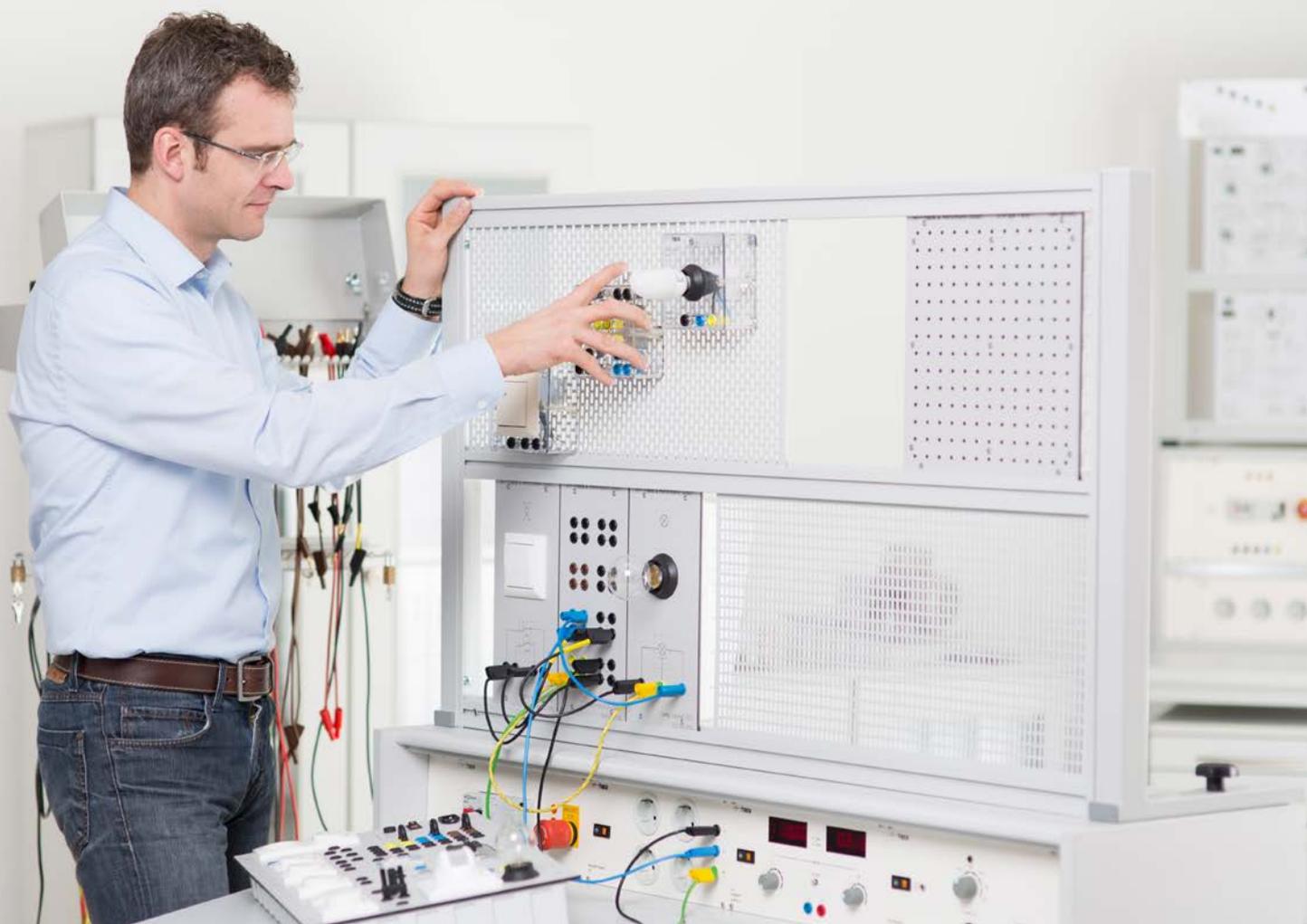


# SAFETY INSTALLATIONS, DOMESTIC & INDUSTRIAL WIRINGS

In this chapter you will get familiar with our training systems for domestic and industrial wirings. You can choose from compact panels with the complete topic in one board, or component panels where more panels can be combined to an individual solution, or alternatively transparent boxes, where you can arrange flexible circuits on perforated grid walls. No matter what system you choose, learning success is always granted. All cable connections are designed for use of the touch-protected 4mm safety leads, connections for extra-low voltage are done with 2mm laboratory leads, this ensures a maximum of safety for the trainees.

All courses for domestic or industrial wirings should start with the basics to electrical safety, e.g. the safeguard panel.



## SAFETY INSTALLATION TECHNOLOGY

The Safeguard Panel is a mandatory training system for all electric professions. It teaches common dangers and protective measures for the erection of low-voltage installations according to German standard VDE0100.

For a safe learning environment the output voltage is reduced by factor 10 (e.g. input: 230V = 23V operating voltage).

The panel is for the simulation of different irregular electric situations, where equipment and person is protected by safety installations, or in case of danger to person a LED in red lights up.

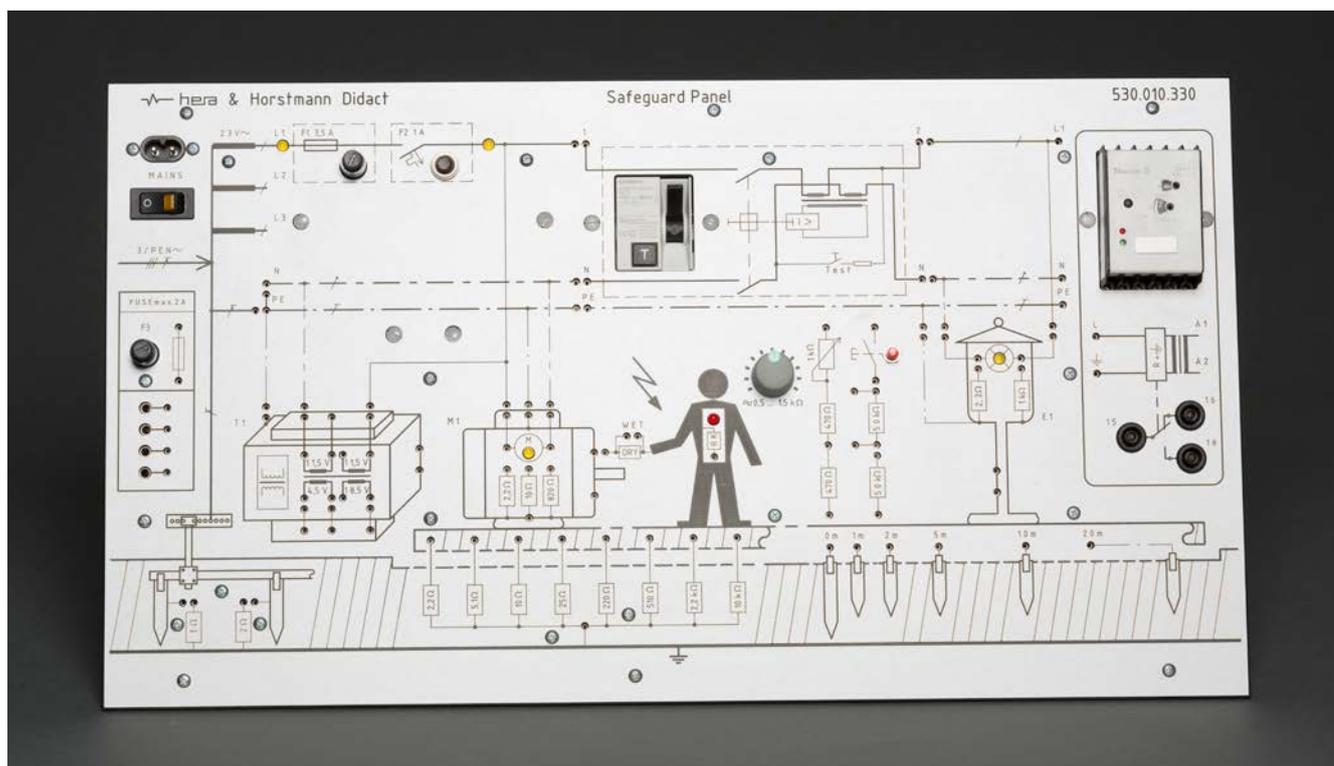
For your measurements you will need a multimeter.

Operating voltage: 110...230V, 50/60Hz

Dimensions: 532 x 297mm (WxH)

### Learning Content:

- Protection against direct and indirect contact
- Active parts, fault types, SELV, PELV, FLEV, etc.
- Protective insulation
- Protective separation
- Protection by safety extra-low voltage
- Residual current device (RCD)
- Automatic circuit breaker
- Summation current transformer
- Autotransformer
- Protective measures in TN -, TT - and IT networks
- Measurement of earth resistance
- Earth electrodes



Safeguard Panel 530.010.330

### Safety Installation Technology

530.010.330	Safeguard Panel	530.018.001	Manual and CD, Basic Tests VDE Protective Measures
530.012.000	Set of Cables and Connectors		

