ETS DIDACTIC GMBH

INSTALLATION ENGINEERING

Lighting Technology

PROJECT LIGHTING SYSTEMS

Installation and commissioning

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

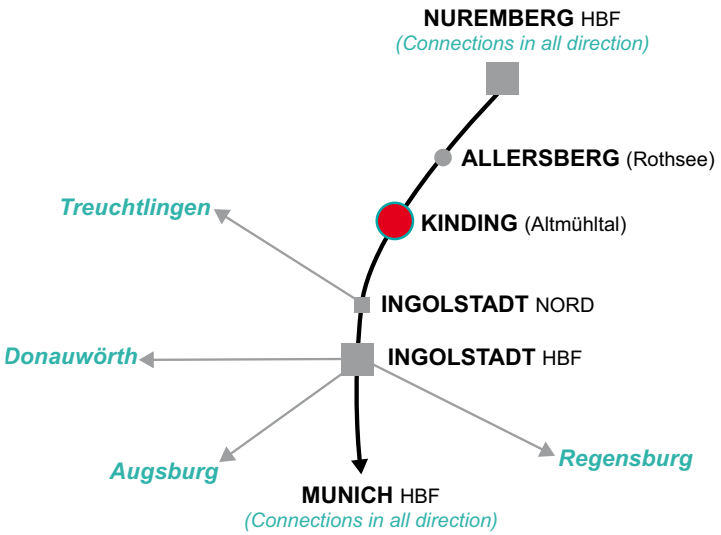
Visit ETS in the Valley of River Altmühl

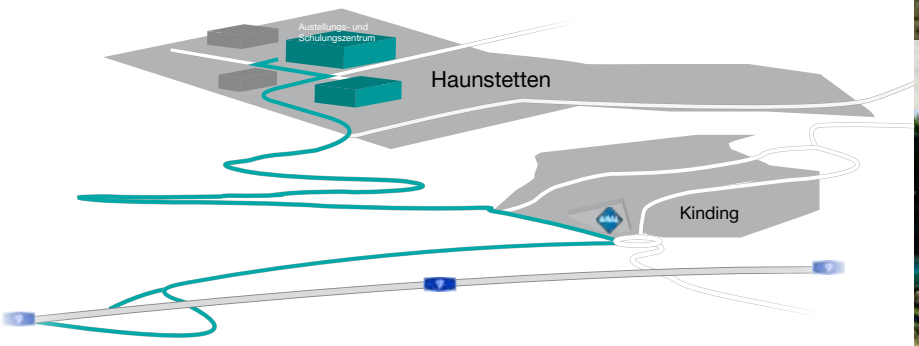
Welcome to Germany - Bavaria

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 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

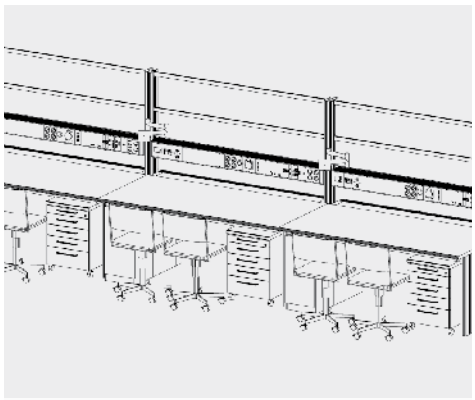
To plan a custom-made room concept with you, we proceed in the following steps:

⟩ 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.

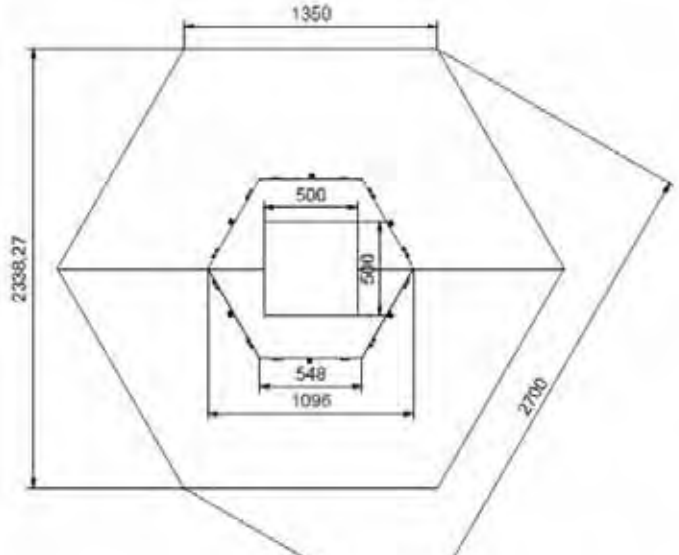
⟩ Taking into account the learning contents an equipment list can be set up. As soon as the extent is defined, the storage equipment is optimised and designed.

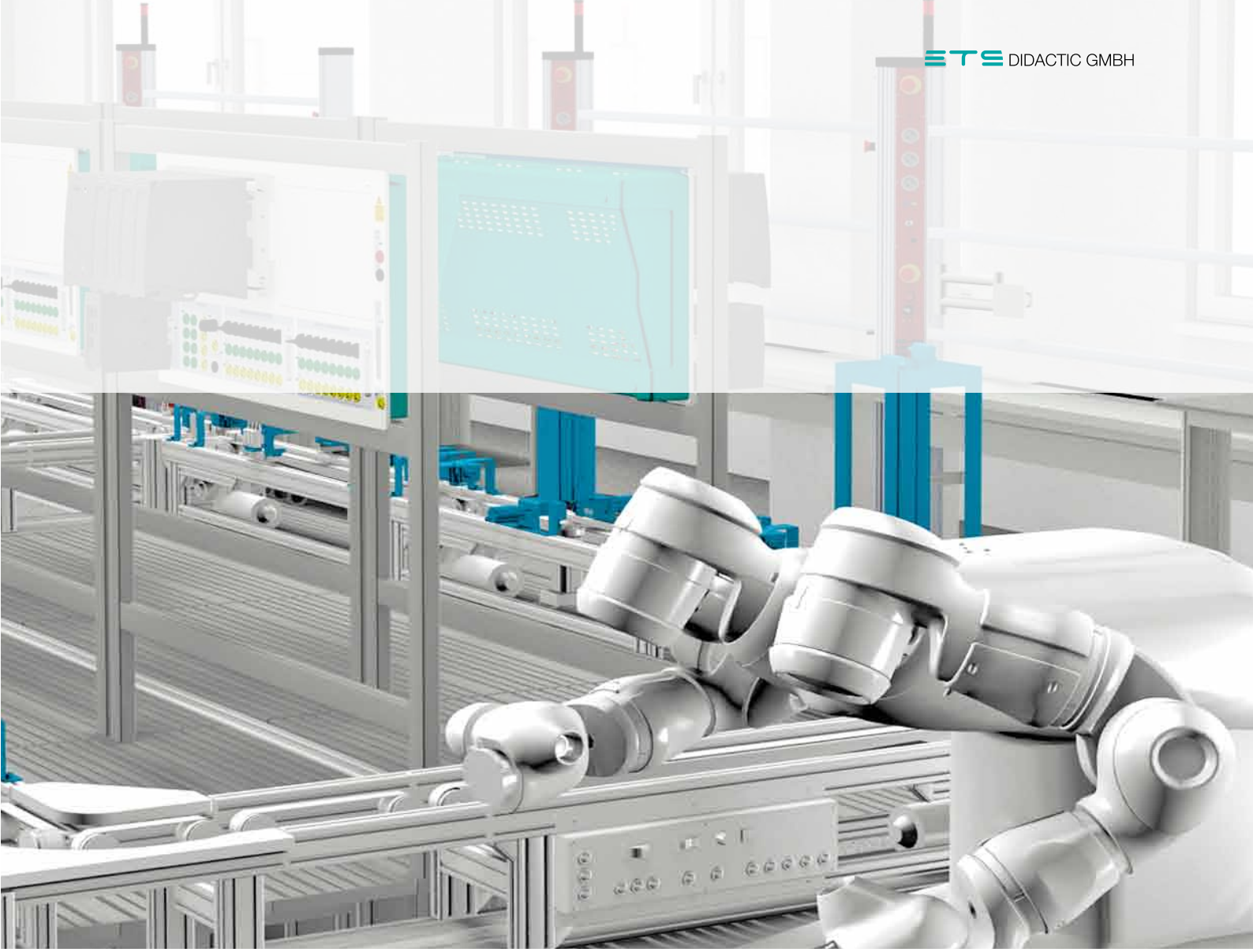
Analysis



Conception

Consulation / Planning





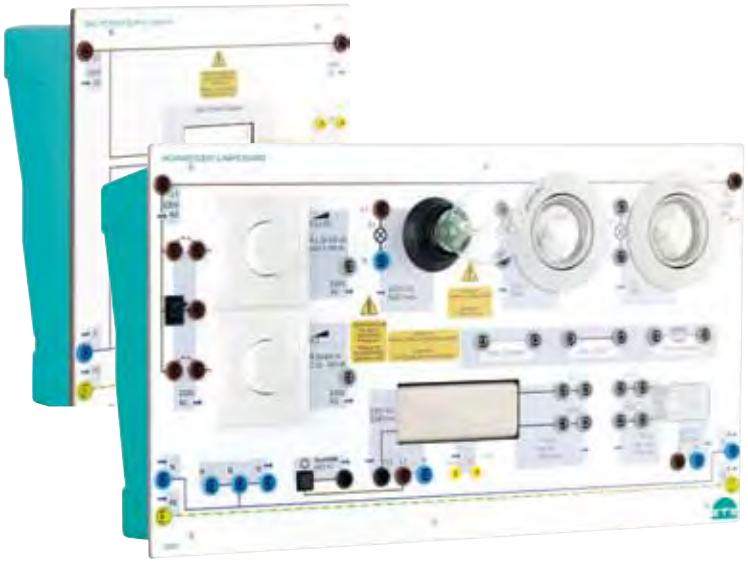
Design / Construction

Workshops

Application

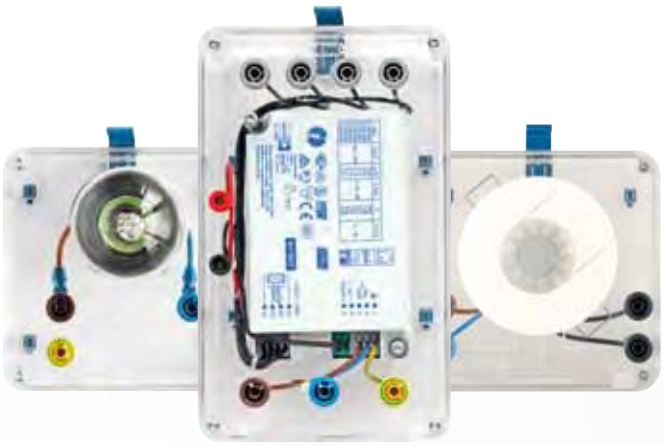
PEOPLE AND TECHNOLOGY – A PERFECT MATCH

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

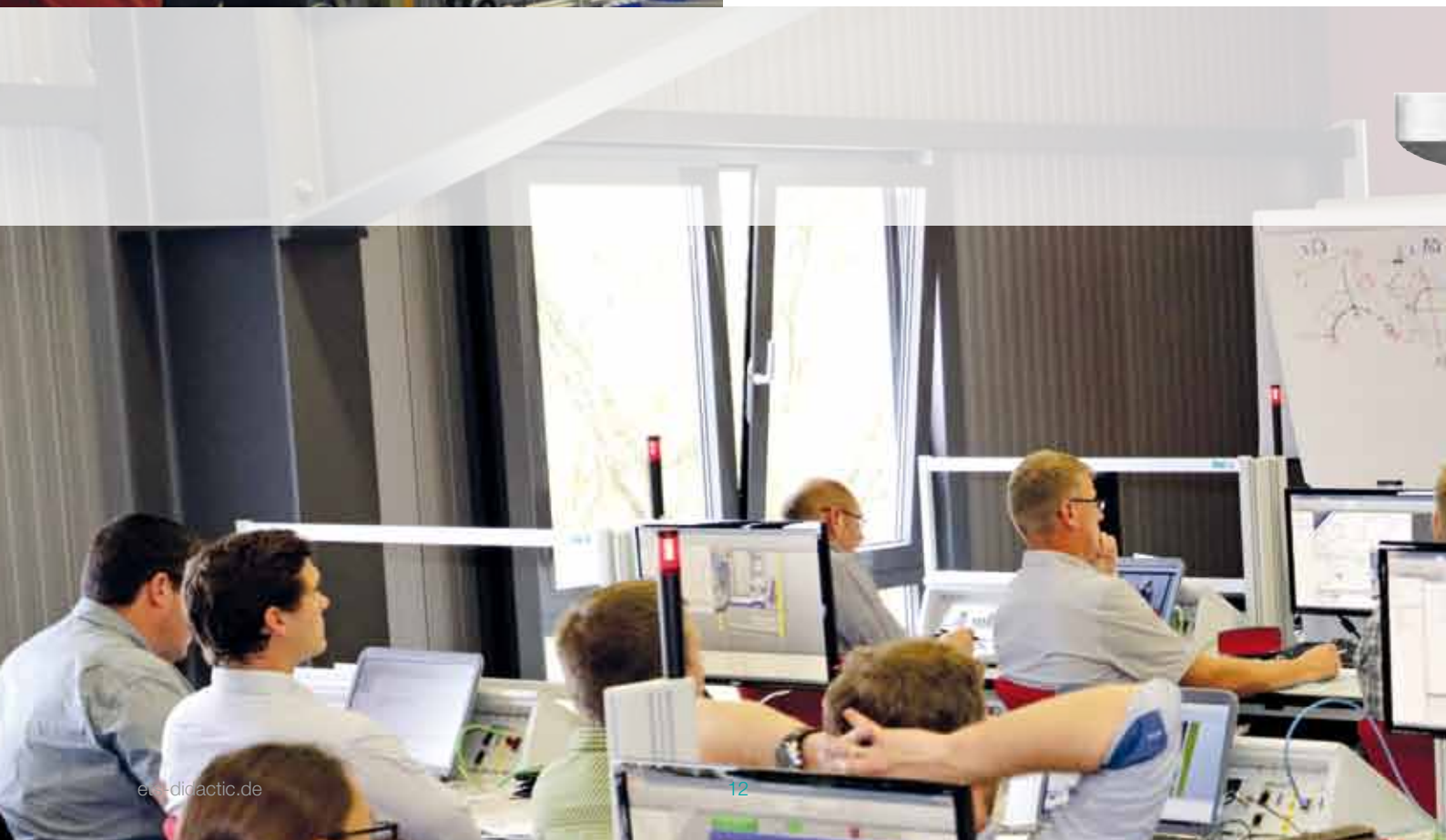
Always up to Date – Training at the Highest Level

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

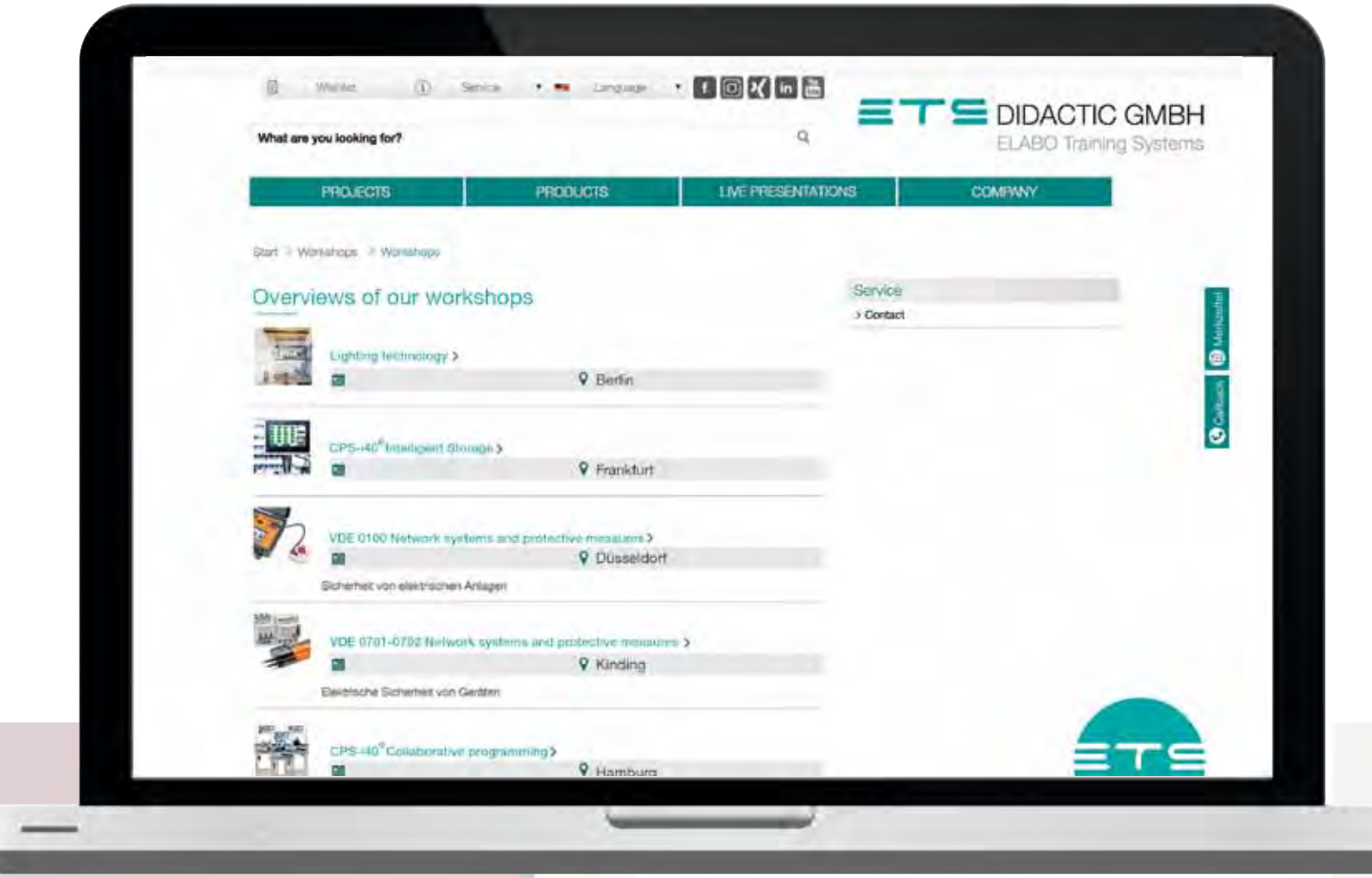
⟩ Learn more about the management and the application of various technologies with the support of the ETS trainers. Find out more about the didactic concept and learn to teach the material quickly and safe.

⟩ 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

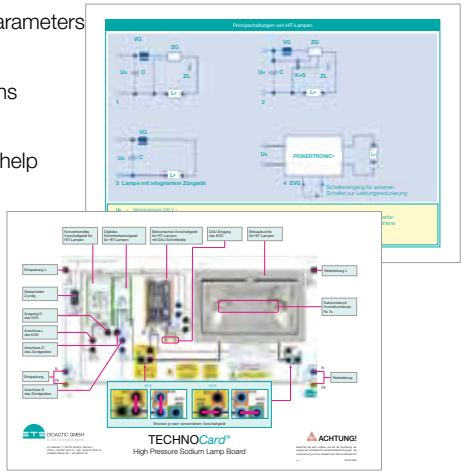
Structure of the Manuals

- 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

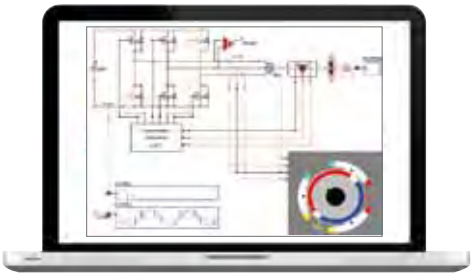
Instructor's Edition / Student Edition

- 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

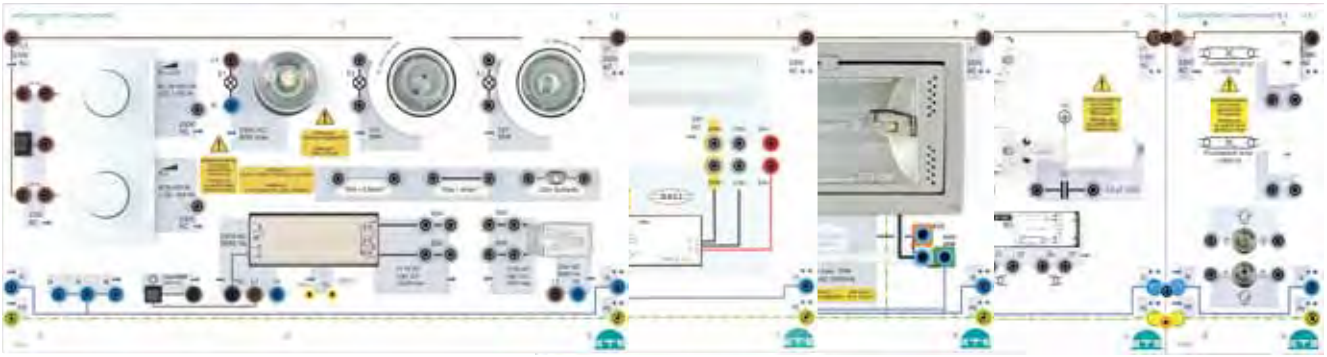
- Contents reduced to main focus of the experiment
- Clear layout
- Basic function
- Various languages

