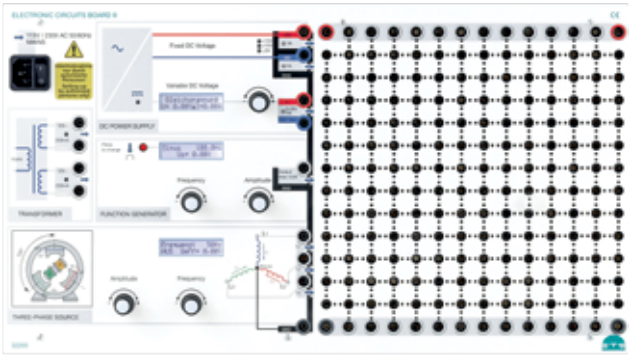
- Contents reduced to main focus of the experiment
- Clear layout
- Basic function
- Various languages

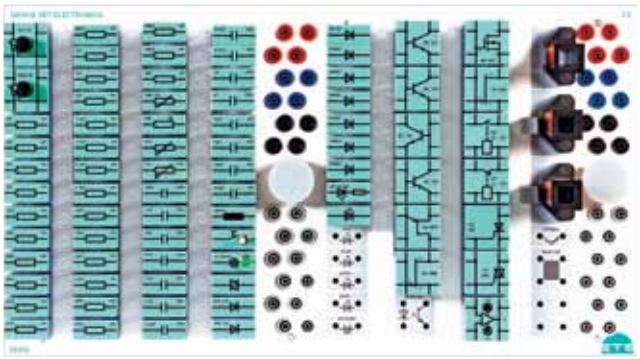
ergonomics

Furniture

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

... the system for the basic electrics, electronics and digital technology

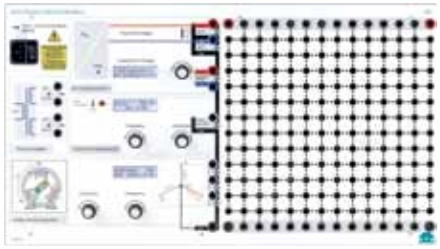




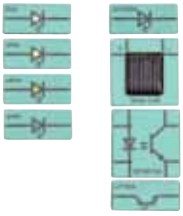
- State-of-the-art technology
- Easy to operate
- Didactically prepared courseware
- Safety for people and machine
- Perfect ergonomic workplaces

HARDWARE

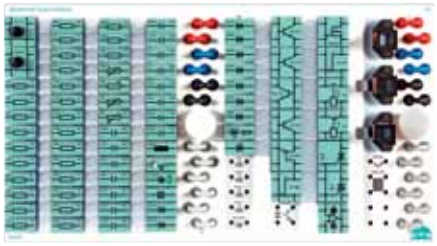
Electronics



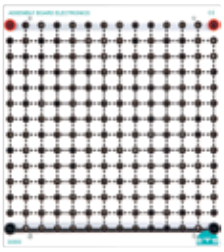
Electronics



Electronics component set
Opto-Electronics



Electronics component set



Plug-in field electronics

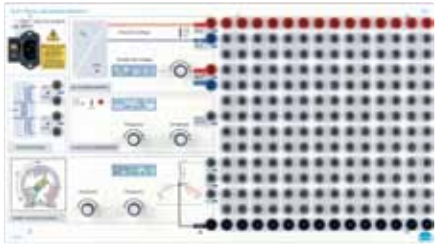
Measuring devices

Color digital oscilloscope 30 MHz

Analog multimeter

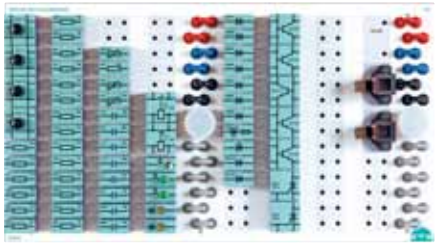
Digital multimeter

Electrical engineering



Electrics / Electrical engineering / Automotive

Electrical engineering kit



Component set Automotive / Automotive

Plug-in field electrics / electrical engineering / Automotive

Universal power supply

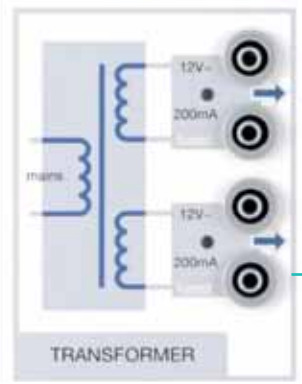
ATTRACTIVE, POWERFUL AND SAFE

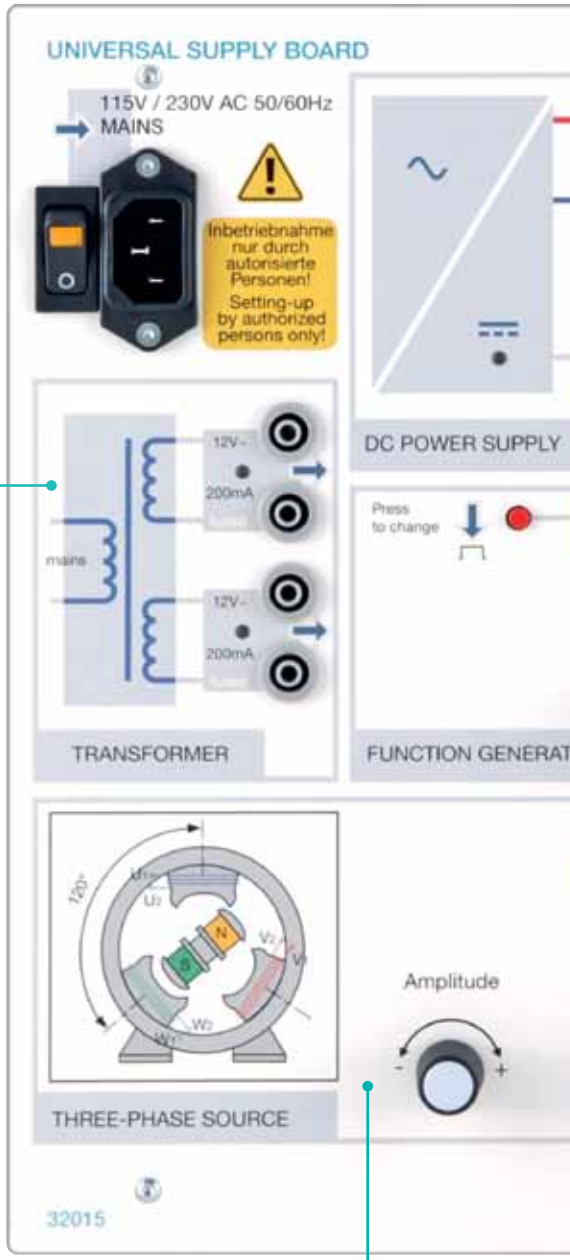
Functions and operating elements

Transformer

⟩ AC voltage sources

2 x 12 V AC / 2.2 A; 50 Hz (Main frequency) fused via PolySwitch





Three-phase generator

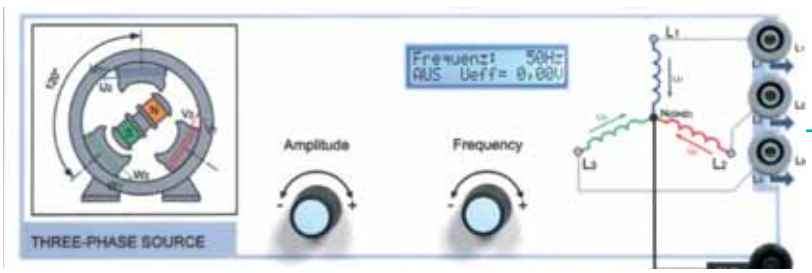
⟩ Frequency: 1...120 Hz, adjustable in 1 Hz steps

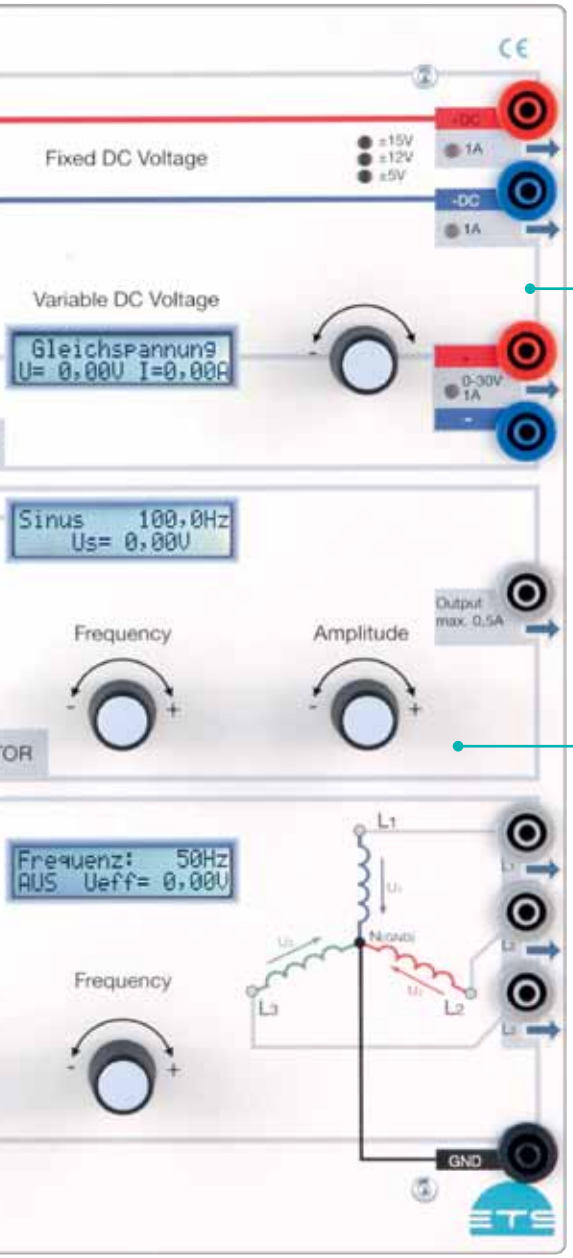
⟩ Conductor voltage: 0...17.3 V_{eff}

⟩ Conductor current: max. 400 mA_{eff}

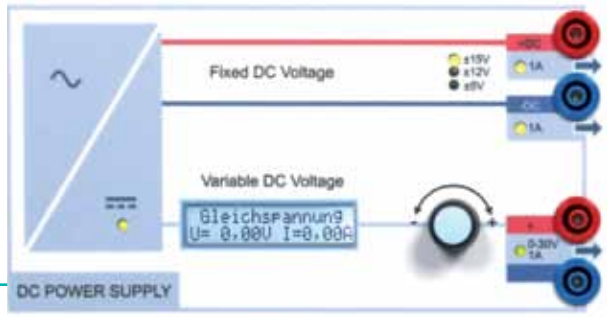
⟩ Display of the sizes in the LCD display

⟩ Short-circuit and regenerative proof up to 40 V DC / 24 V AC





32015 Universal Supply Board



DC Power Supply

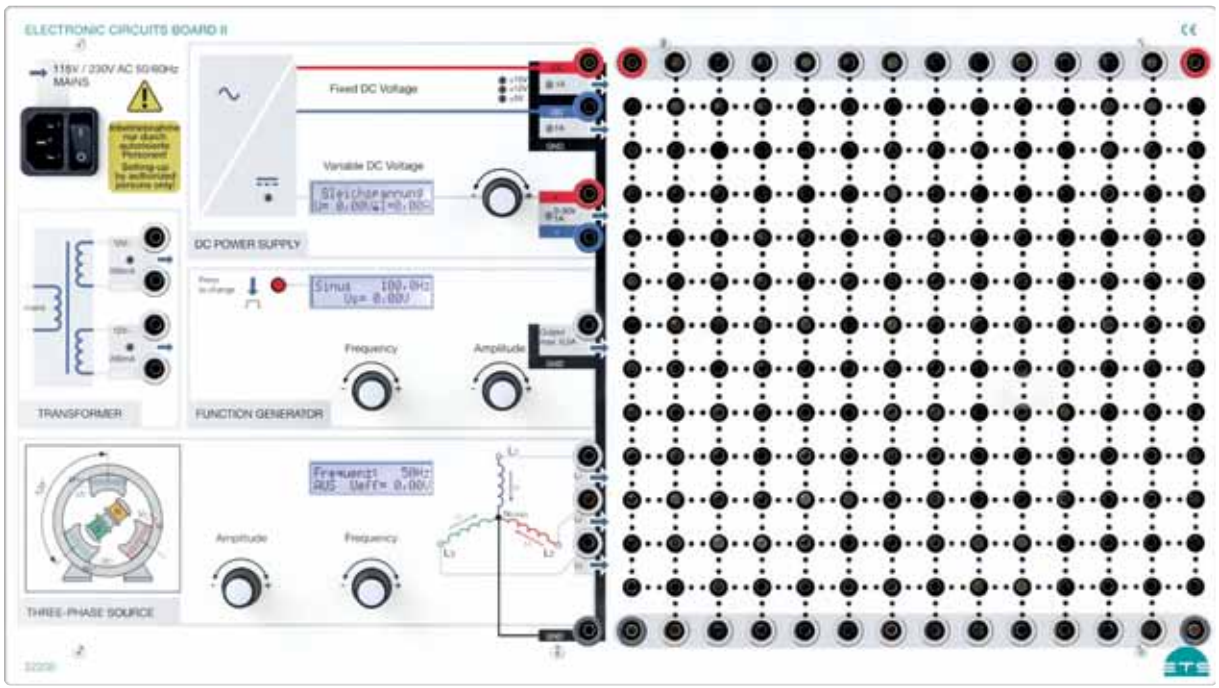
- Adjustable DC power supply, potential-free, 0...30 V / 1.0 A with voltage and current display as well as active current limiting for safe experimentation
- DC voltage source, adjustable, +15 V, +12 V oder +5 V / 1.0 A
- DC voltage source, adjustable, -15 V, -12 V oder -5 V / 1.0 A
- all outputs short-circuitss and regenrative proof up to 40 V DC / 24 V AC, 40 W
- Overload indication via volored LED at output

Function generator

- LCD display with all quantities
- Frequency: 0.1 Hz...400 kHz
- Adjuster for amplitude 0...10 V_s, setting accuracy 10 mV
- maximum current load 0.5 A (peak current)
- Source resistance 15 Ω
- Waveforms: Sine, triangle, rectangle and logic

ELECTRICAL ENGINEERING/ELECTRONICS

Electronic Board



1

Learning objectives

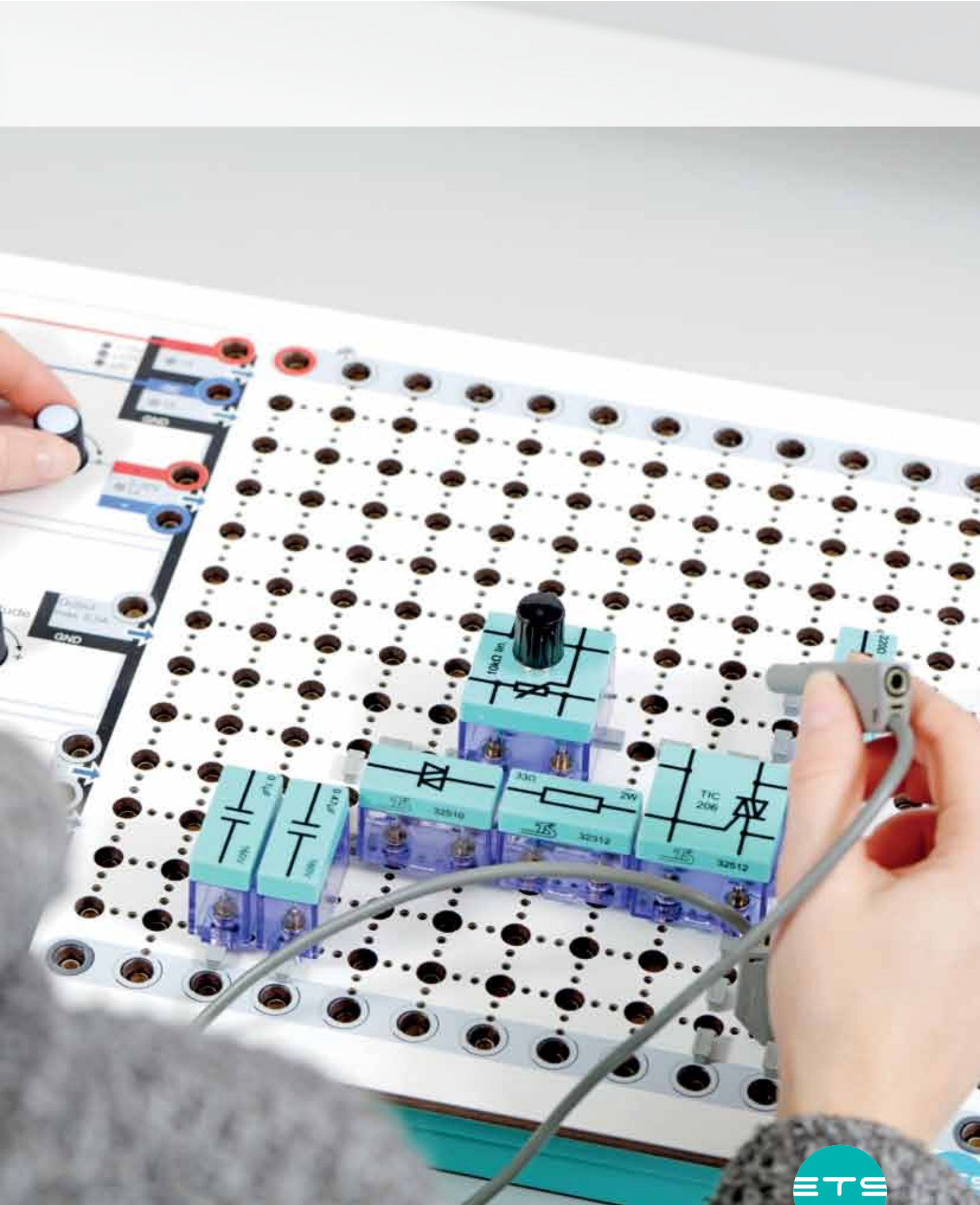
- Basic law of electrical engineering
- Handling and measuring with oscilloscope, multimeter and function generator
- Direct, alternating and three-phase current technology
- Operational amplifier
- Voltage-, temperature- and light-dependent resistors
- Behavior of semiconductors: Diodes, transistors, Thyristors
- Circuits of electronics: amplifiers, flip-flop circuits, power supply circuits

Technical data

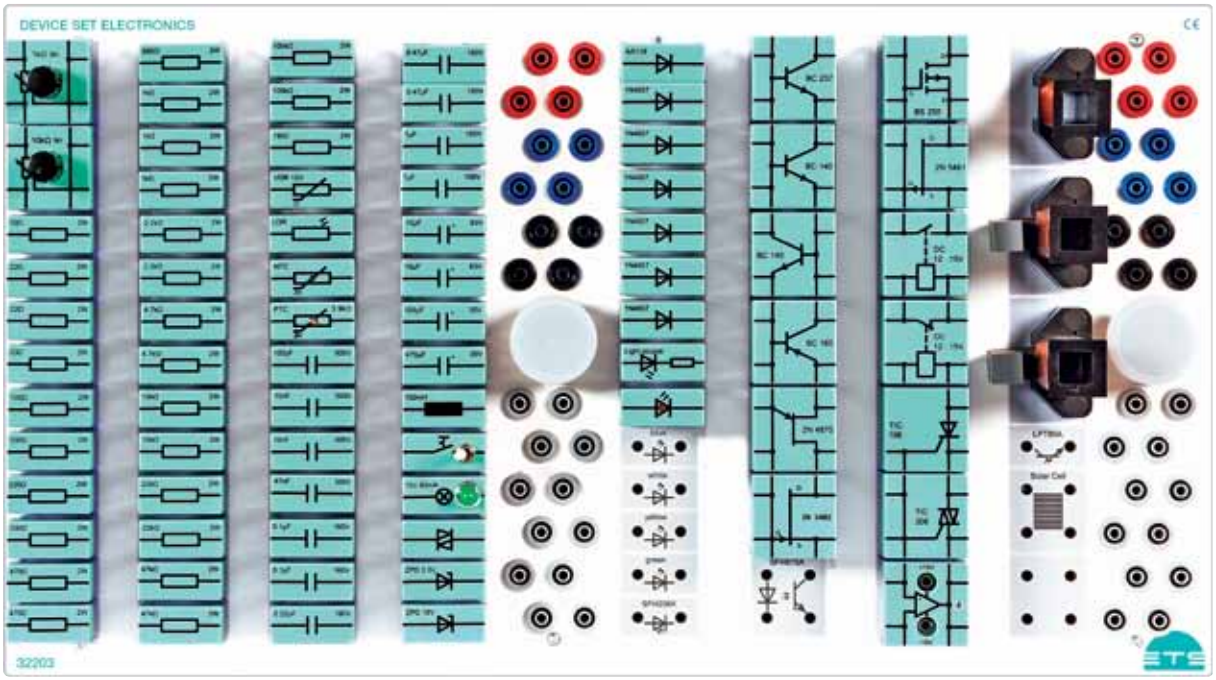
- Voltage sources DC +/-15 V or +/-12 V or +/- 5 V/1 A; DC 0...30 V/ max. 1 A with voltage and current; AC 2 x 12 V/0.2 A (fused via PolySwitch)
- Function generator Frequency 0.1 Hz...200 kHz, amplitude 0...10 VS and waveform adjustable, display of all quantities
- Three-phase generator Phase voltage 0...10 V (rms.); conductor voltage 0...17.3 V (rms.); frequency 1...400 Hz adjustable, display of all quantities, current load per phas max. 400 mA (rms.)
- Experiment panel 4 mm safety sockets, arranged in 19 mm grid, surrounded by 4 2 mm sockets each
- Main connection 230 V AC; 50 Hz; 75 W; protection class I
- Safety power supply outputs short-circuit- and regenerative-proof up to 40 V DC/ 24 V AC, 40 W

No.	Designation	Order No.
1	Electronic Circuits Board II	32200
n.ill.*	Electronic Circuits Board II with component set 32202 installed in case	32200-V2-Z03

* For more information, see page 80.


GND
10kΩ lin
330
2W
TIC
206
32510
32512

Component set electronics

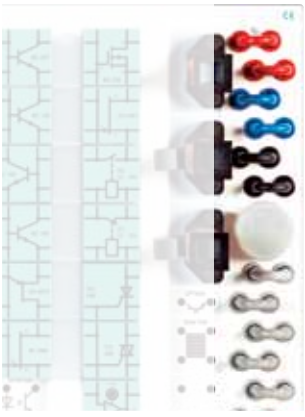


... for the sake of order

The storage plates for pluggable components are printed with the corresponding symbols.	1

Set of accessories, plugged on imprinted Storage Board:

- 28 film resistors 10 Ω...1 MΩ
- 1 VDR resistor
- 1 LDR resistor
- 1 PTC resistor
- 1 NTC resistor
- 11 capacitors 100 pF...1 µF
- 4 electrolytic capacitors 10 µF...470 µF
- 1 potentiometer linear 1 kΩ, 0.5 W
- 1 potentiometer linear 10 kΩ, 0.5 W
- 1 transformer coil N = 300
- 2 transformer coils N = 900
- 1 cut band core (1 Paar)
- 1 coil 100mH
- 1 transistor NPN BC 237, base left
- 1 transistor NPN BC 140, base left
- 1 transistor NPN BC 140, base right
- 1 transistor PNP BC 160, base left
- 1 unijunction transistor PN 2N4870
- 1 D-MOS field effect transistor BS 250, P-channel
- 1 junction field effect transistor 2N 5485, N-channel
- 1 junction field effect transistor 2N 5461, P-channel
- 1 diac, ER 900
- 1 thyristor, TIC 106
- 1 triac, TIC 206
- 1 toggle switch
- 1 lamp, 15 V
- 1 light source
- 1 operational amplifier
- 1 GA-AS light-emitting diode, red
- 1 Ge diode AA118
- 6 Si diode 1N4007
- 1 Zener diode ZPD 3.3 V
- 1 Zener diode ZPD 10 V
- 1 relay DC 12...15 normally open contact
- 1 relay DC 12...15 NC contact



... with the possibility for the storage of jumper plugs with and without safety insulation.