## INSTALLATION TESTS ACCORDING TO VDE STANDARD

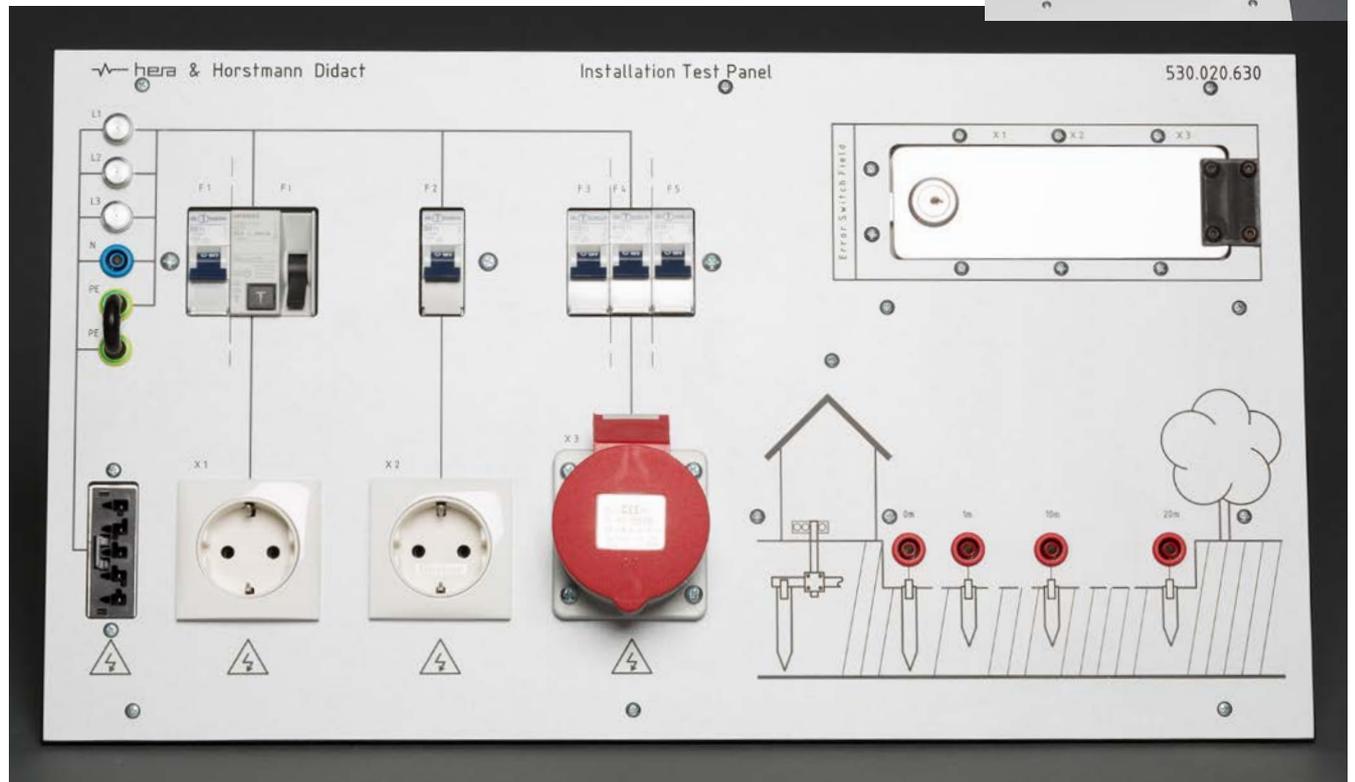
All electric appliances are subject to electrical tests in defined intervals and after repair. The Installation Test Panel teaches the standard procedure according to VDE0100 and how a professional hand-over report looks like.

### Learning Content:

- Effects of human bodies exposed to electricity
- Electrical tests and hand-over test reports
- Conductor failure
- Measurement of loop impedance
- Measurement of line impedance
- Measurement of insulation resistance
- Tripping characteristic of a RCD
- Measurement of earth resistance
- Measurements in 1phase and 3phase sockets
- Measurements in faulty circuits

A lockable failure simulator allows to integrate 24 typical failures (e.g. phase interruption, phase mix-up, resistance), which need to be found by measurement. This provides a very effective training about possible wiring faults during installations and a targeted trouble shooting.

>>Operating voltage: 400V, 3phase, 50/60Hz >>  
Dimensions: 532 x 297mm (WxH)



Installation Test Panel 530.020.630



CEE Adapter 540.099.007



Measurement - and Test Device 590.100.100

Installation Test to VDE Standard			
530.020.630	Installation Test Panel	530.028.631	Manual with CD, Safety Measures as per
590.100.100	Measurement - and Test Device for VDE Test		DIN VDE0100
540.099.007	CEE Adapter		

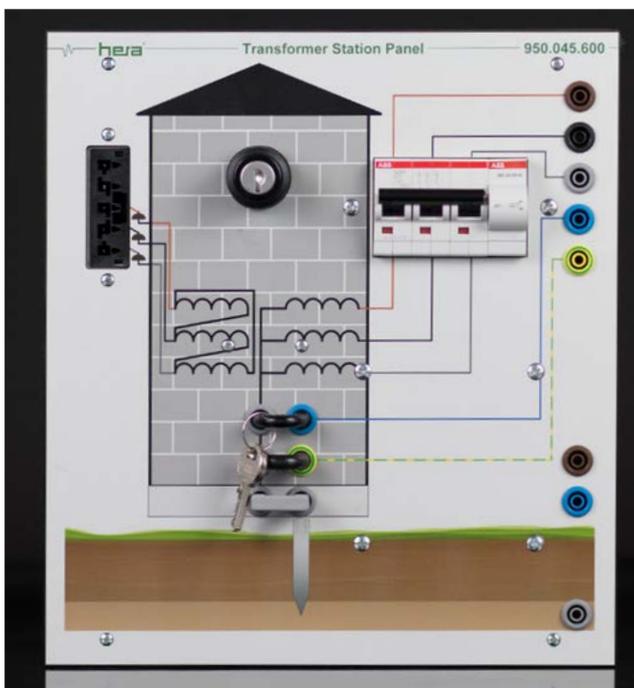
## DOMESTIC POWER DISTRIBUTION

The Domestic Distribution System consists of a Transformer Station 230V/400V (equipped with isolating transformer) with key release and automatic circuit breaker with undervoltage release, as well as the Mains Distribution Panel, which is supplied by the Transformer Station.

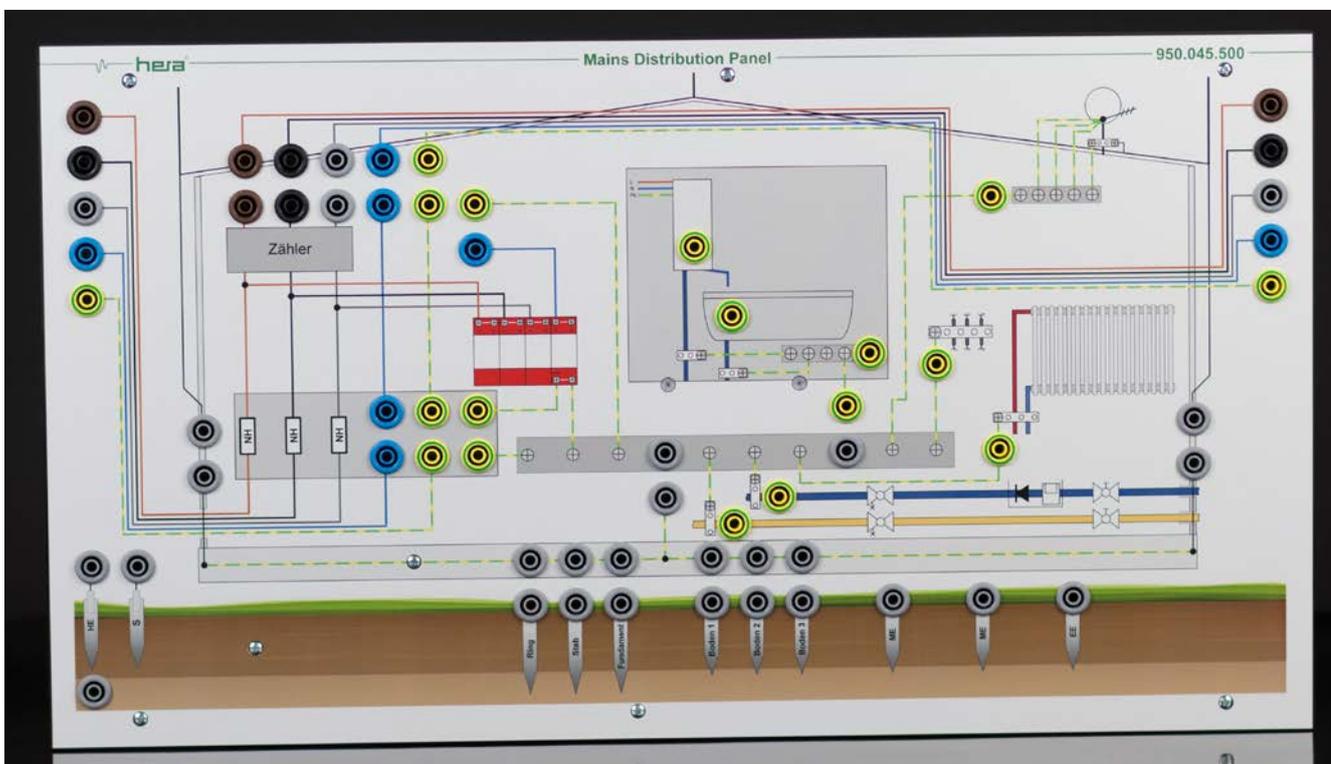
### Learning Content:

- Basics to TN - , TT -, IT networks
- Domestic mains distribution box
- Equipotential bonding
- Fuse - or meter box
- Types of earth contact and specific earth contact
- Wenner and Schlumberger method
- System earth and operational earth
- Types of earth measurement for installations
- Testing the operational earth
- Lighting protection (inhouse and outdoors)

>> Operating voltage: 400V, 3phase, 50/60Hz >>  
 Dimensions: 532 x 297mm (WxH)



Transformer Station 230/400V 950.045.600 (266 x 297mm)



Mains Distribution Panel 950.045.500 (532 x 297mm)

### Domestic Power Distribution

950.045.600	Transformer Station 230/400V	950.045.561	Manual with CD, Domestic Power Distribution
950.045.500	Mains Distribution Panel	950.045.550	Set of Cables and Connectors

## BASICS TO RESIDUAL CURRENT DEVICES

The RCD Test Panel allows the trainee to explore the switching characteristic of different RCDs in a 3phase networks without tripping the inhouse protective installations.