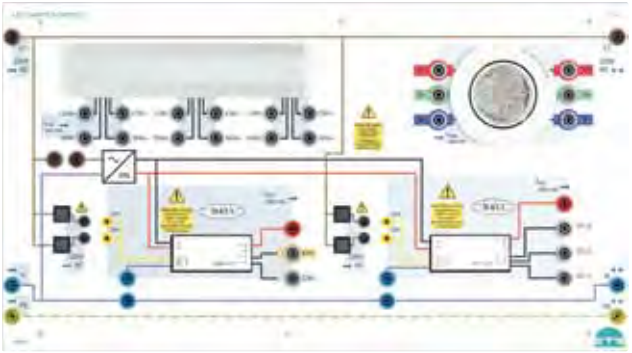
ergonomics

Furniture

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

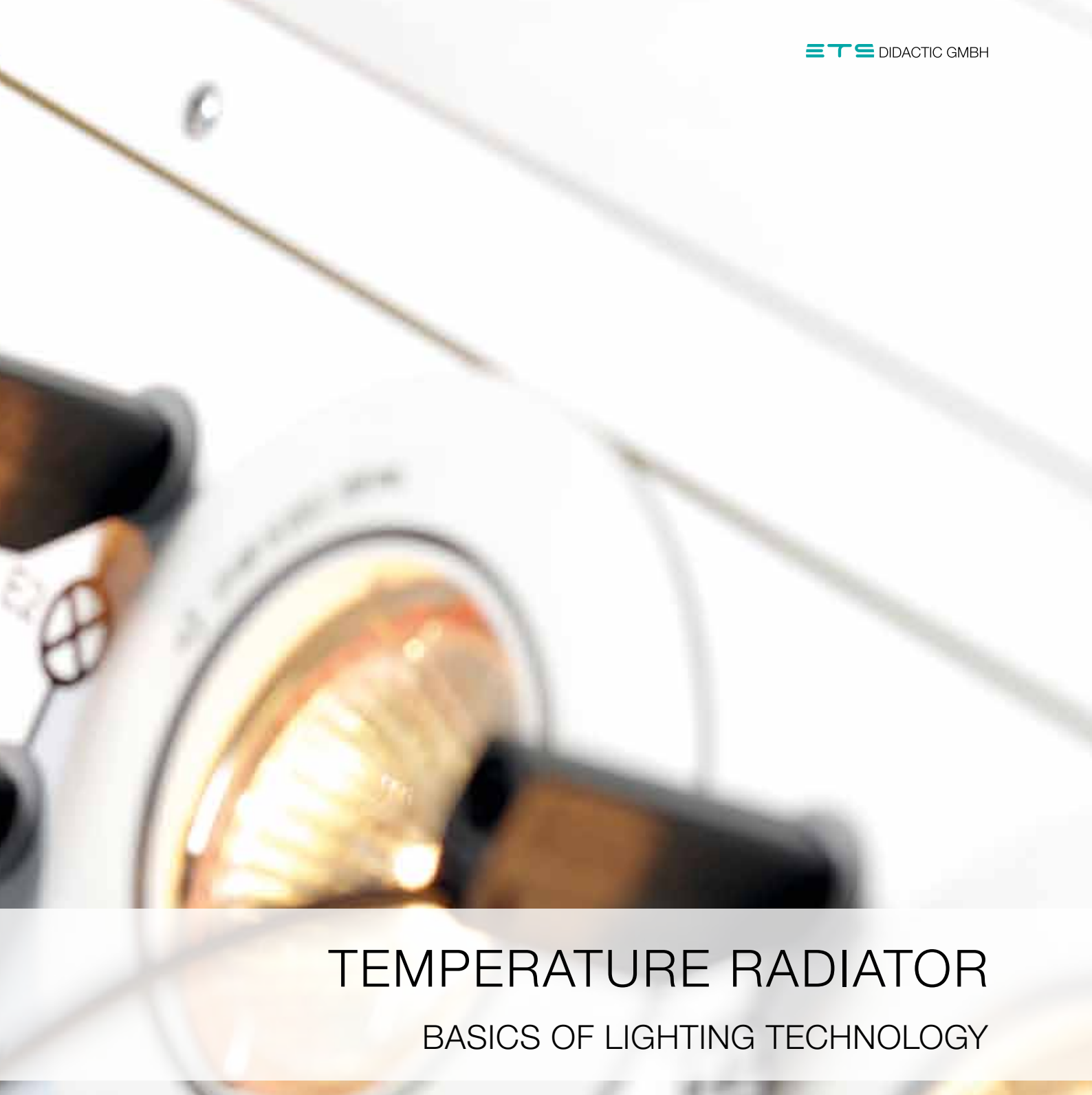
... the System for Installation Engineering





- Latest technology
- Easy to operate
- Didactically prepared courseware
- Safety for human and machine
- Ergonomically perfect workstations

ETS DIDACTIC GMBH

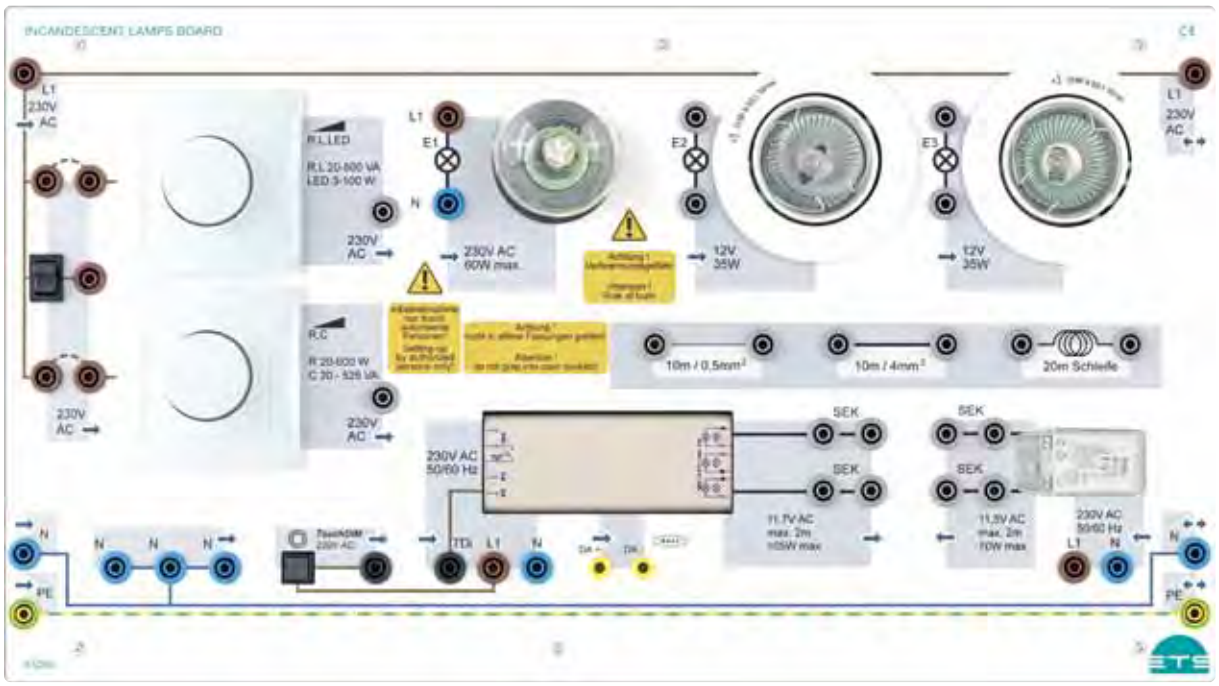


TEMPERATURE RADIATOR

BASICS OF LIGHTING TECHNOLOGY

TEMPERATURE RADIATOR

Incandescent Lamps Board



DALI

1

Learning objectives

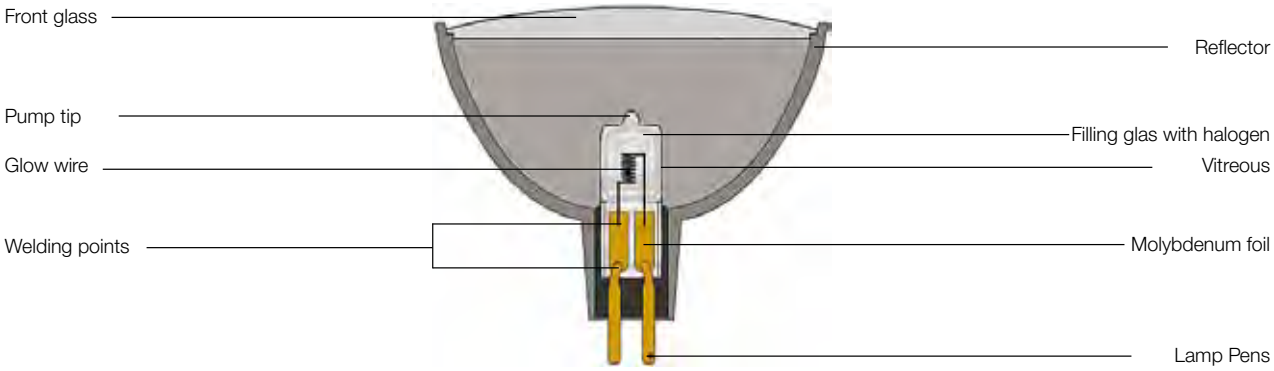
- Basics of lighting technology, luminous flux, luminous intensity, illuminance, efficiency, luminance
- Types of illuminants, temperature lamps, discharge lamps and solid state lamps
- Lamp operating devices, electronic control gear
- Dimming of lamps
- Assessment of application offers
- Calculation of lighting systems
- Metrological examination of lamps

Technical data

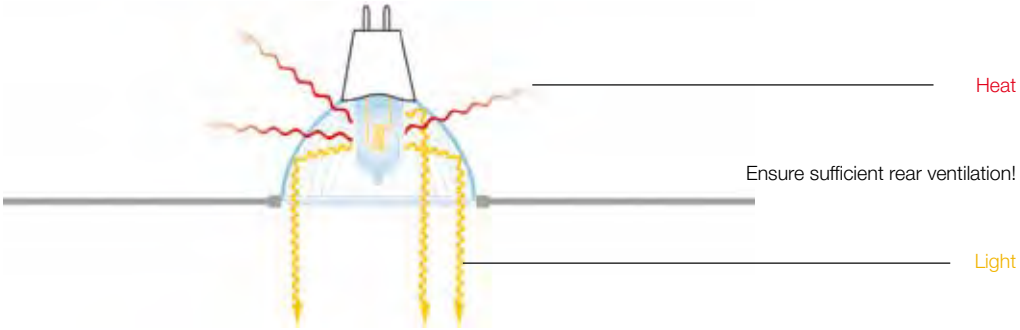
- Dimmer for incandescent lamps and LED lamps (R, L, LED)
- Lamp holder E27
- Dimmer for electronics transformers (R, C)
- Electronics ballast for LV halogen lamps with DALI interface and Touch DIM function
- Electronic transformer for LV halogen lamps
- LV halogen lamps max. 50W
- Set of lamps for 43204
- LV halogen reflector lamp 35 W
- LV halogen reflector lamp ECO 35 W
- 1 pc. High voltage halogen bulb E27/28 W
- Energy saving lamp 5 W
- LED lamp E27/8 W dimmable
- Simulation small conductor cross section
- Simulation of conductor loop
- Control button for touch DIN function switch ON/OFF
- Switch ON/OFF
- All recuired connections with 4 mm and 2 mm safety sockets designed

No.	Designation	Order No.
1	Incandescent Lamps Board	43204

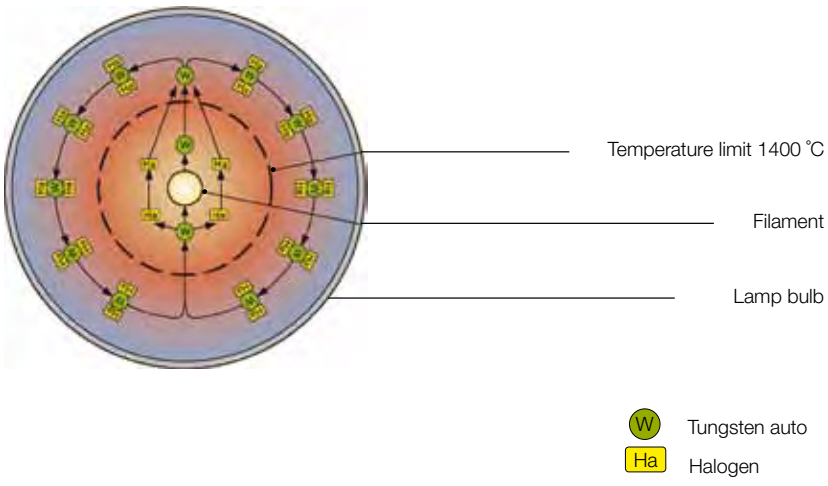
Components of a halogen incandescent lamp



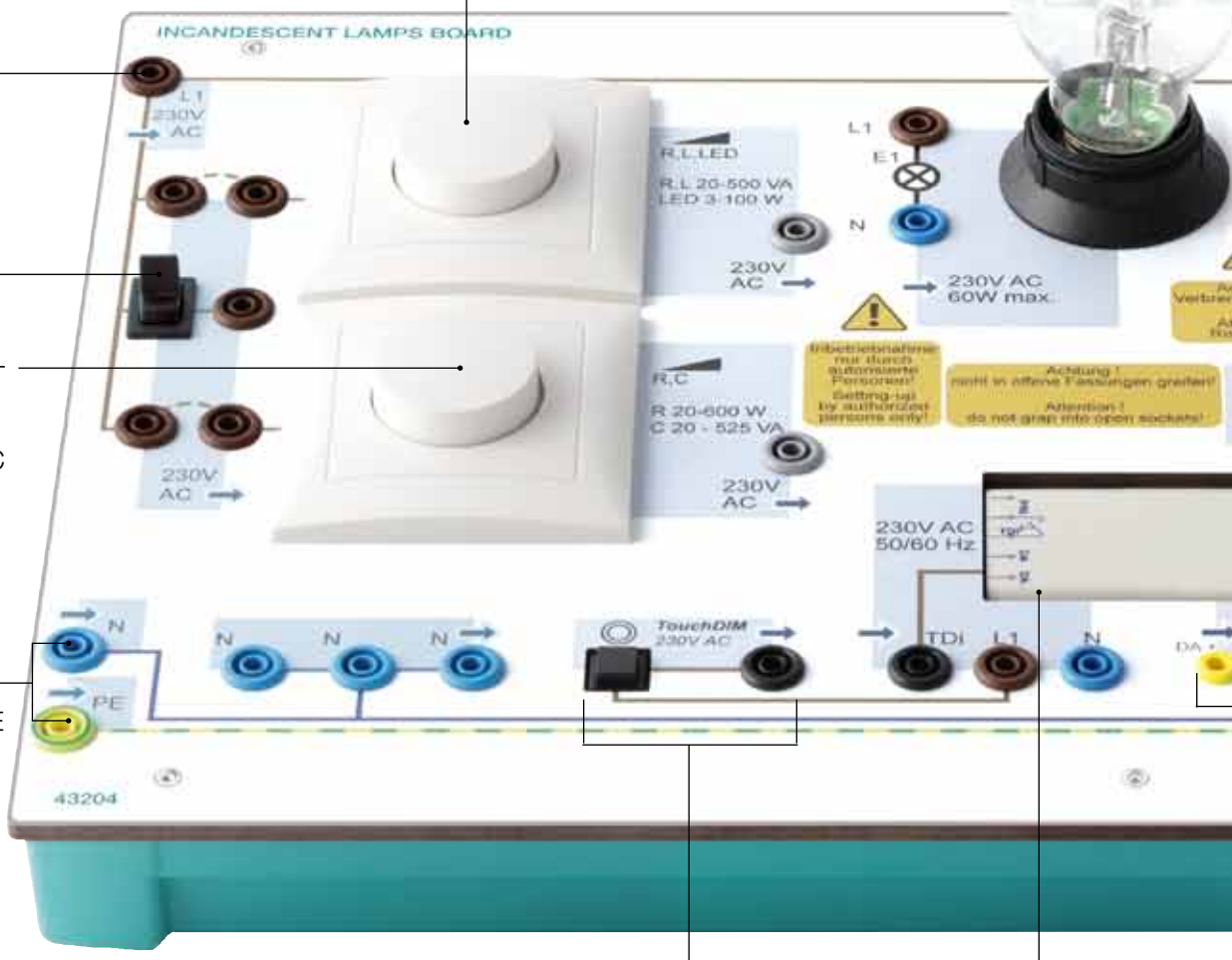
Cold light reflector lamp



Halogen cycle process



Incandescent Lamps Board



Dimmer for incandescent lamps and conventional transformers R+L and LED / phase control

Holder E27

Supply L

Control switch ON / OFF

Dimmer for incandescent lamps and electronic transformers R+C / phase section

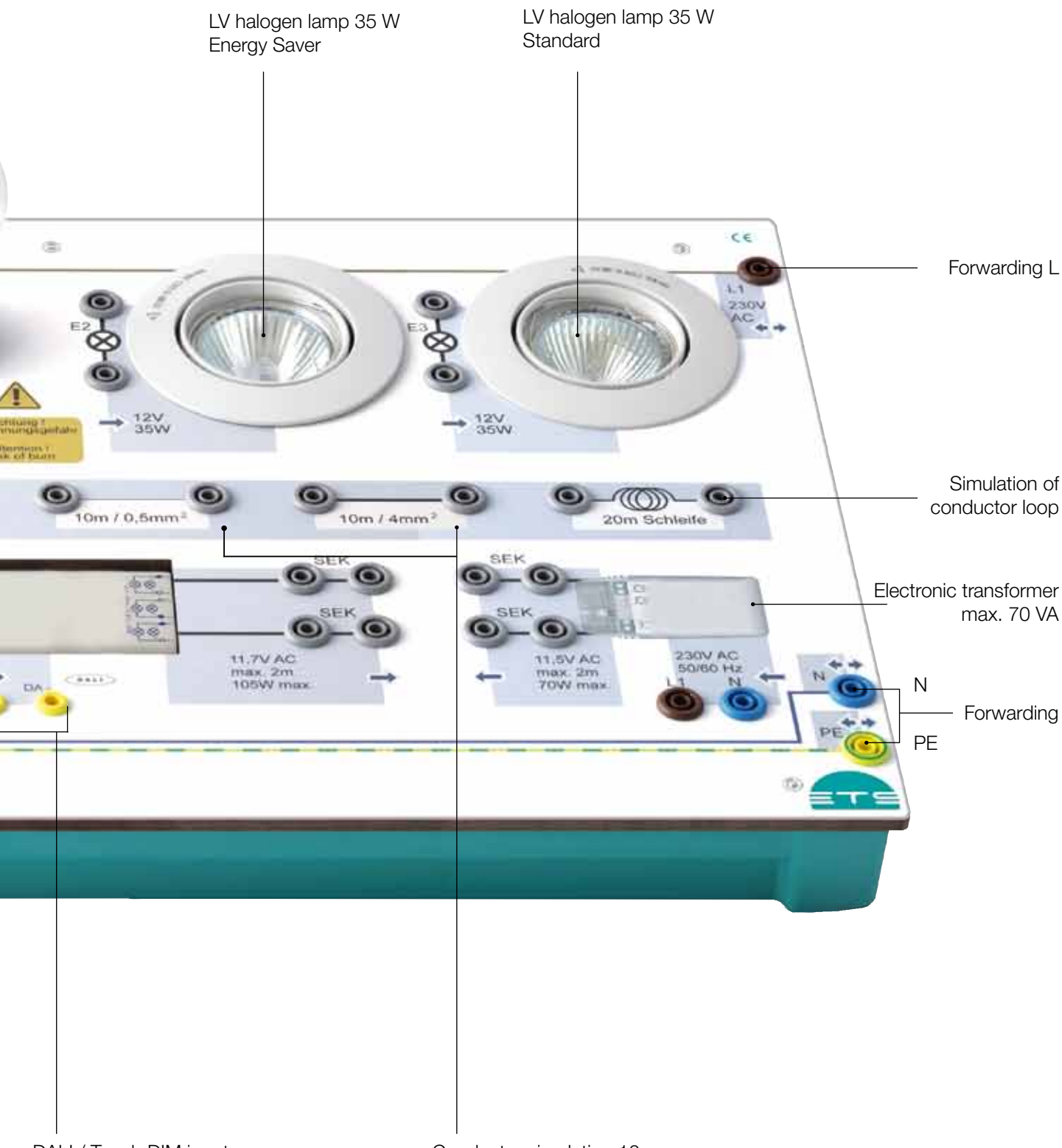
N

Supply

PE

Pushbutton for Touch DIM-Function

Electronic transformer with Touch DIM and DALI-interface, max. 105 VA

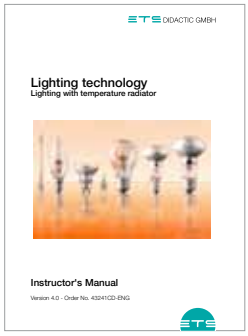

LV halogen lamp 35 W
Energy Saver
LV halogen lamp 35 W
Standard
Forwarding L
Simulation of
conductor loop
Electronic transformer
max. 70 VA
N
Forwarding
PE
DALI / Touch DIM input
of the electronic transformer
Conductor simulation 10 m
0.5 mm² e.g. 4 mm²
E2
E3
12V
35W
12V
35W
L1
230V
AC
10m / 0,5mm²
10m / 4mm²
20m Schleife
SEK
SEK
SEK
SEK
11,7V AC
max. 2m
105W max.
11,5V AC
max. 2m
70W max.
230V AC
50/60 Hz
L1
N
N
PE
DA

TEMPERATURE RADIATOR

Courseware

1

Printed and digital



2

3

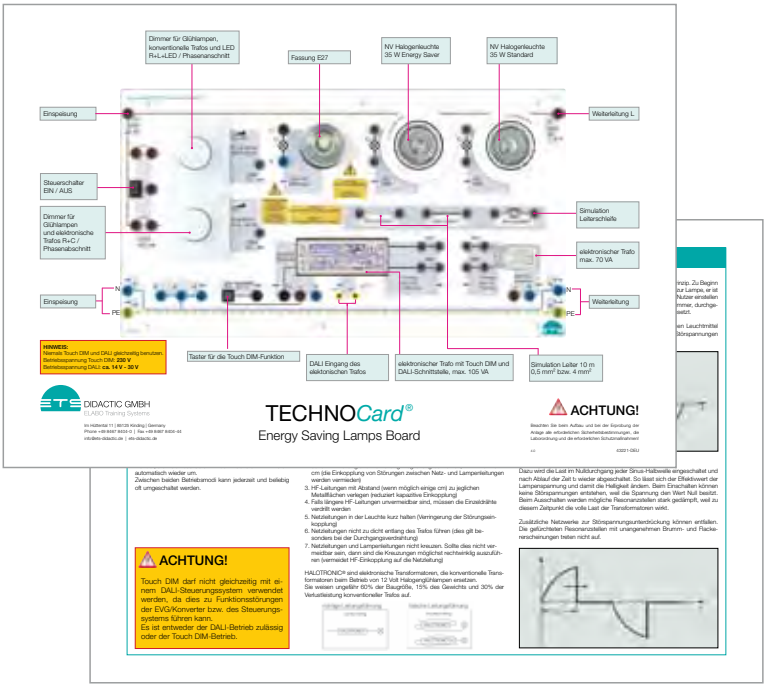
4

5

Manual contents

- Planning and execution of a hallway lighting
- Lighting of a living room with LV halogen luminaires
- Installation of LV halogen spot-lights in hotel corridors

TECHNOCard®



6

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

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Lighting technology - Instructor´s Manual	43241CD-ENG
3	Lighting technology - Student Manual	43240CD-ENG
4	Lighting technology - Commissioning and troubleshooting	43242CD-ENG
5	Lighting technology - Presentation Aids	43243CD-ENG
6	TECHNOCard® - Energy Saving Lamps Board	43221-ENG