No.	Designation	Order No.
1	Device Set Electronics	32203


OTOR / DC-MOTOR
I Motor
A
U = 0 ... 12 V
DC+
DC-Motor 24V 17W
32620
S

PLUG-IN COMPONENTS

Passive and active components

Resistors

⟩ Series E12, 1 Ω ... 10 MΩ/2 W
(1.0 1.2 1.5 1.8 2.2 2.7 3.3 3.9 4.7 5.6 6.8 8.2)

Potentiometers

⟩ Linear, 470 Ω, 1 kΩ, 4.7 kΩ, 10 kΩ, 47 kΩ, 0.5 W

Non-linear resistors

⟩ VDR-, LDR-, NTC-, PTC resistors

Capacitors

⟩ Series E6, 10 pF ... 1 µF
(1.0 1.5 2.2 3.3 4.7 6.8)

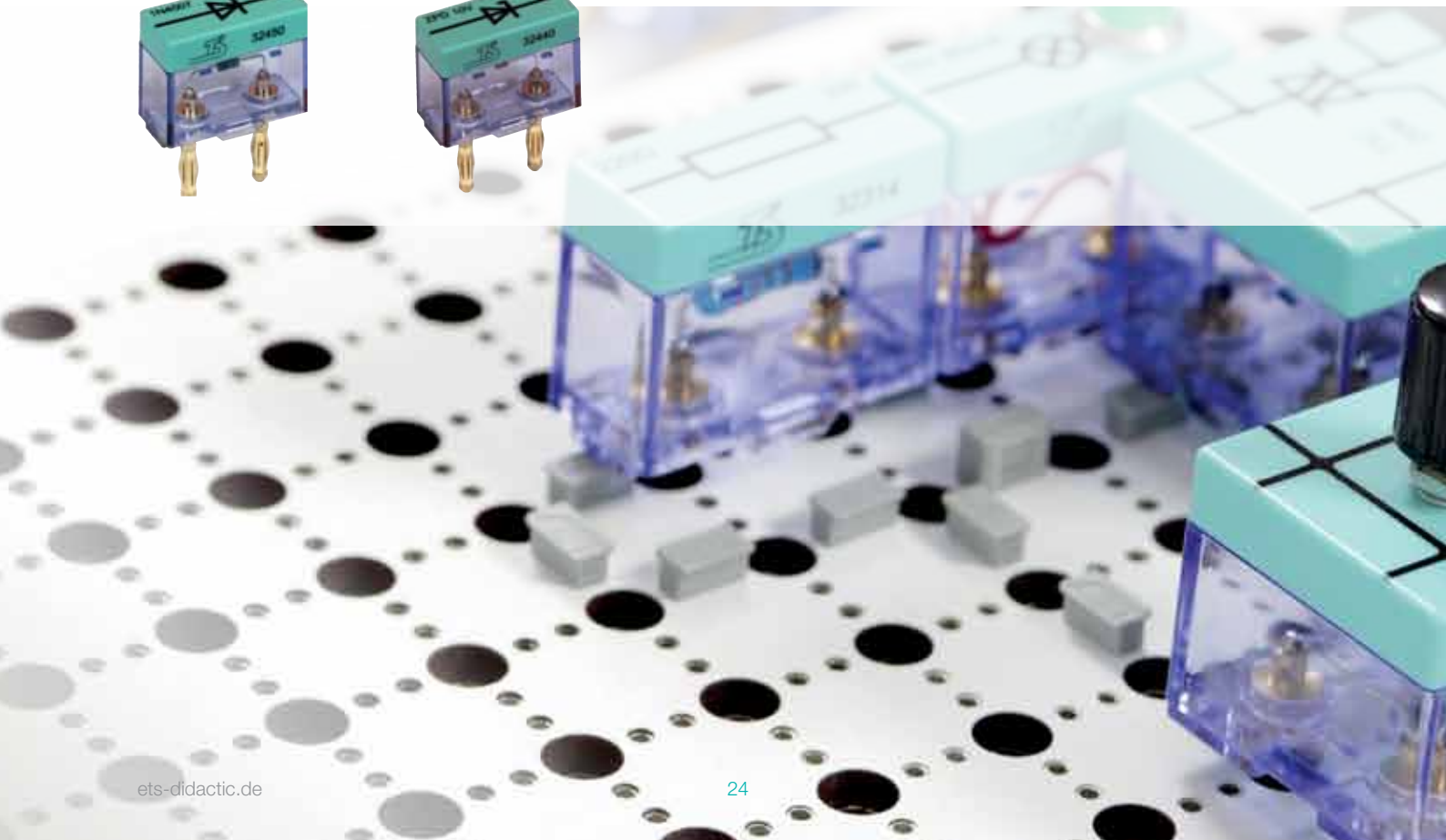
Electrolytic capacitors

⟩ values: 10 µF, 100 µF, 470 µF

Coils

⟩ 100 mH

⟩ Transformer coils with 300 / 900 windings



Semiconductor components

- Germanium and silicon diodes
- NPN and PNP transistors
- PN unijunction transistor
- D-MOS field effect transistor
- Junction field effect transistor, N- and P-channel
- Diac, thyristor, triac, IGBT
- Operational amplifier
- Zener dide ZPD
  values: 3.3 V, 10 V
- Photo diode, photo transistor
- LEDs in red, green, yellow, blue, white

Switching and display components

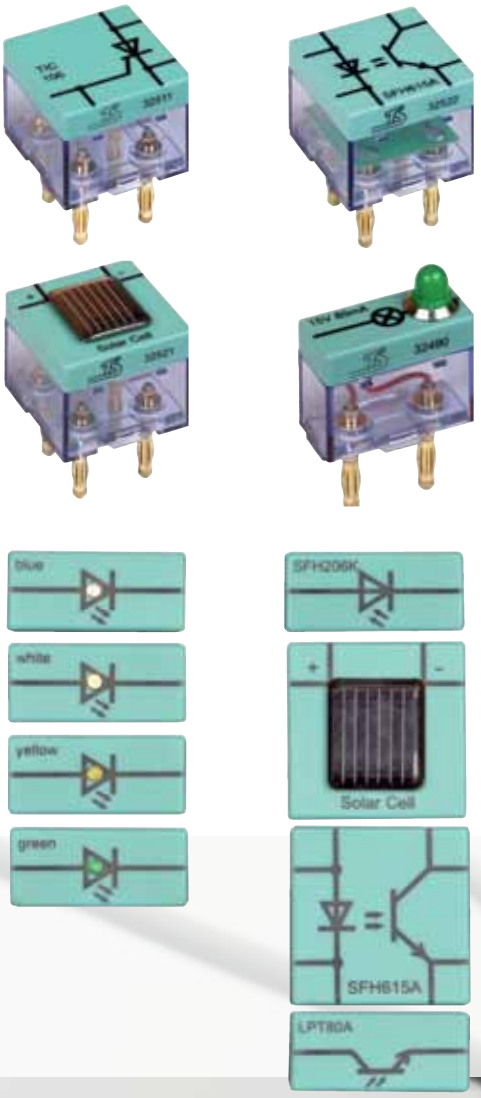
- Switch, pushbutton, relays
- Lamp

Other

- Empty housing, with two and four pins

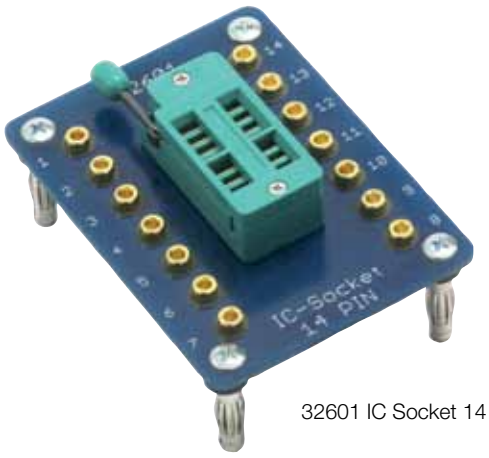
Optoelectronics

- Device set optoelectronics 32 104
  (to complement device set 32 203)
- Photo transistor, photo diode
- Optical coupler, solar cell
- LEDs

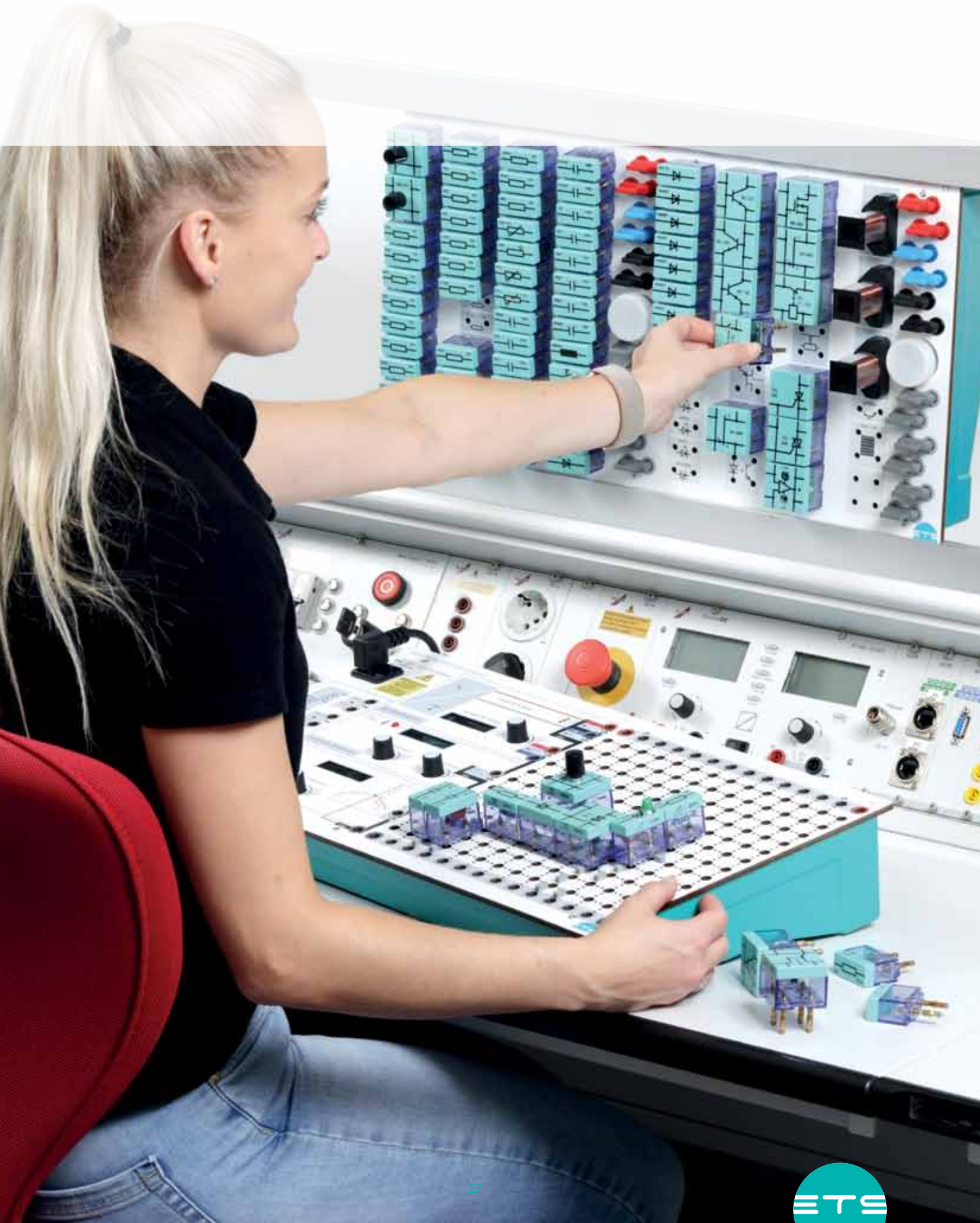


Component overview

- 32302 Set of empty housings with 2 lambella plugs (10 pcs.)
- 32305 Set of empty housings with 2 lambella plugs (10 pcs.)
- 32310 Film resistor 10 Ω/2 W
- 32311 Film resistor 22 Ω/2 W
- 32312 Film resistor 33 Ω/2 W
- 32313 Film resistor 100 Ω/2 W
- 32314 Film resistor 220 Ω/2 W
- 32315 Film resistor 330 Ω/2 W
- 32316 Film resistor 470 Ω/2 W
- 32317 Film resistor 680 Ω/2 W
- 32318 Film resistor 1 kΩ/2 W
- 32319 Film resistor 2.2 kΩ/2 W
- 32320 Film resistor 4.7 kΩ/2 W
- 32321 Film resistor 10 kΩ/2 W
- 32322 Film resistor 22 kΩ/2 W
- 32323 Film resistor 47 kΩ/2 W
- 32324 Film resistor 100 kΩ/2 W
- 32325 Film resistor 1 MΩ/2 W
- 32340 VDR resistor, 12 V/10 kΩ
- 32342 NTC resistor (6 kΩ)
- 32345 LDR resistor
- 32370 Capacitor 100 pF/500 V
- 32371 Capacitor 10 nF/500 V
- 32372 Capacitor 47 nF/500 V
- 32373 Capacitor 0.1 µF/160V
- 32374 Capacitor 0.22 µF/160 V
- 32375 Capacitor 0.47 µF/160 V
- 32376 Capacitor 1 µF/100 V
- 32390 Electrolytic capacitor 10 µF/63 V
- 32391 Electrolytic capacitor 100 µF/35 V
- 32392 Electrolytic capacitor 470 µF/35 V
- 32402 Linear potentiometer 1 kΩ 0.5 W
- 32403 Linear potentiometer 10 kΩ 0.5 W
- 32420 Transformer coil N = 300
- 32421 Transformer coil N = 900
- 32422 Coil 100 mH
- 32430 Taupe-wourn core (1 pair)
- 32440 Zener diode 10 V/40 mA
- 32441 Zener diode 3.33 V/130 mA
- 32442 GA-AS light emitting diode, red, without dropping resistor
- 32443 Light source
- 32444 LED, 5mm, blue
- 32445 Ge diode, AA118
- 32446 LED, 5mm, warm white
- 32447 LED, 5mm, yellow
- 32448 LED, 5mm, green
- 32450 Si diode 1 A
- 32480 Toggle switch
- 32490 Lamp, green, 15 V
- 32501 Transistor NPN, BC237, base left
- 32502 Transistor NPN, BC140, base left
- 32503 Transistor NPN, BC140, base right
- 32504 Transistor PNP, BC160, base left
- 32505 Unijunction transistor, PN 2N4870
- 32506 D-MOS field effect transistor, BS250, P-channel, gate left
- 32507 JFET transistor, 2N5485, 25 V/10 mA, N-channel, gate left
- 32508 JFET transistor, 2N5461, 20 V/10 mA, P-channel, gate left
- 32510 Diac, ER 900
- 32511 Thyristor, TIC 106
- 32512 Triac, TIC 206
- 32520 Photodiode
- 32521 Solar cell
- 32522 Optical coupler SFH615A
- 32523 Phototransistor LPT80A
- 32598 Operational amplifier OP741 with 4mm connection sockets on the top
- 32485 Relay DC 12...15 V NOC, 2 A
- 32486 Relay DC 12...15 V NCC, 2 A
- 32 601 IC socket, 14-pin, on plug-in plate for 19mm grid, plate equipped with 2mm jacks for easy connection



32601 IC Socket 14 Pin



MOTORS

DC motor 24V/17W

1

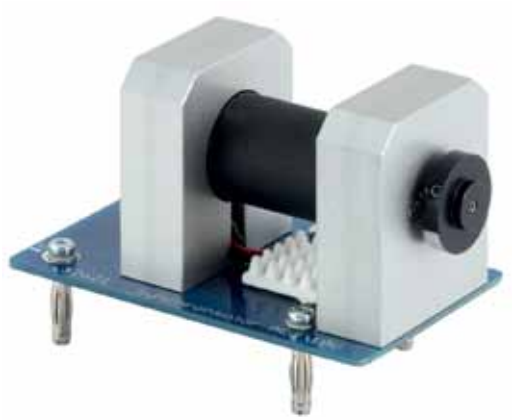
Technical data

DC motor 24V 17W, plug-in module for 19mm grid

- DC motor permanently excited
- nominal voltage 24 V DC
- no-load current < 0,15 A
- no-load current 7000 U/min
- nominal current 1.0 A
- nominal speed 6100 rpm
- Inputs-/outputs on 4mm plug for 19mm plug-in grid

No	Designation	Order No.
1	DC motor 24V/17W	32620

Three-phase synchronous motor AC3/10V



Technical data

- synchronous motor AC3 10V, plug-in module for 19mm grid
- star 10V AC, 1-70 Hz
- rated speed 750 U/min at 50 Hz
- shaft end with washer
- inputs/outputs on 4mm plug for 19mm plug-in grid

2

No.	Designation	Order No.
2	Three-phase synchronous motor AC3/10V	32621

DC TECHNOLOGY

Courseware

1

2

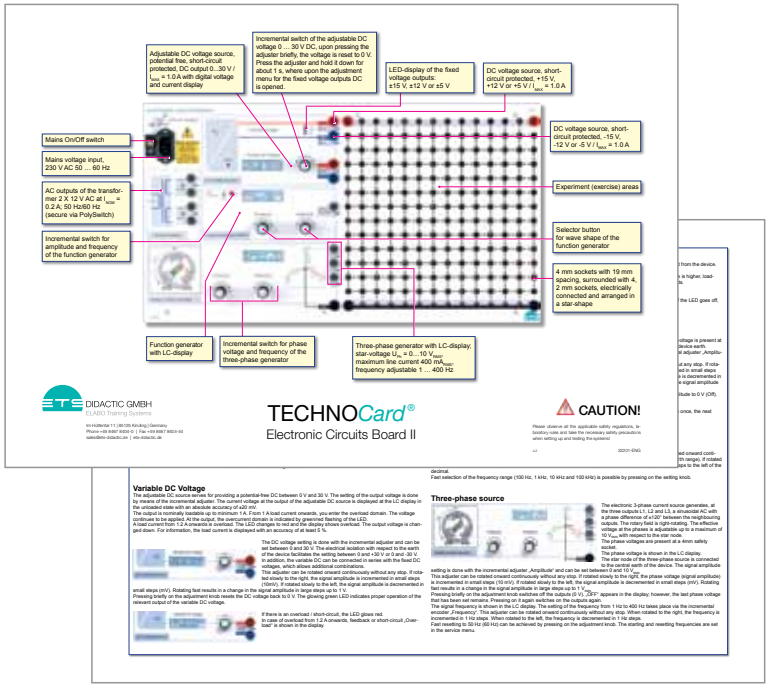
3

Printed and digital

DC Technology

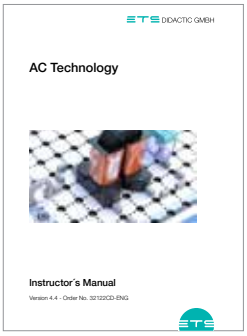
- ⟩ electrical circuit
- ⟩ Ohm´s law
- ⟩ electrical resistors
- ⟩ voltage and current fault circuit
- ⟩ substitute voltage source
- ⟩ interconnection of voltage sources
- ⟩ electric power and work
- ⟩ efficiency of electrical power
- ⟩ power, voltage and current matching

TECHNOCard®



4

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	DC Technology - Instructor´s Manual	32120CD-ENG
3	DC Technology - Student Manual	32121CD-ENG
4	TECHNOCard - Electronic Circuits Board II	32201-ENG

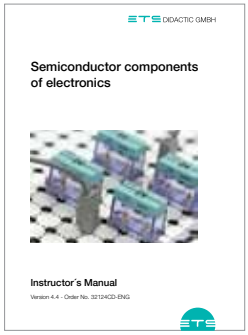


1

2

AC Technology

- rectifier diodes
- rectifier circuits
- Z dioden
- voltage stabilization
- overvoltage protection
- voltage limiting
- light emitting diodes
- bipolar transistors
- basic amplifier circuits
- unipolar transistors
- junction FET
- insulated gate FET
- unijunction transistor (UJT)
- diac
- thyristor triode
- triac
- gate control

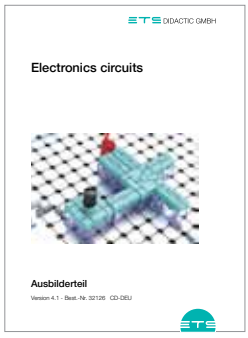


3

4

Semiconductor components of electronics

- multistage amplifiers
- darlington amplifier
- emitter coupled amplifiers
- phase inverting stages
- differential amplifiers
- DC voltage amplifiers
- push-pull amplifier
- feedback
- non-inverting OPVt
- impendance converter
- summing OPV
- subtracting OPV
- integrating OPV
- differentiating OPV
- sine wave generators
- square wave generators



5

6

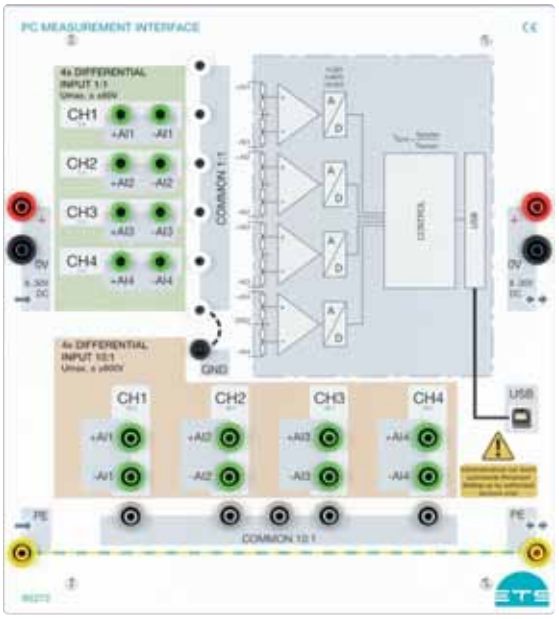
Electronics circuits

- Current types and their parameters
- Active power of alternating voltages
- Three-phase alternating current
- The capacitor in alternating current circuit
- The coil in the alternating current circuit
- interconnection of reactive and active resistors
- oscillating circuits
- RLC filter circuits (filters)
- transformers

No.	Designation	Order No.
1	AC Technology - Instructor´s Manual	32122CD-ENG
2	AC Technology - Student Manual	32123CD-ENG
3	Semiconductor components of electronics - Instructor´s Manual	32124CD-ENG
4	Semiconductor components of electronics - Student Manual	32125CD-ENG
5	Electronics circuits - Instructor´s Manual	32126CD-ENG
6	Electronics circuits - Student Manual	32127CD-ENG

MEASUREMENT TECHNOLOGY

In electrical engineering, measuring instruments with differential input are required for optimum measured value acqusition of signal characteristics.



1

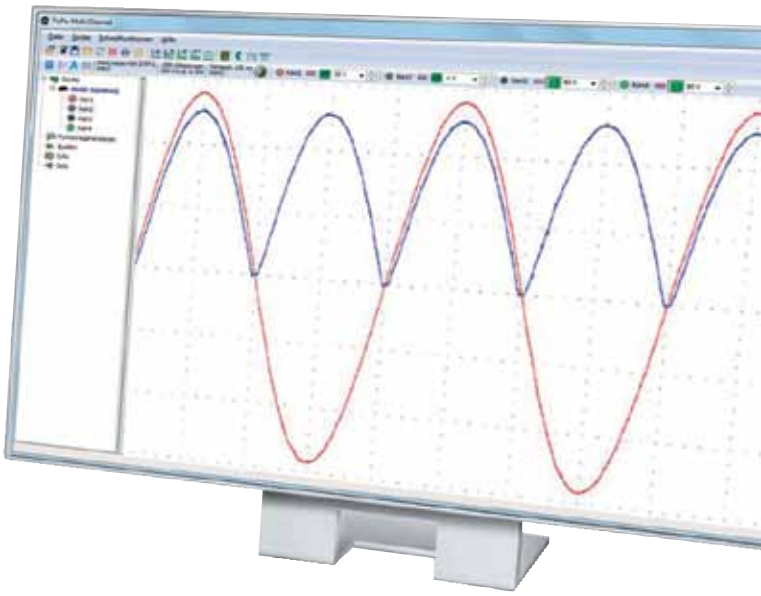
PC Measurement Interface

The "PC measurement interface" is a four-channel measuring instrument with differential inputs. It enables the safe measurement of voltages and derived quantities up to 600V AC. The display and evaluation fo the measurement results is carried out by means of software via connected personal computer.