**Technical Details:**

- RCD Type A 300mA,
- RCD Type A 100mA S (selective)
- RCD Type A 30mA
- RCD Type B (sensitive to all currents) 30mA
  
- RCD outputs to 4mm safety jacks
- Residual current simulation
- Ammeter reading for tripping current

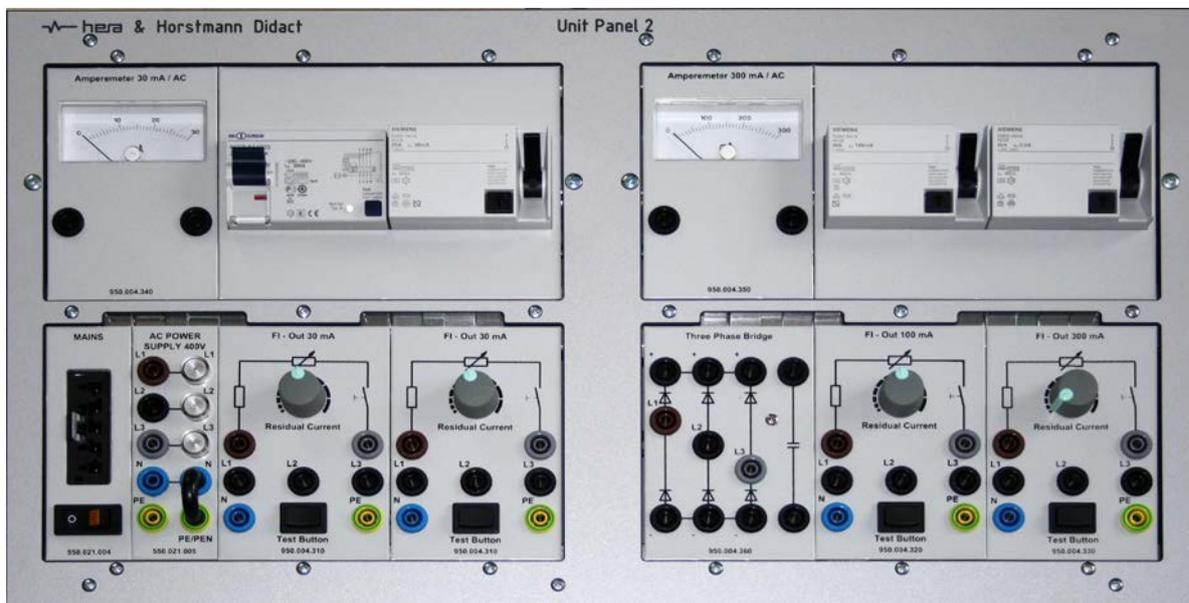
The modulare configuration of the panel allows to exchange the RCDs and tripping equipment.

**Learning Content:**

- Basics to electric safety and leakage currents
- Functionality and characteristics of RCDs
- RCDs for sinus-voltages
- Single pulse and more pulse rectification, with and without capacitor

>>Operating voltage: 400V, 3phase, 50/60Hz >>  
 Dimensions: 532 x 297mm (WxH)

**>> TESTS TO RCD WITHOUT TRIPPING YOUR INHOUSE SAFETY INSTALLATIONS!**



RCD Test Panel 530.030.630

Basics to Residual Current Devices			
530.030.630	RCD Test Panel	530.022.000	Set of Cables and Connectors
530.128.001	Manual with CD		

## INSTALLATION CABIN

- The installation cabin replicates a room and thus offers the possibility for realistic installation arrangements.
- Installations can be done either with the transparent boxes and 4mm laboratory cords or with surface-mounted installation components fixed to the cabin with installation dowels and self-configured cables.
- The cabin can be flexibly equipped with MCB and RCD and different types of power supply (not included).
- The installation walls are available in the universal 10x5mm raster or the specific hera raster. hera installation boxes fit on both rasters.
- Optionally the cabin can be equipped with replacable wooden panels, which can be used from both sides (turnable sides).
- Dimensions: 1200 x 1000 x 2000mm (WxDxH).



Cabin with Wooden Walls



Application with Transparent Boxes



Application with Surface Mounted Installation Material

Installation Cabin			
461.600.000	Installation Cabin, Stationary, hera Raster	461.601.000	Installation Cabin with Casters, hera Raster
461.600.010	Installation Cabin, Stationary, universal Raster	461.601.010	Installation Cabin with Casters, universal Raster
461.600.050	Installation Cabin, Stationary, Wooden Walls	461.601.050	Installation Cabin with Casters, Wooden Walls
301.150.100	Set of Installation Dowels (100 pcs)	302.010.000	Set of Surface Mount Installation Material according to manual 530.038.001

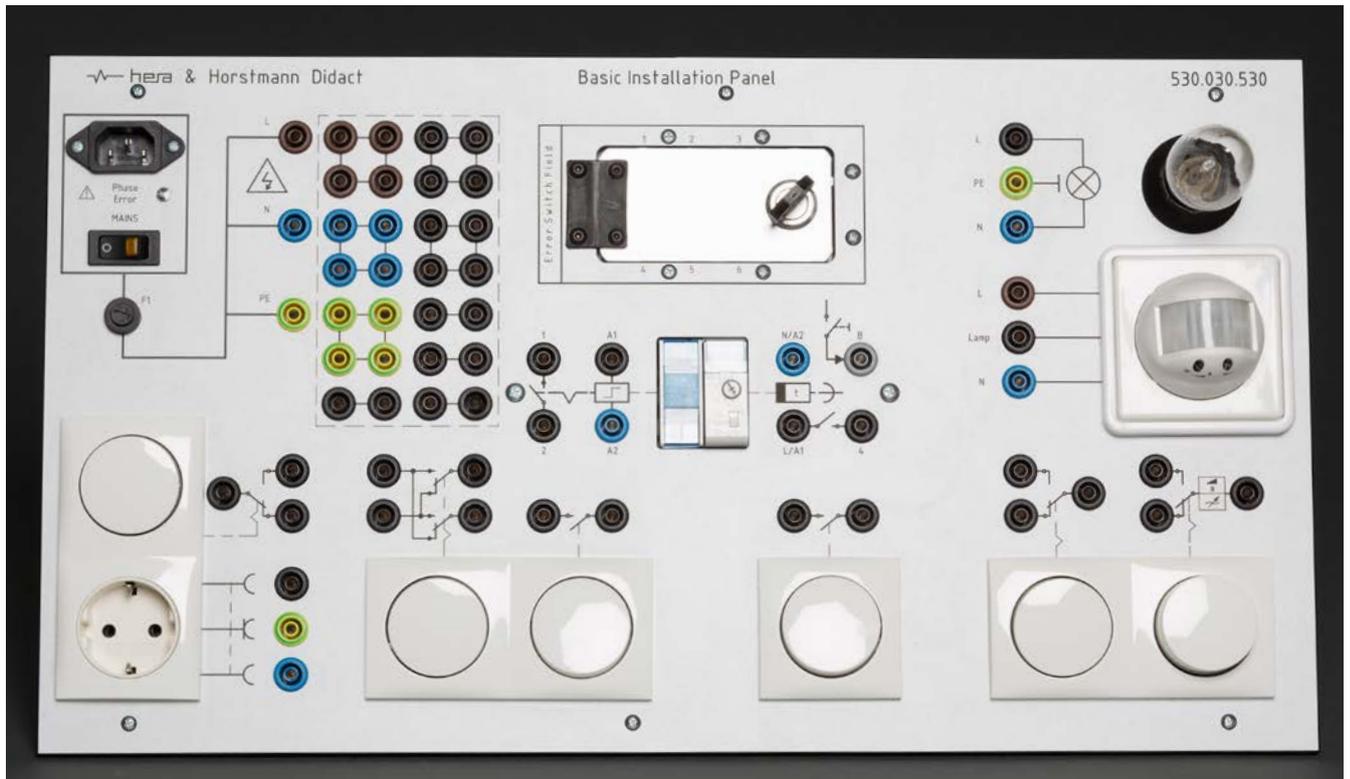
## BASICS TO DOMESTIC INSTALLATIONS

The Basic Installation Panel holds different components for domestic installations connected to 4mm safety jacks and a distribution field for various connection possibilities. A failure simulator with key-lock allows to switch in 6 typical installation failures which need to be found by measurement.

Operating voltage: 110...230V, 50/60Hz  
 Dimensions: 532 x 297mm (WxH)

### Learning Content:

- Circuit symbols, number codes of installation cables
- Wiring diagrams
- Circuits with electrical sockets and lamps
- Dimmer circuits
- Circuits with motion detector
- Circuits with toggle switch
- Circuit with crossover switch
- Circuit with impulse switch
- Staircase time switch
- Measurements in faulty circuits



Basic Installation Panel 530.030.530



Failure Simulator with key-lock

Basics to Domestic Installations			
530.030.530	Basic Installation Panel	530.032.000	Set of Cables and Connectors
530.038.001	Manual with CD, Basics to Installation Technology	590.100.003	Digital Multimeter

## COMPONENT PANELS FOR DOMESTIC INSTALLATIONS

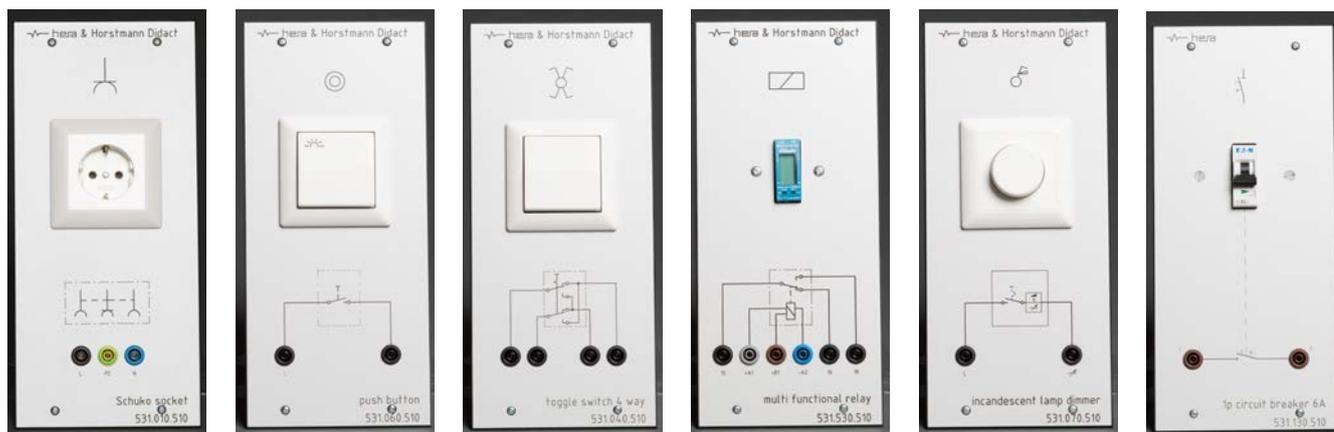
Instead or in addition to the Basic Installation Panel, the circuits can be done with component panels and flexibly connected with 4mm safety cords.