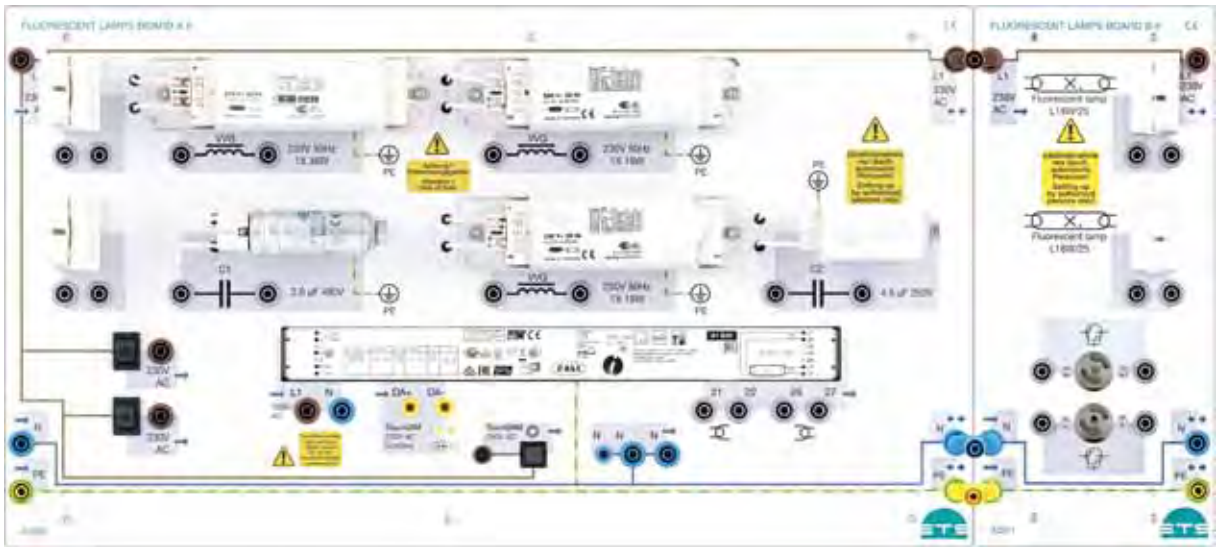

50Hz

DISCHARGE LAMPS

BASICS OF LIGHTING TECHNOLOGY

DISCHARGE LAMPS

Fluorescent Lamps Board A II und B II



1 2

Learning objectives

- Basics of lighting technology, luminous flux, luminous intensity, illuminance
- Types of lamps, temperature lamps, discharge lamps and solid state lamps
- Lamp control gear, low-loss ballasts (VVG), electronic ballasts (EVG)
- Switching of lamp control gear - series connection, parallel connection (duo/tandem) and their compensation
- Dimming of lamps
- Assessment of operational areas
- Calculating of lighting systems
- Metrological examination of lamps

Technical data 43200

- 2 low loss ballasts18 W
- 1 low loss ballasts 36 W
- 2 compensation capacitors 2 µF and 4.5 µF
- 1 electronic ballast with DALI interface and Touch DIM function
- 2 sockets for T8 fluorescent tubes
- All required connection with 4 mm and 2 mm safety sockets

Technical data 43201

Fluorescent Lamps Board B II (required for operation of Fluorescent Lamps Board A II)

- 2 sockets for T8 fluorescent tubes
- 2 sockets for starter
- 3 safety jumper plug 4 mm (br, ye-gn, bl)

No.	Designation	Order No.
1	Fluorescent Lamps Board A II	43200
2	Fluorescent Lamps Board B II	43201

Accessories

1

Learning objectives:

- Determination of important electrical parameters such as active, apperent and reactive power (e.g. for lighting fixtures)
- Measurements of the network load due to harmonics (3-phase representation)
- Measurements of the power factor lambda and cosϕ
- Determination of the electrical parameters of electric motors
- Deployment and use of energy meters
- Energetic examination of the most different consumers
- Vectorial representation of the three-phase system
- Oscilloscope function for voltage and current

Technical data

- Measuring voltage 0 – 600 V AC, max. 5 A
- Operating voltage 230 V AC
- LAN interface
- Integrated oscilloscope function
- Webserver
- Modbus IP interface

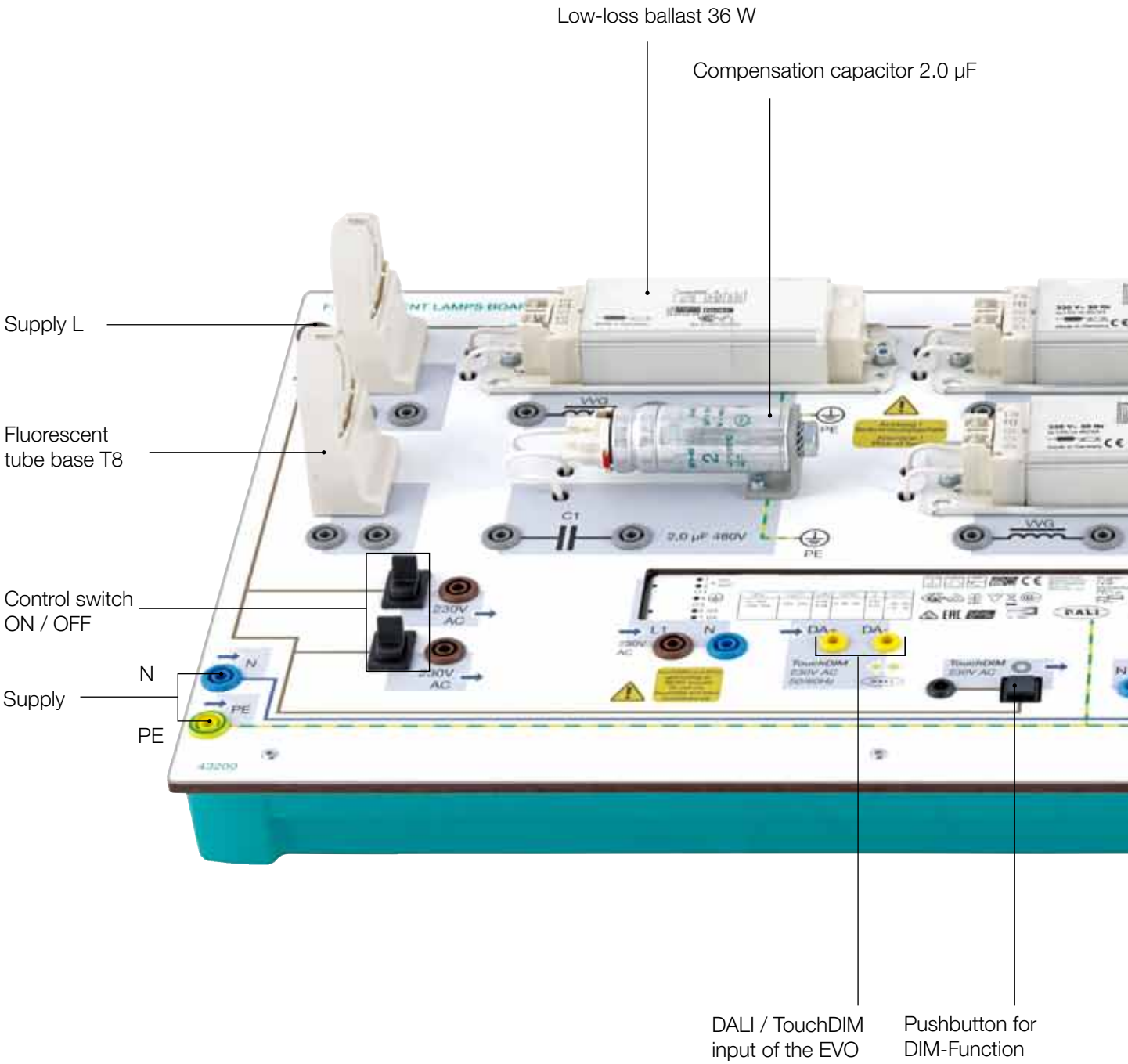
2

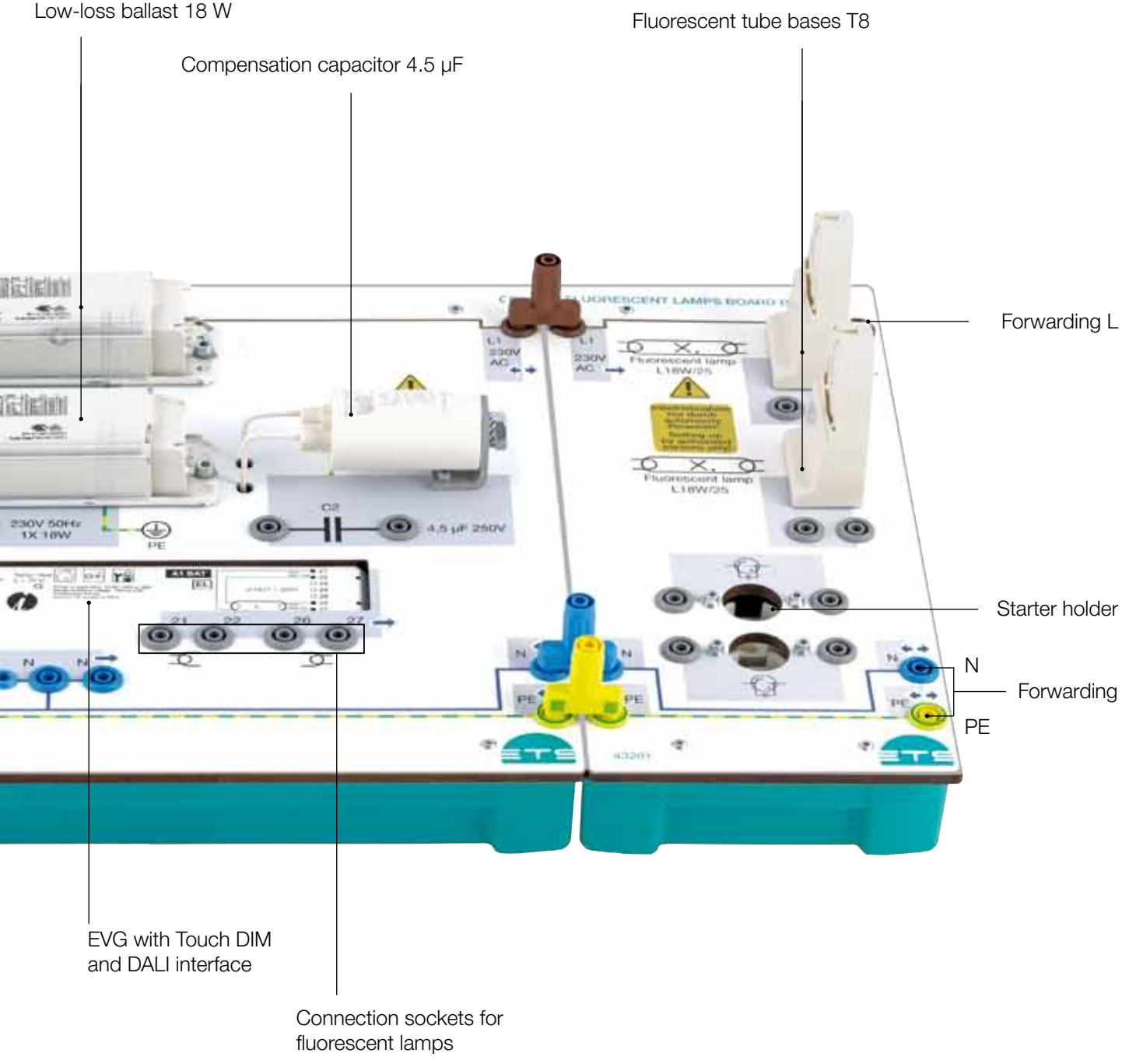
Set of LED tubes and starters
(conventional and LED) consisting of:

- 2 fluorescent tubes T8 with splinter protection
- 2 starters 230V
- 2 starters for serie connection
- electronic starter
- two LED tubes retrofit for low-loss ballast operation and starter
- LED tube retrofit for electronic ballast operation
- two LED tubes retrofit for electronic ballast and low-loss ballast operation and starter

No.	Designation	Order No.
1	Power Quality Analyzer II	40307
2	Set of LED tubes	43202

Fluorescent Lamps Board




Low-loss ballast 18 W
Compensation capacitor 4.5 µF
Fluorescent tube bases T8
Forwarding L
Starter holder
N
Forwarding
PE
EVG with Touch DIM
and DALI interface
Connection sockets for
fluorescent lamps

DISCHARGE LAMPS

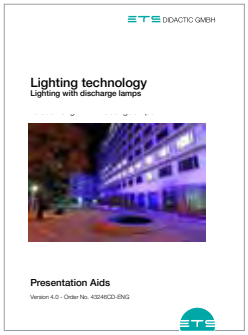
Courseware

1

Printed and digital

2

3

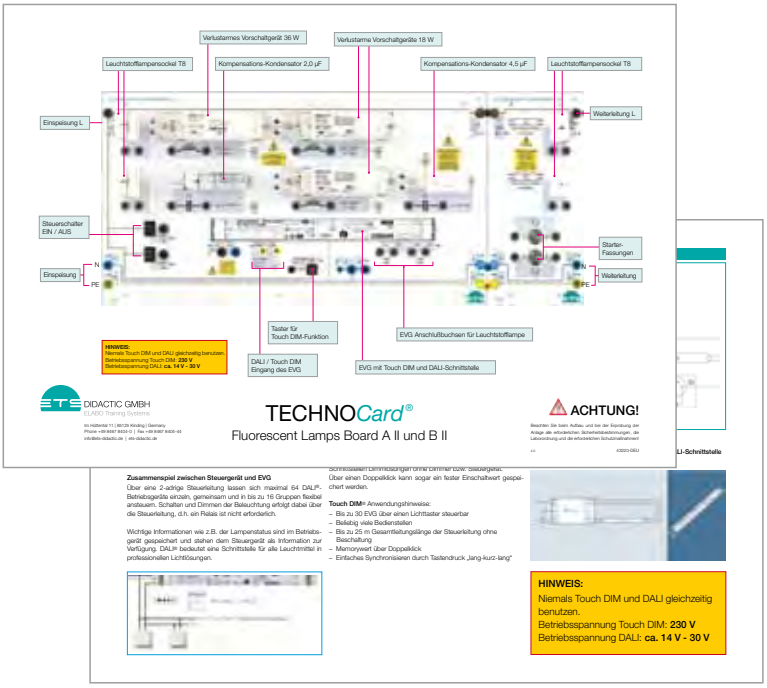


4

Manual contents

- Corridor lighting in an office building
- Lighting of an office with fluorescent lamps
- Installation of a warehouse lighting

TECHNOCard®



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

5

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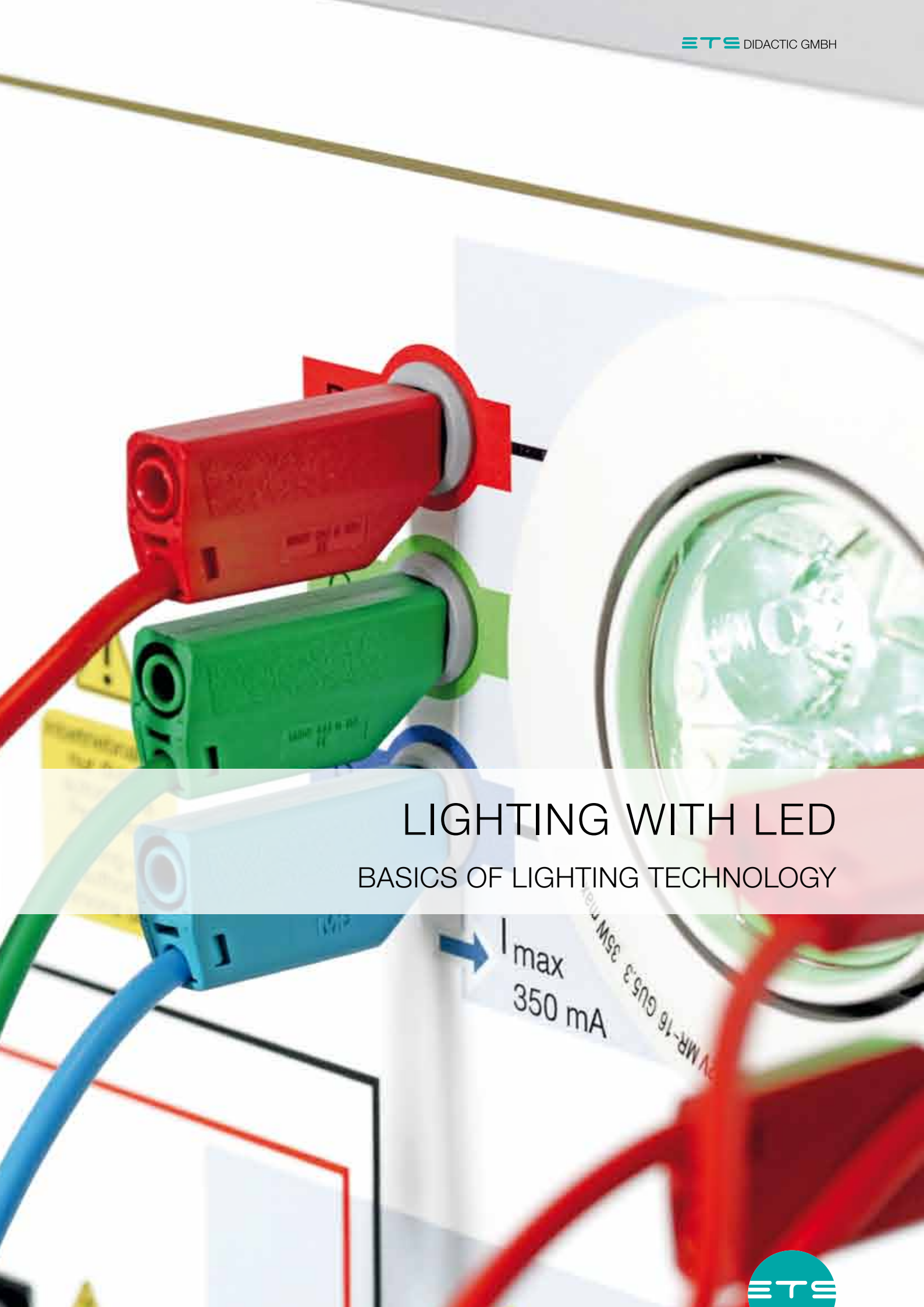
1	Set of ETS ring binders	91903
2	Lighting technology - Instructor´s Manual	43245CD-ENG
3	Lighting technology - Student Manual	43244CD-ENG
4	Lighting technology - Presentation Aids	43246CD-ENG
5	TECHNOCard® - Fluorescent Lamps Board A and B	43220-ENG

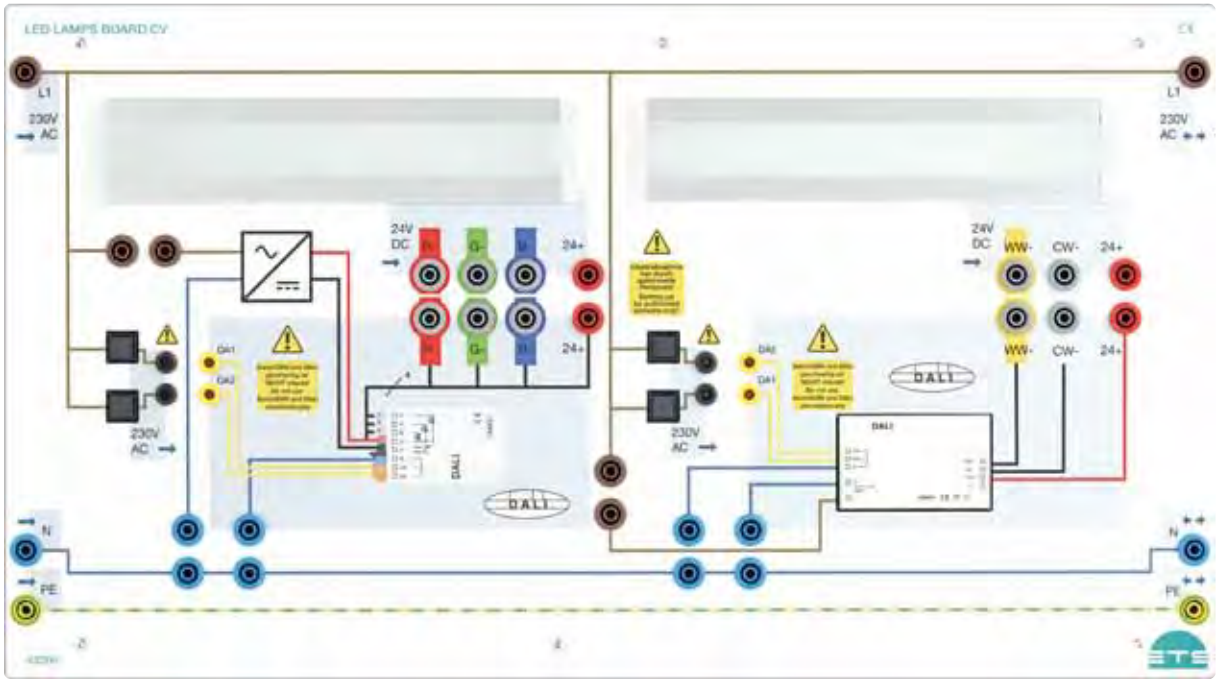


LIGHTING WITH LED

BASICS OF LIGHTING TECHNOLOGY

LIGHTING WITH LED

LED Lamps Board CV (Constant Voltage)



1

Learning objective 1

- Select lamp control gear
- Generation of “white” light via LED
- Efficiency of LED
- Dimming of LED
- Control of LED
- Control and diagnosis of operating devices via DALI

Learning objective 2

- Turnable White applications with LED in operation
- Commissioning RGB applications with LED
- Networking of control gear via DALI
- Control of RGB LEDs via DALI control gear DT8
- Control of Turnable White LED via DALI control gear DT8

Technical data

- Input voltage 230 V / 50 Hz
- LED converter 230 V / 24 V DC 3-channel DT8 RGB
- LED converter 230 V / 24 V DC
- 4 Touch DIM buttons
- Touch DIM function
- LED light strip 24 V DC 1 CW / WW
- LED module RGB 24 V DC (red, green, blue)

No.	Designation	Order No.
1	LED Lamps Board CV	43206

Technical features

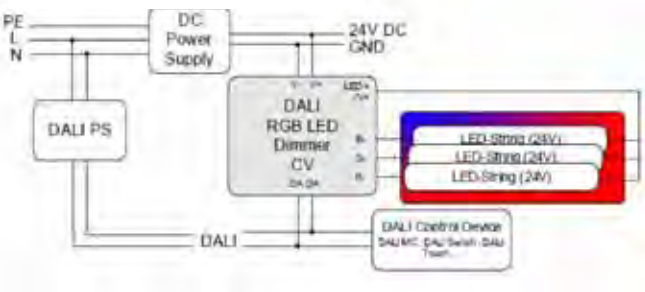
DALI RGB LED dimmer constant voltage

- DALI LED-Dimmer with RGB color control
- DT8 operaring mode: one DALI address for control of brightness and color (DALI DT8, Type RGB)
  Control via two DALI addresses, one to adjust brightness and one to adjust color
- SwitchDim2: operation via two switch inputs enables control of brightness and color without DALI