Performance parameters:

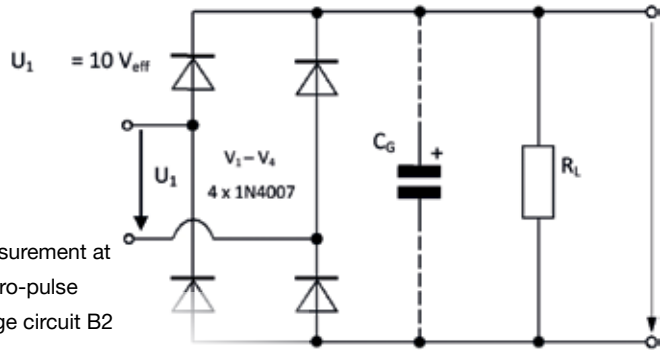
- ⟩ 4 analog input channels with differential input
- ⟩ 5 MHz bandwidth (5.000.000 samples/s)
- ⟩ sampling rate up to 5MHz per channel
- ⟩ Input 1:1:
  - voltge resistant up to $200V_{eff}$ AC
  - 2mm safety sockets
  - measuring ranges from ±200mV to ±80V (peak value)
- ⟩ Input 10:1:
  - voltage resistant up to $600V_{eff}$ AC
  - 4mm safety sockets
  - measuring range from ±2V bis ±800V (peak value)
- ⟩ all inputs touch-proof 600V, CATIII
- ⟩ all inputs clearly configurable by 19mm jumper plugs
- ⟩ 4 measuring instruments in one device
  - 4-channel oscilloscope
  - spectrum analyzer
  - transient recorder
  - voltmeter (average, true rms value)
- ⟩ USB 2.0 High Speed (480MBit/s)
- ⟩ optional operating voltage: 8 … 30V DC
- ⟩ included in delivery: USB cable, software, operation instructions, operating system
- ⟩ requirements: Windows7/Windows8/ Windows10 (32 or 64 Bit)

No.	Designation	Order No.
1	PC Measurement Interface	90272



The simultaneous measurement of the signal characteristics at the input of the B2 bridge circuit and at the output across the load resistor is only possible with an oscilloscope with differetial input or isolation amplifier. The measuring interface has four differential inputs and makes such measuring tasks possible in a simple way.

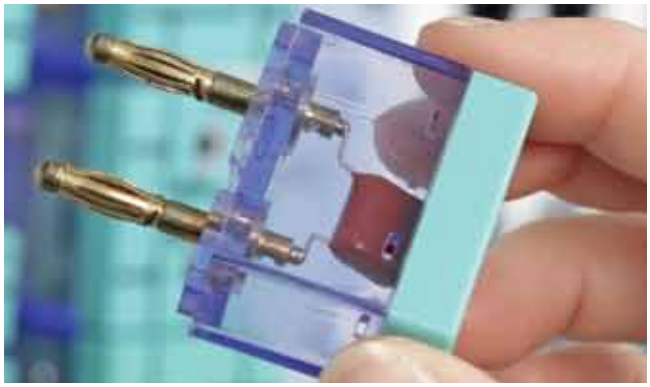
In addition, the experiment descriotions contain ready-made measuring profiles for loading, from the measuring software to the measuring interface.



Measurement at the tro-pulse bridge circuit B2

ACCESSORIES

Connecting systems and connections



Making the connection...

Components and connections are provided with gold-plated lamella plugs asuring resistance against corrosion and low conract resistance.

2mm connections

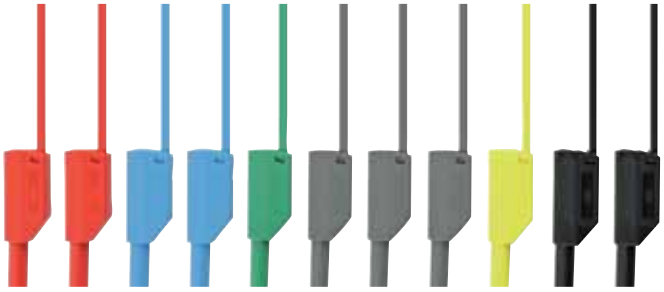
⟩ 70 connecting plugs 2mm (C6000306)

On the experimenting field provided with 4/2mm sockets, connections between components and to the power supply bar are made with 2mm connectors.

Accessories connection technology 4mm

› Accessory set safety connection lines 11 pieces

1



› Set of safety jumper plugs 24 pieces, colored

2

Measurement accessories

› Adapter BNC plug to 4mm safety socket (C6010235)

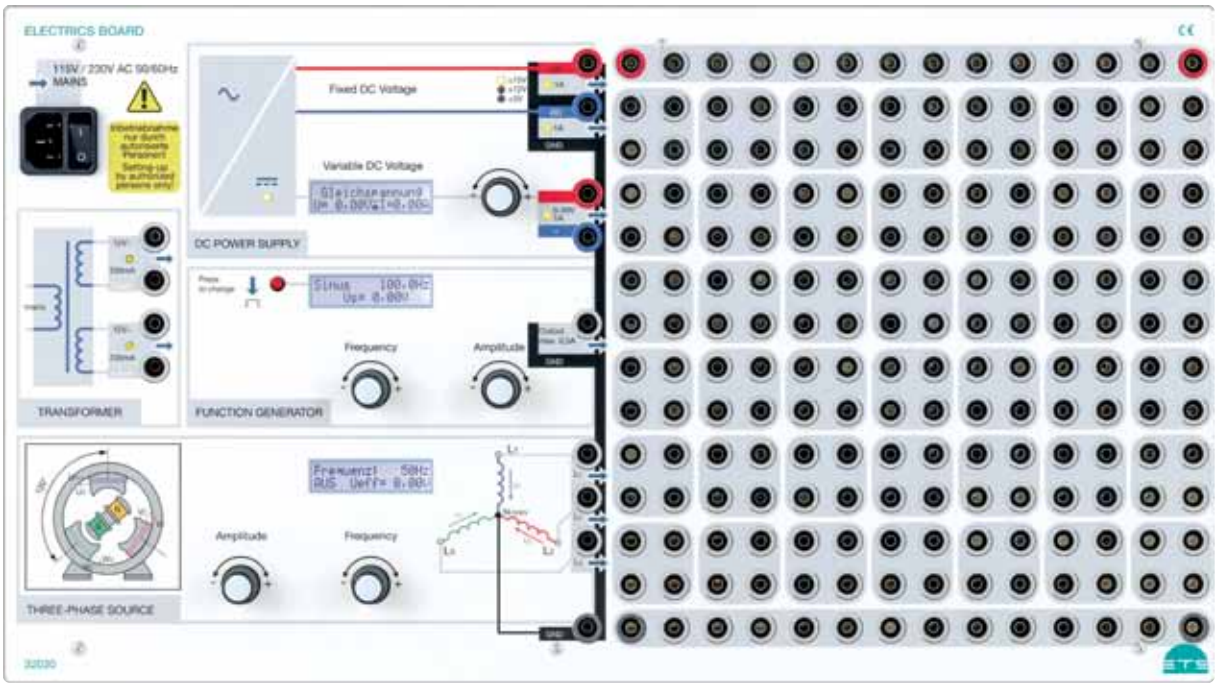
Three adapters BNC to 4mm safty connectors are needed to connect standard oscilloscopes.

3

No.	Designation	Order No.
1	Safety connection lines (11-piece)	90030
2	Safety bridge plug (24-pieces)	90036
3	BNC plug to 4mm safety socket	C6010235

ELECTRICAL ENGINEERING

Fundamentals Board Electrical Engineering



1

Learning objectives

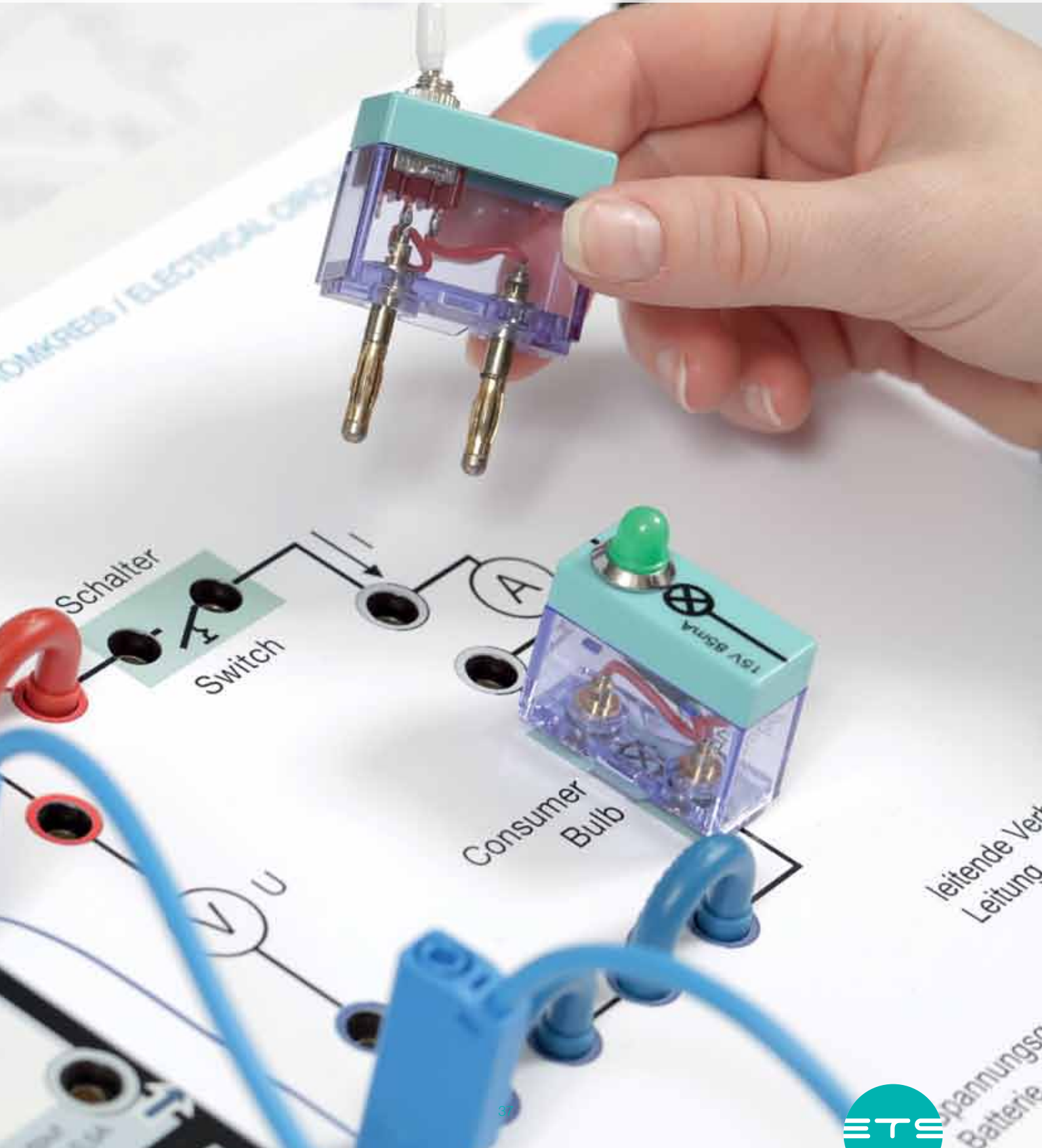
- Basic laws of electrical engineering
- Handling and measuring with oscilloscope, multimeter and function generator
- Passive components in the direct current circuit
- Capacitor and coil in the alternating current circuit
- Transformer
- Three-phase systems
- Behavior of semiconductors: diodes, transistors, thyristors
- Operational amplifier

Technical data

- Voltage sources DC +/-15 V or +/-12 V or +/- 5 V/1 A; DC 0...30 V / max. 1 A with voltage and current display; AC 2 x 12 V/0.2 A (fused via PolySwitch)
- Function generator frequency 0.1 Hz...200kHz, amplitude 0...10 VS and waveform adjustable, display of all quantities
- Phase voltage 0...10 V (rms.); conductor voltage 0...17.3 V (rms.); frequency 1...400 Hz adjustable, display of all quantities, current load per phase max. 400 mA (rms.)
- 42 plug-in fields in 19mm grid with 5 electrically connected 4mm safety sockets each
- Main connection 230 V AC; 50 Hz; 75 W; potection class I
- Safety power supply outputs short-circuit- and regenerative-proof up to 40 V DC/ 24 V AC, 40 W

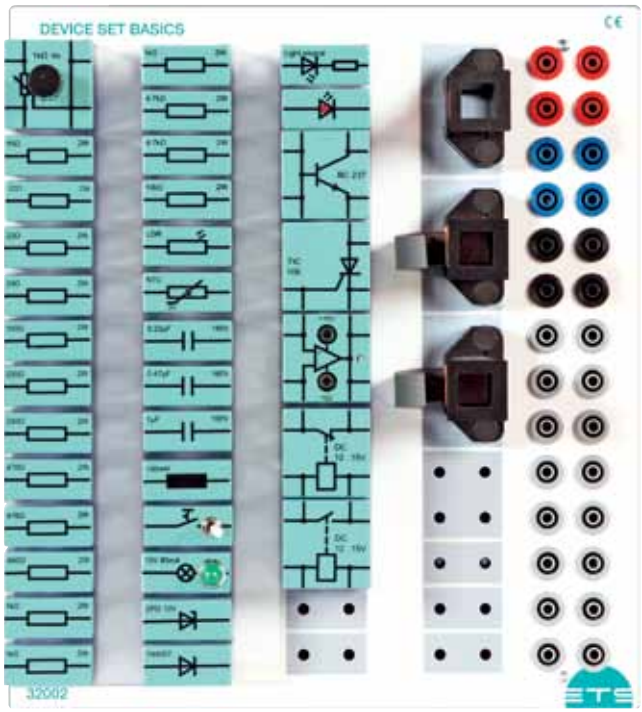
No.	Designation	Order No.
1	Electrics Board	32030
n.ill.*	Electrics Board with component set 32203 installed in case	32030-Z03

* For more information, see page 52.


Schalter
Switch
A
Consumer
Bulb
V
U

ELECTRICAL ENGINEERING

Components

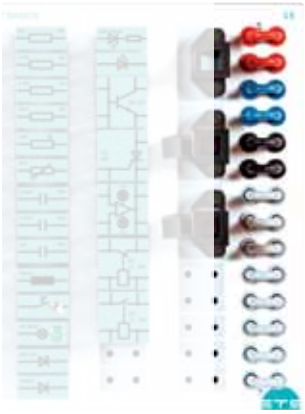


1

Technical data

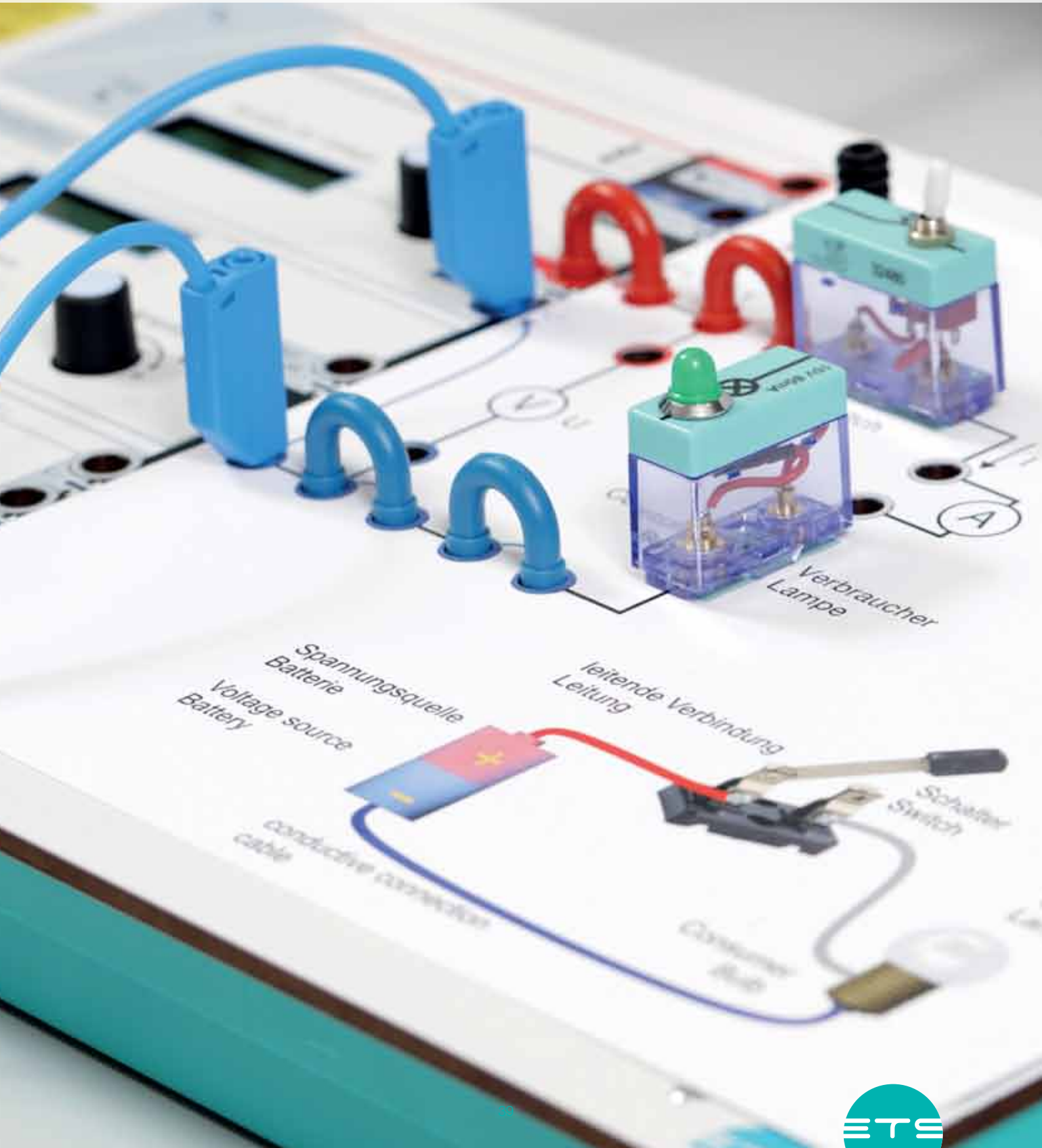
Storage plate printed incl. the following plug-in components:

- 16 film resistors 10 Ω...10 kΩ
- 1 LDR resistors
- 1 NTC resistors
- 3 capacitors 0.22 µF...1 µF
- 1 potentiometer linear 1 kΩ
- 1 transformer coil N = 300
- 2 transformer coils N = 900
- 1 cut band core (1 pair)
- 1 coil 100 mH
- 1 GA-AS light emitting diode red
- 1 Si diode 1N4007
- 1 zener diode ZPD 10 V
- 1 transistor NPN BC 237, base left
- 1 thyristor TIC 106
- 1 toggle switch
- 1 lamp 15 V
- 1 loght source
- 1 operational amplifier
- 1 relay 12...15 V DC, switching contact normally open
- 1 relay 12...15 V DC, switching contact normally closed



... with the possibility for the storage of jumper plugs.

No.	Designation	Order No.
1	Device Set Basics	32002


Verbraucher
Lampe
Spannungsquelle
Batterie
Voltage source
Battery
leitende Verbindung
Leitung
conductive connection
cable
Schalter
Switch

ELECTRICAL ENGINEERING

Fundamentals Board Electrical Engineering

Adjustable DC voltage source potential-free, 0 ... 30 V/ I_{MAX} = 1.0 A with digital voltage and current display

DC voltag sourse short-circuit proof, +15 V, +12 V or +5 V / I_{MAX} = 1.0 A

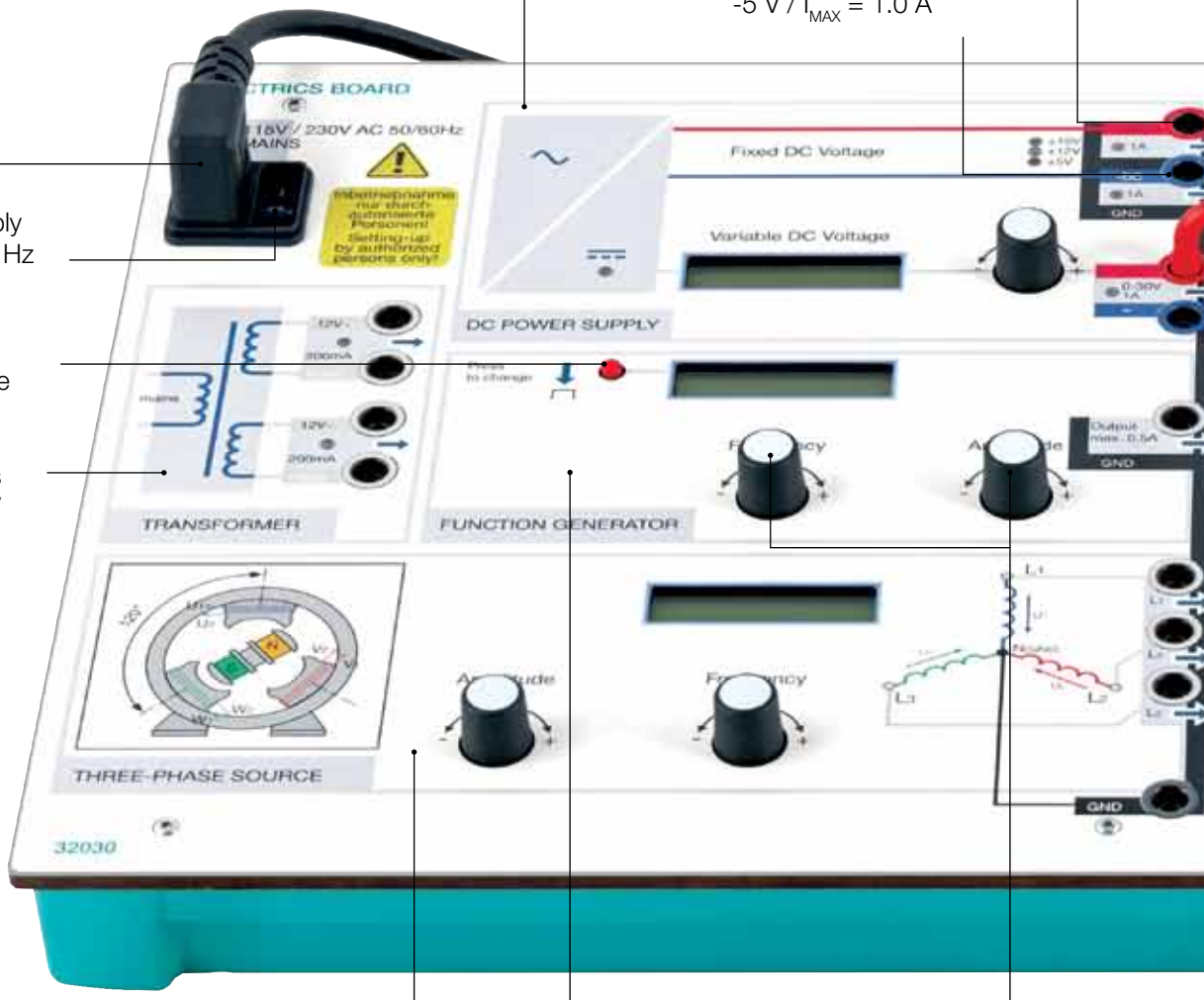
DC voltage source short-circuit proof, -15 V, -12 V or -5 V / I_{MAX} = 1.0 A

Power switch

Mains voltage supply 230 V AC 50 ... 60 Hz

Selection button of the waveform of the function generator

AC voltage outputs transformer 2x12 V AC



Frequency generator with LC-Display

Three-phase current souce with LC display; 0 ... 10 V_{eff}, maximum phase current 400 mA_{eff}, frequency 1 ... 400 Hz