For configurations with many component panels we suggest to use a training system frames to keep your bench top clear for manuals and measuring instruments.

>> Operating voltage: 230/400V, 50/60Hz >>  
Dimensions: 133 x 297mm (WxH)

### 531.000.100 Set of Panels: Installation Technology (according to manual 530.038.001)

- 2x Distribution Panel
- 2x Toggle Switch 3-way
- 2x Pushbutton
- 2x Socket E27
- 1x PE Socket
- 1x Crossover Switch
- 1x Dimmer
- 1x Motion Detector
- 1x Impulse Switch
- 1x Staircase Time Switch



#### Component Panels for Domestic Installations

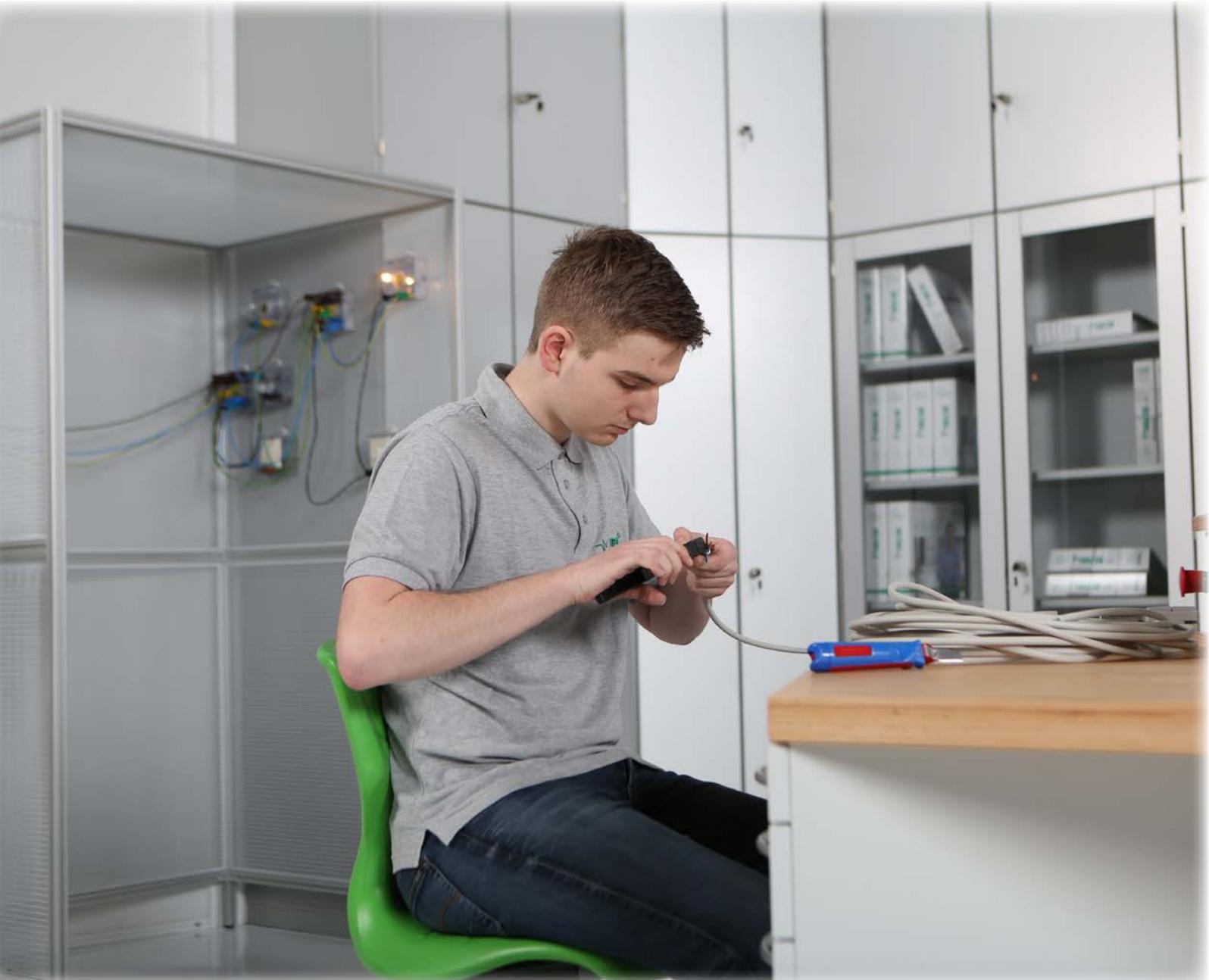
531.000.100	Set of Component Panels according to manual	531.510.510	Impulse Switch 230V
531.000.510	Mains Adapter (CEE Plug with 2,5m cable - 4mm jacks)	531.520.510	Staircase Time Switch
531.020.510	Distribution Panel with 8 Distribution Points	531.530.510	Multifunction Time Relay 8-230V; 1x Change-Over
531.130.510	Circuit Breaker 1pole, 6A	531.110.510	Pushbutton - Doorbell
531.140.510	Circuit Breaker 3polig, 6A	531.120.510	Pushbutton - Door Opener
531.180.510	Neozed Fuse 3 x 6A	531.150.510	Buzzer 5 - 8V
531.190.510	RCD 30mA, 4poles	531.160.510	Bell Transformer
531.210.510	RCD 30mA, 2poles		

#### Blank Panels and Hoods

531.010.510	PE Socket	500.000.001	Blank Panel S (W:133)
531.030.510	Change-Over Switch	500.000.002	Blank Panel M (W:266)
531.040.510	Cross-Over Switch	500.000.003	Blank Panel L (W:532)
531.050.510	Series Switch	500.000.011	Blank Panel S with Ergonomic Hood
531.060.510	Pushbutton - Lamp	500.000.012	Blank Panel M with Ergonomic Hood
531.070.510	Dimmer for Incandescent Lamp	500.000.013	Blank Panel L with Ergonomic Hood
531.080.510	Motion Detector	500.000.021	Ergonomic Hood S
531.200.510	Cellar Lamp 60W	500.000.022	Ergonomic Hood M
531.310.510	Lamp Socket E27 (incl. LED bulb)	500.000.023	Ergonomic Hood L
531.170.510	Lamp Socket 3x E14		

# INSTALLATIONS WITH TRAINING BOXES

In addition to the compact panels or component panels we offer the transparent boxes which can be used in combination with installation walls or installation cabins. The cabins can be equipped with circuit breakers and power connectors and offer most realistic roomlike conditions. All boxes are equipped with replacable hooks. If preferred, the set of installation material is available without housing but with installation dowels and cable ducts instead.



## TRAINING BOXES FOR INSTALLATION TECHNOLOGY

Modular training system for the basic circuits of domestic installations. All components are in a transparent box with replacable hooks and detachable cover. All boxes are suitable for the specific hera grid (12x5mm) or the universal grid (10x5mm). All connections are done with touch protected 4mm safety cords.

Dimensions: 115 x 115 x 50mm.



completely housed, transparent training box with replacable hooks and safety lock for hera & universal installation walls

### 302.000.101 Set of Boxes: Installation Technology

(according to manual 530.038.001)

- 3x Distribution Box
- 1x Circuit Breaker 1pole C1A
- 1x RCD 2poles 16/ 0,01A
- 1x PE Socket
- 3x Lamp Socket E27 with LED bulb
- 2x Pushbutton
- 1x Pushbutton for Lamp
- 1x Change-Over Pushbutton
- 2x Change-Over Switch
- 1x Change-Over Switch with Light Indication
- 1x Cross-Over Switch
- 1x Series Switch
- 1x Dimmer for Incandescent Lamps
- 1x Impulse Switch 230V
- 1x Staircase Time Switch 230V
- 1x Relay 230V / AC, 1 NOC
- 1x Motion Detector



#### Training Boxes for Installation Technology

302.000.101	Set Boxes according to manual 530.038.001	302.107.100	Lamp Socket E14 with Bulbs 40W + 25W
302.100.500	Feeding Panel with Power Cable	302.107.300	3fold Lamp Socket E14 with Bulbs 25W
302.100.100	Distribution Box	302.114.100	Impulse Switch 230V
302.101.100	Automatic Circuit Breaker 1pole C1A	302.114.300	Time Switch
302.101.300	Automatic Circuit Breaker 1pole C10A	302.114.200	Multifunction Time Relay 8 - 230V; 1x Change-Over, time setting 0,1s ... 40h
302.101.500	Automatic Circuit Breaker 2poles B10A	302.115.100	Motion Detector
302.101.600	Automatic Circuit Breaker 3poles C10A	302.115.200	Twilight Sensor
302.102.100	RCD 2poles 2polig 16/ 0,01A	302.140.100	Impulse Switch 230V AC
302.102.500	RCD 4poles 25/ 0,03A	302.142.100	Relay 230V AC with 3x Change-Over
302.105.100	Socket with PE	302.177.100	Staircase Time Switch
302.111.100	Change-Over Switch	302.104.100	AC Electricity Meter with S0-Interface
302.111.200	Change-Over Switch with Light Indicator	302.104.200	3Phase Electricity Meter with S0-Interface
302.112.100	Cross-Over Switch	302.108.100	Simulation Ground Fault
302.112.200	Series Switch		
302.112.400	Off-Button 3poles		
302.110.100	Pushbutton	302.000.000	Empty Transparent Box (loose spare parts)
302.110.200	Pushbutton with Light Indicator	302.000.010	Pair of Replacement Hooks for Transparent Box
302.110.300	Change-Over Pushbutton	302.000.020	Safety Lock for Transparent Box
302.113.100	Dimmer for Incandescent Lamp	461.061.104	Installation Wall for Training System Frame 600mm
302.113.200	Dimmer for Electric Transformers	461.081.104	Installation Wall for Training System Frame 800mm
302.106.100	Lamp Socket E27 with LED Bulb		