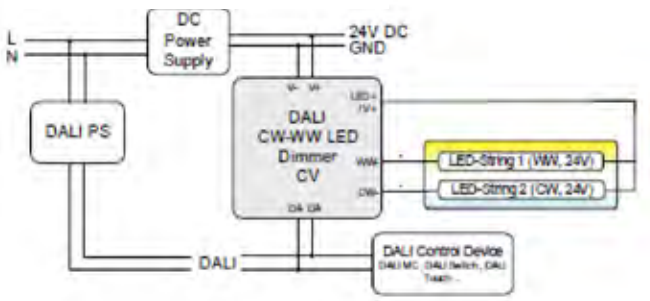
DALI CW-WW LED dimmer constant voltage

- DALI LED dimmer for independent control of brightness and color temperature
- DT8 operating mode: control of brightness and color temperature via one DALI address (Device Type 8, Colour Type TW)
  Control via two DALI addresses, one for adjusting brightness and one for adjusting color
- Balance&Dim operating mode: control via two DALI addresses, one for adjusting the brightness and one for adjustin the channel distribution (e.g. color temperature)
- Dim2Warm operating mode: one DALI address for dimming with simultaneous change of color temperature
- SwitchDim2: operation via two switch inputs enables control of brightness and color without DALI

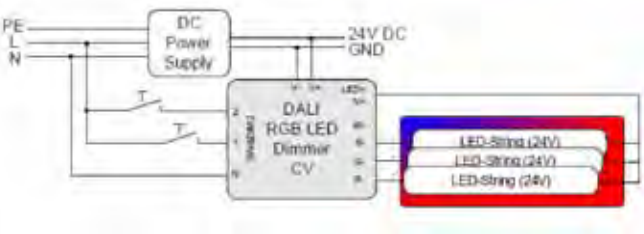
Control via DALI:



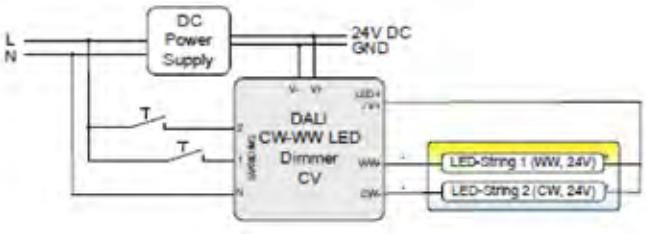
Control via DALI:



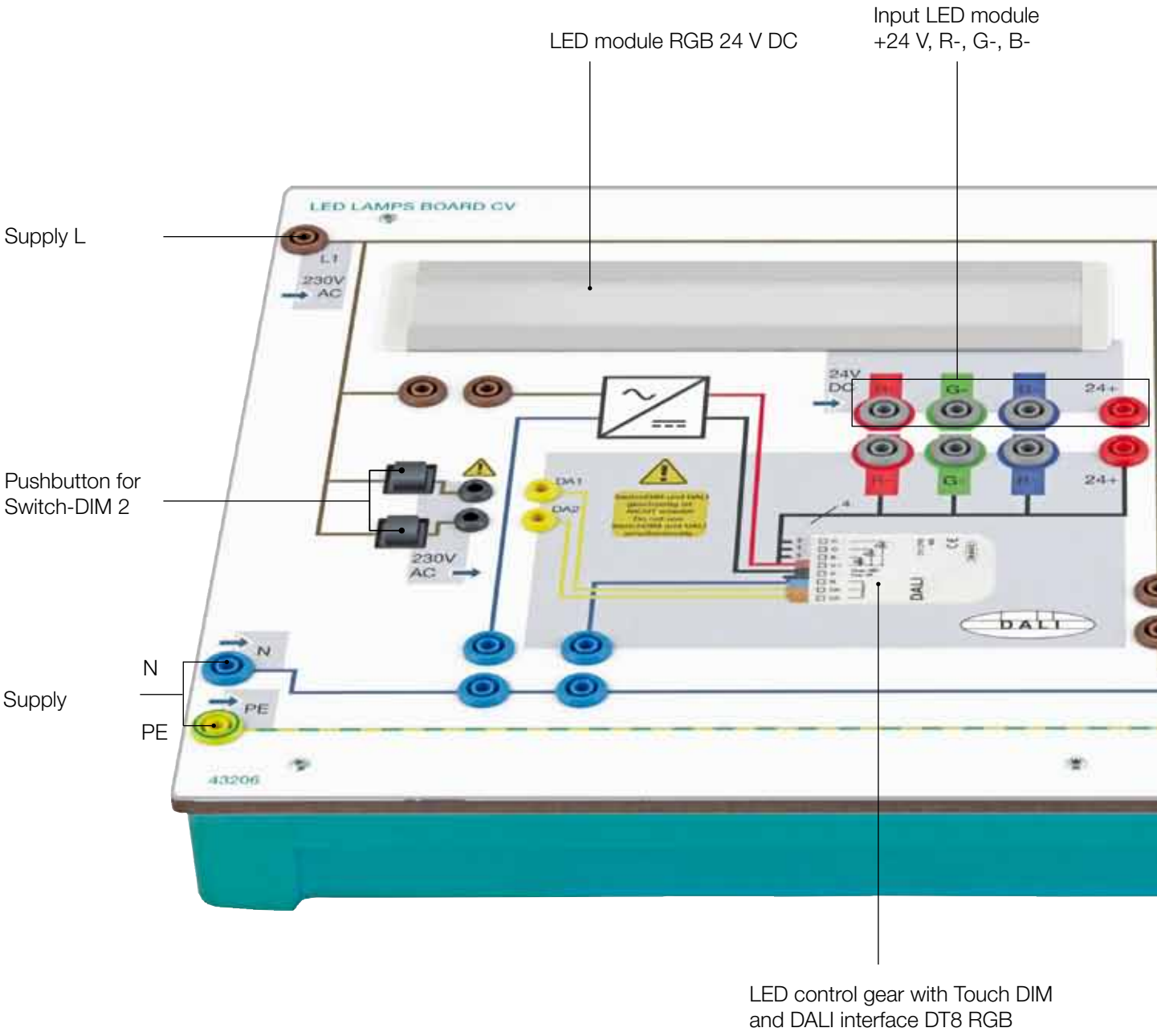
Control via SwitchDim2:

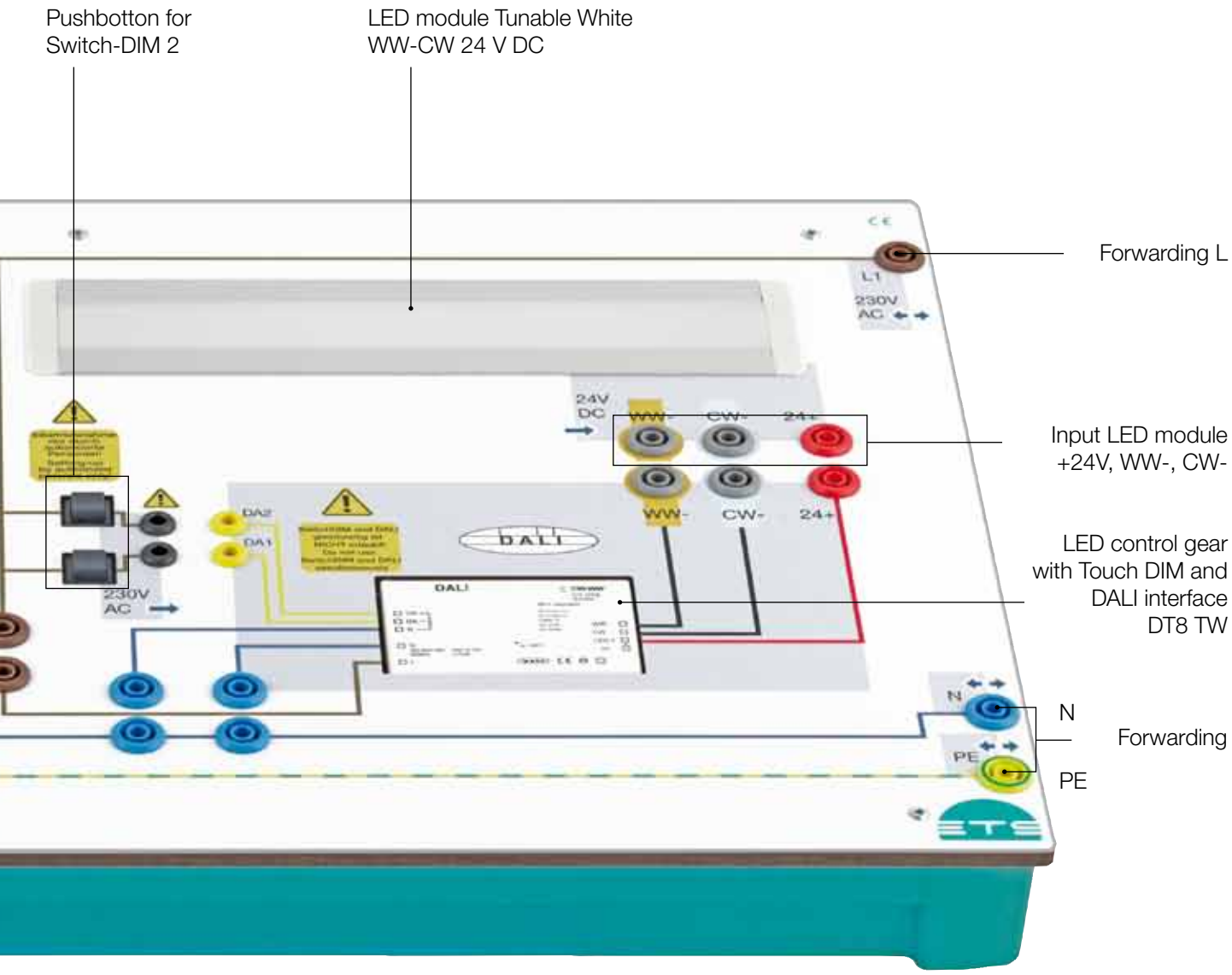


Control via SwitchDim2:



LED Lamps Board CV



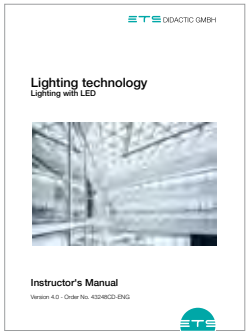

Pushbotton for
Switch-DIM 2
LED module Tunable White
WW-CW 24 V DC
Forwarding L
Input LED module
+24V, WW-, CW-
LED control gear
with Touch DIM and
DALI interface
DT8 TW
N
Forwarding
PE
L1
230V
AC
24V
DC
WW-
CW-
24+
DA2
DA1
DALI

LIGHTING WITH LED

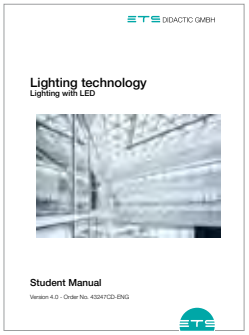
Courseware

1

Printed and digital



2



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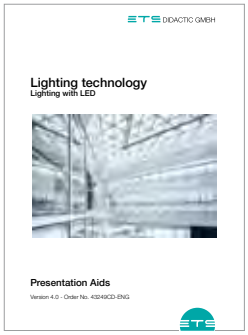
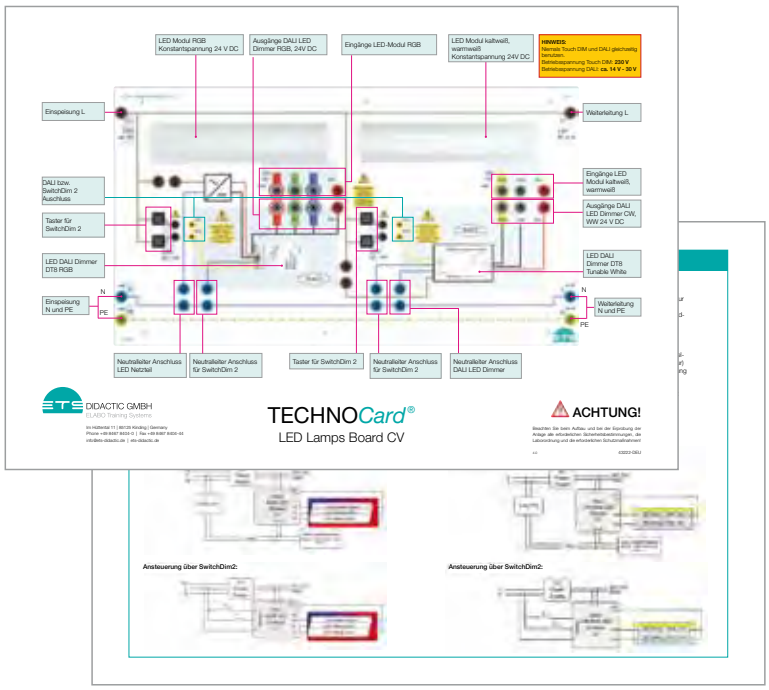


4

Manual contents

- Planning and execution of office lighting
- Planning and execution of effect lighting
- Planning and execution of cove lighting

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.

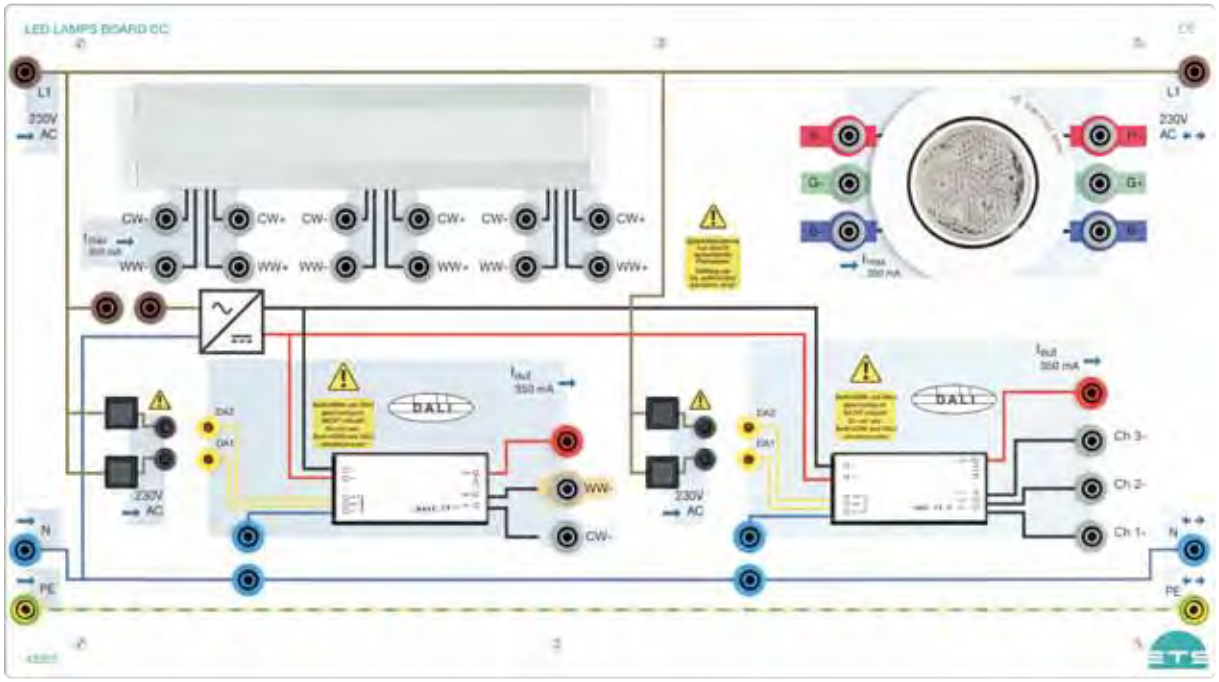
- Display board in 303 mm x 426 mm format
- Double-sided color design
- Robust, hard-wearing quality

5

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Lighting technology - Instructor´s Manual	43248CD-ENG
3	Lighting technology - Student Manual	43247CD-ENG
4	Lighting technology - Presentation Aids	43249CD-ENG
5	TECHNOCard® - LED Lamps Board CV	43222-ENG

LIGHTING WITH LED

LED Lamps Board CC (Constant Current)



1

Learning objectives 1

- Select lamp control gear
- Generation of “white” light via LED
- Efficiency of LED
- Dimming of LED
- Control of LED
- Control and diagnosis of control gear via DALI

Learning objectives 2

- Turnable White applications with LED in operation
- Commissioning RGB application with LED

Technical data

- LED converter DALI constant current 3 x 350mA DT6
- LED converter DALI constant current 2 x 350mA, DT6
- 3 LED module TW (WW/kW) constant current 350mA
- 3 LED Spot RGB constant current 350mA
- LED power supply 230V/24V DC

No.	Designation	Order No.
1	LED Lamps Board CC	43207

Technical features

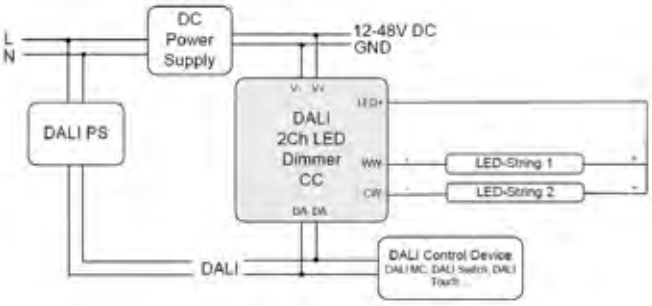
DALI 2 channel immer CC

- **DT6 operating mode:**
  Separate control of the channels via two DALI addresses
- **Balance&Dim operating mode:**
  Control via two DALI addresses, one for adjusting the brightness and one for adjusting the channel distribution (e.g. color temperature)
- **Operating mode Dim2Warm:**
  One DALI address, for dimming with simultaneous change of color temperature
- **SwitchDim2:**
  Operation via two pushbutton inputs enables control of brightness and color temperature without DALI

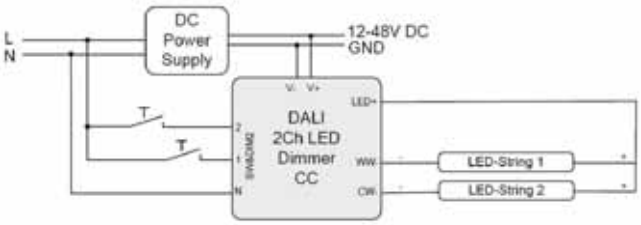
DALI 3 channel dimmer

- **DT6 operating mode:**
  Separate control of the channels via three DALI addresses
- **Betriebsart Colour&Dim:**
  Control via two DALI addresses, one for adjusting brightness and one for adjusting color
- **SwitchDim2:**
  Operation via two pushbutton inputs enables control of brightness and color without DALI

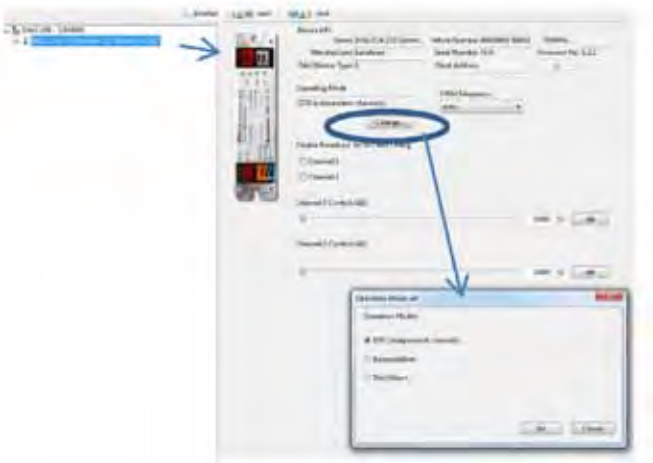
Control via DALI (variant with common positive pole):



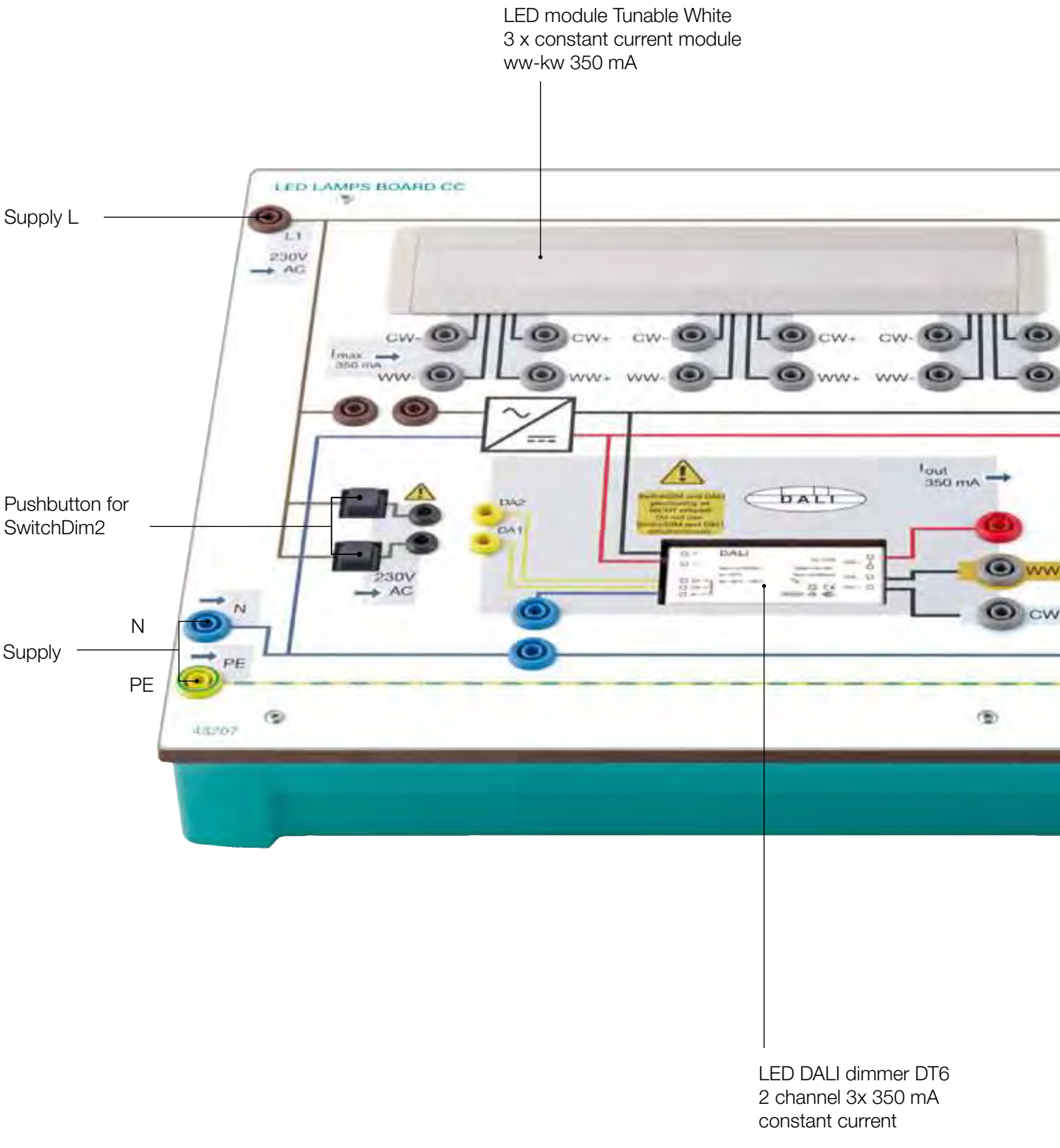
Control via SwitchDim2: (variant with common positive pole):