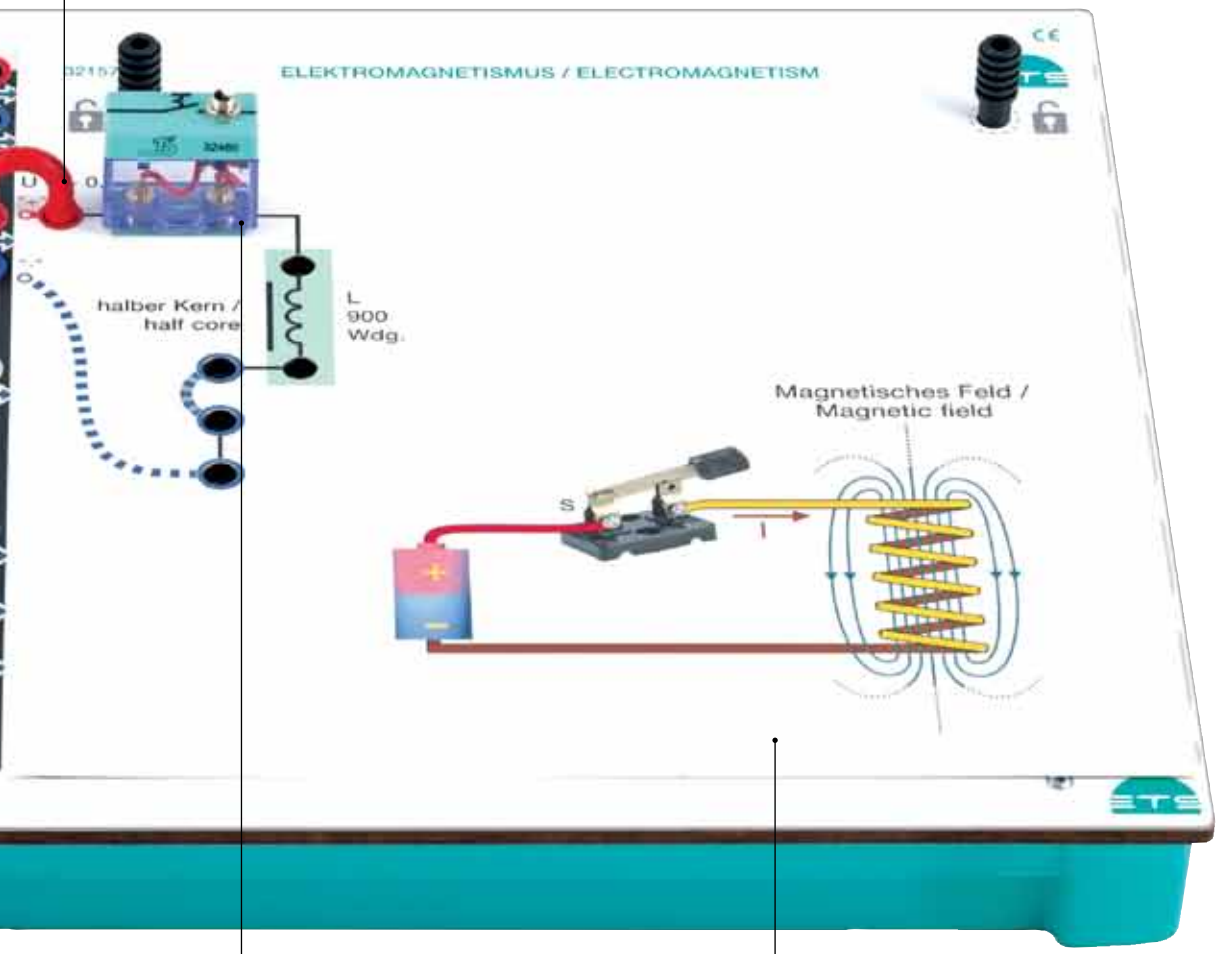
Adjuster for amplitude and frequency of the function generat

Electrics Board with equipped overlay mask in half format

Advantages:

- Didactic reduction on the essentials
- perfect adaption to the learning progress of the student

Jumper plug

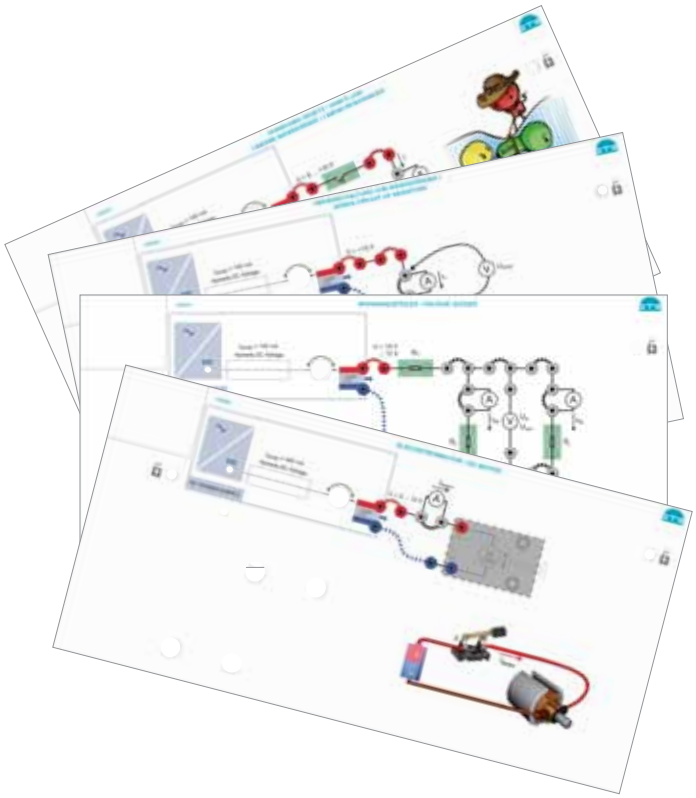


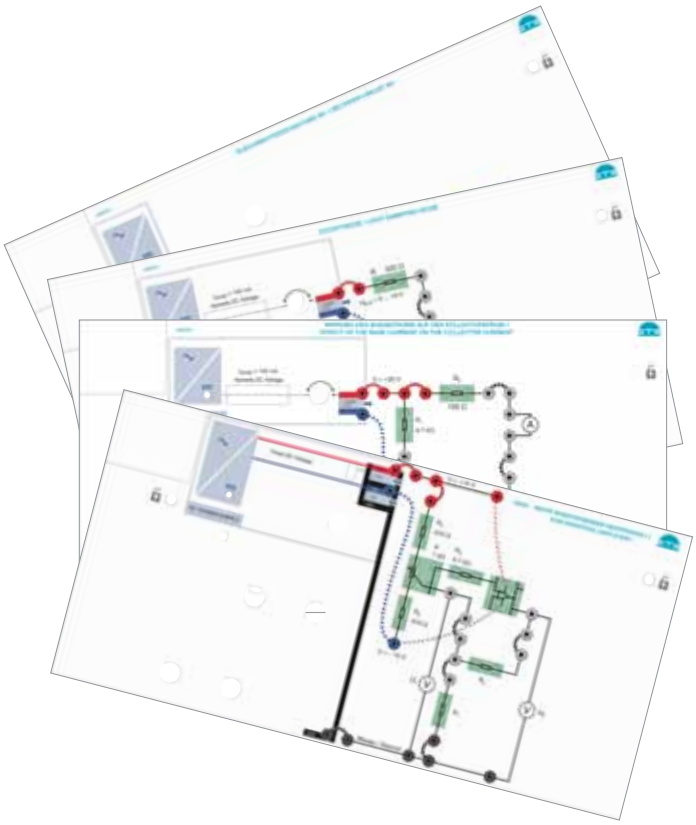
Plug-in modules

Overlay mask (half size) facilitats test setup and increases circuit reliability – ideal for beginners

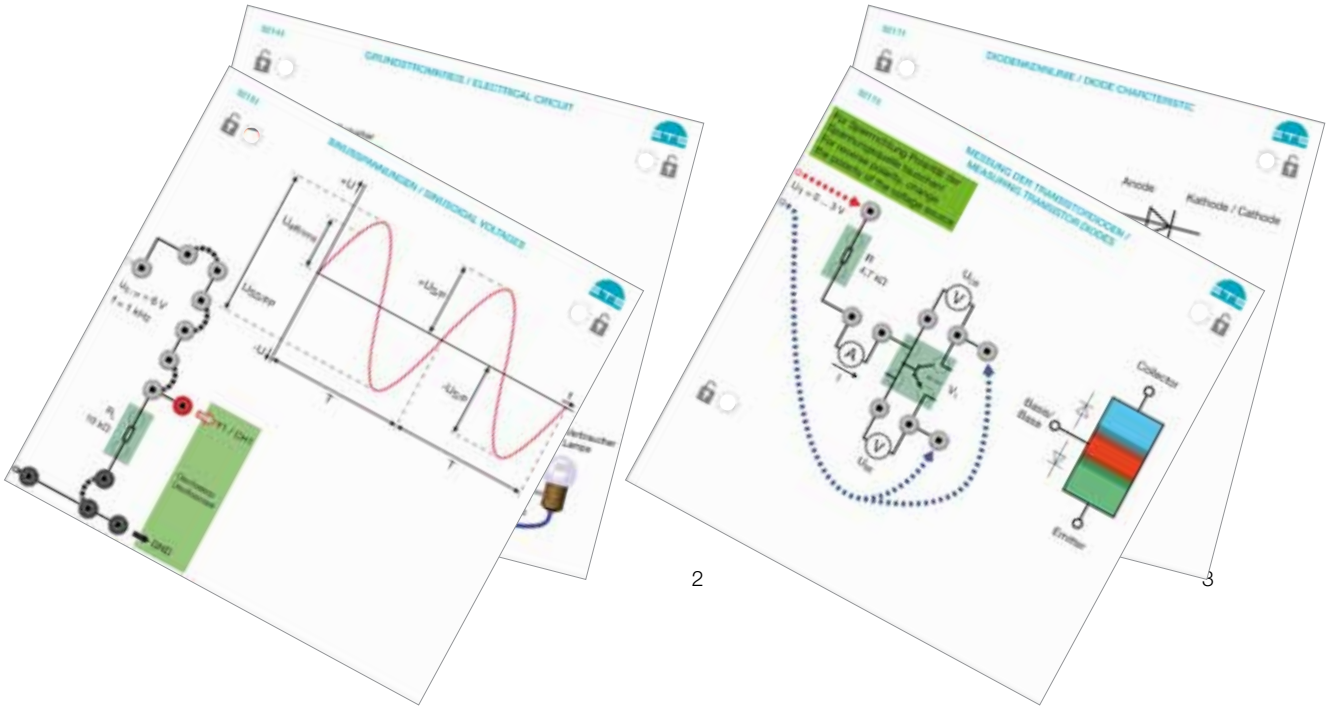
DIDACTIC SUPPORT MASKS

Reduction to the essentials



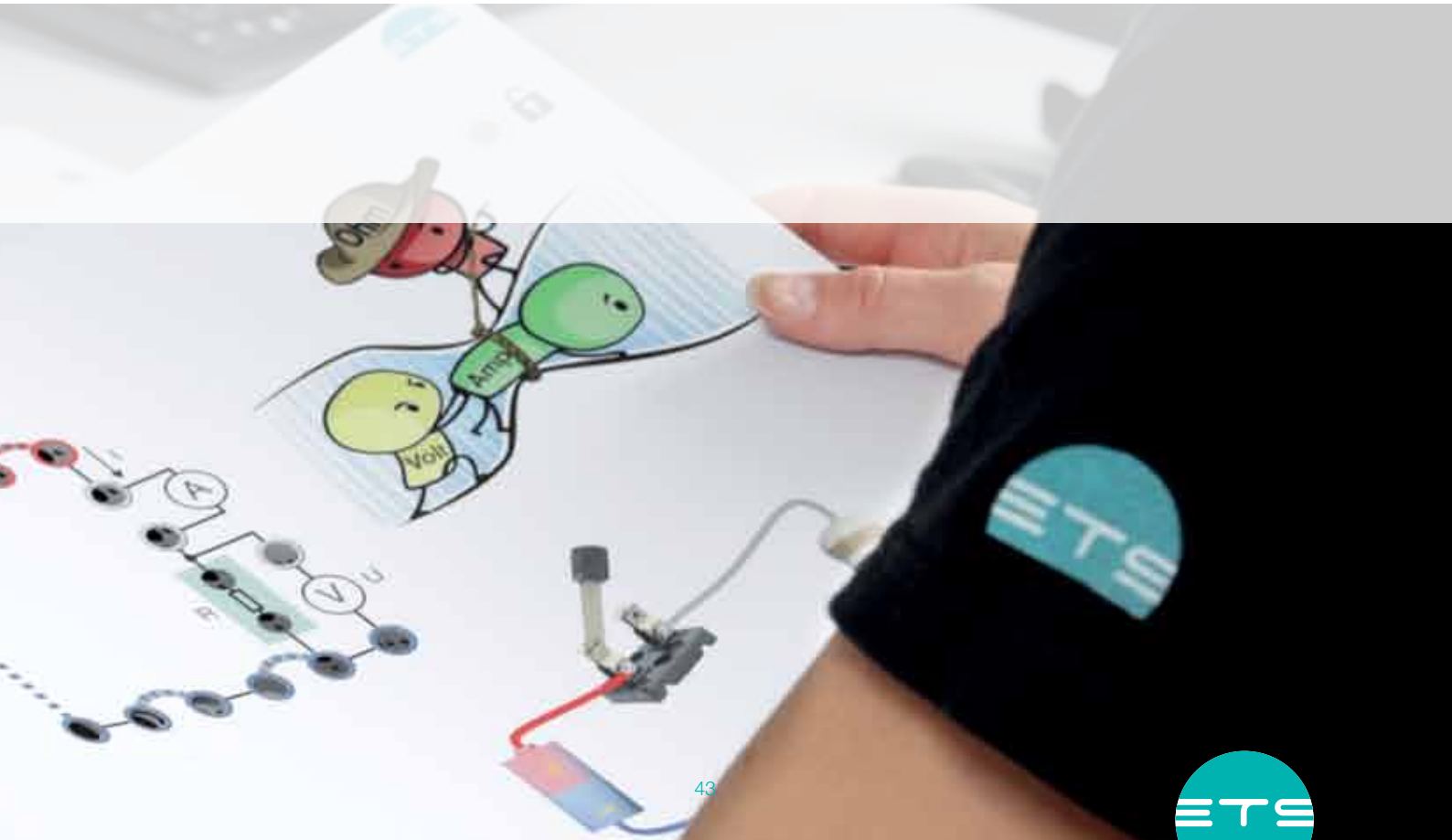


No.	Designation	Order No.
1	Set 1 full format	32040
2	Set 2 full format	32070



2 3

No.	Designation	Order No.
1	Set 1 half format	32140
2	Set 2 half format	32170

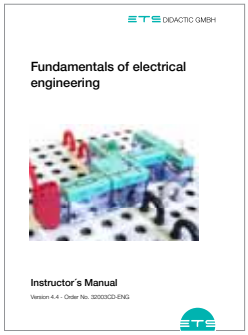


FUNDAMENTALS OF ELECTRICAL ENGINEERING

Courseware

1

Printed and digital



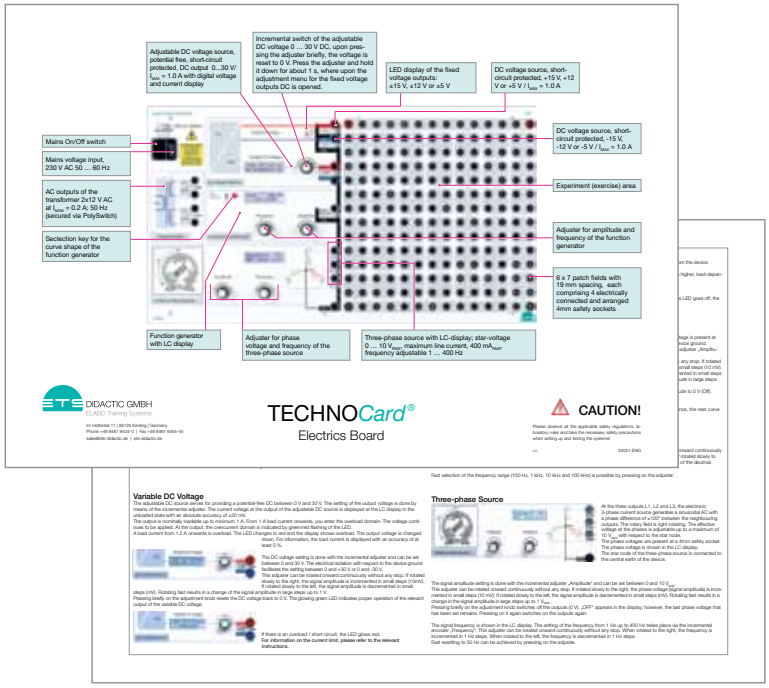
2

3

Manual content

- The electrical circuit
- Ohm´s law
- Electrical resistors
- Interconnection of voltage sources
- Electric power and work
- Efficiency
- Types of current and their characteristics
- Active power of alternating voltage
- Three-phase AC (three-phase current)
- The capacitor in the AC circuit
- The coil in the AC current circuit
- Interconnection of reactive and active resistors
- Oscillating circuits
- RLC screening circuits (filter)
- Transformers
- Diodes and rectifier circuits
- Bipolar transistors
- The thyristor triode
- Operational amplifiers
- Square wave generators

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.

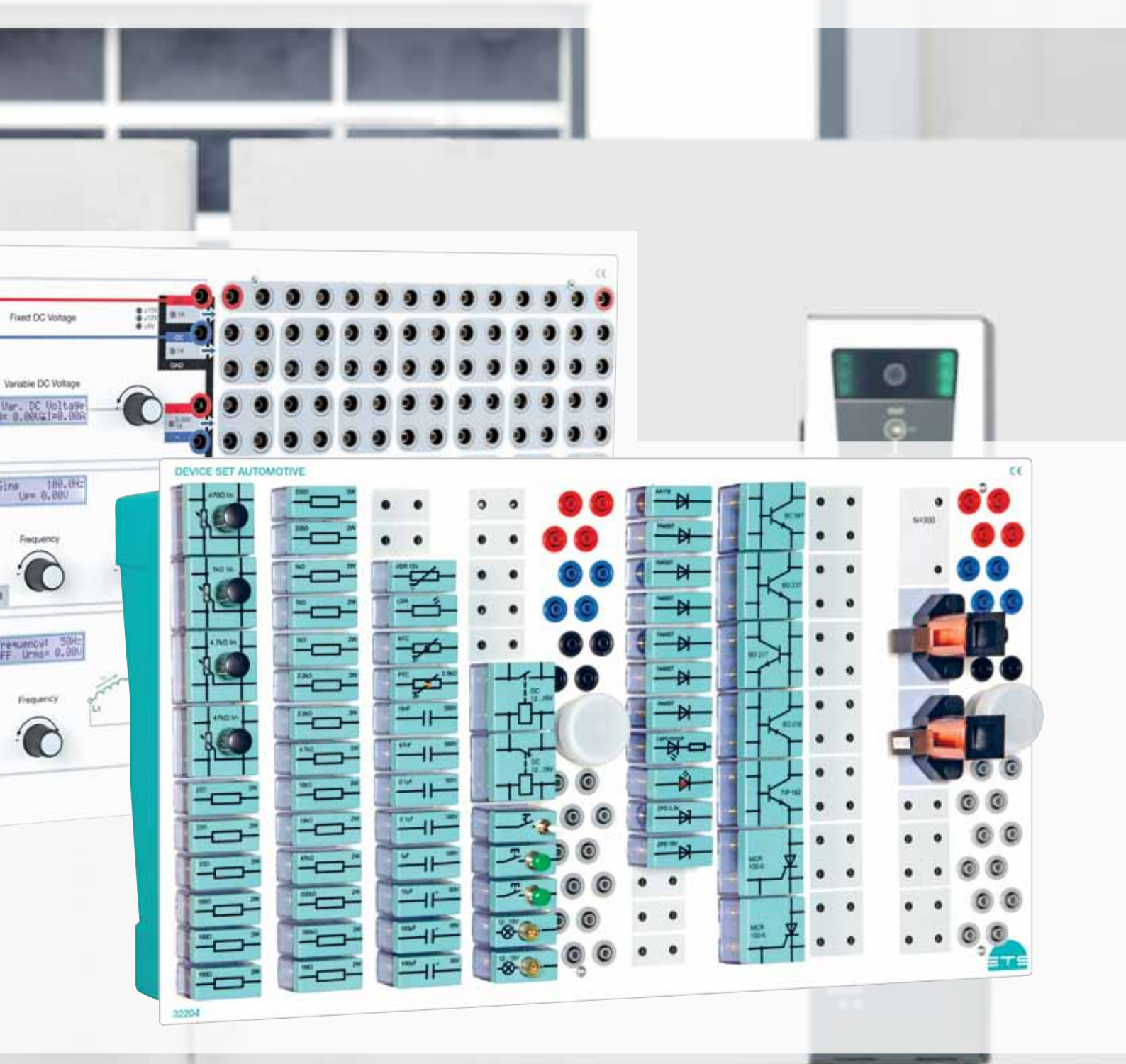
- Display board in 303mm x 426mm format
- Double-sided color design
- Robuts, hard-wearing quality

4

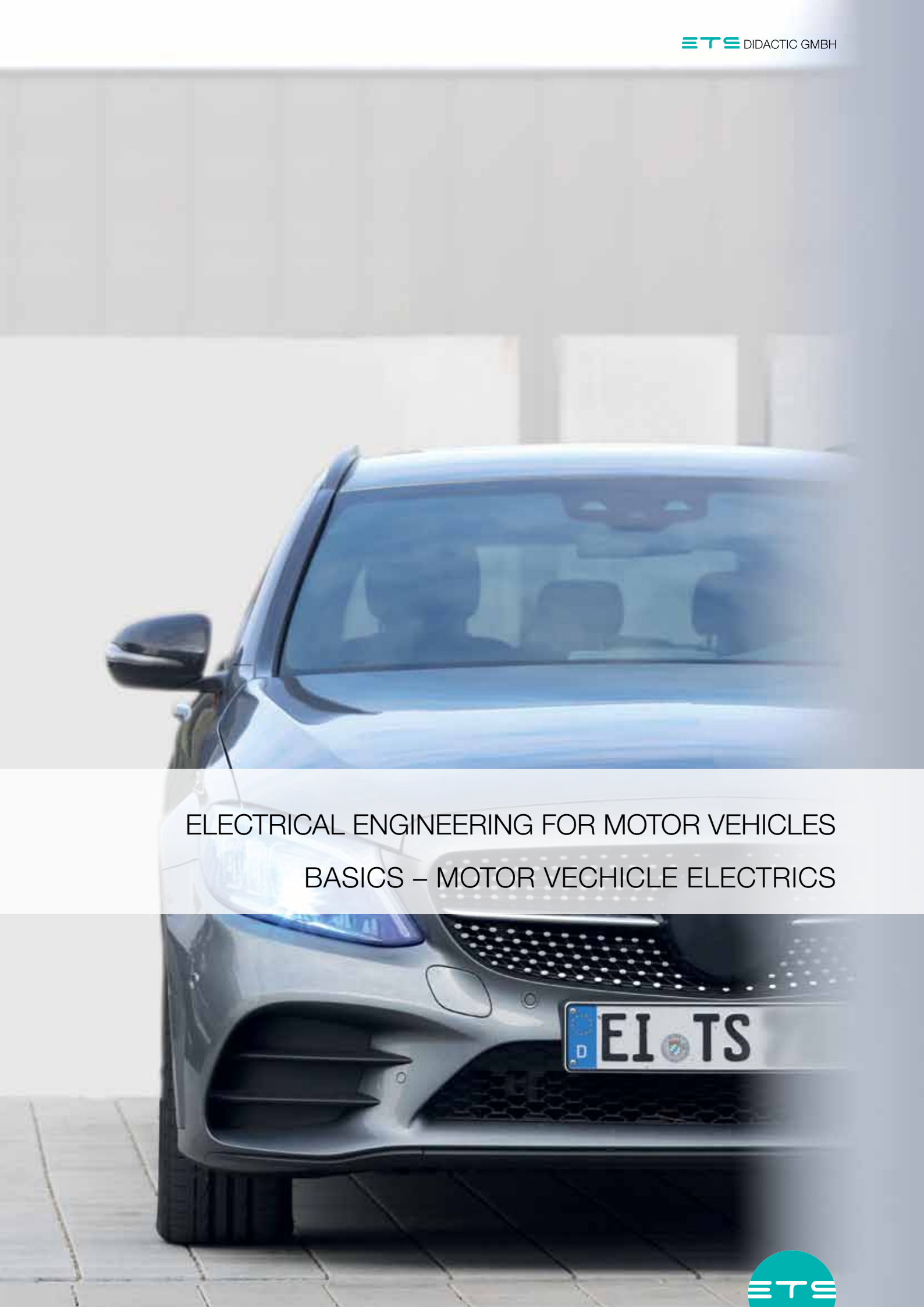
No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Fundamentals of electrical engineering - Instructor´s Manual	32003CD-ENG
3	Fundamentals of electrical engineering - Student Manual	32004CD-ENG
4	TECHNOcard - Electrics-Board	32031-ENG