## DOOR BELL - AND INTERCOM SYSTEMS

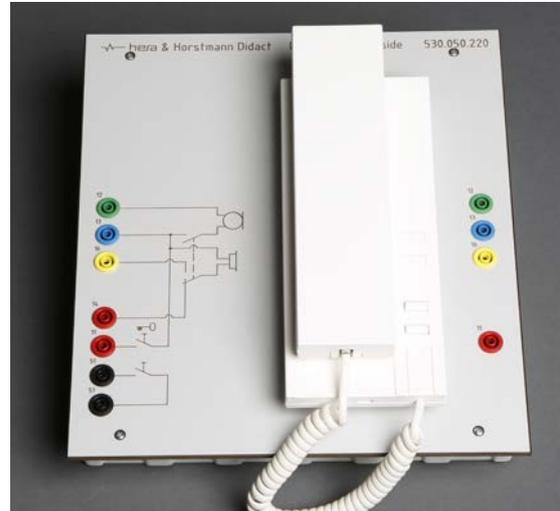
The topic of door bell - and intercom system can be realized either with our panel solution or with the transparent training boxes. Wiring is conveniently done with 4mm safety leads.

The ideal training system holds one outdoor and two indoor units.

>> Operating voltage: 230V, 50/60Hz >>  
Dimensions: 266 x 297mm (WxH)



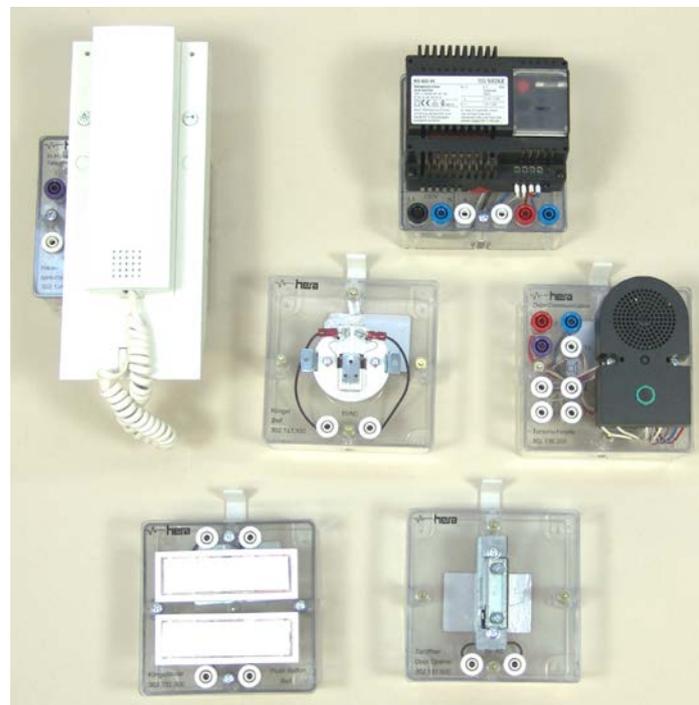
Outdoor Unit 530.040.220



Indoor Unit 530.050.220

### Panel for Door Bell - and Intercom System

530.040.220	Component Panel Door Intercom Outside	530.048.001	Manual with CD
530.050.220	Component Panel Door Intercom Inside		
530.042.000	Set of Cables and Connectors		



### Transparent Boxes for Door Bell - and Intercom System

302.130.100	Bell Transformer 230V/8V	302.133.100	Buzzer 8V AC
302.132.300	Bell Button 2fold	302.135.300	Power Supply for Intercom
302.132.100	Door Opener Button	302.136.200	Door Intercom Outside
302.131.100	Door Bell 8V	302.136.100	Door Intercom Inside
302.131.500	Door Opener 8V	530.048.001	Manual with CD

## BASICS TO LIGHTING TECHNOLOGY

The Lighting Panel compares characteristics like power consumption, illumination, light flux, light efficiency, light intensity, light quantity and phase angle for various light types under different conditions.

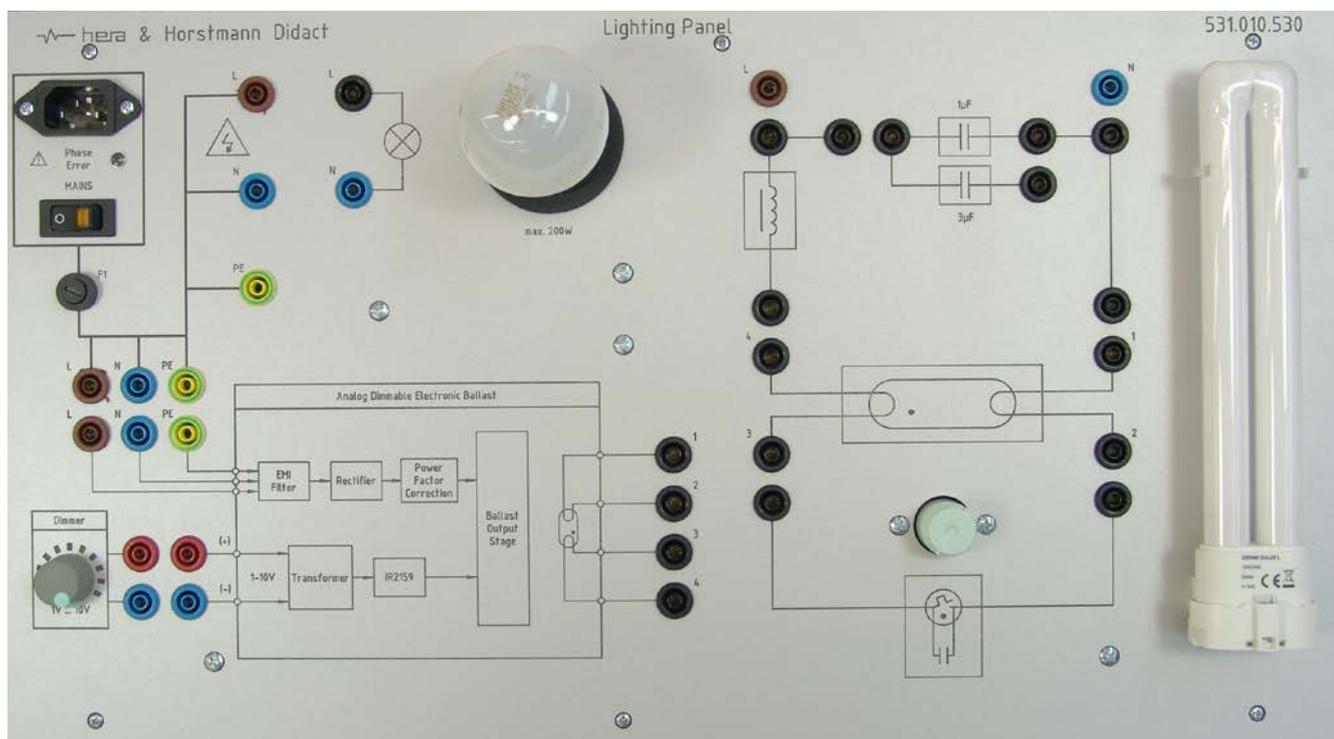
### Technical Details:

- Filament Lamp
- Halogen Lamp
- Mixed Light Lamp
- Fluorescent Lamp
- Energy Saving Lamp
- Electric Starter and Choke
- Dimmer

### Learning Content:

- Characteristics of filament lamps
- Characteristics of halogen bulbs
- Characteristics of a mixed light lamp
- Characteristics of a compact fluorescent lamp
- Characteristics of a fluorescent lamp
- Characteristics of a fluorescent lamp

>> Operating voltage: 220V... 240V, 50/60Hz >>  
 Dimensions: 532 x 297mm (WxH)



Lighting Panel 531.010.530

### Basics to Lighting Technology

531.010.530	Lighting Panel	531.018.001	Manual with CD
531.011.000	Set of Accessory; Starter and Lamps Set	590.010.001	Lux Meter, digital
531.012.000	Set of Cables and Connectors		

## COMPONENT PANELS AND BOXES TO **LIGHTING TECHNOLOGY**



Lamp Socket E27 531.310.510



Special Lamp Panel 531.030.520

### Component Panels

531.310.510	Lamp Socket E27	531.540.520	Low-Pressure Sodium Vapor Lamp
531.320.510	Fluorescent Lampe 18W		incl. Ballast and Starter
531.330.510	Starter and Low-Loss Ballast 18W	531.030.520	High-Pressure Lamps (Halogen, Sodium, Mercury)
531.345.510	Capacitor 4,5µF		incl. Ballast and Starter
		531.032.520	Set of Cables and Connectors