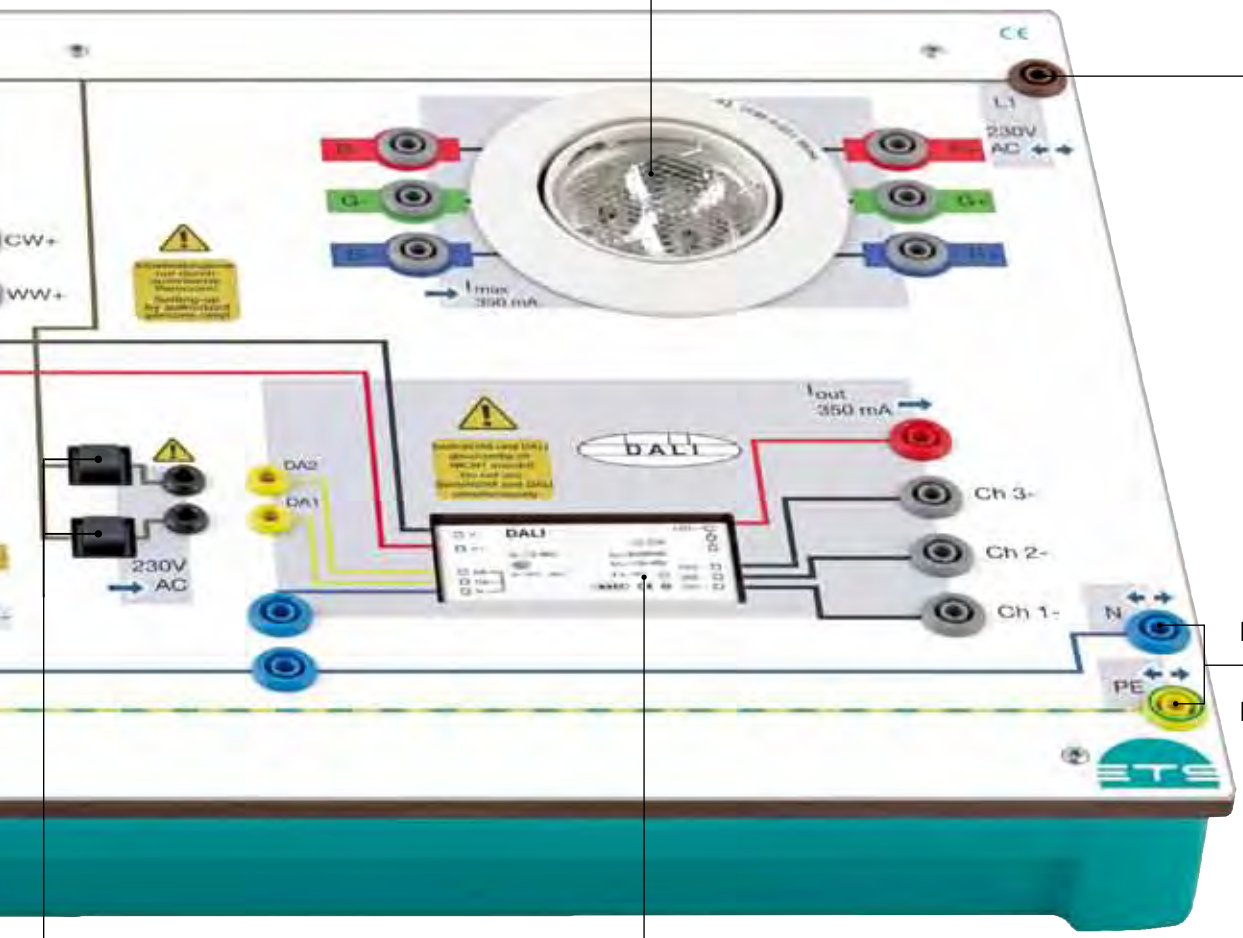
- **Selecting the operating mode for both devices**
  The operating mode can be easily set using the PC software tool DALI-Cockpit on the overview page of the device.



LED Lamps Board CC



LED module RGB
constant current 3x 350mA



Forwarding L

N

Forwarding

PE

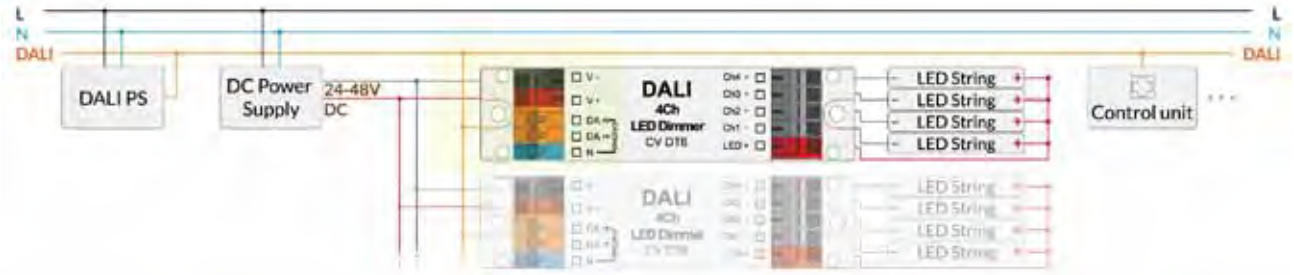
Pushbutton for
SwitchDim2

LED DALI dimmer DT6
3 channel 3x 350 mA
constant current

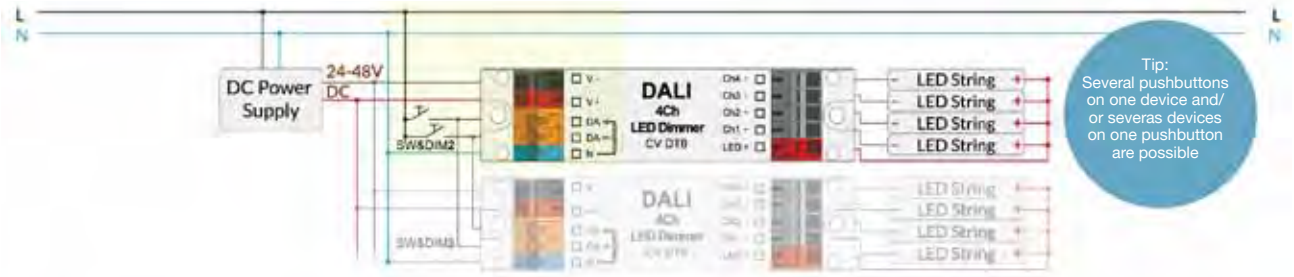
SPECIAL FEATURES

The DALI LED dimmer

Connection example: LED dimmer control via DALI



Connection example: LED dimmer control via push button (SW&DIM2)



The SW&DIM2 is operated with one or two standards pushbuttons: Pushbutton 1 is used to specify the brightness

Button 2 can control Tunable White, Color or scenes depending on device type and settings

Alternative operating modes
As an alternative to the DT8 and DT6 control commands, the following operation modes can be used (both via DALI and pushbuttons):

Operaring mode: DIM2WARM
for the control of Tunable White luminaires:

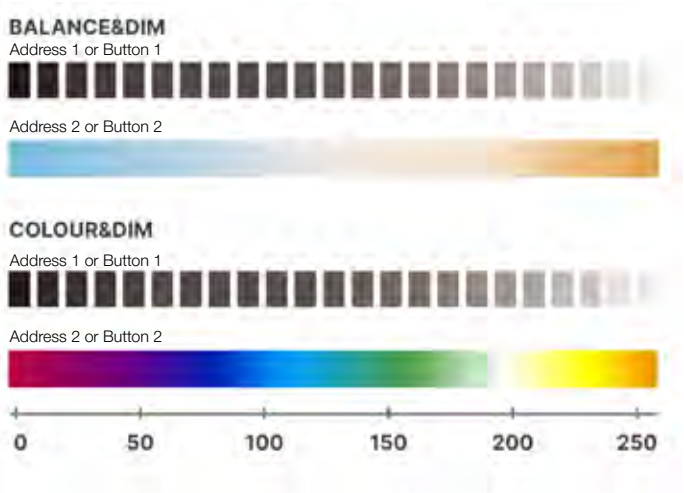
DALI control
Only one DALI address is needed to control the brightness while changing the color temperature, the lower the dimming value, the warmer the light.

SW&DIM2 control:
Button 1 (input SwD1): control of brightness with simultaneous change of color temperature, the lower the dimming value, the warmer the light.

Operating mode: BALANCE&DIM and operating mode COLOUR&DIM
to control Tunable White or RGB (W) luminaires:

DALI control:
Address 1 to control brightness
Address 2 to control color temperature, color or indirect/direct lighting

SW&DIM2 control:
Button 1 (input SwD1) to control brightness
Button 2 (input SwD2) to control color temperature, color or indirect/direct lighting.



Operating mode: Scene switch
Default setting for 1 channel DT6 devices:

Button 1 SW&DIM, button 2 is used to switch from scene to scene. Scenes are predefined in the delivery state, these can be configurated via the DALI Cockpit software.

Operating mode: Corridor
automatic switch-off after a defined period of time.

Mode with integrated automatic staircase controller, e.g. for simple control with relay contact of one or more motion detectors of light barriers.

DALI

Courseware

1

Printed and digital

2

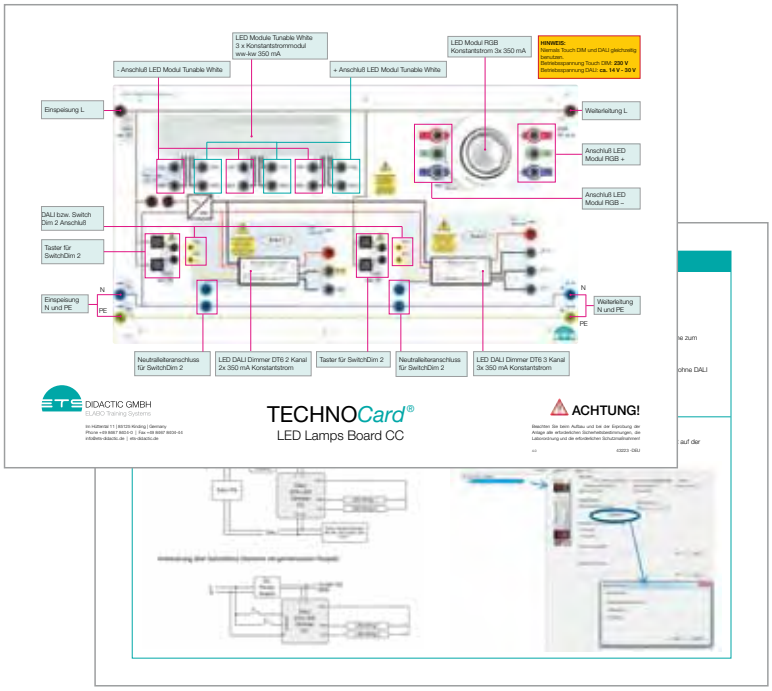
3

4

Manual contents

- ⟩ Basics DALI
- ⟩ DALI commissioning
- ⟩ DALI broadcast control RGB

TECHNOCard®



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

5

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Lighting technology, DALI - Instructor´s Manual	43251CD-ENG
3	Lighting technology, DALI - Student Manual	43250CD-ENG
4	Lighting technology, DALI - Presentation Aids	43252CD-ENG
5	TECHNOCard® - LED Lamps Board CC	43223-ENG

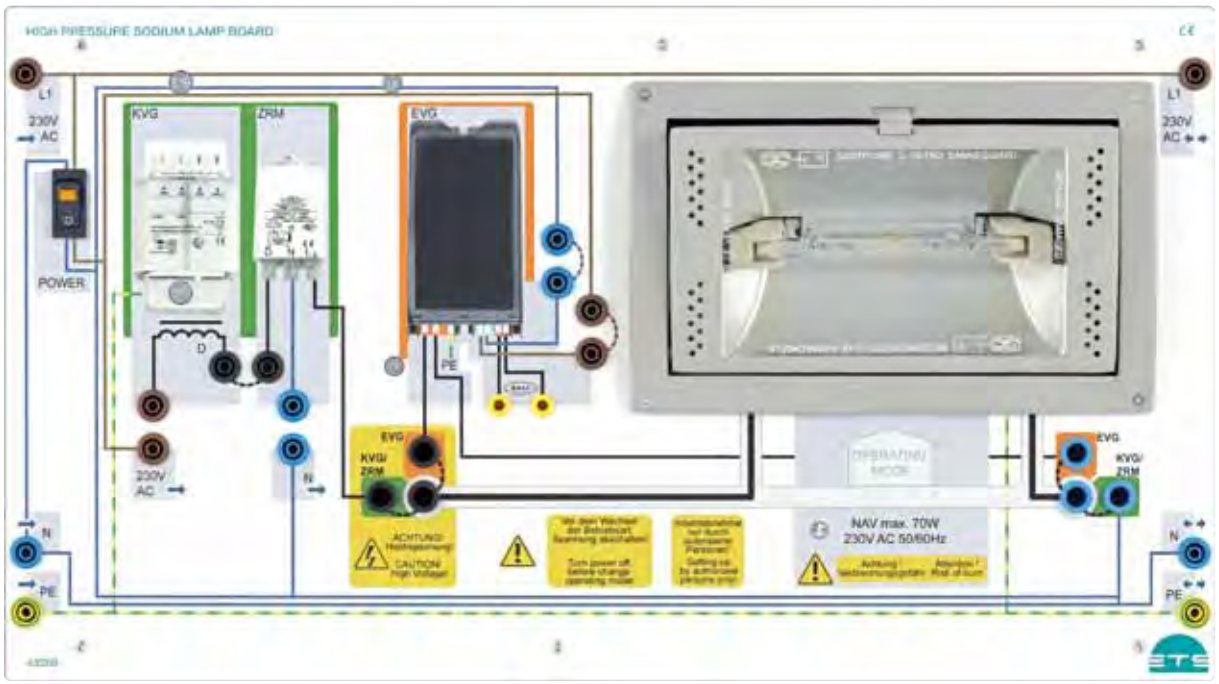
ETS DIDACTIC GMBH

SPECIAL LAMPS

BASICS OF LIGHTING TECHNOLOGY

SPECIAL LAMPS

High Pressure Sodium Lamp Board



DALI

1

Learning objectives

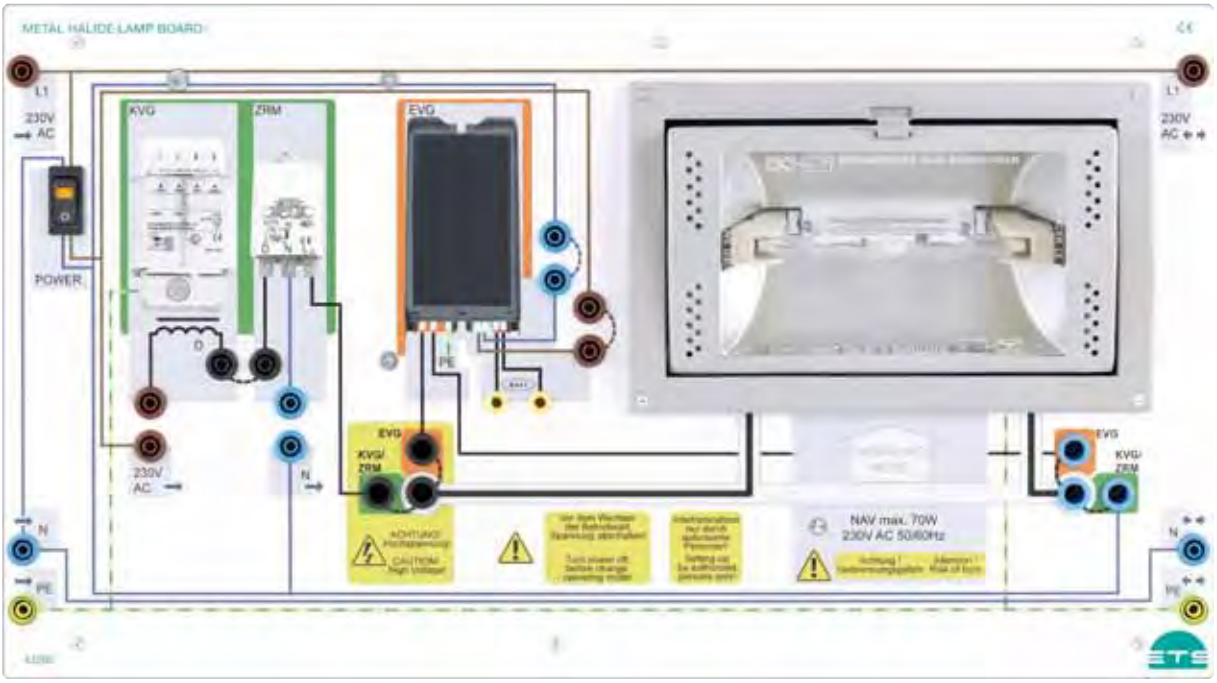
- Basics of lighting technology luminous flux, luminous intensity, illuminance, efficiency, luminance
- Circuits of lamp control gear and ignitors
- High-pressure discharge lamps on EVG
- Dimming of lamps
- Assessing areas of application
- Calculation of lighting systems
- Metrological examination of lamps
- Control and diagnosis of operating devices via DALI
- Networking of operating devices via DALI

Technical data

- Conventional ballast
- Digital safety ignitor
- electronic ballast with DALI interface
- Pivoting recessed luminaire for high-intensity discharge lamps, with UV filter and protective glass
- High-pressure sodium lamp 70 W
- ON/OFF switch
- All necessary connections led out on 4 and 2 mm safety sockets
- The wiring of the lamp circuit is done with special high voltage measuring leads and the corresponding sockets.

No.	Designation	Order No.
1	High Pressure Sodium Lamp Board	43208

Metal Halide Lamp Board



DALI

1

Learning objectives

- Basics of lighting technology luminous flux, luminous intensity, illuminance, efficiency, luminance
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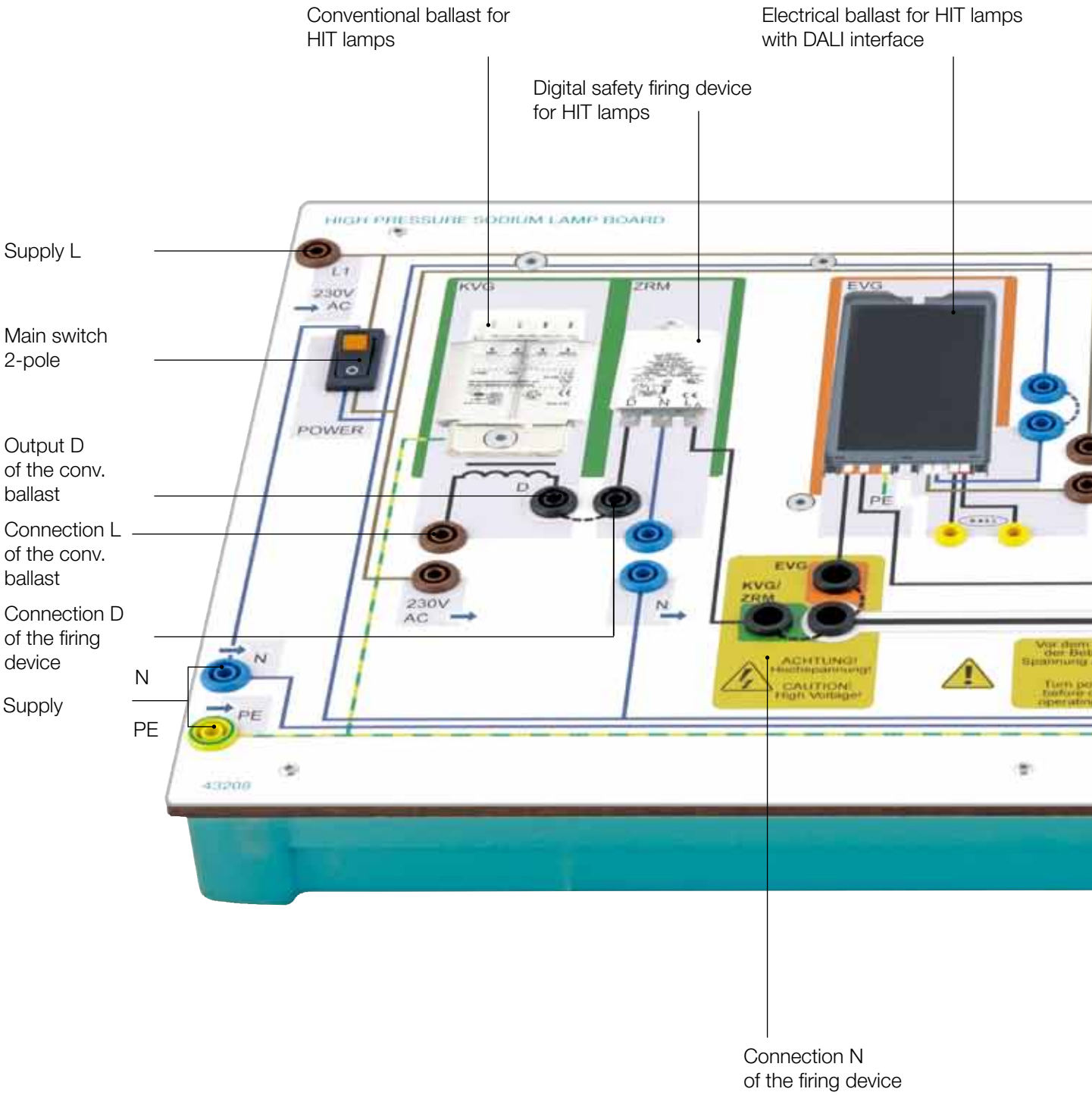
- Control and diagnosis of operating devices via DALI
- Networking of operating devices via DALI