BASIC CIRCUITS OF AUTOMOTIVE ELECTRICS/ELECTRONICS

Electrical engineering in the motor vehicle



ETS DIDACTIC GMBH

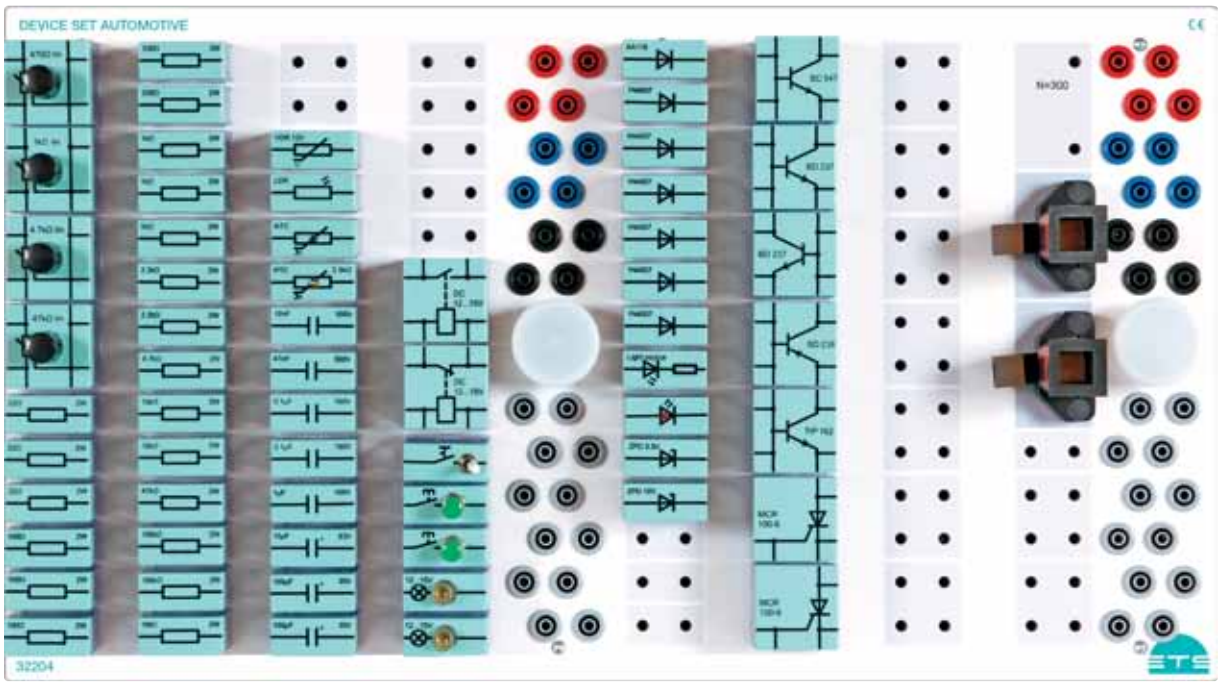


ELECTRICAL ENGINEERING FOR MOTOR VEHICLES

BASICS – MOTOR VECHICLE ELECTRICS

AUTOMOTIVE

Set of components



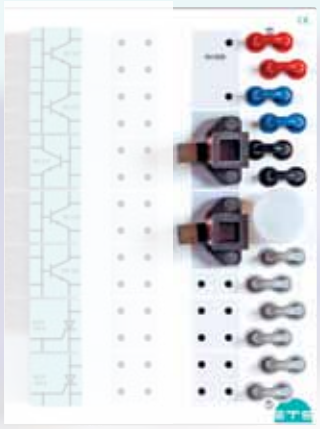
1

Technical data

The set of plug-in modules for experiments on the fundamentals of electrical engineering/electronics in automotive engineering, incl. storage plate for plug-in modules and 24 safety jumper plugs, printed with the circuit symbols of the components.

- Film resistors 22 Ω/2 W
- Film resistors 33 Ω/2 W
- Film resistors 100 Ω/2 W
- Film resistors 330 Ω/2 W
- Film resistors1 kΩ/2 W
- Film resistors 2.2 kΩ/2 W
- Film resistors 4.7 kΩ/2 W
- Film resistors 10 kΩ/2 W
- Film resistors 47 kΩ/2 W
- Film resistors 100 kΩ/2 W
- Film resistors 1 MΩ/2 W
- Potentiometer, linear 470 Ω /0.5 W
- Potentiometer, linear 1 kΩ /0.5 W
- Potentiometer, linear 4.7 kΩ /0.5 W
- Potentiometer, linear 47 kΩ/0.5 W
- VDR resistor, 11 V/1 mA
- LDR resistor
- NTC resistor (6 kΩ)
- PTC resistor (3.9 kΩ)
- Capacitor 10nF / 500 V
- Capacitor 47nF / 500 V
- Capacitors 0,1µF / 160 V
- Capacitors 1µF/100 V
- Electrolytic capacitors 10µF/63 V
- Electrolytic capacitors 10 µF/35 V
- Coild N = 900
- Cut tape core (1 pair)
- GA-AS light emitting diode, red without series resistor
- Ge diode, 30 mA
- Light source
- Si diodes, 1 A
- Zener diode, 3.3 V/130 mA
- Zener diode, 10V/40 mA
- Thyristors MCR100-6, 0,8 A
- Transistor BC547 NPN, 45V/500mW, base left
- Transistor BD237 NPN, 80 V/25 W, base left
- Transistor BD237 NPN, 80 V/25 W, base right
- Transistor BD238 PNP, 80 V/25 W, base left
- Darlington transistor TIP162 NPN 380 V/125 W, base left

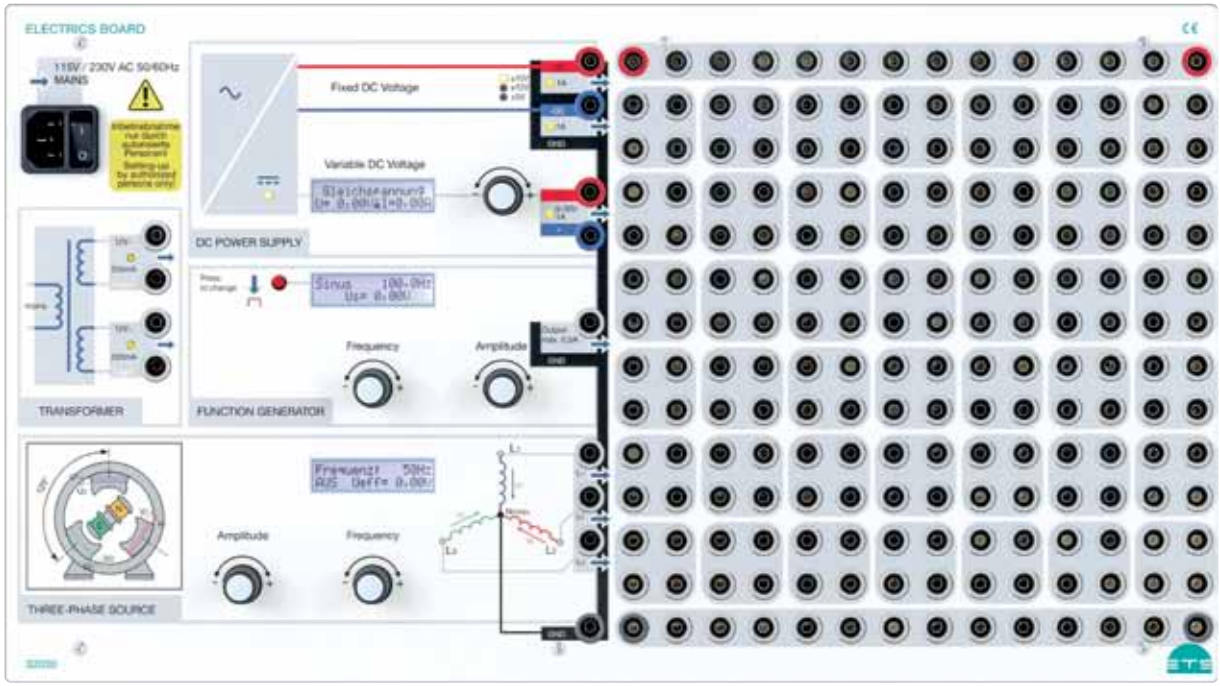
No.	Designation	Order No.
1	Device Set Automotive	32204



... with the possibility for the storage of jumper plugs.

BASICS OF AUTOMOTIVE ELECTRICS/ELECTRONICS

Fundamentals board electrical engineering



1

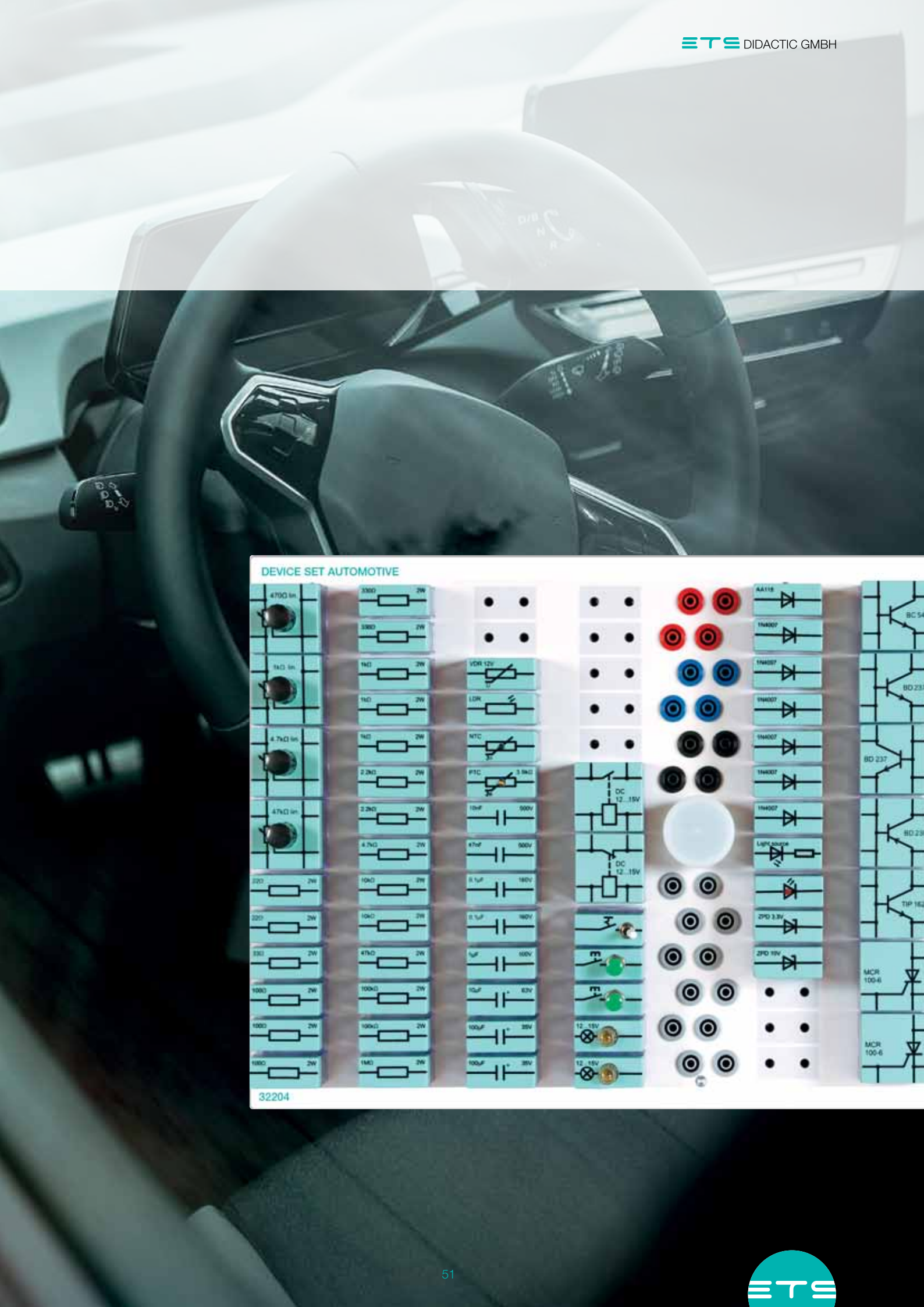
Learning objectives

- Basic laws of electrical engineering
- Handling and measuring with oscilloscope, multimeter and function generator
- Passive components in the direct current circuit
- Capacitor and coil in the alternating current circuit
- Transformer
- Three-phase systems
- Behavior of semiconductors: diodes, transistors, thyristors
- Operational amplifier

Technical data

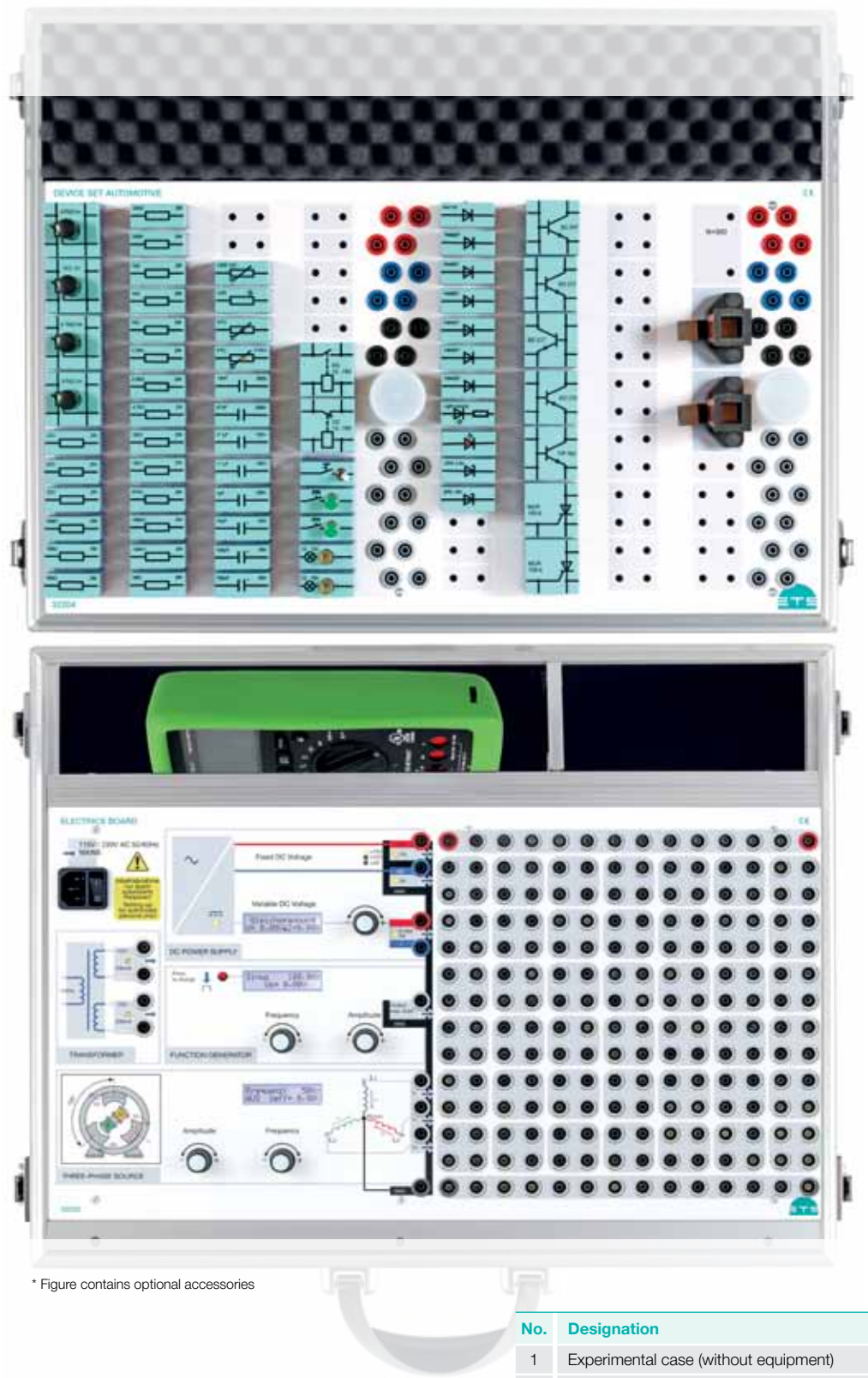
- Voltage sources DC +/-15 V or +/-12 V or +/- 5 V/1 A; DC 0...30 V / max. 1 A with voltage and current display; AC 2 x 12 V/0.2 A (fused via PolySwitch)
- Function generator frequency 0.1 Hz...200kHz, amplitude 0...10 VS and waveform adjustable, display of all quantities
- Phase voltage 0...10 V (rms.); conductor voltage 0...17.3 V (rms.); frequency 1...400 Hz adjustable, display of all quantities, current load per phase max. 400 mA (rms.)
- 42 plug-in fields in 19mm grid with 5 electrically connected 4mm safety sockets each
- Main connection 230 V AC; 50 Hz; 75 W; potection class I
- Safety power supply outputs short-circuit- and regenerative-proof up to 40 V DC/ 24 V AC, 40 W

No.	Designation	Order No.
1	Electrics Board	32030


DEVICE SET AUTOMOTIVE
32204

FUNDAMENTALS OF AUTOMOTIVE ELECTRICS – CASE

Mobile – ready for use anytime, anywhere



1 and 2

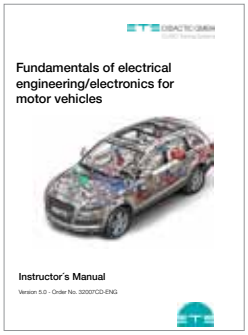
* Figure contains optional accessories

No.	Designation	Order No.
1	Experimental case (without equipment)	91801
2	Experimental case with Electrics Board and set of components Device Set Automotive	32030-Z04

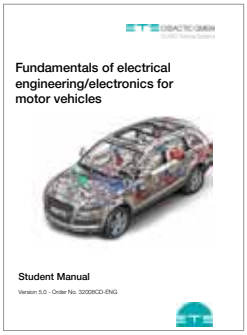
COURSEWARE

Fundamentals of electrical engineering for automotive engineering

1



2



3

Printed and digital

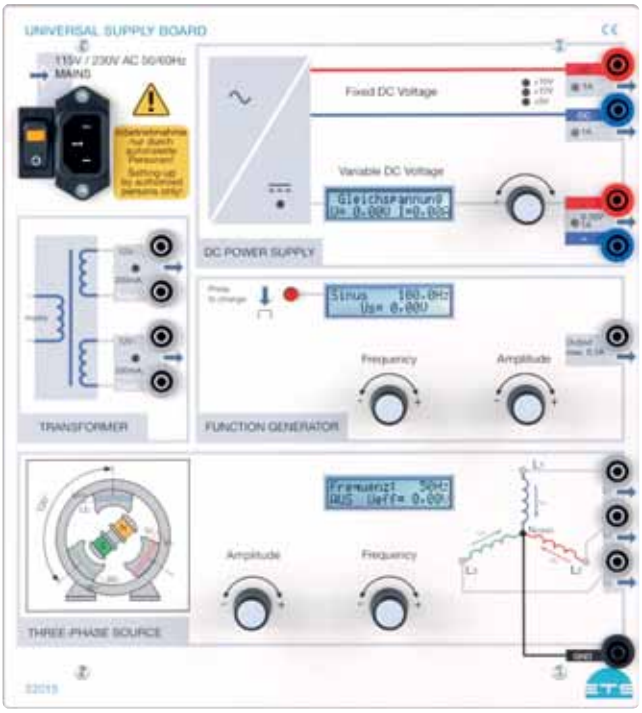
Manual content

- The electric circuit
- Ohm´s law
- Electrical resistors
- Interconnection of voltage sources
- Electric power and work
- Efficiency
- Types of current and their characteristics
- Active power of alternating voltages
- Three-phase alternating current (three-phase-current)
- The capacitor
- Electromagnetism and coils
- Transformators
- Electric motor
- Diodes and rectifier circuits
- Bipolar transistors
- Electrical and electronic switches
- The thyristor triode

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Fundamentals of electrical engineering automotive - Instructor´s Manual	32007CD-ENG
3	Fundamentals of electrical engineering automotive - Student Manual	32008CD-ENG
n.ill.	TECHNOCard - Electrics Board (Information on p.43)	32031-ENG

UNIVERSAL SOLUTIONS

Universal power supply



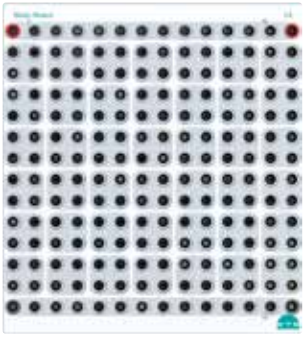
1

Technical data

- Voltage souces DC +/-15 V or +/-12 V or +/- 5 V/1 A; DC 0...30 V/max. 1 A with voltage and current display; AC 2 x 12 V/0.2 A (fused via PolySwitch)
- Function generator frequency 0.1 Hz...200 kHz, amplitude 0...10 VS and waveform adjustable, display of all quantities
- Three-phase generator phase voltage 0...10 V (rms); phase voltage 0...17.3 V (rms); frequency1...400 Hz adjustable, display of all quantities, current load per phase max. 400 mA (rms)
- Mains connection 230 V AC; 50 Hz; 75 W; protection class I
- Safety power supply outputs short-circuit and regenerative proof up to 40 V DC/ 24 V AC, 40 W

No.	Designation	Order No.
1	Universal Supply Board	32015

Plug-in Boards / Assembly Boards

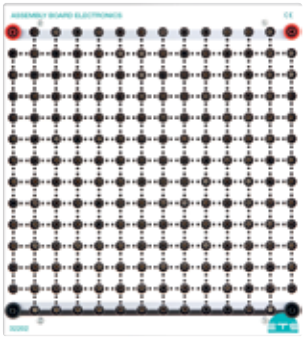


1

Technical data

Universal mounting plate for setting up experimental circuits with pluggable components

- Patch panel with 4mm safety sockets, arranged in 19mm grid; four sockets each are electrically connected to each other. Electrical connections on the front panel are color-coded.
- Experimentier board im DIN A4 format with photorealistic, four-color design of the front panel
- Colored wire representation accoring to color code
- The board surface is scratch-resistant due to a special coating
- Didactic standard labeling with operating instructions and connection options facilitate commissioning for the user



2

Technical data

Universal mounting plate for setting up experimental circuits with pluggable components

- Patch panel with 4mm safety sockets, arranged in 19mm grid. Each 4mm socket is surrounded by four 2mm sockets, which are electrically connected to it.
- Experimentier board im DIN A4 format with photorealistic, four-color design of the front panel
- Colored wire representation accoring to color code
- The board surface is scratch-resistant due to a special coating
- Didactic standard labeling with operating instructions and connection options facilitate commissioning for the user

No.	Designation	Order No.
1	Basic Board	32013
2	Assembly Board Electronics	32202

TRAINING CONCEPT ELECTRICAL ENGINEERING

9 topics, 64 chapters, 775 pages in 3 folders

Teaching – Training – Technology

MEDIA-T3BoxX
teaching training technology

Discover the excellent concept of the Media-T3BoxX.