### Training Boxes

302.106.100	Lamp Socket E27	302.113.300	Electronic Potentiometer for Electric Ballast
302.107.100	Lamp Socket E14	302.121.700	Electric Ballast, dimmable
302.121.400	Low-Loss Ballast 18W	302.120.600	Compact Fluorescent Lamp, dimmable
302.121.500	Low-Loss Ballast 36W	302.122.100	Capacitor 3,4µF for Double-Circuit
302.121.300	Electric Ballast 18W	302.122.200	Capacitor 4,5µF for Suppression
302.121.600	Electric Ballast 36W	302.126.100	Socket for Na-High-Pressure Lamp E40 and Bulb
302.113.200	Dimmer for Electronic Transformers	302.126.200	Ballast for Na-High-Pressure Lamp
302.120.100	Fluorescent Socket, no Starter (left side)	302.124.100	Conventional Transformer 230V/ 11,5V 60W
302.120.200	Fluorescent Socket, with Starter (right side) and 18W Tube	302.124.200	Electronic Transformer 20 – 70W
302.120.300	Fluorescent Socket, with Starter (right side) and 36W Tube	302.125.100	Halogen Lamp Socket with Bulb
302.120.500	Socket for Compact Fluorescent Lamp and 18W Bulb	302.126.100	Socket for Na-High-Pressure Lamp with 150W Bulb and Starter

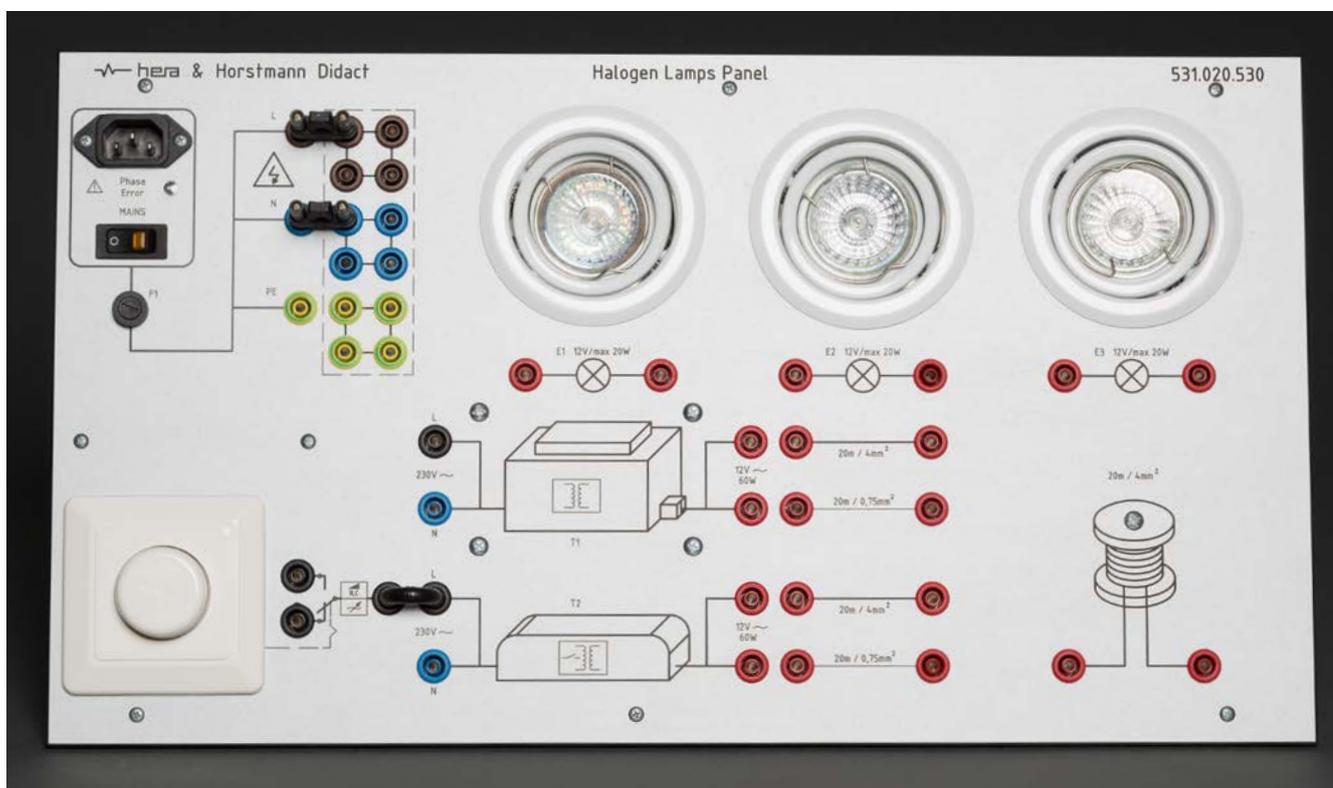
## BASICS TO HALOGEN LAMPS

The Halogen Lamps Panel is a perfect addition to the Lighting Panel, it intensifies the knowledge to halogen low-voltage lamps. The panel is equipped with 1x halogen low-voltage lamp with increased efficiency and 2x standard halogen low-voltage lamps, one transformer and a dimmer with phase angle control.

### Learning Content:

- Power loss of transformers
- Dimming halogen low-voltage lamps
- Characteristics of halogen low-voltage lamps and the influence of cable diameter and cable length

>> Operating voltage: 220V... 240V, 50/60Hz >>  
 Dimensions: 532 x 297mm (WxH)



Halogen Lamps Panel 531.020.530

Basics to Halogen Lamps			
531.020.530	Halogen Lamps Panel	590.010.001	Digital Lux Meter
531.022.000	Set of Cables and Connectors		
531.018.001	Manual with CD, Lighting Technology		

## BASICS TO LED TECHNOLOGY

The LED Lamp Panel compares the characteristics of light emitting diodes and power diodes with energy-saving lamps and halogen lamps by means of energy consumption, brightness, light diffusion, costs and operating hours. A digital thermometer with selector switch indicates the waste heat of each lamp. The panel is equipped with manual RGB controller for an individual adjustment of each color and the color changes can be observed.

For examination of the PWM signals the BNC outputs can be connected to an oscilloscope.

### Learning Content:

- Diodes and breakdown voltage
- Basics and characteristics of RGB diodes and power diodes
- Basics and characteristics of energy-saving lamps and halogen lamps
- Dimming with pulse width modulation (PWM)

>> Operating voltage: 220V... 240V, 50/60Hz >>  
 Dimensions: 532 x 297mm (WxH)



LED Lamp Panel 531.030.530



### Basics to LED Lamps

531.030.530	LED Lamp Panel	531.028.001	Manual with CD, LED Lamp Panel
531.032.000	Set of Cables and Connectors	590.010.001	Digital Lux Meter

## INSTALLATION TECHNOLOGY - ALARM SYSTEMS

The alarm systems are for the comprehension of intruder - and fire alarm systems, it teaches about the required components, the different types of sensors and its functionality.

### Fire Alarm System consisting of:

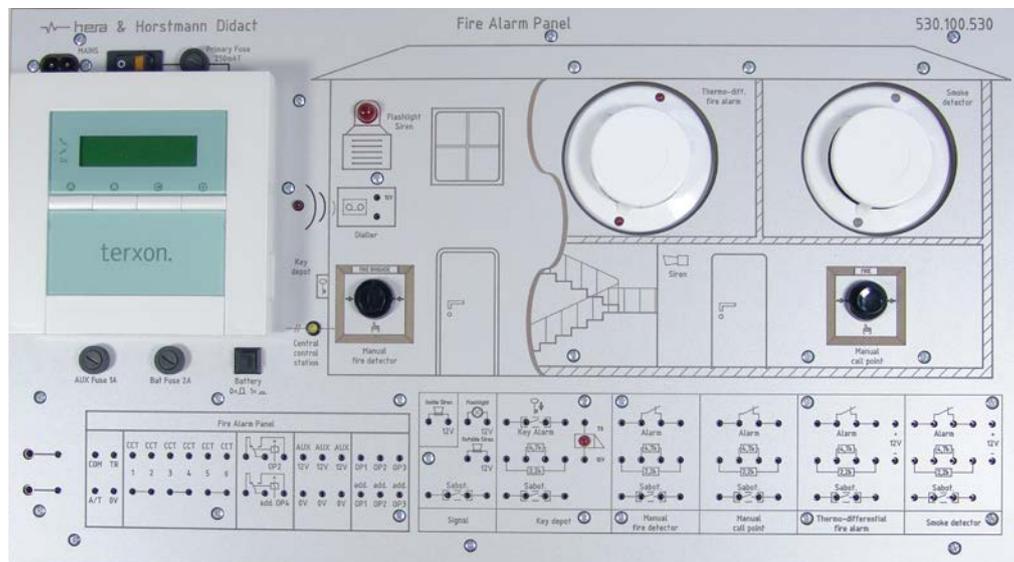
- Central Alarm Unit Terxon SX
- Infrared Sensor
- Smoke Detector
- Manual Call Point
- Alarm Center

>> Operating voltage: 220V... 240V, 50/60Hz >>

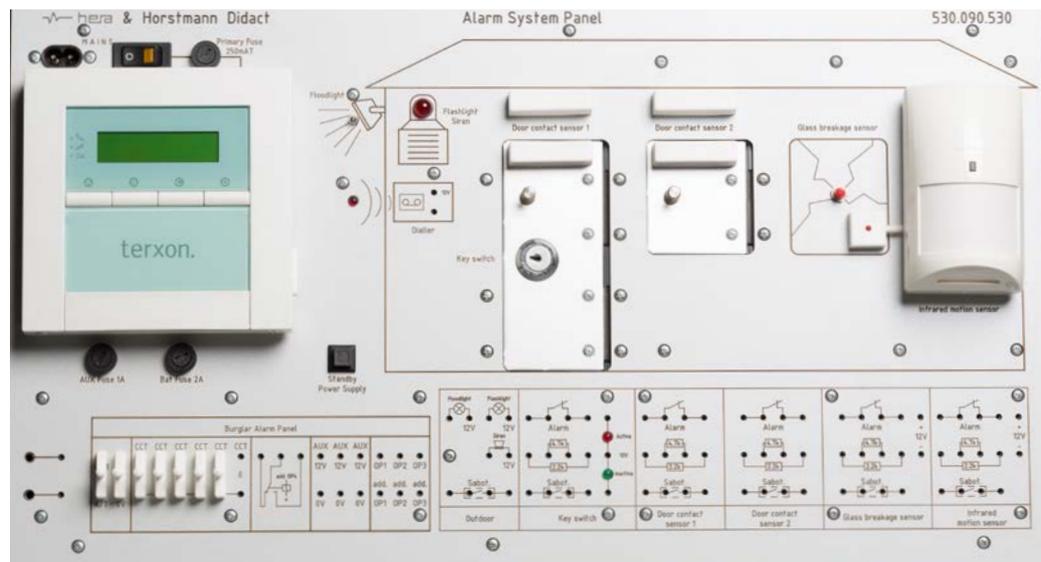
Dimensions: 532 x 297mm (WxH)