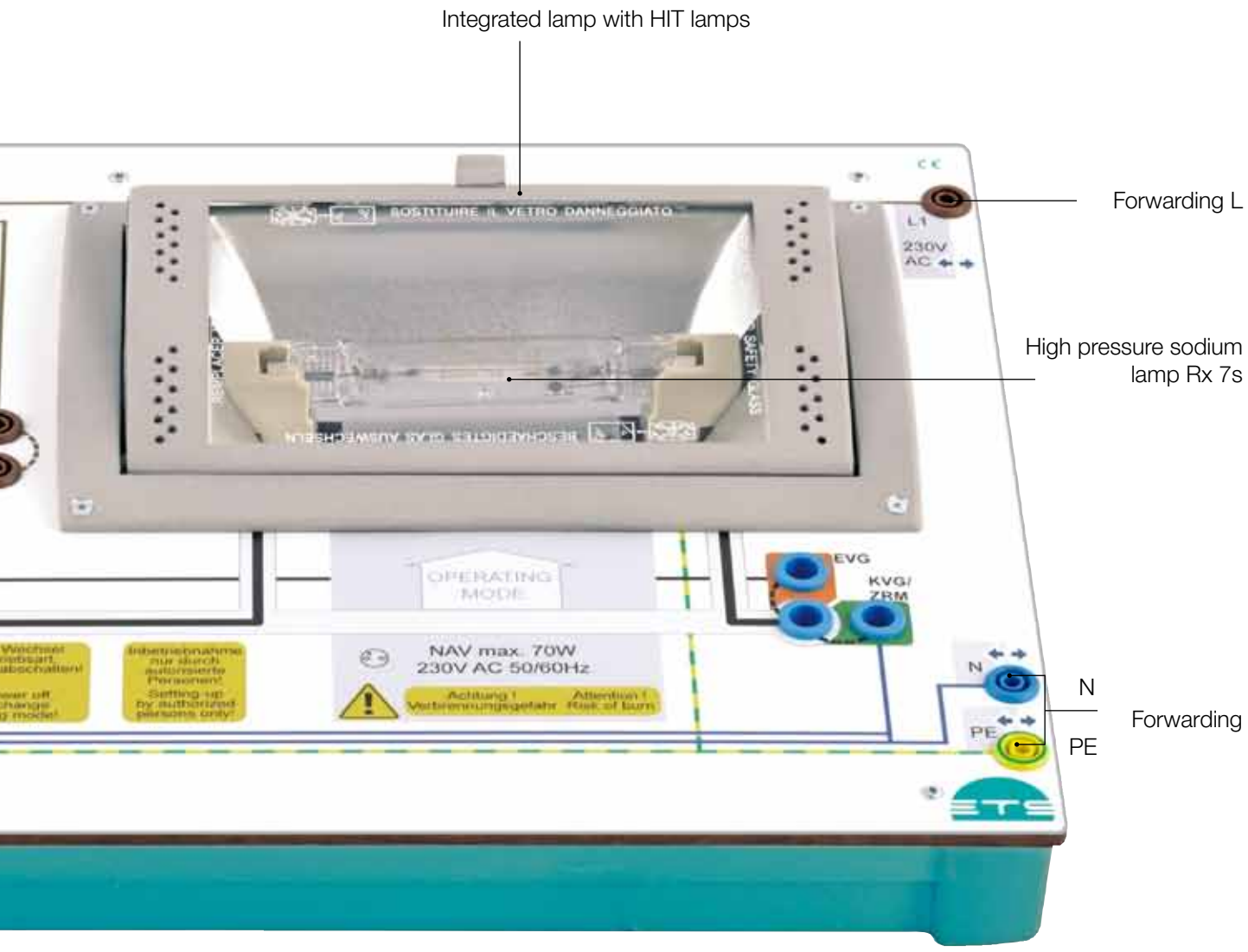
Technical data

- Conventional ballast
- Digital safety ignitor
- Electronic ballast with DALI interface
- Pivoting recessed luminaire for high-intensity discharge lamps, with UV filter and protective glass
- High-pressure sodium lamp 70 W
- ON/OFF switch
- All necessary connections led out on 4 and 2 mm safety sockets
- The wiring of the lamp circuit is done with special high voltage measuring leads and the corresponding sockets.

No.	Designation	Order No.
1	Metal Halide Lamp Board	43209

High Pressure Sodium Lamp Board




Integrated lamp with HIT lamps
Forwarding L
High pressure sodium lamp Rx 7s
N
Forwarding
PE
L1
230V AC
EVG
KVG/ ZBM
N
PE
NAV max. 70W
230V AC 50/60Hz
OPERATING MODE

SPECIAL LAMPS

Courseware

1

Printed and digital

2

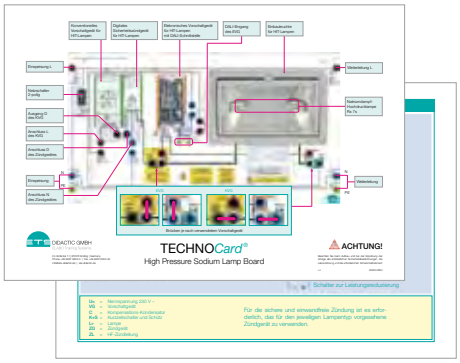
3

4

Manual contents

⟩ Project 1:
Installation of HTI downlights

⟩ Project 2:
Lighting of walkway on a company premises



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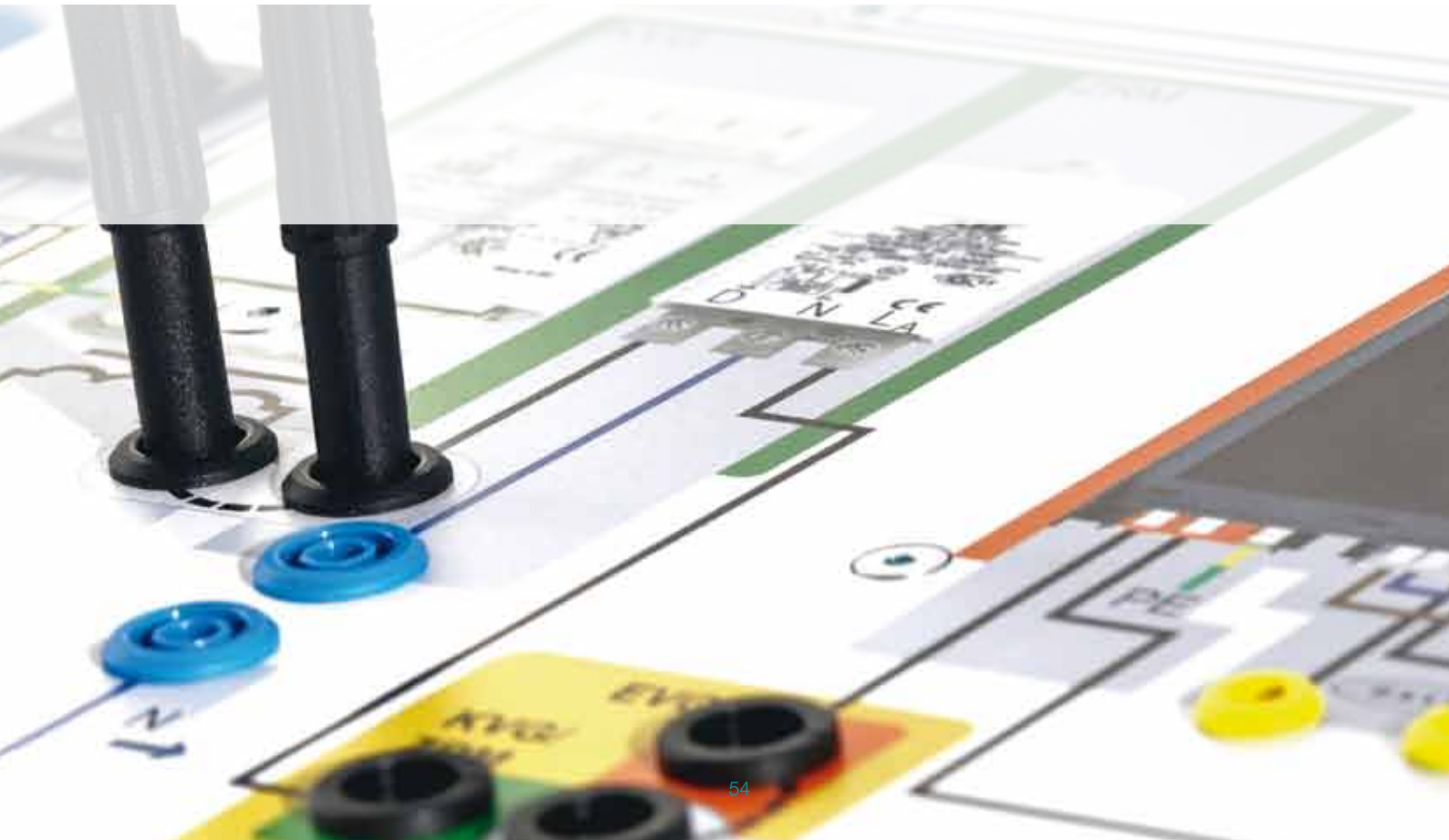
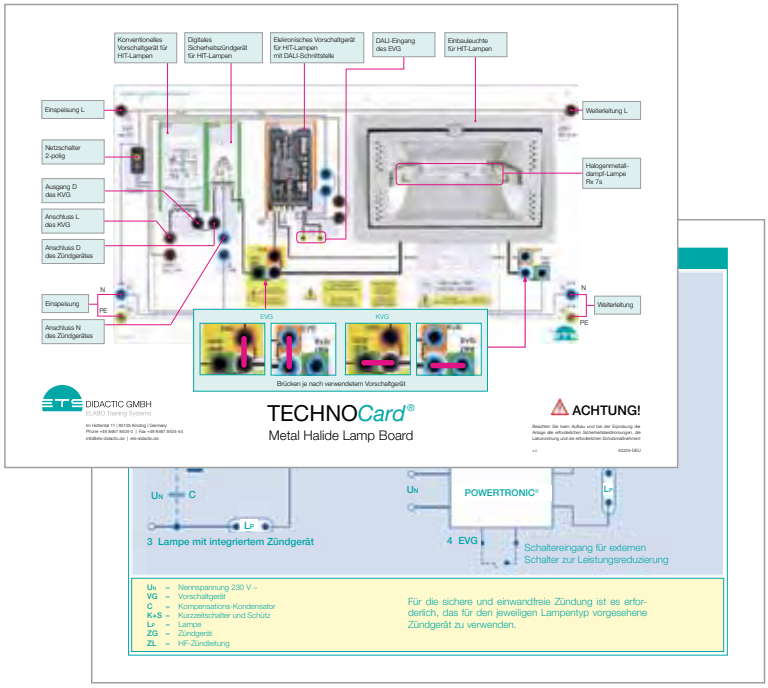


TECHNOCard®



6

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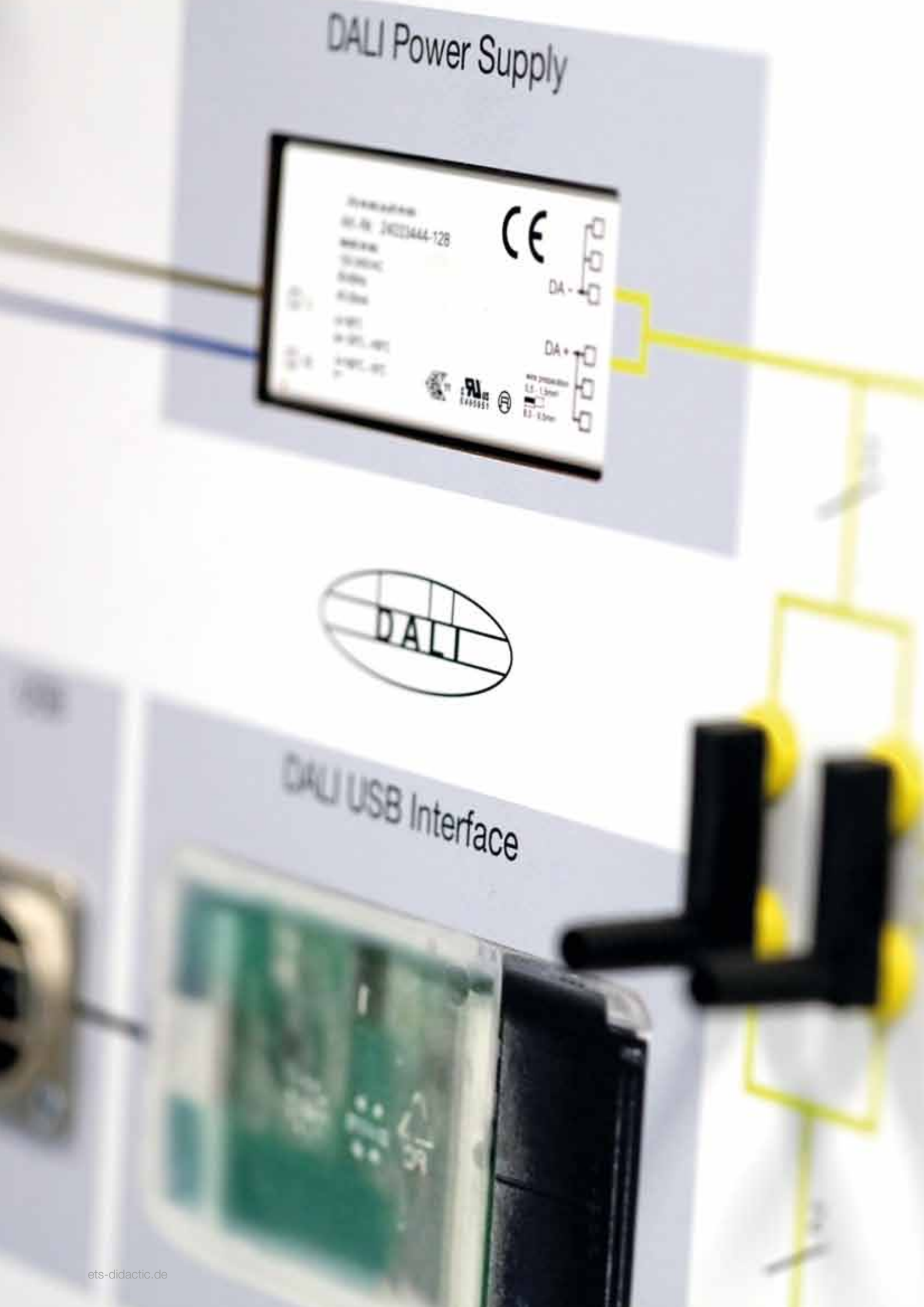
- Display board in 303 mm x 426 mm format
- Double-sided color design
- Robust, hard-wearing quality

No.	Designation	Order No.
1	Set of ETS ring binders	91903
2	Lighting technology - Instructor´s Manual	43255CD-ENG
3	Lighting technology - Student Manual	43254CD-ENG
4	Lighting technology - Presentation Aids	43256CD-ENG
5	TECHNOCard® - High Pressure Sodium Lamp Board	43224-ENG
6	TECHNOCard® - Metal Halide Lamp Board	43225-ENG



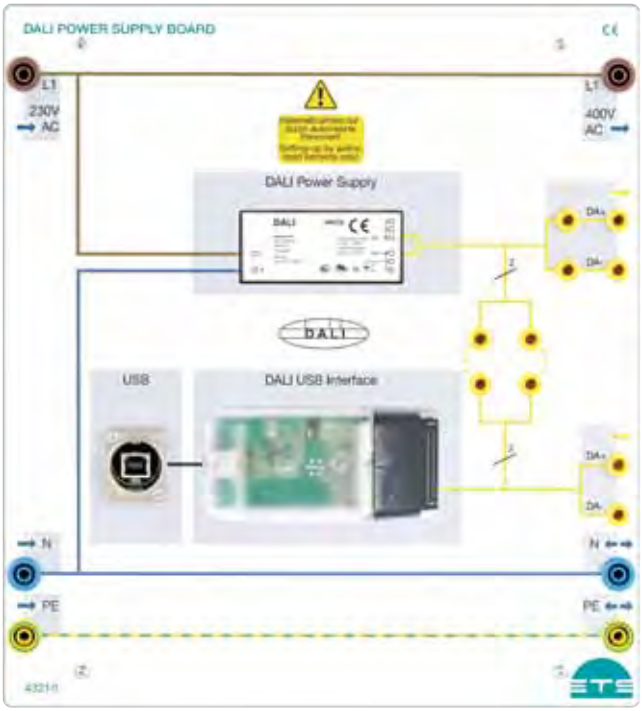
ETS DIDACTIC GMBH

LIGHTING CONTROL WITH DALI

BASICS OF LIGHTING TECHNOLOGY

LIGHTING CONTROL WITH DALI

DALI Power Supply Board



1

Learning objectives

- Getting to know the basics of the DALI system
- Structure of DALI controllers
- Commissioning and trouble-shooting
- Integration of sensors (e.g. light and motion) in DALI systems

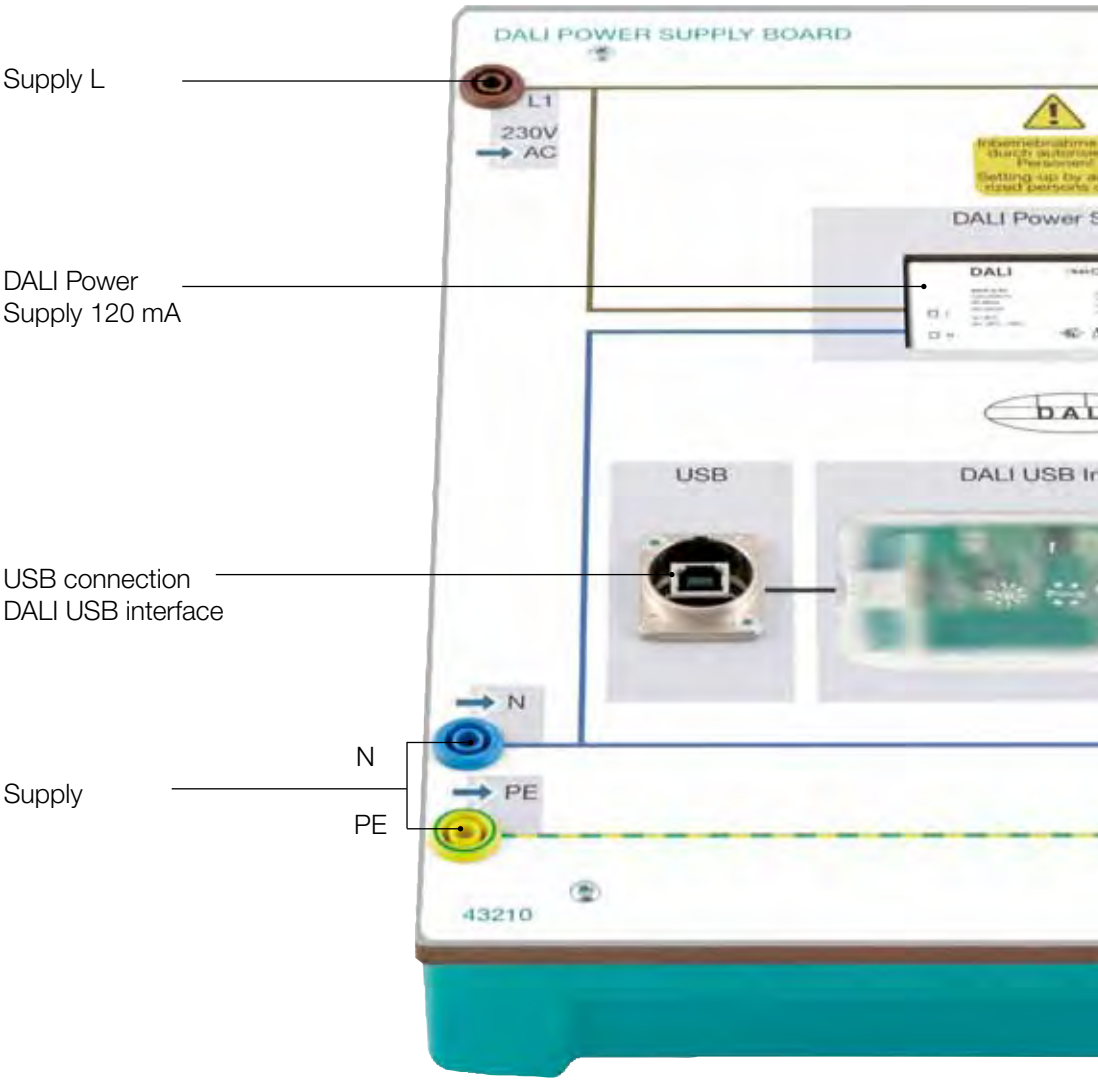
Technical data

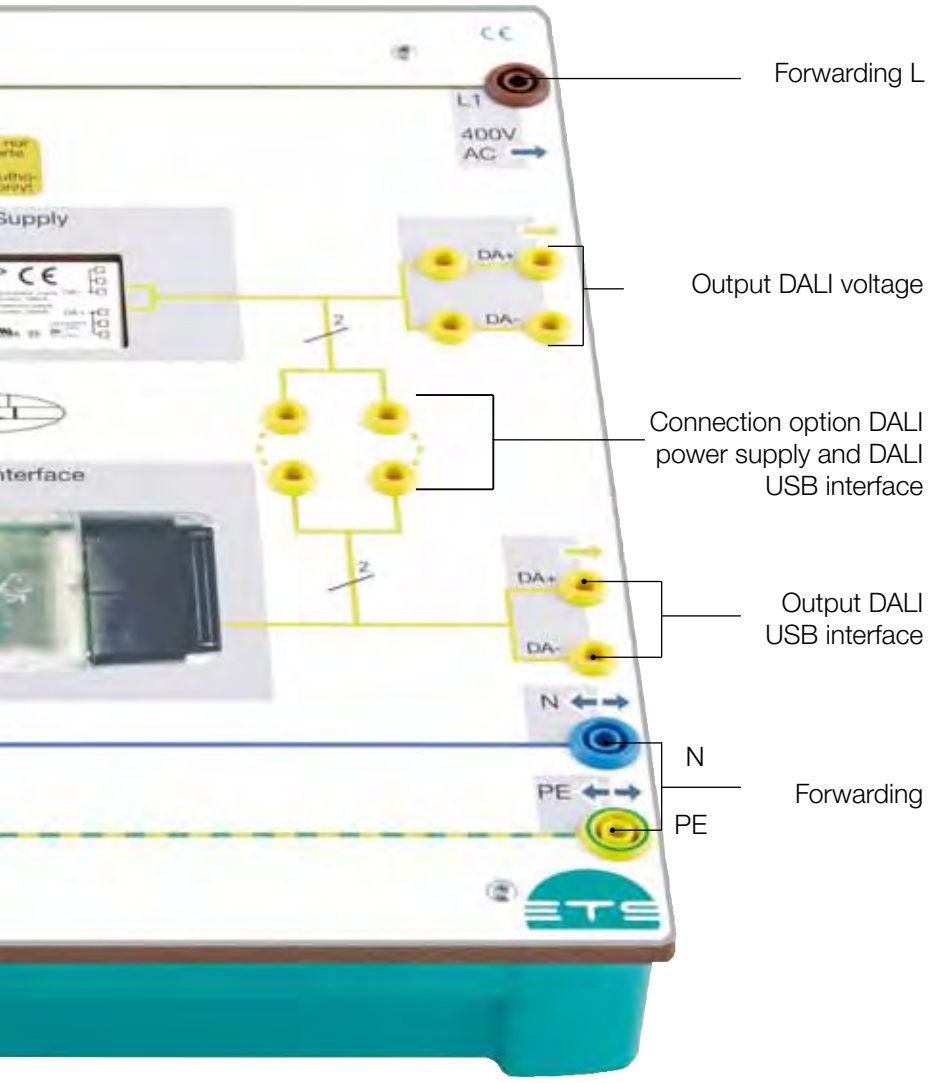
- DALI power supply 128 mA
- DALI USB Interface
- DALI Cockpit Software
- All required connections on 4 and 2 mm safety sockets