Supplement your teaching in a new, easy and uncomplicated way with a hardware-independent training concept for electrical engineering.

In nine chapters, participants are taught the basics of electrical engineering, based on a student script.

The lecturer document is characterized by a clear red thread.
1000 questions and answers, as well as many prepared exames, make sustainable teaching easy.
The documents are designed for approximately 160 – 175 teaching units.

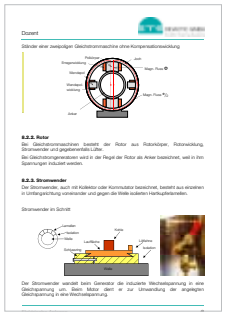
Special design:
The instructor can see by the colors whether the student has the same information or whether he has to work out the formula, calculations or pictures with the participants.

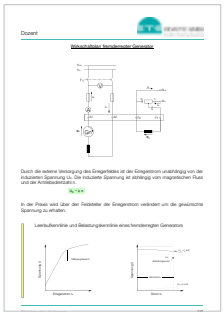
Highlights
- Clear red thread
- Approx. 1000 questions and answers
- 14 exams
- Many PowerPoint slides
- Each chapter is self-contained
- Hardware independent learning
- Modular ordering possible

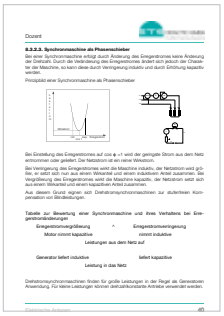
CONCEPT EXAMPLE

MEDIA-T3 BoxX
teaching training technology

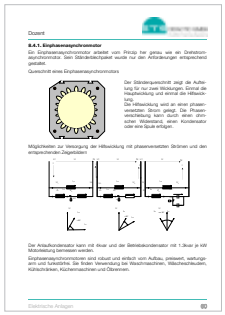
Topic: electrical machines

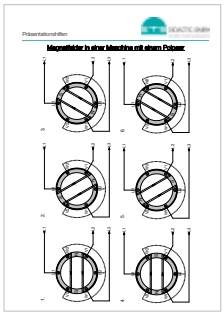


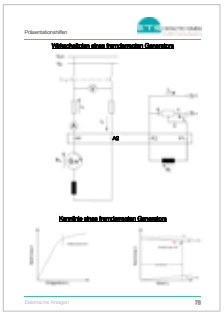




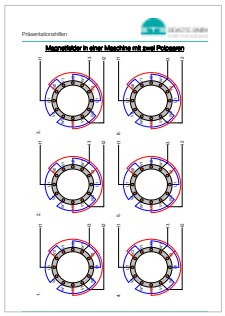
Lecturer



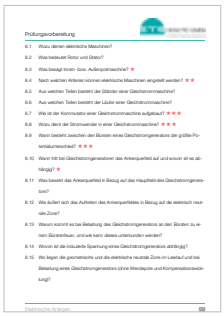




Presentation Aids



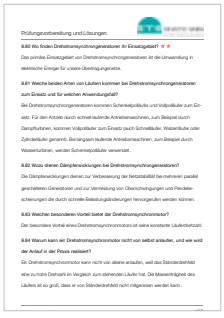
Questions



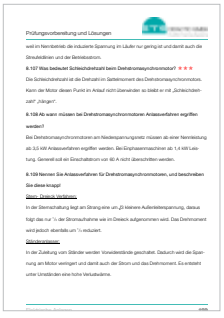
Questions and solutions

Exam preparation

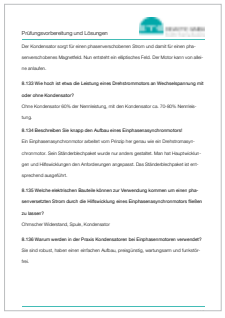
Exam 1



Exam 1 and solution



Exam 2



Exam 2 and solution

Exam

MEDIA-T3-BOXX

Courseware

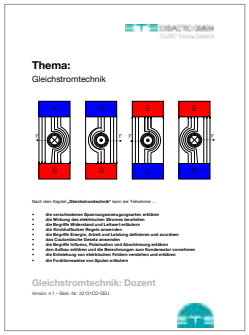
1

Printed and digital

2

Chemistry/electrochemistry

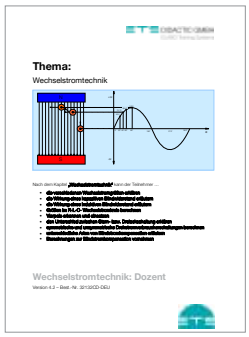
- Basic terms like substances, mixtures, chemical compound
- Explain and understand the periodic table
- Different types of bonds
- Difference between cohesion and adhesion
- Different groups of substances
- Sequence of an electrolysis
- Circuits of electric voltage generators
- The electrochemical equivalent
- Term voltage series
- Different primaty and secondary elements
- The electrical behaviour of electrochemical elements
- The chemical process corrosion
- Types of corrosion protection



3

Direct current technology

- Different types of voltage generation
- Evaluate the effect of electric current
- The terms resistance and conductance
- Kirchhoff´s rules
- Concept of energy, work and power
- Coulomb´s law
- Influence, polarization and shielding
- Construction of capacitor and the calculation
- Formation of electric fields
- The function of coils



4

Alternating current technology

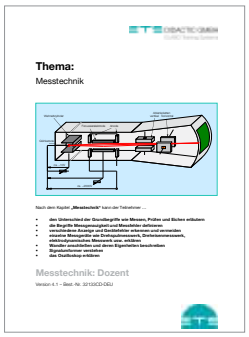
- Explain alternating current quantities
- Effect of capacitive reactance
- Effect of inductive reactance
- Calculate quantities in the R-L-C alternating current circuit
- Recognize and use for poles
- Difference between star and delta connection
- Calculate symmetrical and unbalaced three-phase circuits
- Different types of reactive current compensation
- Calculations for reactive current compensation

No.	Designation	Order No.
1	Set of ETS ring binders	91906
2	Chemistry/electrochemistry	32130CD-ENG
3	Direct current technology	32131CD-ENG
4	Alternating current technology	32132CD-ENG

MEDIA-T3BoxX
teaching training technology

1

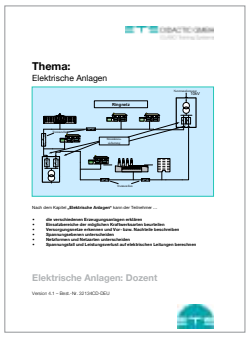
Printed and digital



2

Measuring technology

- Difference of the basic terms measuring, testing and calibrating
- Terms measurement accuracy and measurement error
- Detect and avoid display and device errors
- Measuring devices such as moving coil measuring mechanism, moving iron measuring mechanism, electrodynamic measuring mechanism
- Connecting transducers and their characteristics
- Signal converter
- The oscilloscope



3

Electrical plants

- Explain generation plants
- Fields of application of the possible types of power plants
- Supply networks and their advantages and disadvantages
- Differentiate between voltage levels
- Distinguish between network forms and networks types
- Voltage drop and power loss on electrical lines

4

Switchgear

- Actuator types
- Important characteristics
- Characteristics of line circuit breakers
- Differences between disconnectors, load breakers and circuit breakers
- Proper use of contactors and relays
- Selecting and using safety protection combinations

No.	Designation	Order No.
1	Set of ETS ring binders	91906
2	Measuring technology	32133CD-ENG
3	Electrical plants	32134CD-ENG
4	Switchgear	32135CD-ENG

MEDIA-T3 BOXX

Courseware

1

Printed and digial

2

Transformers

- Structure and effect of transformers
- Processes during a load and no-load operation
- Short-circuit voltage and short-circuit current
- Load characteristics
- Design of single-phase and three-phase transformers
- Basic requirements to ensure parallel operation of transformers
- Special transformers
- Design of welding transformers formators

3

Electrical machines

- Basic concepts of electrical machines
- Difference between DC generator and motor
- Armature reaction, current turns etc.
- Circuit types of direct current machines
- Construction of three-phase machines
- Different fields of application of three-phase machines
- Distinguishing and using special motors
- Recognize different single-phase motors

4

Control engineering

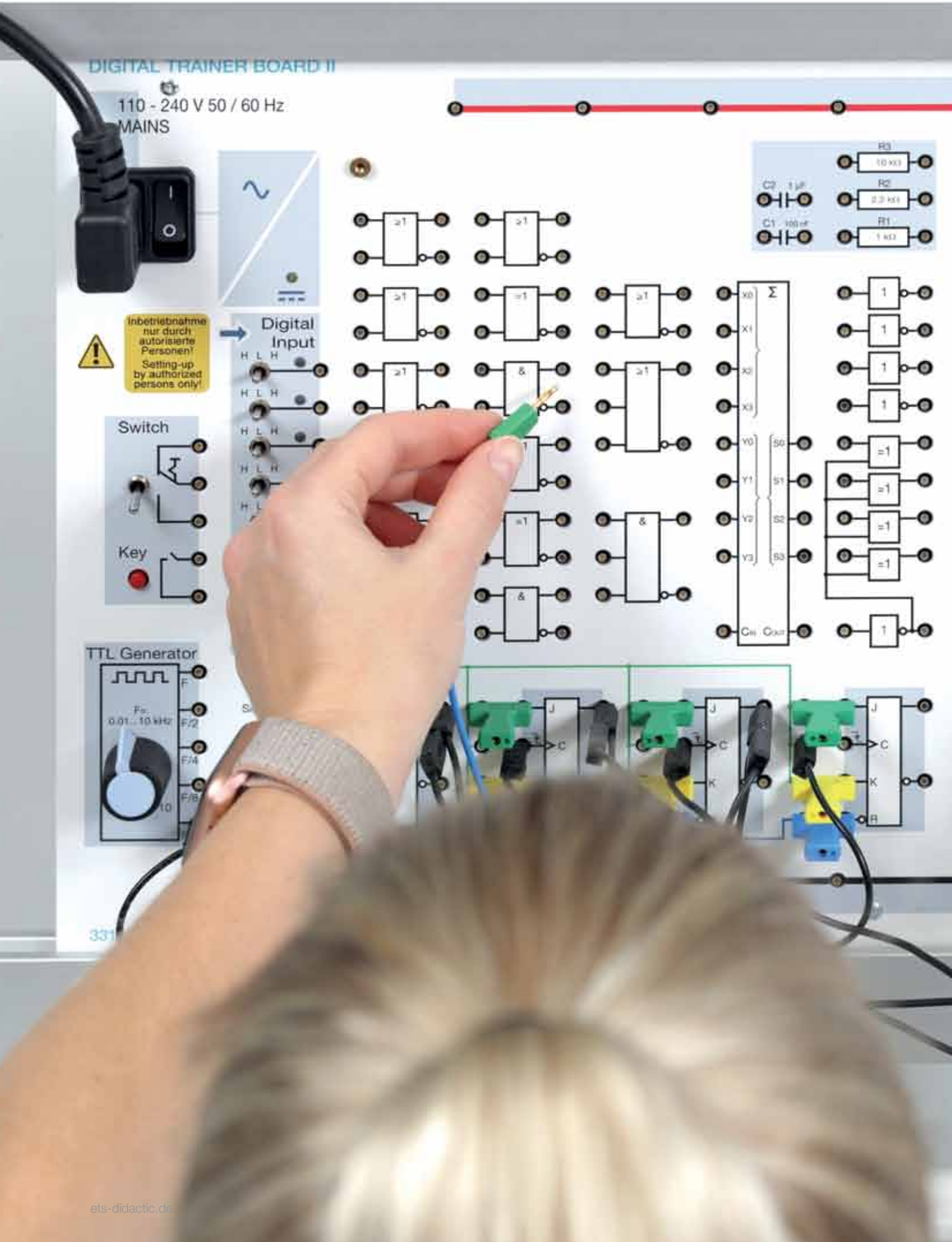
- Basic terms such as control path, actuator, manipulated variable
- Difference between open and closed loop control
- Types of control such as schedule ontrol, fixed value control and follow-up contol
- Difference between continuous and discontinuous controllers
- The most different continous controllers and their interaction with other controllers
- Controlled systems according to their order

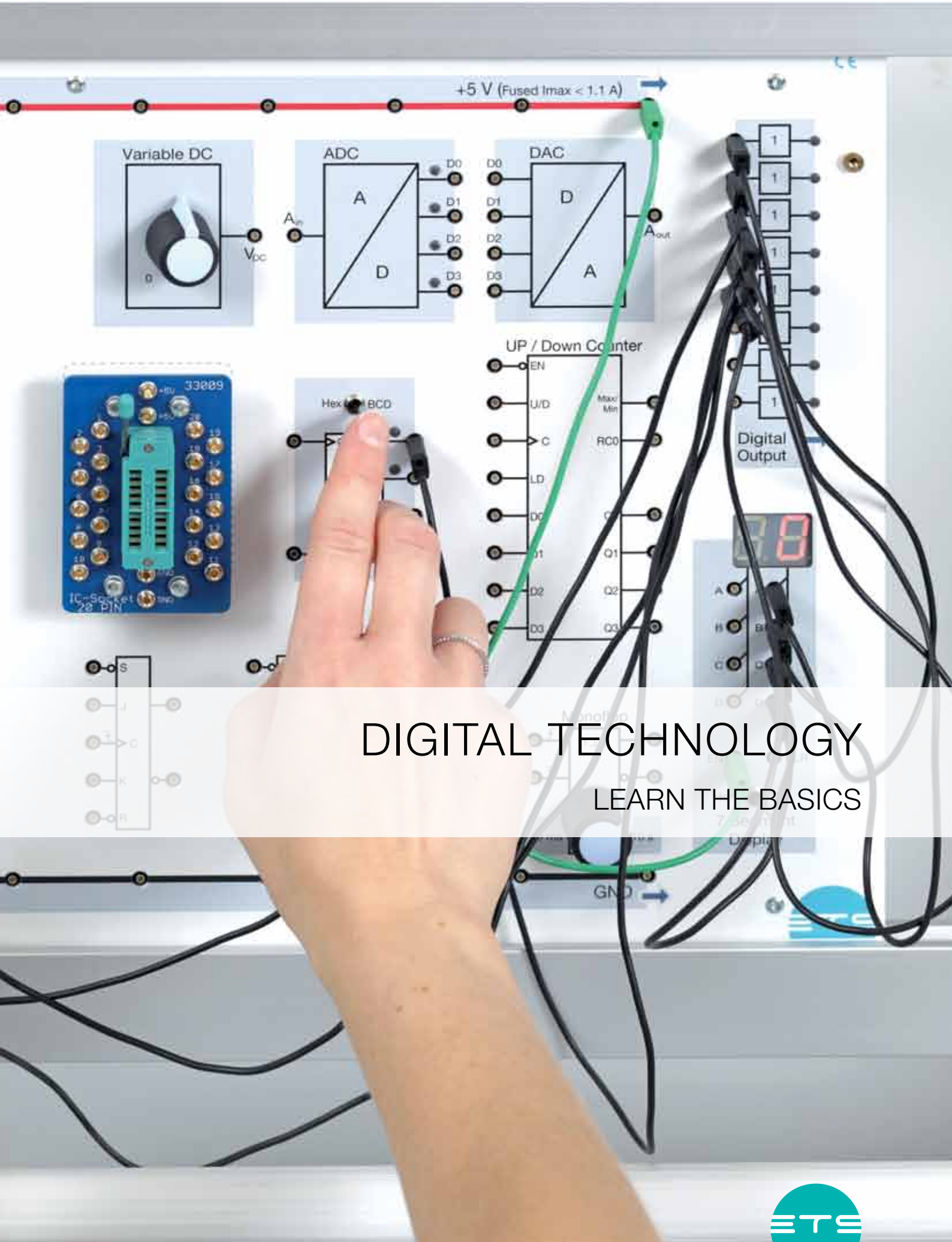
No.	Designation	Order No.
1	Set of ETS ring biners	91906
2	Transformers	32136CD-ENG
3	Electrical machines	32137CD-ENG
4	Control engineering	32138CD-ENG

ETS DIDACTIC GMBH

MEDIA-T3 BoxX

teaching training technology


DIGITAL TRAINER BOARD II
110 - 240 V 50 / 60 Hz
MAINS
Inbetriebnahme nur durch autorisierte Personen!
Setting-up by authorized persons only!
Digital Input
Switch
Key
TTL Generator



DIGITAL TECHNOLOGY

LEARN THE BASICS

HARDWARE

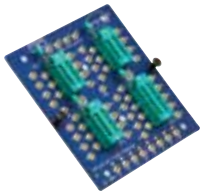
Digital technology

Logic trainer

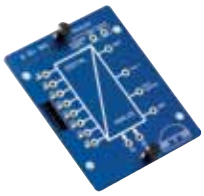
µ-trainer

Component collection logic ICs

Breadboard Wiring Set

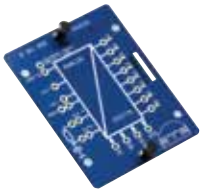


Universal logic module



8Bit DAU module

ELABOino-One

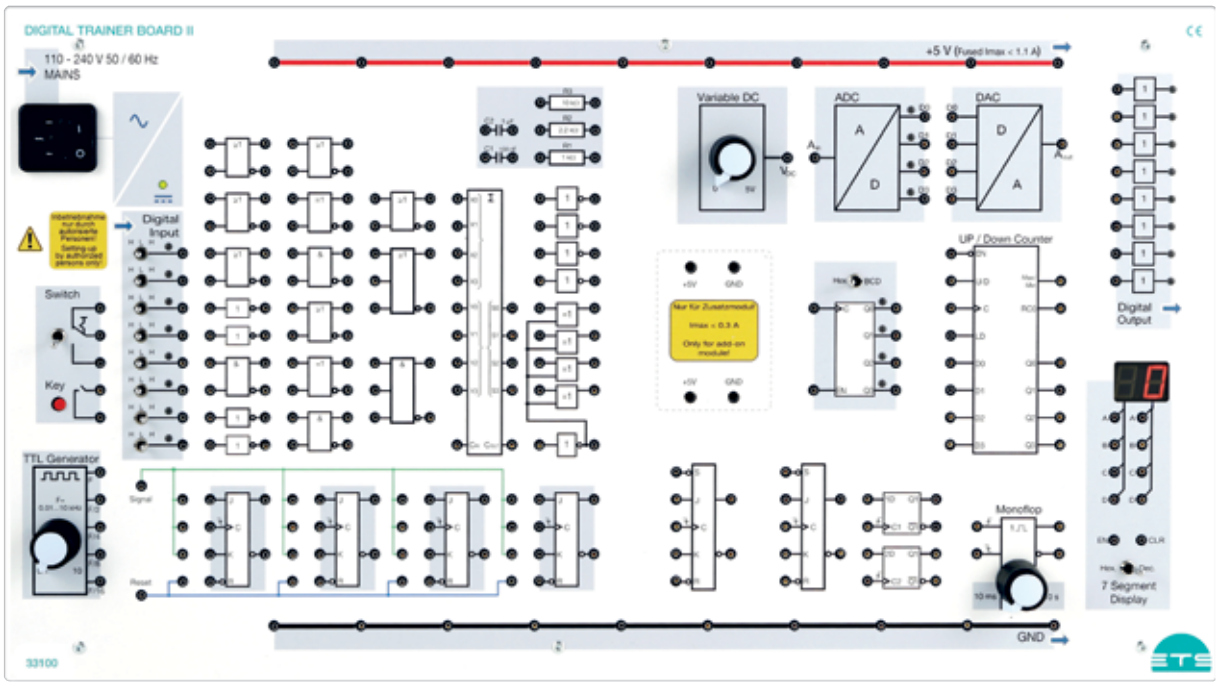


8Bit ADU module

Prototype module

DIGITAL TECHNOLOGY

Basic trainer digital technology



1

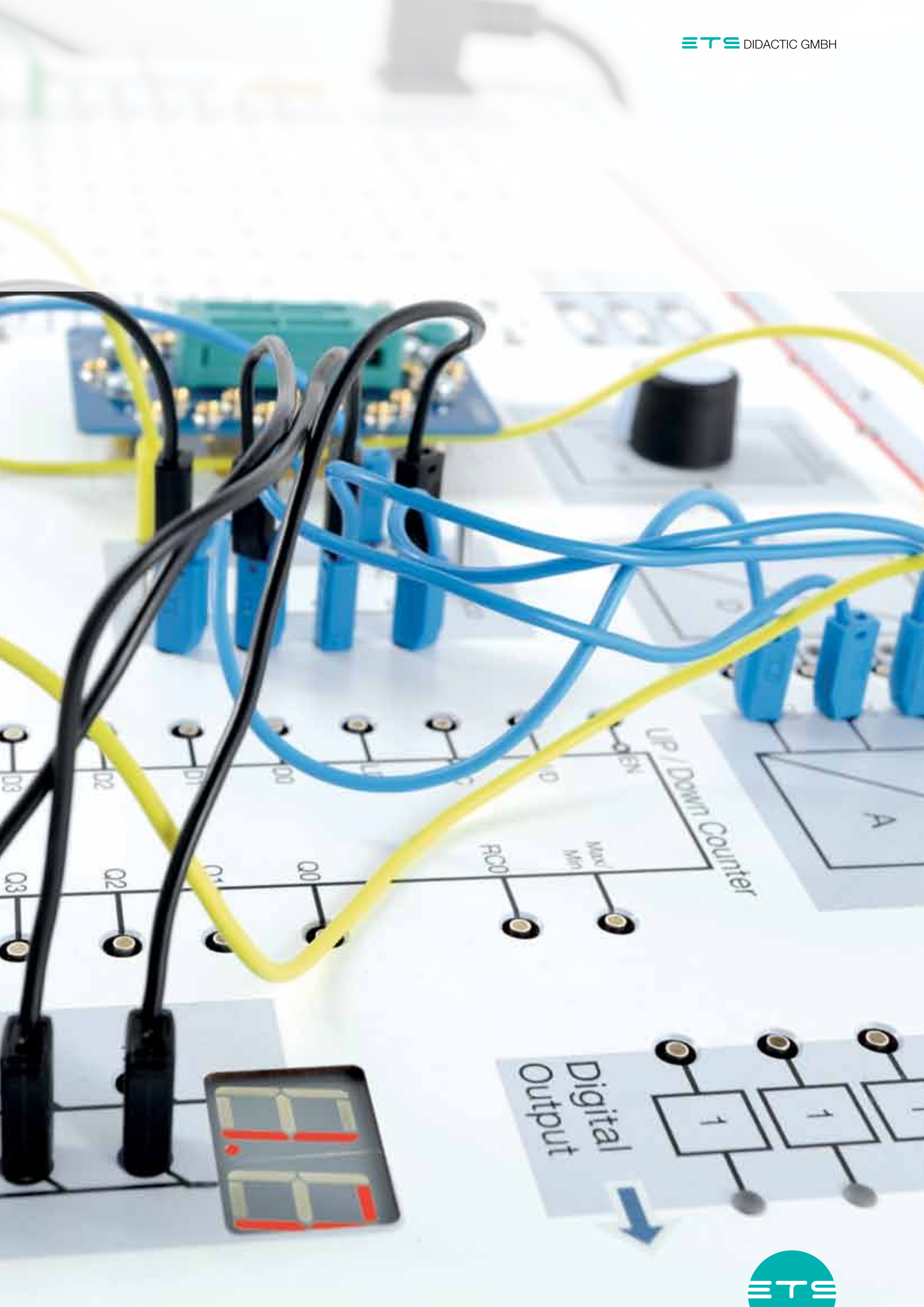
Learning objectives

- Basic circuits, properties and characteristic of digital circuits
- counters, flip-flops, registers, memories, ALU
- Building and analyzing control systems with digital technology components

Inegrated functions:

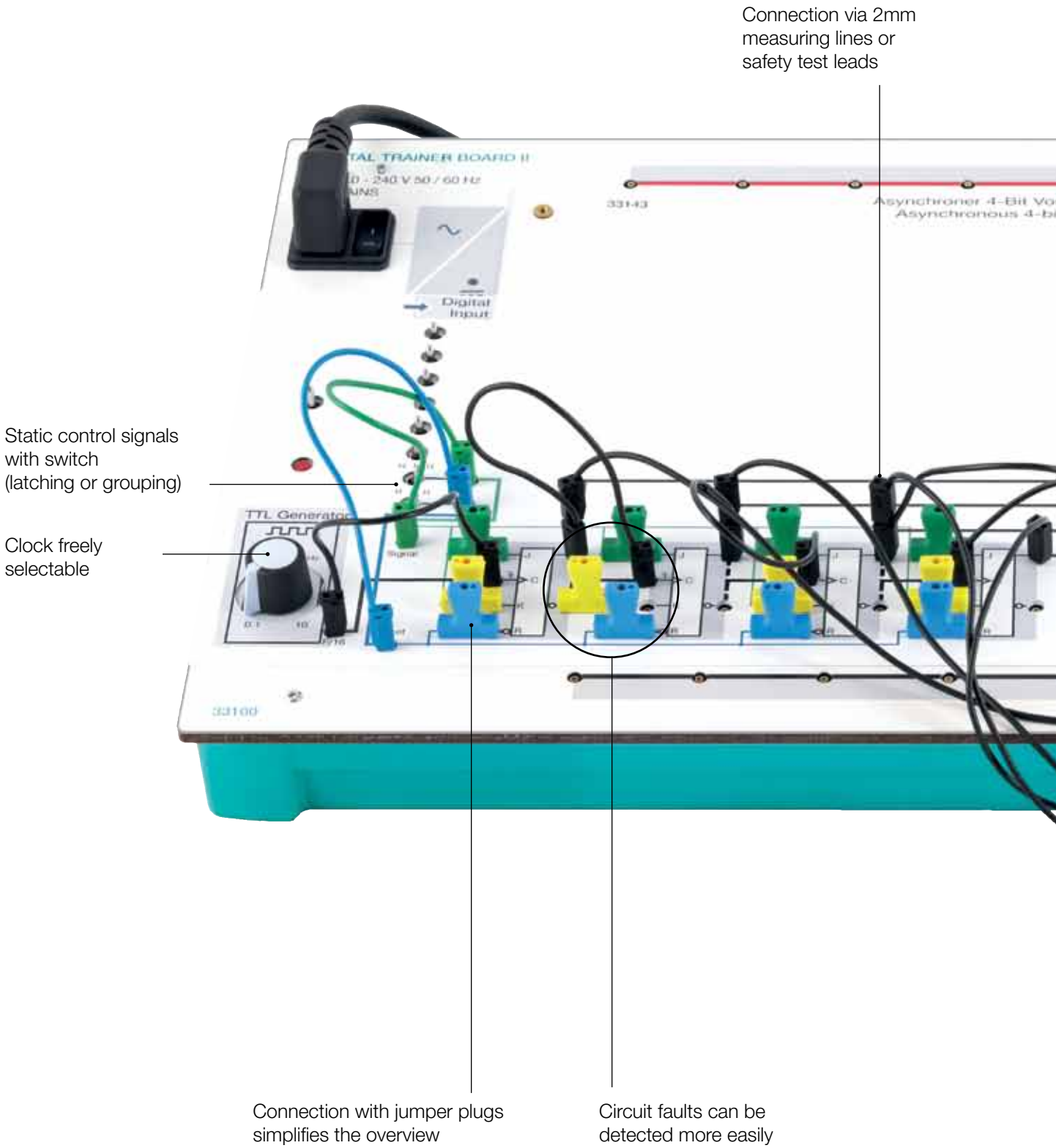
- Power supply, +5 V DC/1 A, stabilized and short-circuit proof
- Variable adjustable clockgenerator, 0.1...10 kHz, with downstream divider, divider factors: 2, 4, 8 and 16
- Bounce-free L/H input switches
- Toggle switch, freely switchable (not debounced)
- Pushbutton, freely switchable (not debounced)
- AND/NAND gates with 2 inputs each
- AND/NAND gate with 3 inputs each
- OR/NOR gates with 2 inputs each
- OR/NOR gates with 3 inputs
- XOR gates with 2 inputs
- Inverter
- JK master-slave flip-flops
- 4-bit full adder
- switchable HEX/DEC counter with optical display
- Up/down-4-bit binary
- 2-bit buffer with release
- variable adjustable monoflop, 10s, with positive or negative input
- 7-segment display (2 digits) with integrated decoder, switchable from hexadecimal to decimal
- LEDindicators with upstream driver
- adjustable voltage source 0 … 5 V
- ADU 4 bit
- DAU 4 bit
- 3 resistors and 2 capacitors to build up of RC timers
- Power-supplied slot for additional modules or IC sockets
- Distribution rail, +5V and 0V

No.	Designation	Order No.
1	Digital Trainer Board II	33100


UP / Down Counter
D3
D2
D1
D0
EN
RCO
Q3
Q2
Q0
A
Digital
Output
1
1

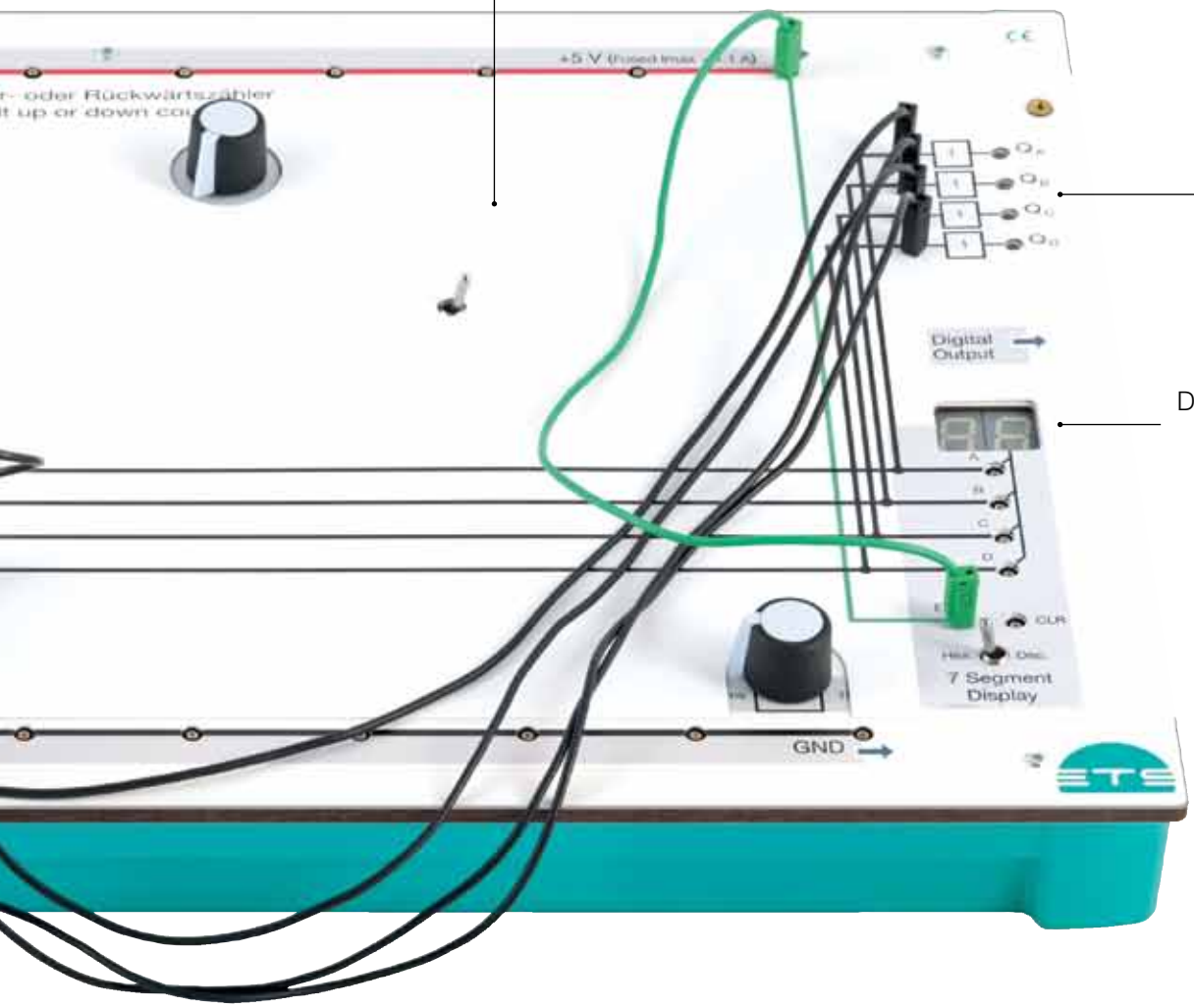
DIGITAL TECHNOLOGY

Digital Trainer Board II in the experiment "Asynchronous 4-bit counter"



Overlay mask for the experiment facilitate the experiment setup and provide an overviews

Digital Trainer Board II including overlay mask for didactic reduction to the essentials.

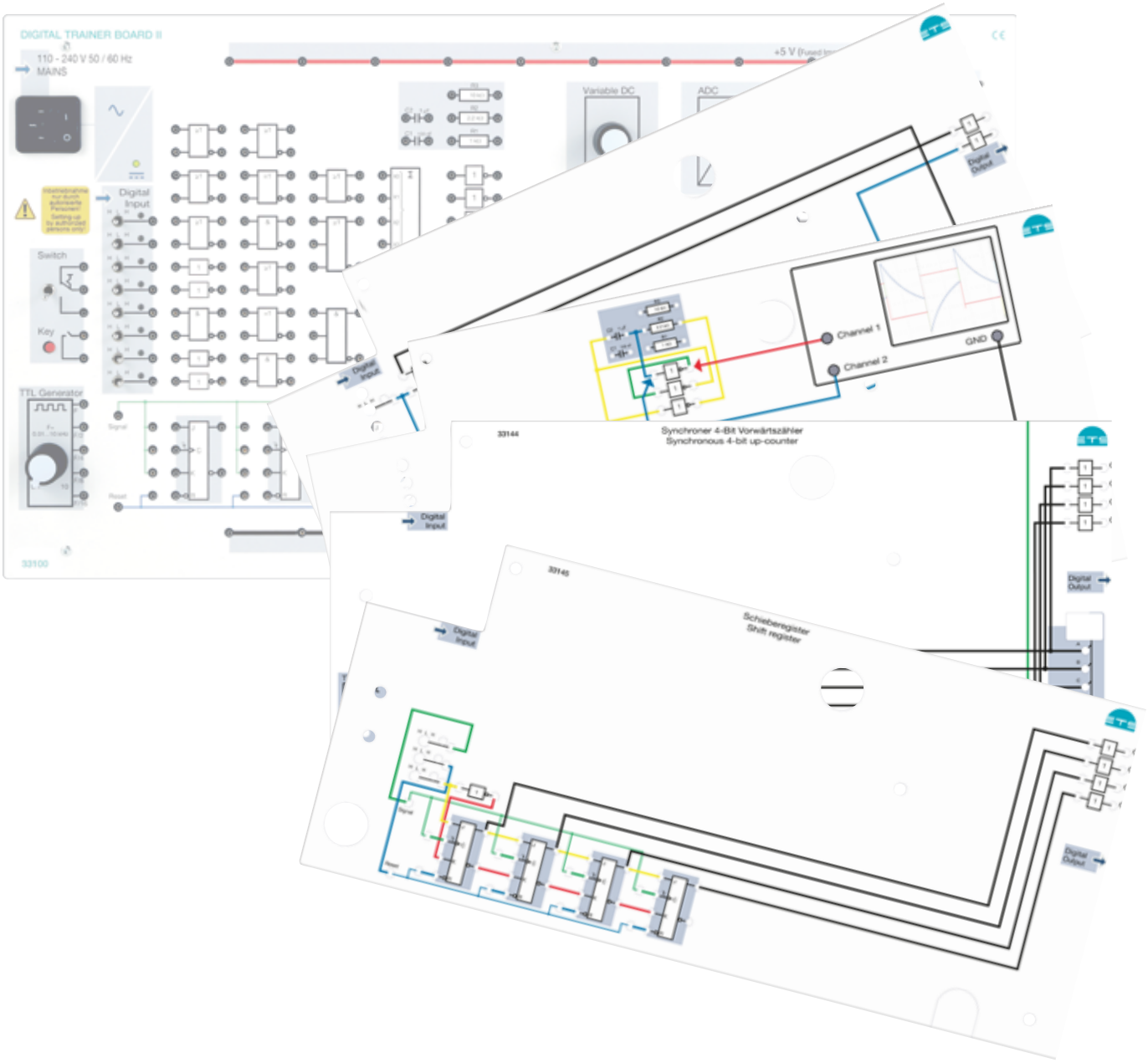


Display binary

Display hexadecimal or decimal

DIGITAL TECHNOLOGY

Basic digital technology trainer – overlay masks



No.	Designation	Order No.
1	Set of overlay masks – digital technology	33105

Courseware

1

2

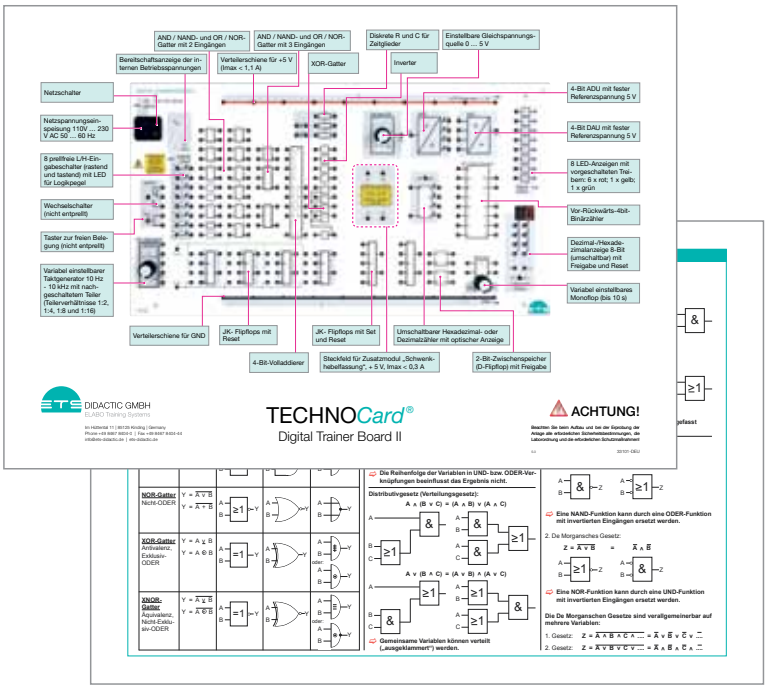
3

Printed and digital

Manual content

- Comparison analog technology — digital technology
- Logical basic connection
- Compound basic operations
- TTL circuits in practice
- The laws of switching algebra
- Development of digital circuits
- Analysis of logical switching networks
- Toggle stages, counter circuits
- Shift registers, memory registers
- Codes and code converters
- Computing circuits
- A/D converters — D/A converters
- Multiplexer — demultiplexer
- Application examples

TECHNOCard®

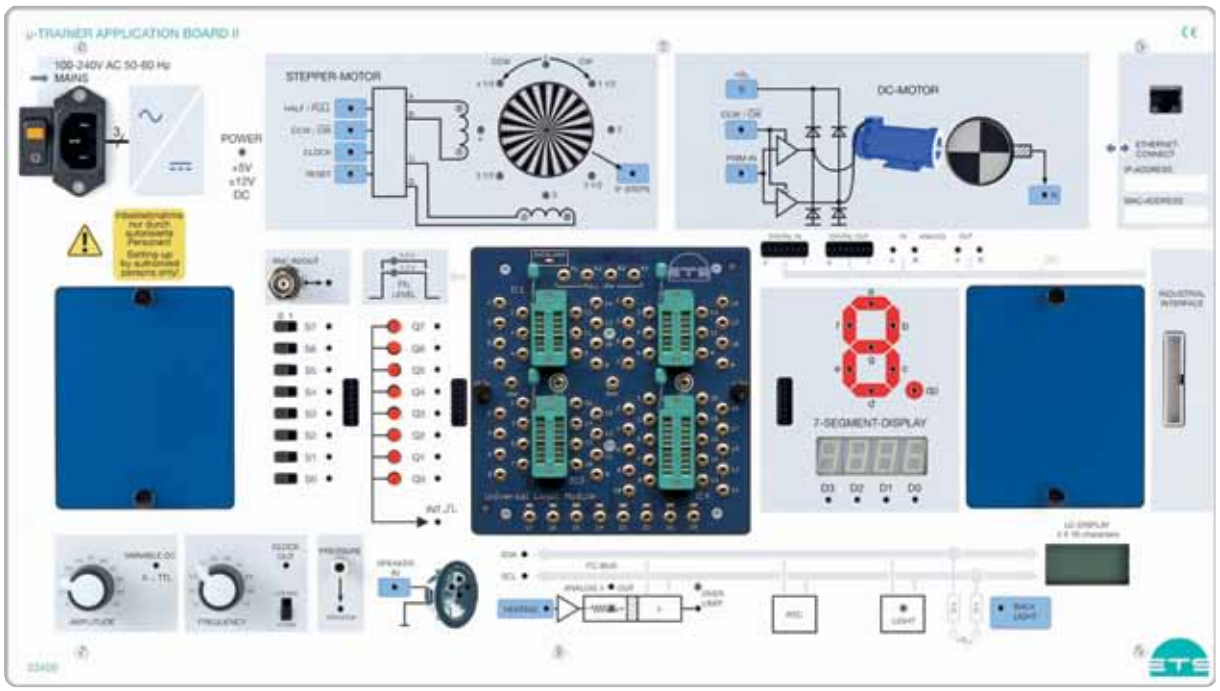


4

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Basics of digital technology - Instructor´s Manual	33111CD-ENG
3	Basics of digital technology - Student Manual	33110CD-ENG
4	TECHNOCard - Digital Trainer Board II	33101-ENG

µ-TRAINER

Basics of digital technology with ICs



1

Learning objectives

- Methods of digital circuit analysis
- Methods of digital circuit synthesis
- Logic circuits in practice
- Construction of circuits with ICs
- Characteristics of circuits
- Measuring equipment and methods
- Complex logic circuits and converters

Technical data

- Computer interface via Ethernet
- Connection via 2mm plug-in system or bus connector (8-pin 1:1, ribbon cable)
- Power supply: 110 … 240 V AC 50 … 60 Hz
- Internal operating voltage: 3.3 V; 5.0 V; +/-12 V
- Central on/off switch
- Logic level: 3.3 V or 5.0 V
- Dimensions: 532 x 297 x 85mm
- Device form: console housing

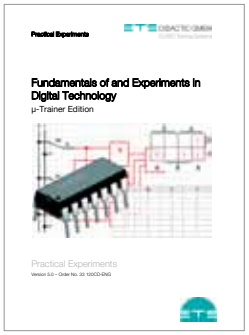
µ -Trainer Application Board II equipped with 33406 Universal Logic Module

No.	Designation	Order No.
1	µ -Trainer Application Board II	33400

Courseware

1

2



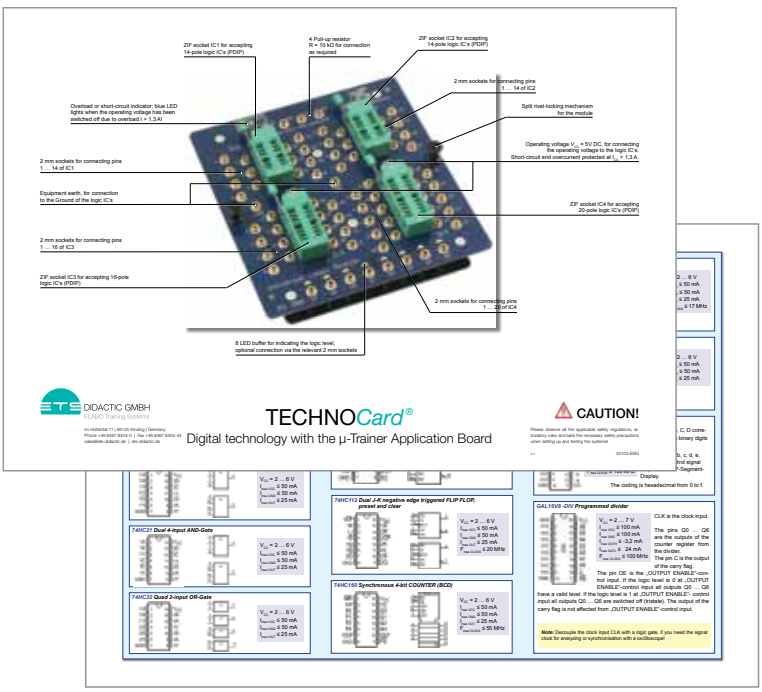
3

Printed and digital

Manual content

- Introduction of digital technology
- Basic logic circuits
- Logic circuits in practice
- Boolean circuit algebra
- De Morgan´s laws
- Circuit synthesis
- Disjunctive normal form
- Conjunctive normal form
- Adders and subtractors
- Comparators
- Flipflops
- Monostable flipflops
- Astable flipflops
- Counter circuits
- Shift registers
- Multiplexers and demultiplexers
- Analog-to-digital converters
- Digital-to-analog converters

TECHNOCard®



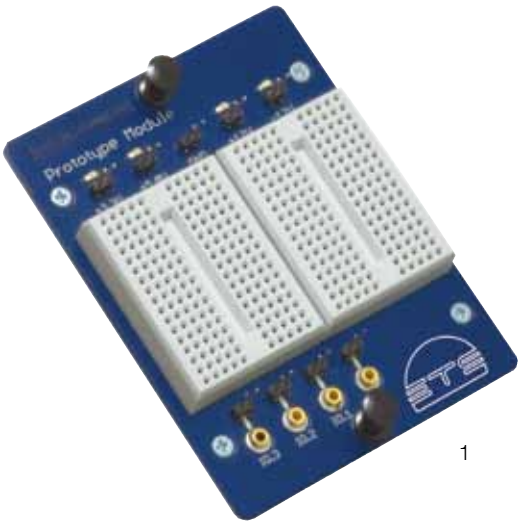
4

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Fundamentals and basic circuitsof digital technology - Instructor´s Manual	33121CD-ENG
3	Fundamentals and basic circuitsof digital technology - Student Manual	33120CD-ENG
4	TECHNOCard - Digital technology on the µ-trainer Application Board	33103-ENG


TECHNOCard®
Nutzung des Application Board II
ACHTUN

MODULE

Prototype module



1

Technical data

- 2 breadboard pads 10 x 17 pin
- 4 control inputs with 2mm sockets and pin
- 4 operating voltage outputs on pin:
  3.3 V, 5.0 V, +12 V and –12 V
- Operating voltage 3.3 V und 5.0 V
  short-circuit proof, $I_{nom} \leq 1.3$ A
- Operating voltage +12 V and –12 V
  short-circuit proof, $I_{nom} \leq 0,3$ A
  (continuous load)
- Indication of operational readiness via LED
- Dimensions 78 x 95 x 32mm

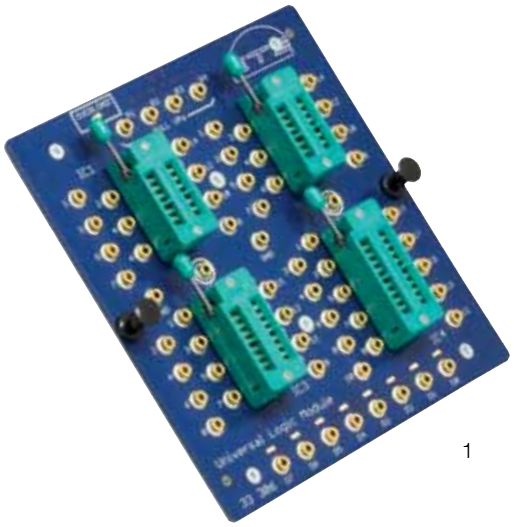
The "prototype module" is a self-contained extension module for the µC training system. It allows the additional and free construction of digital circuits basedon a breadboard system.