### Intruder Alarm System consisting of:

- Central Alarm Unit Terxon SX
- PIR Motion Sensor
- Reed Contact for Door and Window
- Glass Breakage Sensor
- Key Switch for Entrance Door
- External LED indication for activated / not activated
- Alarm Sirene with Flash Light
- Outer Light
- Dialing Simulator
- Alarm Center



Fire Alarm Panel 530.100.530



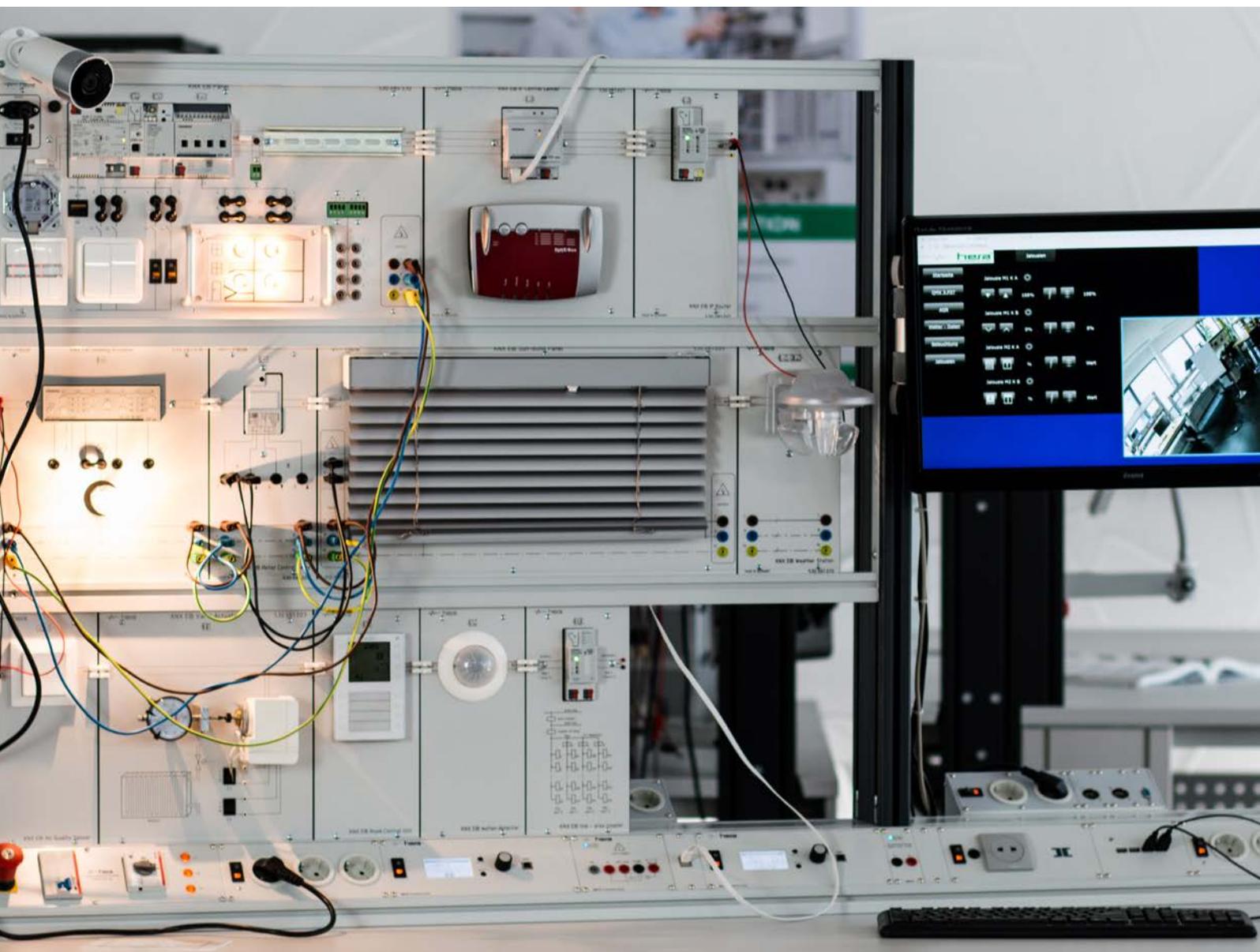
Intruder Alarm Panel 530.090.530

### Installation Technology - Alarm Systems

530.090.530	Intruder Alarm System	530.100.530	Fire Alarm System
530.092.000	Set of Cables and Connectors	530.102.000	Set of Cables and Connectors
530.098.001	Manual with CD, Intruder Alarm System	530.108.001	Manual with CD, Fire Alarm System

# INSTALLATION TECHNOLOGY - BUILDING AUTOMATION

The KNX bus is the most common field-bus solution for public buildings but of course it is also applicable for domestic homes. The importance of building automation is constantly rising as it provides smart solutions with comfort -, safety - and energy-saving features. Learn how to integrate and coordinate lighting, heating, shading, observing functions in your projects with different topologies.



## BUILDING AUTOMATION - KNX BUS

Building automation is an essential part of the installation technology due to comfort -, safety - and energy-saving features. The system teaches about the required components, how to set-up the bus-system and integrate the components, program the features and organize in different topologies, e.g. in multi-storey buildings.

The basic training can be done with the compact KNX EIB Panel and EIB software or for a extensive training some or all component panels can be added.

The profile rail allows the integration of extra components.

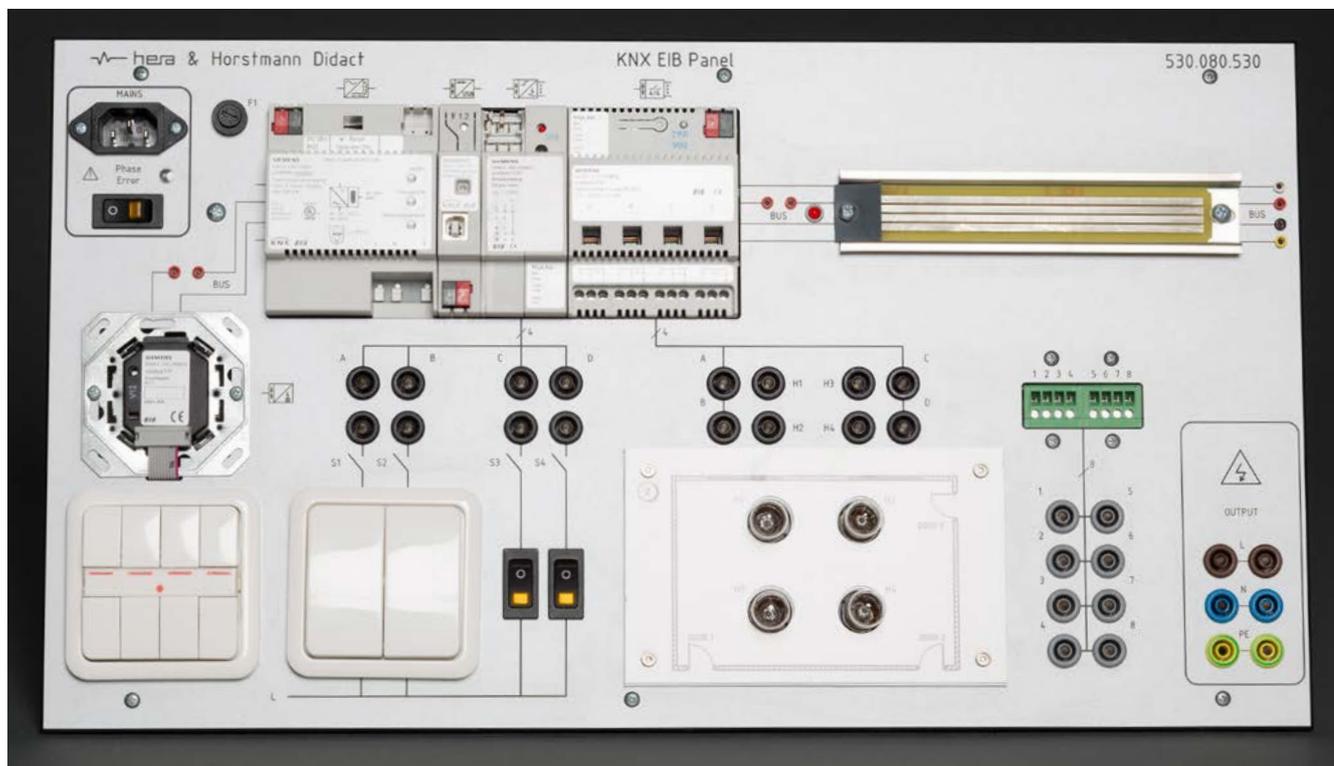
>> Operating voltage: 120V... 240V, 50/60Hz >>

Dimensions: 532 x 297mm (WxH)

### The panel hold following components:

- Power Supply with Choke
- USB Interface
- 4fold Binary Input
- 4fold Switching Actuator
- Bus Coupler UP
- 4fold Pushbutton with LED Indication
- LED Bus Detector
- Double Pushbutton
- 2x Control Switch
- 4 Lamps for Load Simulation
- 2 Masks for Room Simulations

If you decide for a system with several component panels, then we recommend to use a training system frame to keep your bench top clear.