No.	Designation	Order No.
1	DALI Power Supply Board	43210


USB 2.0 High Speed Cable
STYLE 2725 80°C 30V
USB
DALI
N
PE

DALI Power Supply Board





Forwarding L

Output DALI voltage

Connection option DALI power supply and DALI USB interface

Output DALI USB interface

N

Forwarding

PE

LIGHTING CONTROL WITH DALI

DALI Touch Panel Board

1

Learning objectives

- Get to know the basics of the DALI system
- Structure of DALI controllers
- Commissioning and trouble-shooting
- Integration of sensors (e.g. light and motion) in DALI systems
- Creation of operating pages

Technical data

- DALI Touch Panel with Blue-tooth interface
- Set of control surfaces
- App for Android and iOS
- All required connections on 2 mm safety sockets

No.	Designation	Order No.
1	DALI Touch Panel Board	43211

DALI TOUCHPANEL BOARD

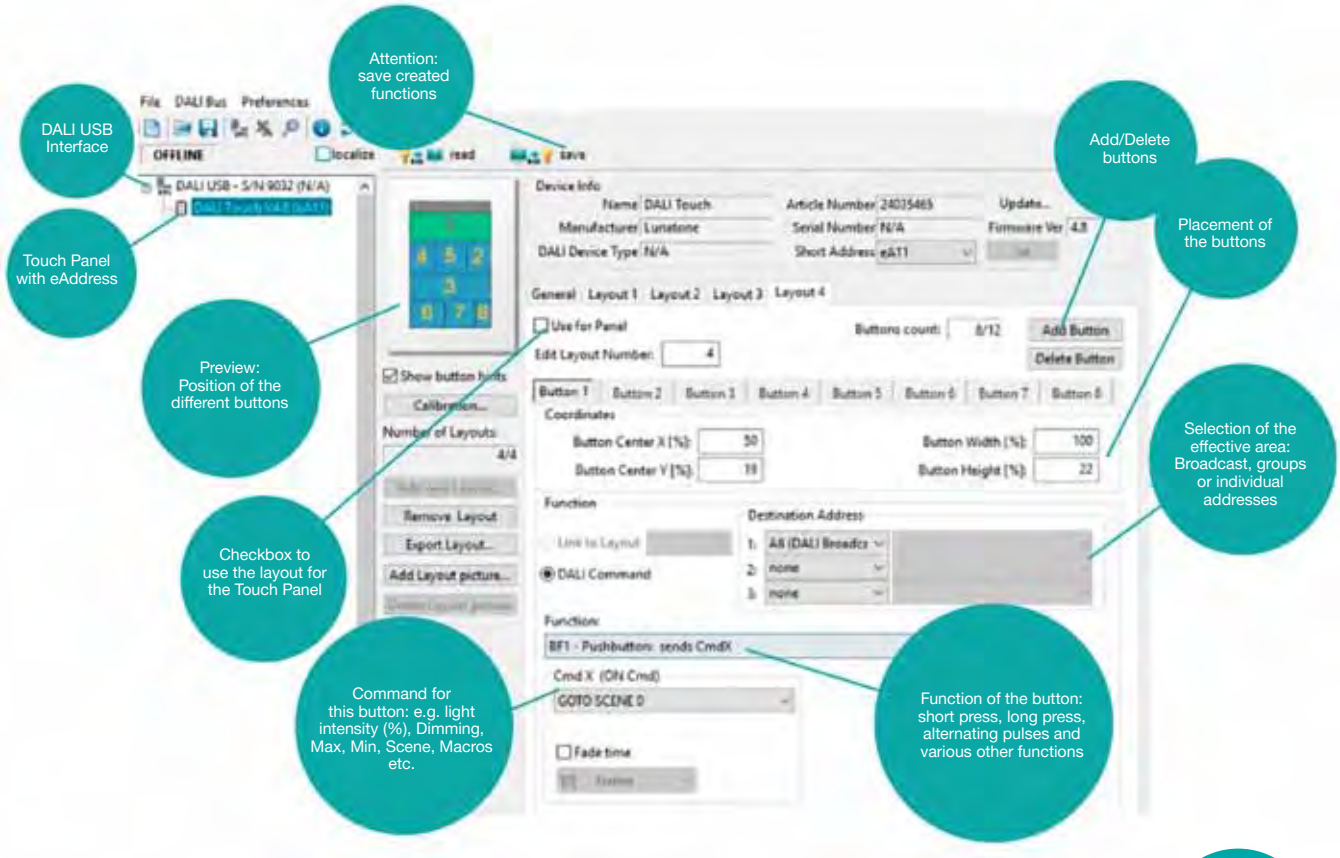
DALI Touchpanel Board with Bluetooth 4.0 is a multifunctional control device with up to 12 freely configurable buttons combined with a Bluetooth connection to iOS and Android devides (DALI Touch App). Induvidual layouts and menus can be stored on www.dalitouch.com and thus shared with fellow users. The Bluetooth devices have a range of about 10-15m.

App for Android and iOS

DALI Touch

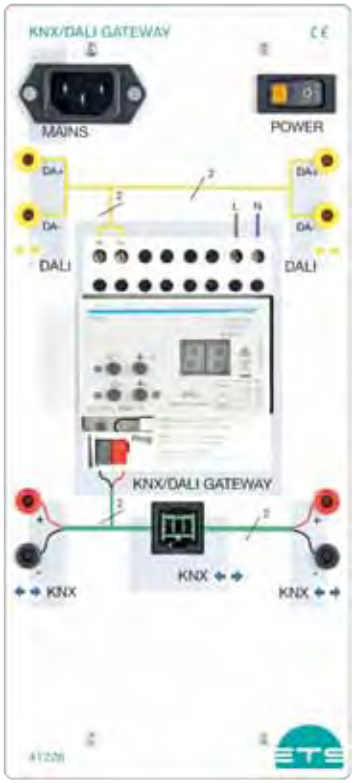
You can download the app for your smartphone here:

Typical setup for color and color temperature control:



GATEWAY DALI LIGHTING CONTROL

KNX / DALI Gateway



1

Learning objectives

- Project planning of KNX systems
- Commissioning and trouble-shooting
- Commissioning of a DALI bus system
- Integration of the DALI bus system into a KNX system
- Documentation and maintenance

Technical data

- DALI interface for the integration of up to 64 DALI devices
- DALI bus voltage: approx. 19 V DC
- KNX bus connection
- Ansteuerung von DALI device control DT8 8 (Turnable white)
- Main voltage:110 – 240 V AC 50 / 60 Hz
- All inputs and outputs are connected via safety sockets (2 mm)

No.	Designation	Order No.
1	KNX DALI Gateway	41226

DALI DIGITAL ADDRESSABLE LIGHT INTERFACE

What is DALI?

DALI is an independent multi-master system (several control units in one bus system). It can operate as an autonomous lighting management system and can also be connected to a higher-level building management system. DALI works as an addressable, bidirectional communication management system in which control devices recieve feedback from the components of the system. The DALI protocol was internationally standardized in 1999 in IEC 62386. DALI is an open standard for LED control gear and ballasts. Switches and sensors are defined in the DALI-2 standard.

DEVICE TYPE - DT

In the DALI standard, devices are diveded into nine different types:

- DT0, DT2 and DT3 describe fluorescent and halogen lamps
- DT4 is used for phase dimming of 230V luminaires e.g. incandescent lamps and retrofit LED lights
- DT5 are signal converters that convert DALI signals into convert analog dimming signals e.g. 0-10V
- DT6 is used for single color LEDs - 1 channel
- DT7 is the pure ON/OFF function e.g. relay modules
- DT8 is used for color management
  - Tunable White and RGB / RGBW

CONSTRUCTION OF A DALI SYSTEM

A DALI system includes the following components:

- DALI bus supply: Each DALI circuit needs a bus supply
- Control devices: These are devices that send DALI commands and thus control operating devices (e.g. key couplers, rotary dimmers, touch panels and many other control elements).
- Control gear: DALI ballasts and actuators (e.g. DALI LED dimmers) which can be adjusted based on stored parameters and received DALI commands operate a light source accordingly. The simplest DALI circuit thus consists of a device for the DALI bus supply, a control device that sends commands and an operating device that recieves and executes the commands.

COMMISSIONING AND CONFIGURATION OF THE DALI BUS

With the PC program DALI Cockpit and a DALI USB interface a DALI system can be addressed and configured.

ADDRESSES, GROUPS AND SCENES

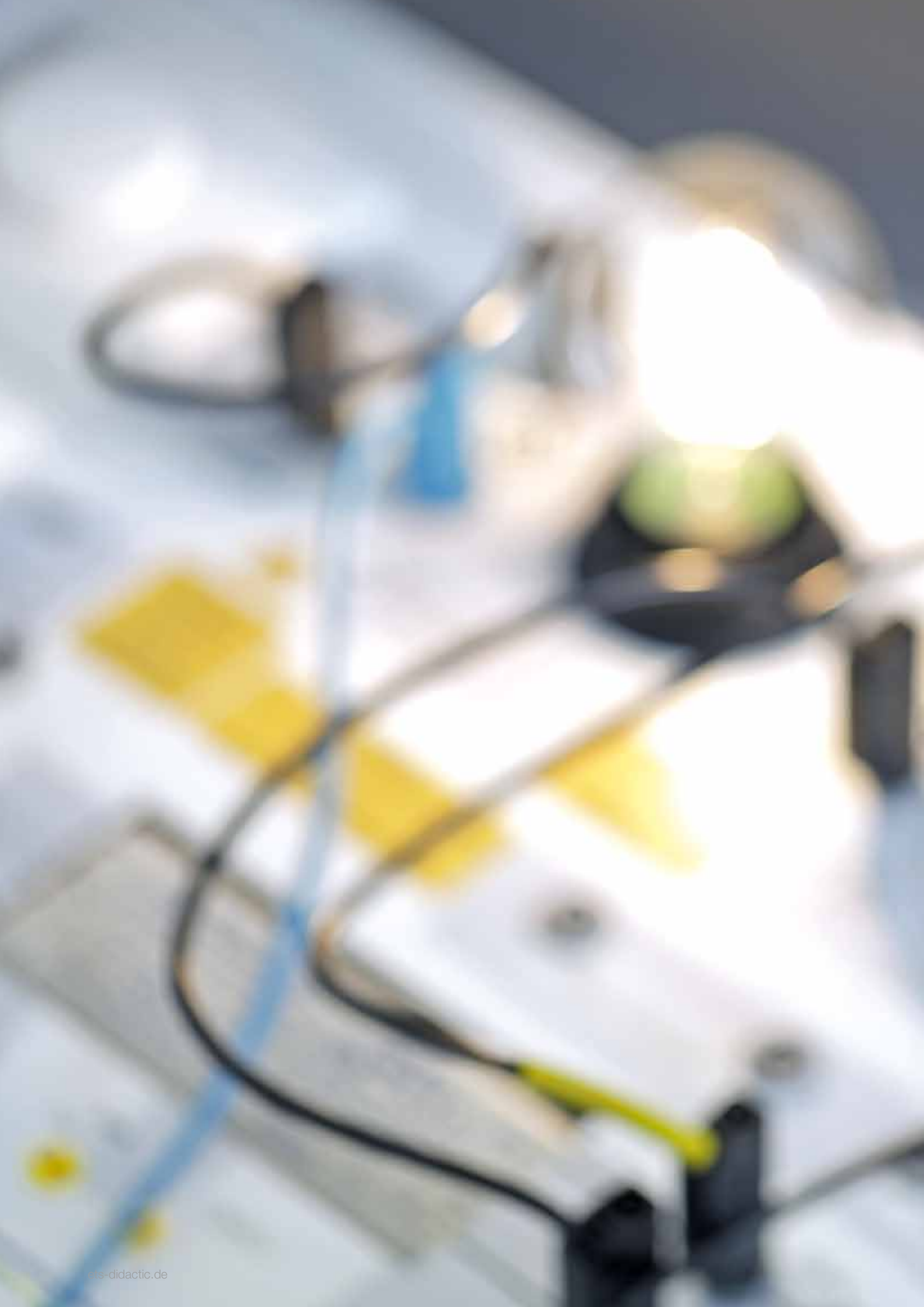
An operating device can be controlled by means of DALI commands. The effective range of a DALI command is defined by the target address contained in the command. A distinction is made between individual addresses, group addresses and broadcast (entire DALI bus). Groups: Commands to groups can be used to switch and dim entire areas together. Up to 16 groups can be created in the DALI system, each DALI device can belong to one or more groups. Scenes: Each DALI device has a memory for 16 scenes. A DALI scene is an operating state, e.g. dimming value or color adjustment of a luminaire. The scene call can be sent to the device directly, to a group or to the entire DALI bus (broadcast).

DALI FACTS

- up to 64 addressable DALI control gears
- up to 16 DALI groups
- up to 16 DALI scenes
- DALI bus voltage: 12V to maximum 22.5V (standard 16V)
- DALI system current: <250mA
- Data transmission speed: 1200Baud (asynchronous interface)
- Cable length up to 300m (with 1.5mm^2 conductor cross section), resulting from the permissible voltage drop on the DALI line of maximum 2V.

INTEGRATION OF DALI

Integration into KNX systems is possible via a DALI/KNX gateway. For control and monitoring, DALI systems can be connected to a superordinate building management system (BMS).



MEASURING DEVICES

MEASURE, ANALYZE AND CONTROL

MEASURING DEVICES

Infrared Thermometer Laser Pointer

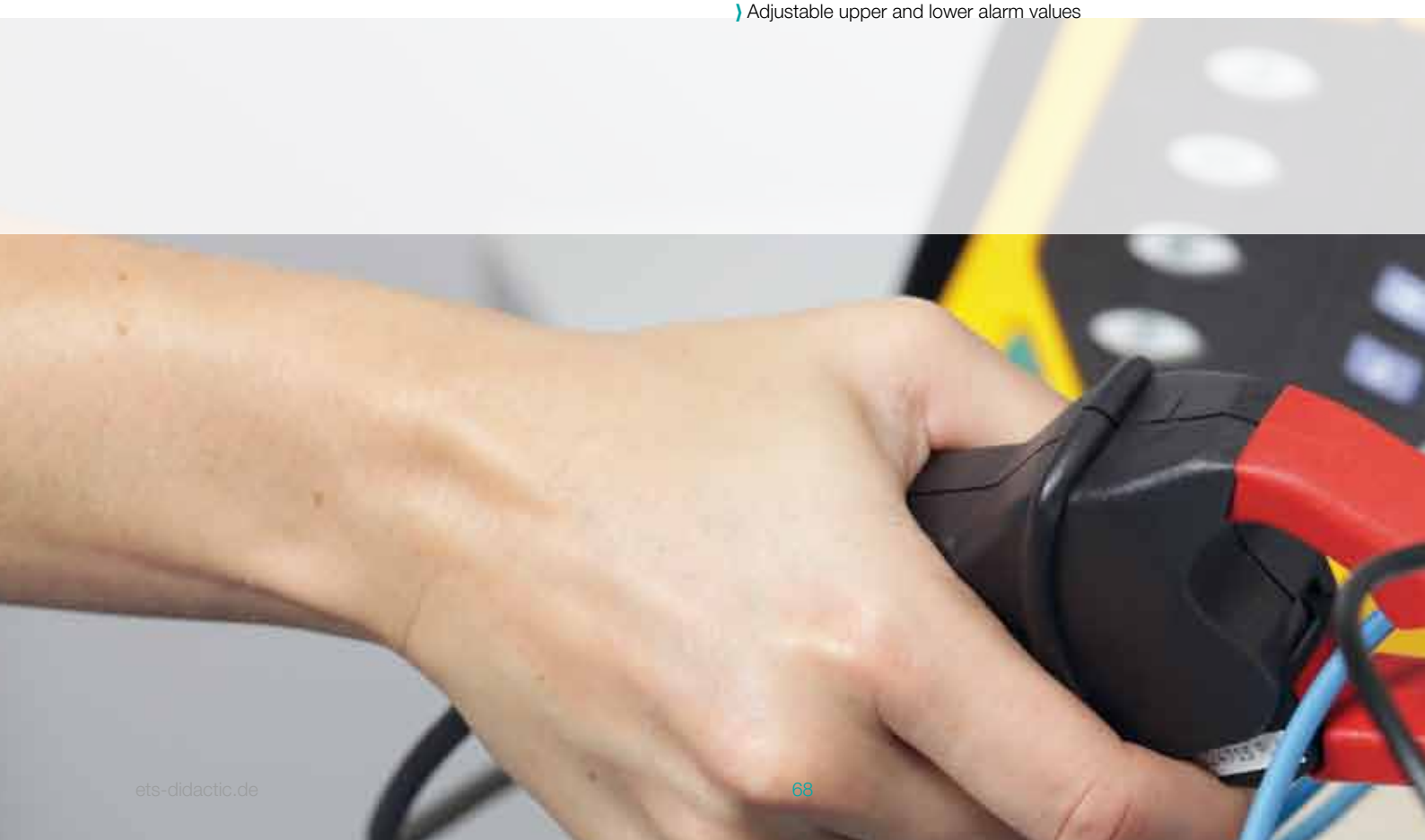
1

Technical data

- Measuring range -35°C bis +450°C
- Measurement accuracy: ≥ 0° C: ± 1,8 °C or ± 1,8 % of reading (whichever is greater) < 0°C : ± (1,8°C + 0,1°C/°C)
- Display resolution 0,1°C (0,1°F)
- Respons time 250 ms (95 % of display)
- Number of target scanners: One laser beam
- Measurement functions: Instantaneous measurement, MAX, MIN, avarage (AVG), difference (DIF), continuous measurement by blocking the trigger handle, alarms
- IP65 protection class
- Drop resistance: up to drop heights of 3 meters
- Tripod thread: available

Features

- Compact and robust devices: drop-proof up to 3 m drop height, splash-proof and dust-proof according to IP65
- Excellent measuring cables
- Wide measuring range from -35°C to +650°C
- Double laser sighting beam (CA 1862) for accurate localization of the mearuring point
- Adjustable upper and lower alarm values



Power analyzer 3Phases

2

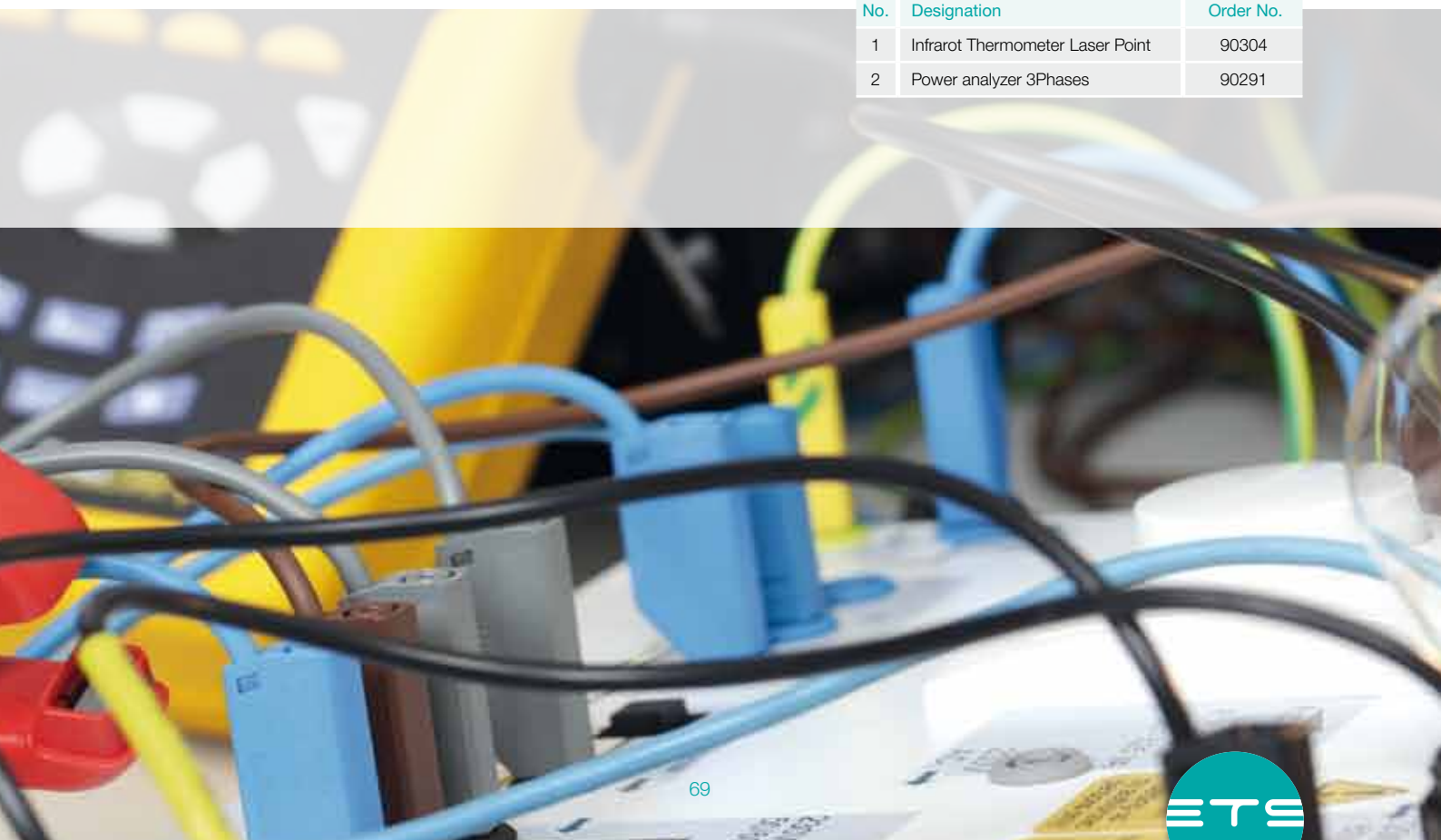
Technical data

- Number of inputs five voltage / four current
- Voltage (TRMS AC+DC) 2 V to 1000 V
- Current (TRMS AC+DC) MN93A: 0,005 Aac to 100 Aac
- Frequency 40 Hz to 69 Hz
- Powers W, VA, var, VAD, PF, DPF, cos ϕ, tan ϕ
- Energies Wh, var, VAh, VADh
- Harmonics mearurement up to 50. order with phasing
- Transient measurenemnt 210
- Inrush (inrush current measurement) Yes, up to 10 minutes
- Recording up to several years