2

A useful accessory for the prototype module is the 33391 ***Breadboard Wiring Set***

No.	Designation	Order No.
1	Prototype module	33410
2	Breadboard Wiring Set	33391

Univeral logic module



1

2

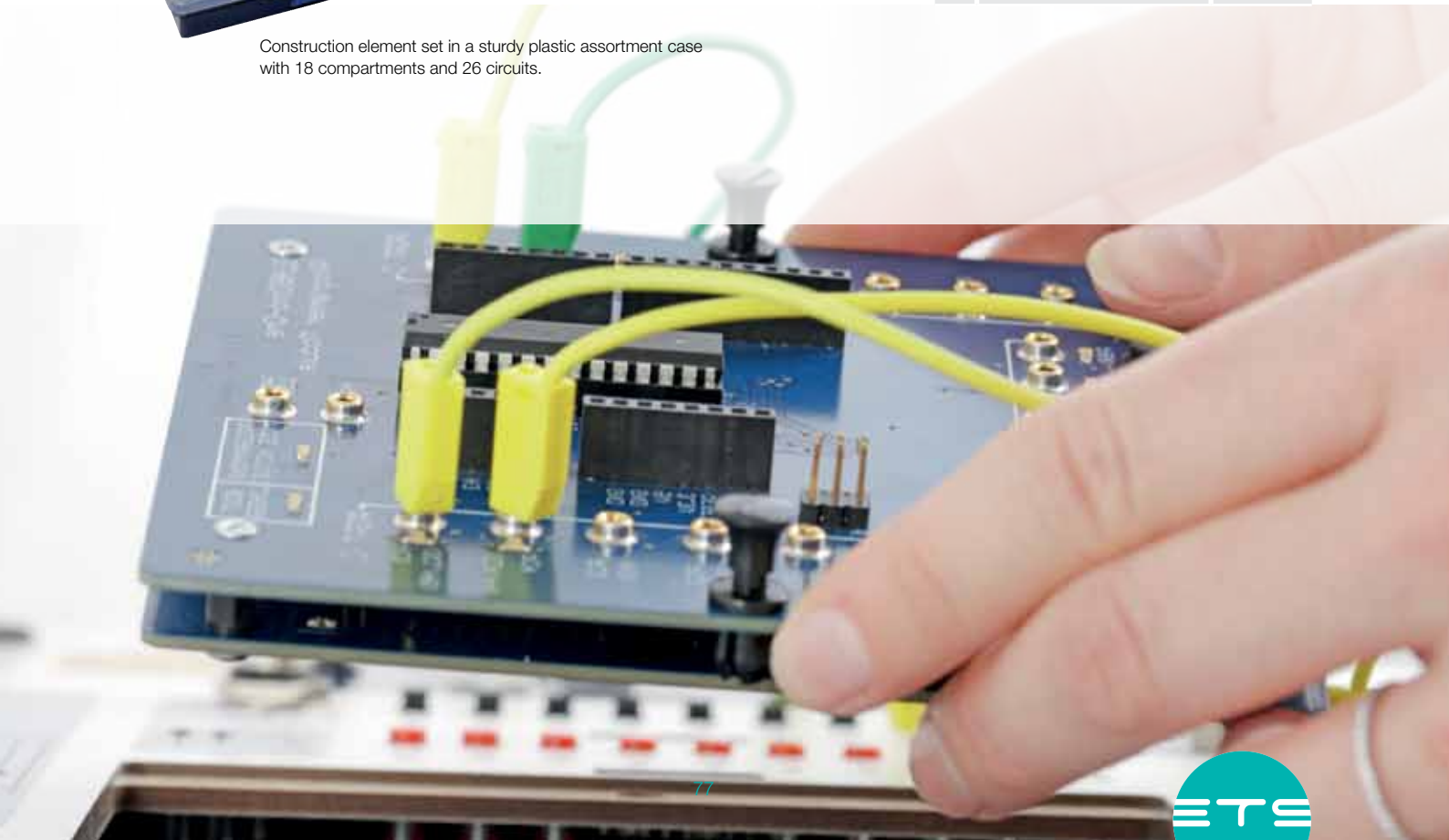
Construction element set in a sturdy plastic assortment case with 18 compartments and 26 circuits.

Technical data

- 4 ZIF socket, all pins freely connectable via 2mm sockets, of which
  - 2 x ZIF socket 14 pin
  - 1 x ZIF socket 16 pin
  - 1 x ZIF socket 20 pin
- 8 x LED with separate inputs for display of logic levels; buffered
- 4 x Pull-up 10 kΩ
- Logic level: +5 V TTL
- Operating voltage short-circuit proof, $I_{nom} \leq 1.3$ A
- Overload indication with brigh blue LED
- Dimensions 120 x 125 x 30mm

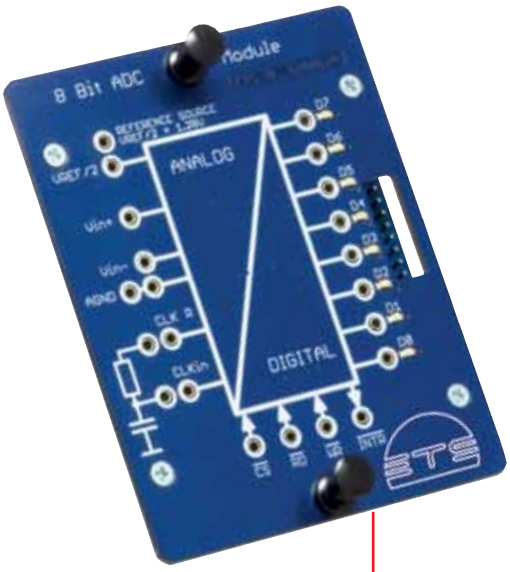
The "Universal Logic Module" (33406) is a self-contained extension module for the µC training systemand is used for the investigation and free experimentation with logic circuits.

No.	Designation	Order No.
1	Universal Logic Module	33406
2	Basic Set Logic ICs	33390

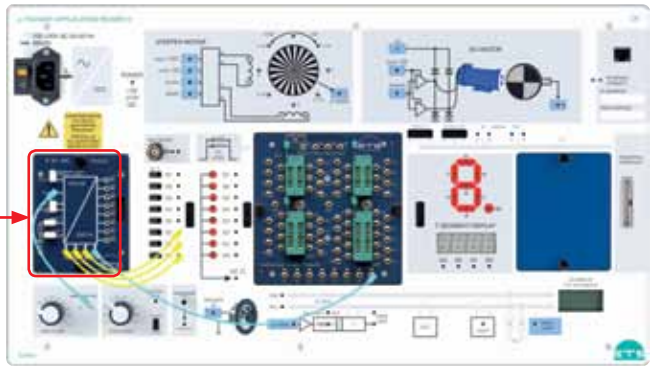


EXPANSION MODULES

8 Bit ADU module



1



Das „8 Bit ADU module“
is a self-contained extension module for the µC-training system.

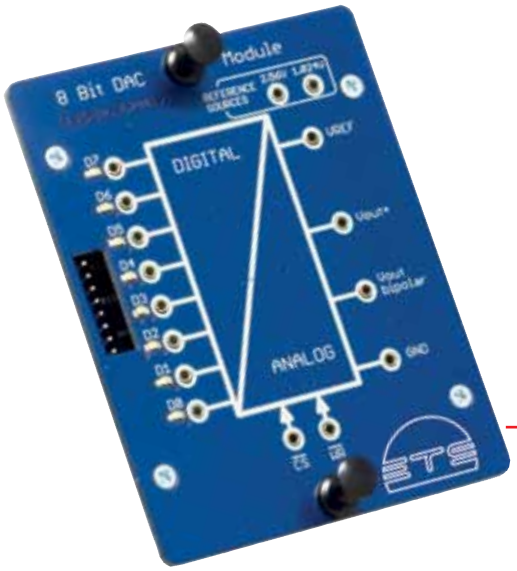
The 8 bit analog to digital converter can be operated with microcontroller control and also with static control signals to investigate the operation of an analog to digital converter.

Technical data

- 1-channel AD converter
- Reference voltages 2.56 V, Vcc internal or external up to maximum 5 V
  Attention: The reference voltage level to be fed in is 0.5 x V_{REF}!
- Differential input with 2mm sockets
- 8 outputs with 2mm sockets and bus connector
- 4 control inputs and outputs with 2mm sockets
- Logic level: +3.3 V or +5 V according to programmer or logic module specification
- Dimensions
  78 x 95 x 32mm
- with manual and CD-ROM, incl. example programs of the controller

No.	Designation	Order No.
1	8 Bit ADC module	33407

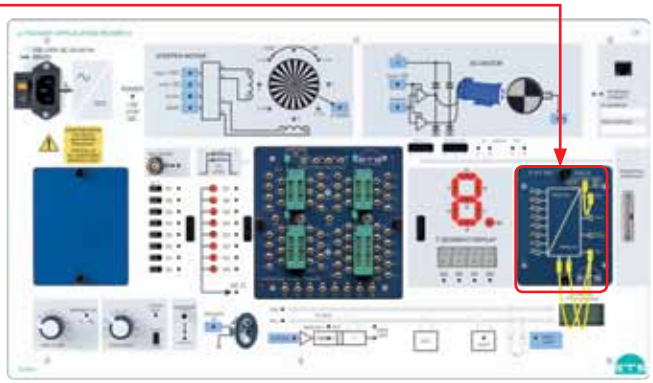
8 Bit DAU module



The „8 Bit DAU module“
is a self-contained extension module for the µC trainings system.

The 8-bit digital-to-analog converter can be operated with microcontroller control and also with static control signals to study the operation of a digital to-analog converter.

1



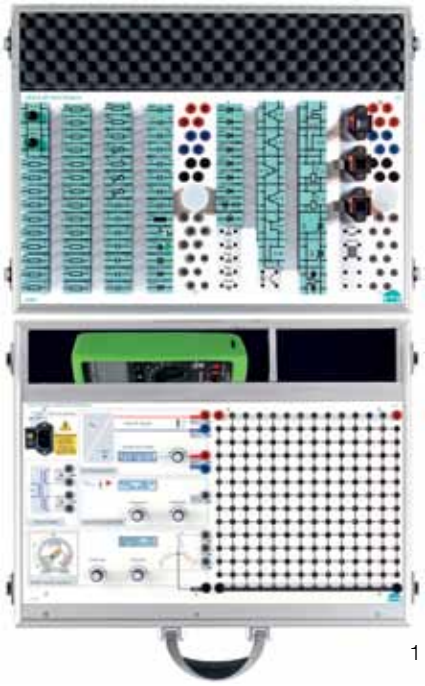
Technical data

- 1-channel DA converter
- Reference voltage 2.56 V, 1.024 V or external up to maximum 4.2 V
- 8 inputs with 2mm sockets and bus connectors
- 1 output with 2mm socket unipolar
- 1 output with 2mm sockets bipolar
- 2 control inputs with 2mm sockets
- Logic level: +3.3 V or +5 V according to programmer or logic module specification
- Dimensions 78 x 95 x 32mm
- with manual and CD-ROM, incl. example programs of the controller

No.	Designation	Order No.
1	8 Bit DAU module	33408

MOBILE SYSTEMS

Experiment at any place, at any time



1 and 2

We also supply our boards permanently installed in a lockable experimental case with removable lid, which provides space for the corresponding accessory sets.

Due to its robust yet lightweight aluminum outer shell, it is ideally suited for transport and at the same time allows safe and dust-free storage of the training systems.

No.	Designation	Order No.
1	Experimental case (without equipment)	91801
2	Experimental case with Electronic Circuit Board II and set of electrics/electronics components	3200-V2-Z03

MEASURING DEVICES

Digital multimeter, analog multimeter

1

2

3

Professional digital multimeter

The multimeter for training

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

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 malfunction protection
- AC and DC voltage up to 1000 V
- AC and DC current up to 10 A
- Resistance measurement 30 MΩ and continuity test
- Frequency and capacitance
- Temperature with PT-100 probe
- Diode test and duty cycle
- automatic range selection
- MAX/MIN and Data HOLD
- AutoPowerOFF

Analog multimeter

for training

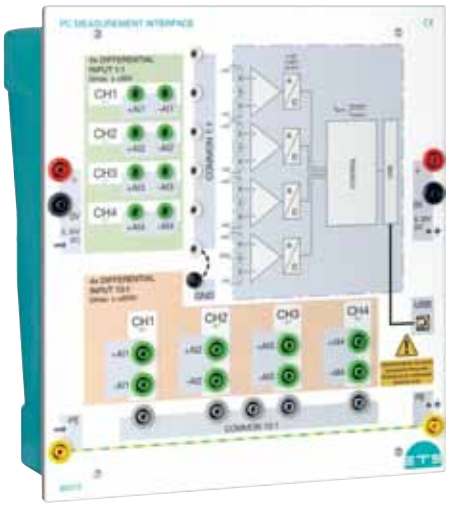
The multimeter meets the requirements for teaching and professional training and is also suitable for calibration and revision wotk in service.

Funktions

- Voltage measurement 0...100/300 mV/1 V=0 ... 3/10/30/100/300 V=/~
- Current measurement 0 ... 100 mA/1/10/100 mA/1/3 A = ~
- Optional setting: zero left/center
- Excellent overload capability, automatic battery shutdown
- Accessories

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

Oscilloscopes



1

PC Measurement Interface

For detailed info on page 32-30.

2

Color digital oscilloscope 30MHz

- 125 MSamples/s per channel
- Signal memory 10.000 x 8 bits per channel
- 2 channels
- Deflection coefficients 2 mV/Div to 10 V/Div, time base 5 ns/Div to 100 s/Div
- USB interface incl. software and driver
- Color display

No.	Designation	Order No.
1	PC Measurement Interface	90272
2	Color digital oscilloscopes 30MHz	90266

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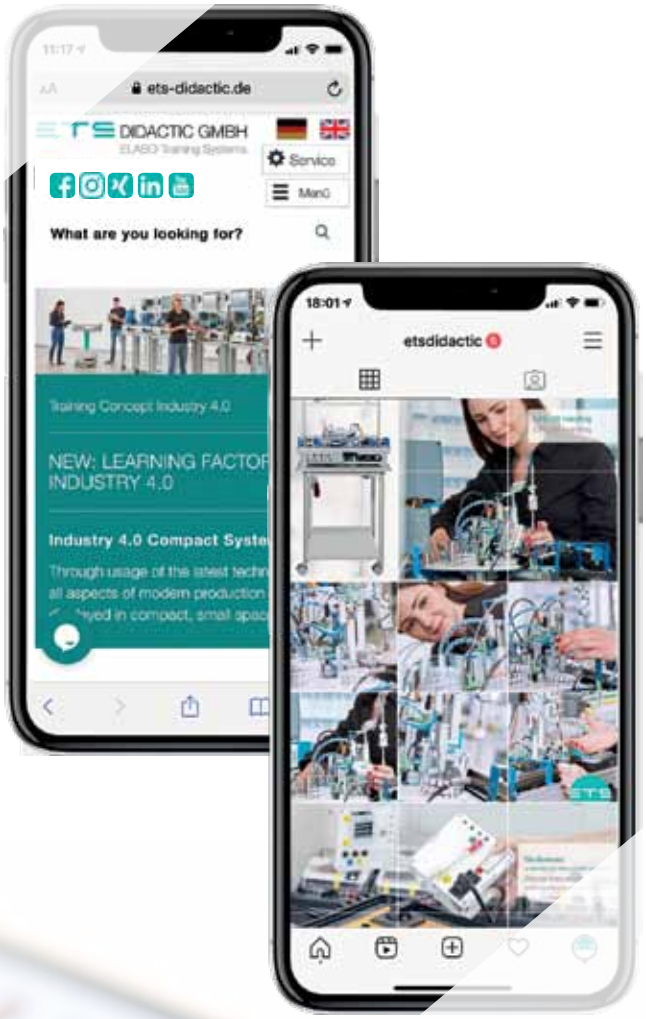
with us on social media



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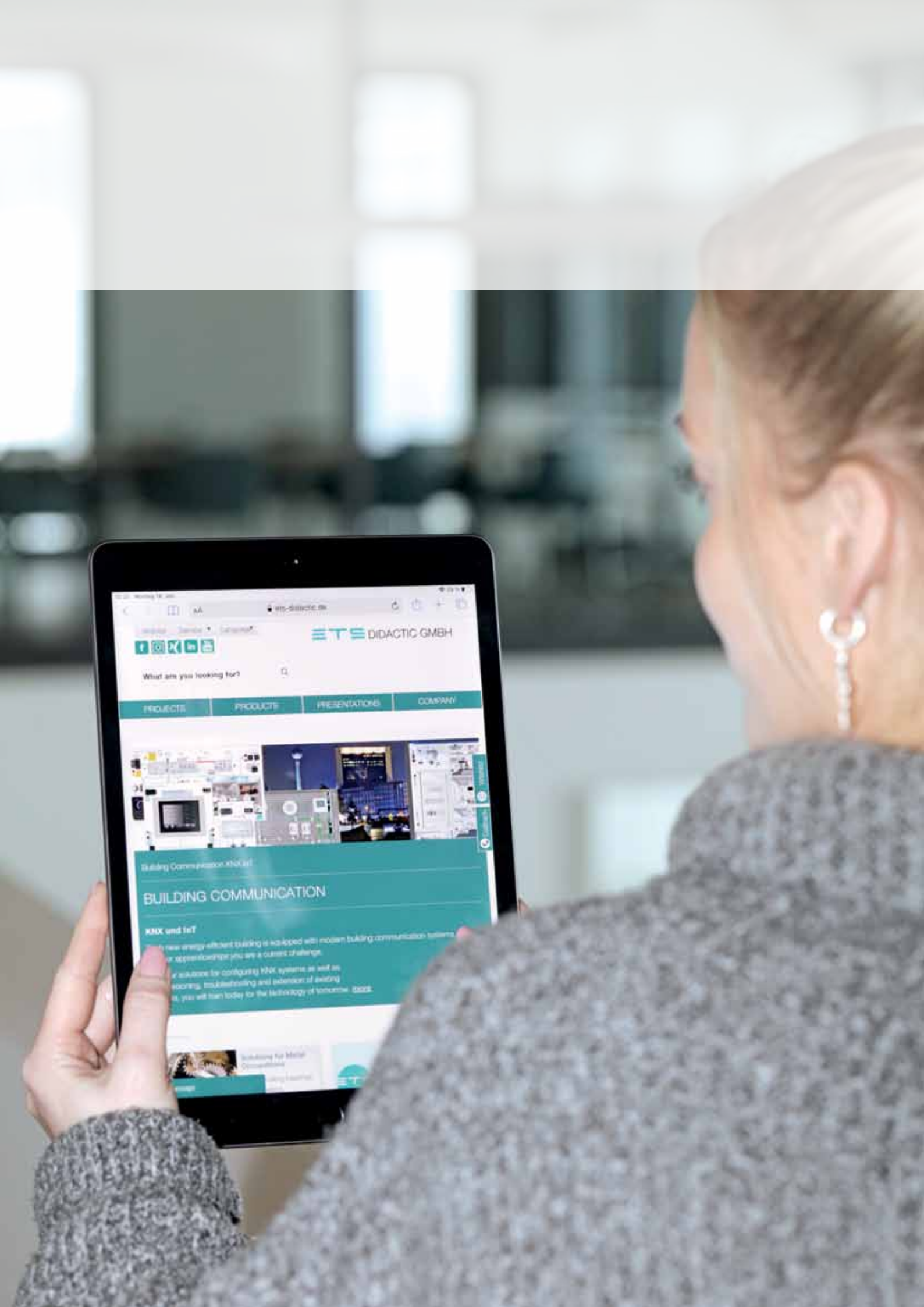
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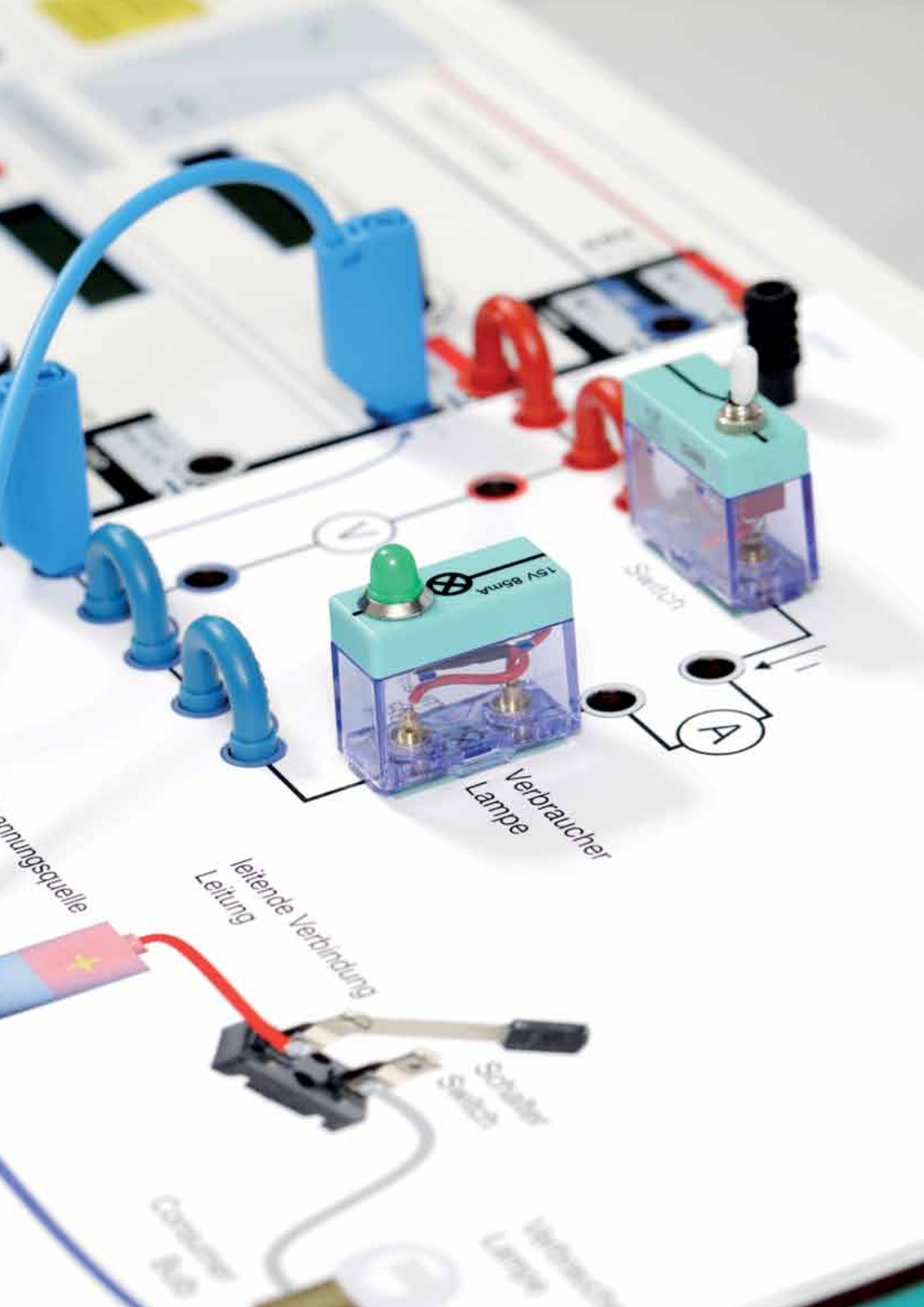
1.5V 85mA
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A
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YOUR ENQUIRY

Electrical engineering / Electronics / Digital technology – The basics in detail

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	Elektronic Circuit Board incl. assembly kit 32203	32200-V0-Z03
	Device Set Electronics	32203
	DC-Motor 24V / 17W	32620
	Three-phase current synhronmotor AC3/10V	32621
	Electrics Board	32030
	Didactic overlay maske set 1 full format	32040
	Didactic overlay maske set 2 full format	32070
	Didactic overlay maske set 1 half format	32140
	Didactic overlay maske set 2 half format	32170
	Electrics Board Case with Device set 32302	32030-Z04
	Device Set Basics	32302
	Handbook Instructor's Manual, incl. CD	32003CD-ENG

Qty	Designation	Order No.
	Handbook Student Manual, incl. CD	32004CD-ENG
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	Fundamentals of electrical engineering/electronics	
	Set of ETS ring binders	91903
	DC technology	
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	Handbook Student Manual, incl. CD	32121CD-ENG
	TechnoCard® – Electric Circuits Board II	32201-ENG
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Continuation - see page 2

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March 2021

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