Features

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

No.	Designation	Order No.
1	Infrarot Thermometer Laser Point	90304
2	Power analyzer 3Phases	90291



MEASURING DEVICES

Thermal imagine camera

1

Technical data

- Sensor size 80 x 80
- Temperature range -20°C to +250°C
- Field of view 20°C x 20°C
- Focusing fixed
- Minimum focusing distance 40 cm
- Connectable measuring devices Multipurpose clamps F407, F607, Multimeter CA5293

Features

- Large 2,8 inch screen
- Roller shutter
- Bluetooth connection to other measuring devices
- Standard AA batteries
- CAmReport Software

Lux meter with internal memory, interface and software

2

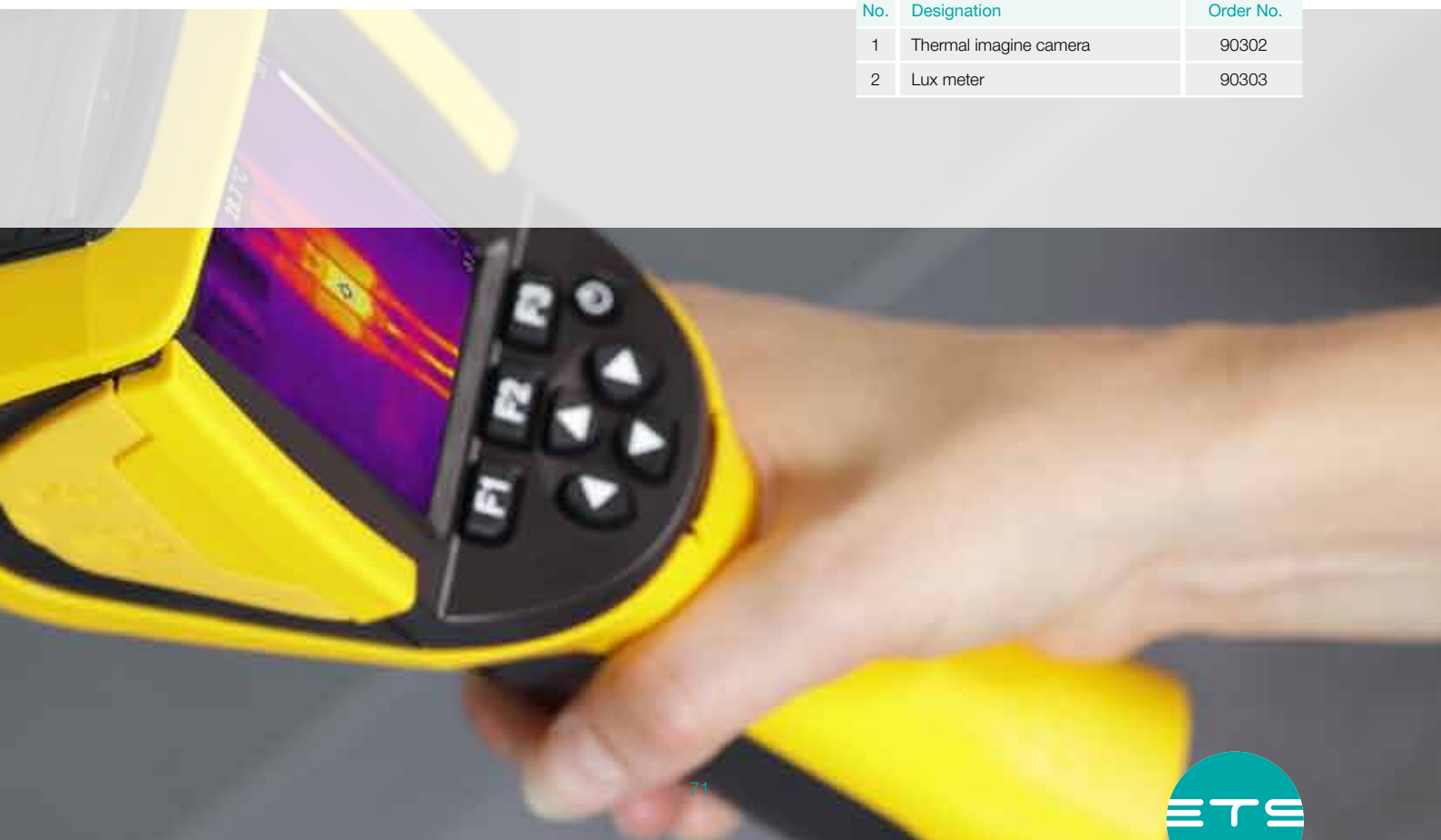
Technical data

- Measuring range 0,1 lx bis 200 000 lx (Lux)
- Battery life 500 hrs. (manual operation) / three years for recordings (with 15 minutes storage interval)
- Two communication interfaces: Bluetooth wireless connection and USB connection
- Mounting: housing has magnetic mount, slot for wall mounting, compatible with multifix accessories
- IP50 protection class
- Compliance with IEC 61010-1 / IEC 61326-1 / class C lux meter standard NF C 42-710

Features

- Compensation of the spectral error of LED of fluorescent light sources
- Cartographic display
- Min, max, average and hold function
- Removable sensor head

No.	Designation	Order No.
1	Thermal imagine camera	90302
2	Lux meter	90303



MEASURING DEVICES

Digital multimeter

1

Professional digital multimeter

The multimeter for education

The professional multimeter is designed to measure DC & AC voltage up to 1000 V in the measurement category CAT III 600 V or CAT IV 300 V safety according to the specifications of IEC/EN61010-1.

The device equipped with a mechanical protection against operating errors. The multimeter has a large, high-resolution display with bargraph and a AutoPowerOff function to conserve battery power.

Ideally suited for laboratory use in school and training.

Functions

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

2

MEASURING DEVICES

Power Quality Analyzer Board II

3

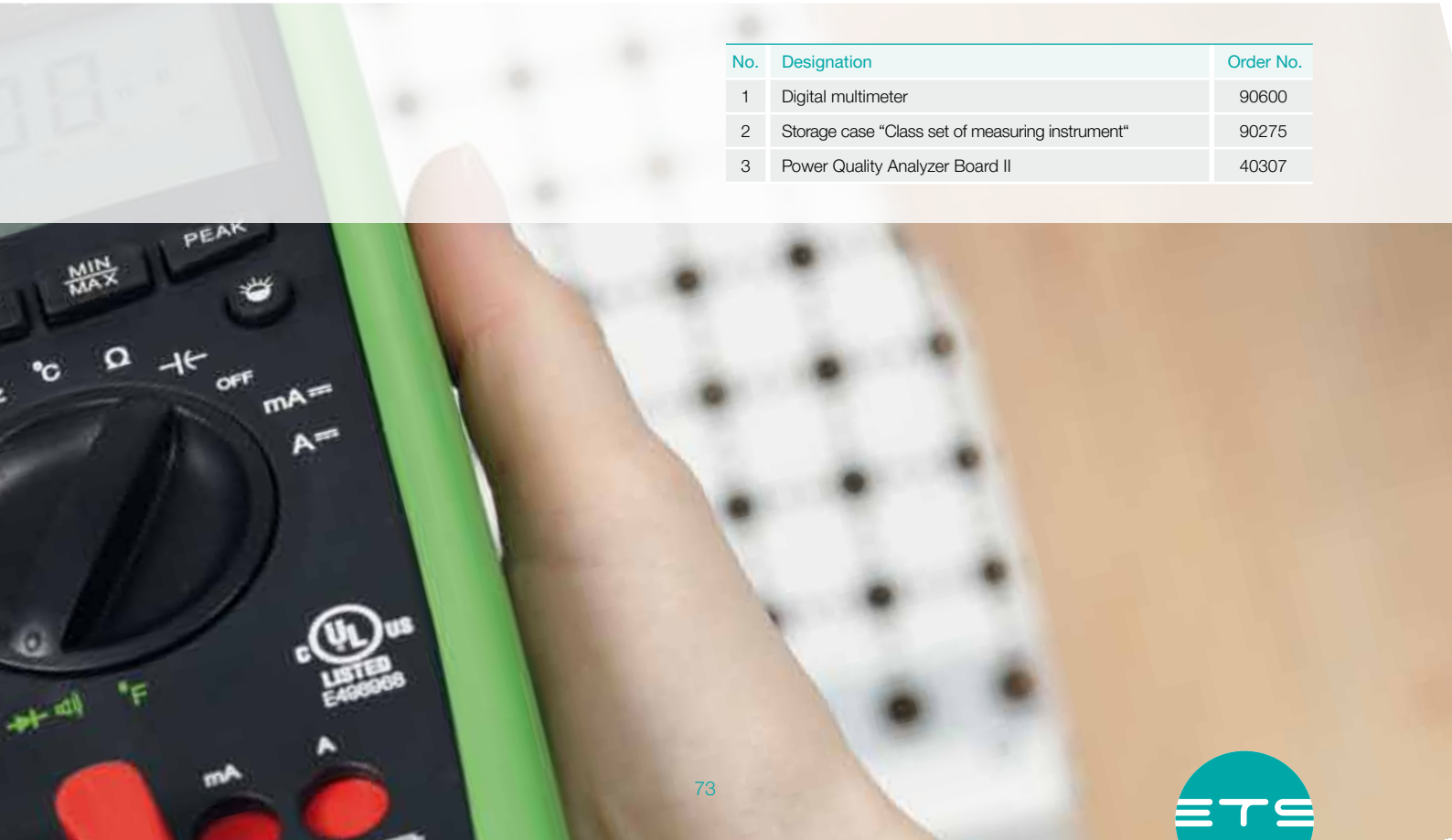
Learning objects

- Determination of important electrical parameters such as active, apparent and reactive power (e.g) for lighting fixtures)
- Measurements of the network load due to harmonics (3-phase representation)
- Measurements of the power factor lambda and cosϕ
- Determination of the electrical parameters of electric motors
- Application and use of energy meters
- Energetic investigation of different consumers
- Vectorial representation of the three-phase system
- Oscilloscope function for voltage and current

Technical data

- Measuring voltage 0 – 600 V AC, max. 5 A
- Operating voltage 230 V AC
- LAN interface
- Integrated oscilloscope function
- Web server
- Modbus IP interface

No.	Designation	Order No.
1	Digital multimeter	90600
2	Storage case “Class set of measuring instrument“	90275
3	Power Quality Analyzer Board II	40307



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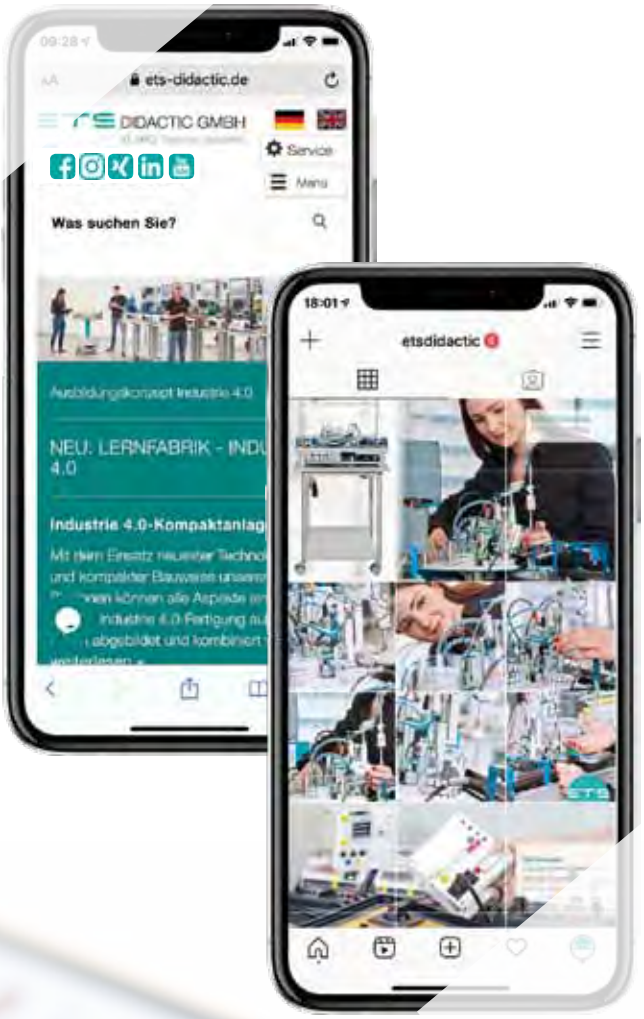

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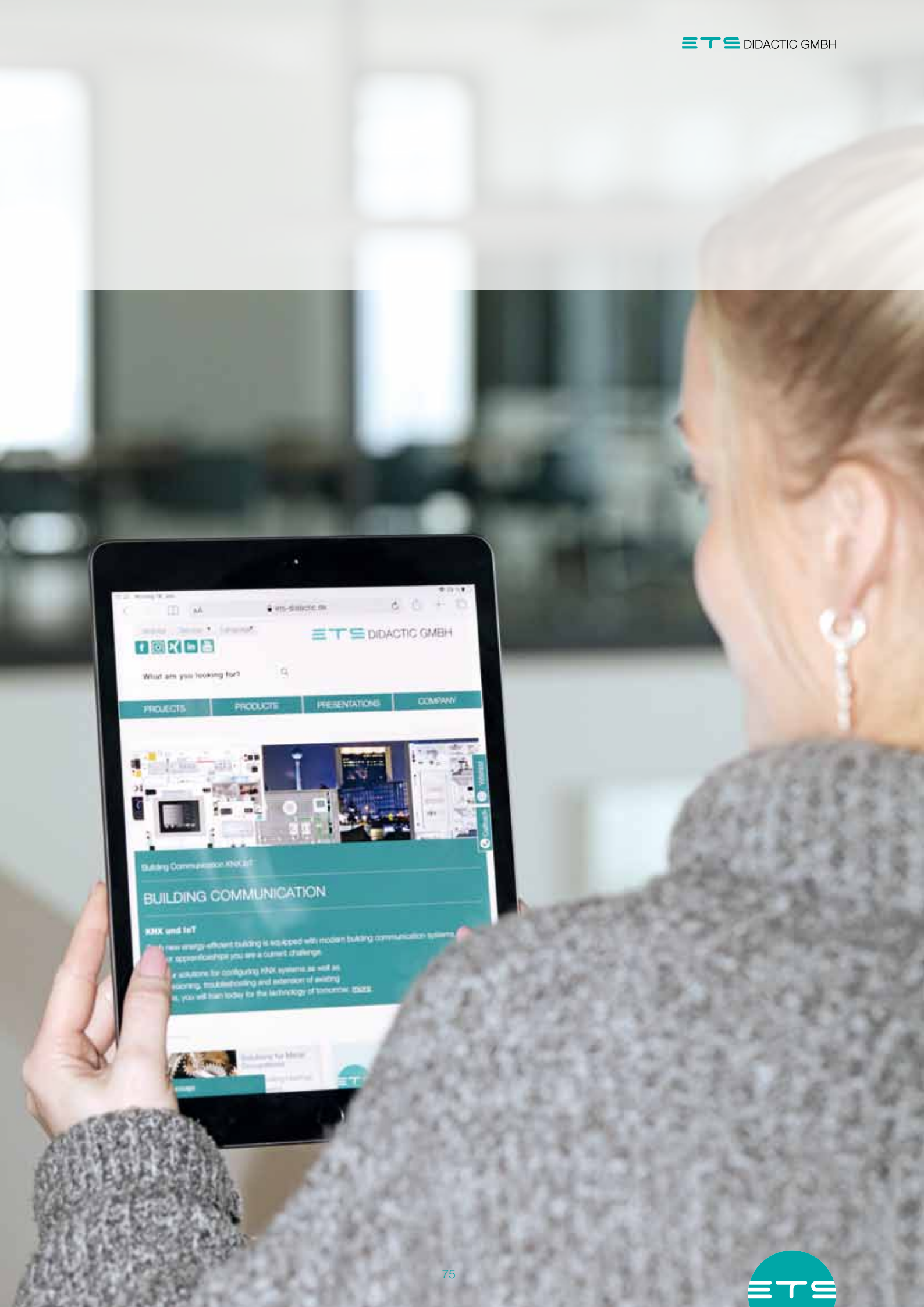
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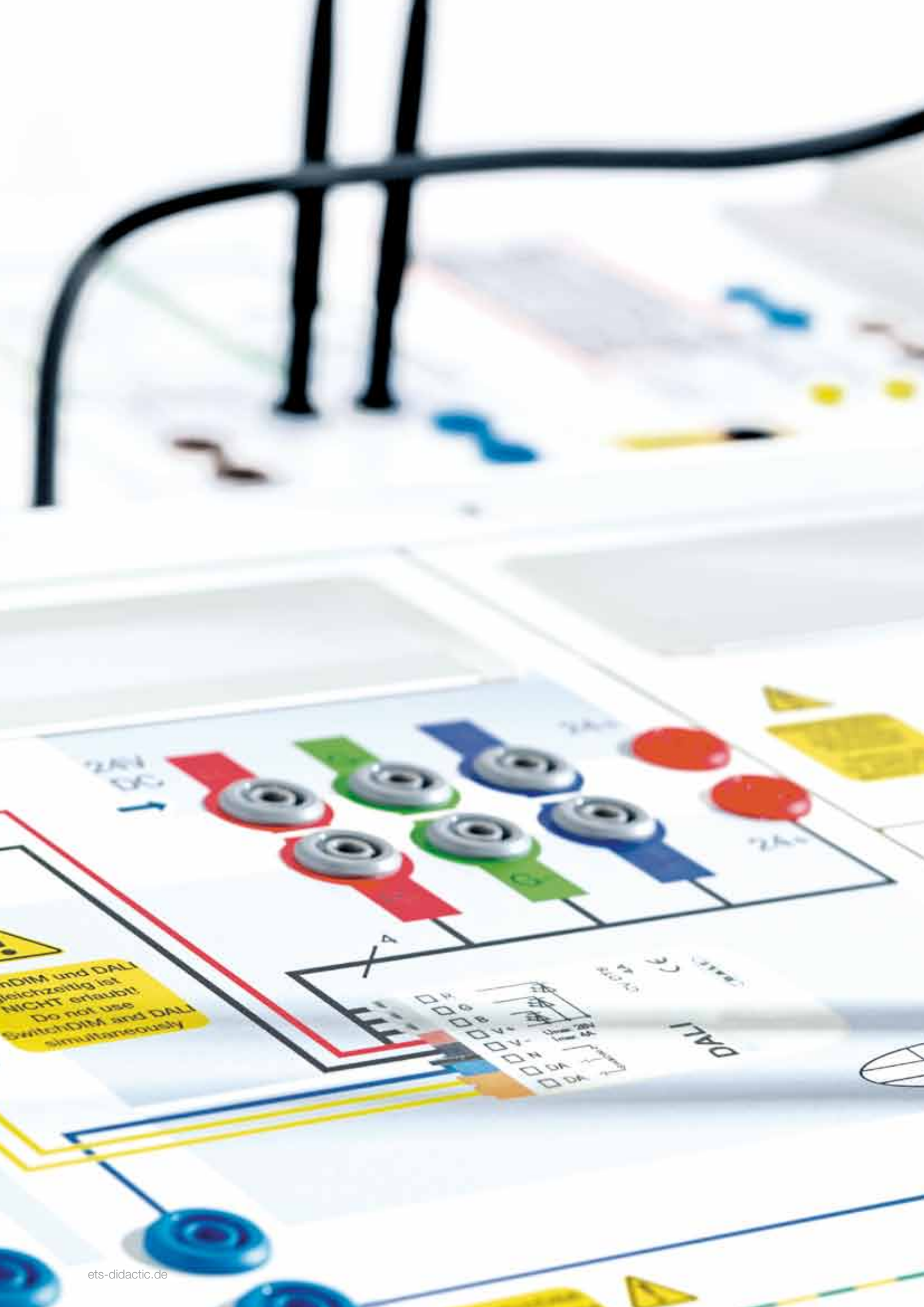
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We would like:

○ to be contacted by telephone ○ Information about seminar dates ○ to have an on-site consulting ○ to recieve an offer about..

Qty.	Designation	Order No.
	Incandescent Lamps Board	43204
	Set of ETS ring binders	91903
	Lighting technology – Instructor´s Manual	43241CD-ENG
	Lighting technology – Student Manual	43240CD-ENG
	Lighting technology – Commissioning/Troubleshooting	43242CD-ENG
	Lighting technology – Presentation Aids	43243-ENG
	TECHNOCard® – Energy Saving Lamps Board	43221-ENG
	Fluorescent Lamps Board A II	43200
	Fluorescent Lamps Board B II	43201
	Power Quality Analyzer Board II	40307
	Set of LED tubes	43202
	Lighting technology – Instructor´s Manual	43245CD-ENG
	Lighting technology – Student Manual	43244CD-ENG
	Lighting technology – Presentation Aids	43246CD-ENG
	TECHNOCard® – Fluorescent Lamps Board A und B	43220-ENG
	LED Lamps Board CV	43206
	Lighting technology – Instructor´s Manual	43248CD-ENG
	Lighting technology – Student Manual	43247CD-ENG
	Lighting technology – Presentation Aids	43249CD-ENG
	TECHNOCard® – LED Lamps Board CV	43222-ENG
	LED Lamps Board CC	43207

Qty.	Designation	Order No.
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	Lighting technology – Student Manual	43250CD-ENG
	Lighting technology – Presentation Aids	43252CD-ENG
	TECHNOCard® – LED Lamps Board CC	43223-ENG
	High Pressure Sodium Lamp Board	43208
	Metal Halide Lamp Board	43209
	Lighting technology – Instructor´s Manual	43255CD-ENG
	Lighting technology – Student Manual	43254CD-ENG
	Lighting technology – Presentation Aids	43256CD-ENG
	TECHNOCard® –High Pressure Sodium Lamp Board	43224-ENG
	TECHNOCard® – Metal Halide Lamp Board	43225-ENG
	DALI Power Supply Board	43210
	DALI Touch Panel Board	43211
	KNX DALI Gateway	41226
	Infrarot Thermometer Laser Point	90304
	Power analyzor 3Phases	90291
	Thermal imaging camera	90302
	Lux meter	90303
	Digital multimeter	90600
	Storage case “Class set of measuring instruments“	90275

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