KNX EIB Panel 530.080.530

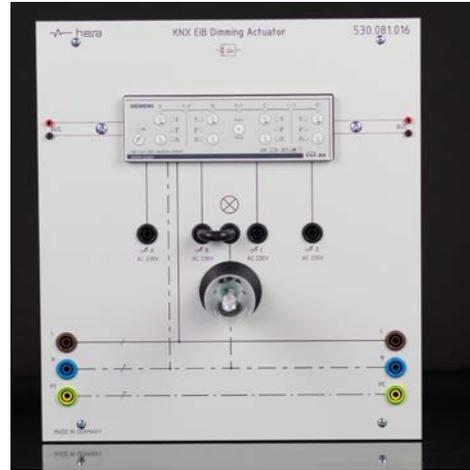
KNX EIB Installationsbus			
530.080.530	KNX EIB Panel	530.088.101	Manual with CD: Tests to KNX EIB Panel
530.082.000	Set of Cables and Connectors	530.088.001	Manual EIB: Planning, Installing and Visualizing (ETS5)
530.980.010	ETS 5 Lite Software Trainee Version		
530.980.011	ETS 5 Software Professional Version		

## BUILDING AUTOMATION - COMPONENT PANELS

The compact panel can be added by following component panels in order to achieve a smart system with the most common applications.



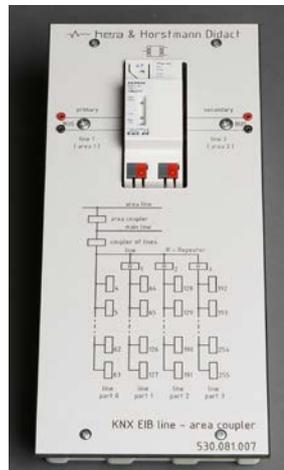
**530.081.021 IP Control Center (W: 266)**  
 communication between KNX devices and computer (or e.g. smart phone)  
 WLAN-Router  
 Web-Server for control and monitoring (e.g. control by computer, smart phone or notebook)  
 web-editor for creating a full graphic design with all control and monitoring elements



**530.081.016 KNX EIB Dimming Actuator 4fold (W: 266)**  
 4 outputs for switching and dimming of ohmic inductive and capacitive loads  
 3 outputs can alternatively used to switch RGB lights incl. E14 socket



**530.081.017 KNX EIB IP Router (W: 133)**  
 connects bus lines or bus areas by fast Ethernet 10base T and remote access in combination with the router



**530.081.007 KNX EIB Line - Area Coupler (W: 133)**  
 couples a KNX line to the main line or to an area line  
 used also as repeater



**530.081.020 KNX EIB Weather Station (W: 133)**  
 measurement and monitoring of wind / brightness / temperature  
 anemometer for measuring the wind speed



**530.081.008 KNX EIB Motion Sensor (W: 133)**

### Component Panels KNX EIB Installation Bus

530.081.021	KNX EIB IP Control Center with WLAN Router
530.081.016	KNX EIB 4fold Dimming Actuator
530.081.017	KNX EIB IP-Router
530.081.007	KNX EIB Line - Area Coupler
530.081.020	KNX EIB Weather Station
530.081.008	KNX EIB Motion Sensor

## BUILDING AUTOMATION - COMPONENT PANELS



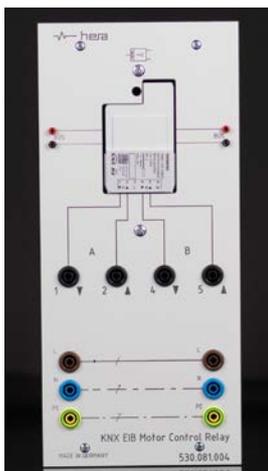
**530.081.015 KNX EIB Room Control Unit (W: 133)**  
control of heating, ventilation and air conditioning  
control of light, shutters and scenes  
temperature indication  
16 programmable buttons



**530.081.018 KNX EIB Air Quality Sensor (W: 133)**  
room sensor for CO<sup>2</sup> and humidity measurement  
LED indication for air quality



**530.081.003 KNX EIB Heating Actuator (W: 266)**  
simulation of a heating actuator  
status indication with analogue reading  
input port simulation



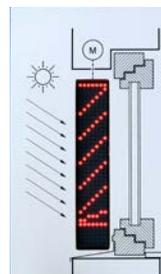
**530.081.004 KNX EIB Actuator for Sun Blinds (W: 532)**  
for max. 2 sun blinds



**530.081.005 KNX EIB Sun Blinds (W: 532)**  
with integrated end switches  
stop in each position and adjustable lamellas



**530.081.018 WIFI IP Camera for In- and Outdoor Applications (W: 166)**  
Resolution 1920x1080  
Lense 4mm, 16fold digital zoom  
1x IR LED, night vision camera up to 15m  
Access via Windows Client Software and iOS & Android App  
independent from KNX system



**530.081.022 KNX EIB LED Sun Blinds Simulation (W: 166)**

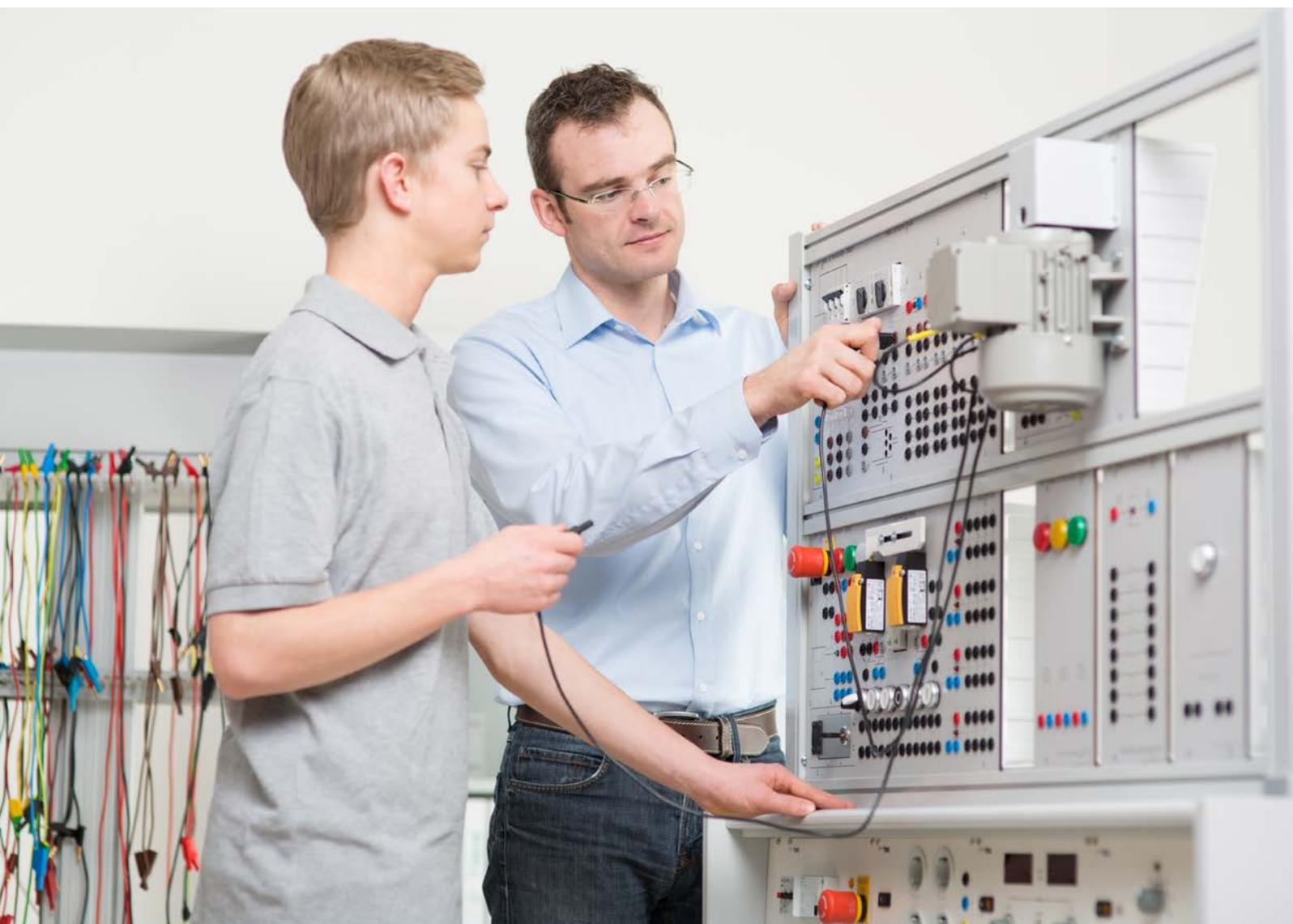
### Component Panels: Building Automation

530.081.015	KNX EIB Room Control Unit
530.081.019	KNX EIB Air Quality Sensor
530.081.003	KNX EIB Heating Actuator
530.081.004	KNX EIB Actuator for Sun Blinds
530.081.005	KNX EIB Sun Blinds (220V...240V only)
530.081.022	KNX EIB LED Sun Blinds Simulation
530.081.018	WIFI IP Camera for In- and Outdoor Applications

# INDUSTRIAL WIRING - CONTROL ENGINEERING

Roughly spoken electric tools and processing machines consist of a control circuit for controlling the functions and a load circuit with the drive.

Our system for control engineering consists of the Control Engineering Panel (Control Circuit), the Main Contactor Panel and the Basic Motor Panel (Load Circuit). The trainees get to know different types of wiring with respect to functionality and safety (e.g. how to wire a mechanical press and ensure accident prevention for the operator). The Control Engineering Panel is a basic course for manufacturing, servicing and repairing electric tools and conventional machines and is a perfect foundation for professions related with automation technology.



## BASICS TO INDUSTRIAL CONTROL CIRCUITS

The Control Engineering Panel is a self-sufficient training system for doing tests with industrial control circuits. The panel holds a variety of signal lamps, pushbutton, auxiliary contactors, end switches, time relays which can be connected with 4mm safety cords. The trainer is with lockable failure box, so the trainees get to know the most common failures and learn how to trouble shoot.

The second part of the manual is with load circuit, so for a more extended training we recommend the Basic Motor Panel and Contactor Panel.

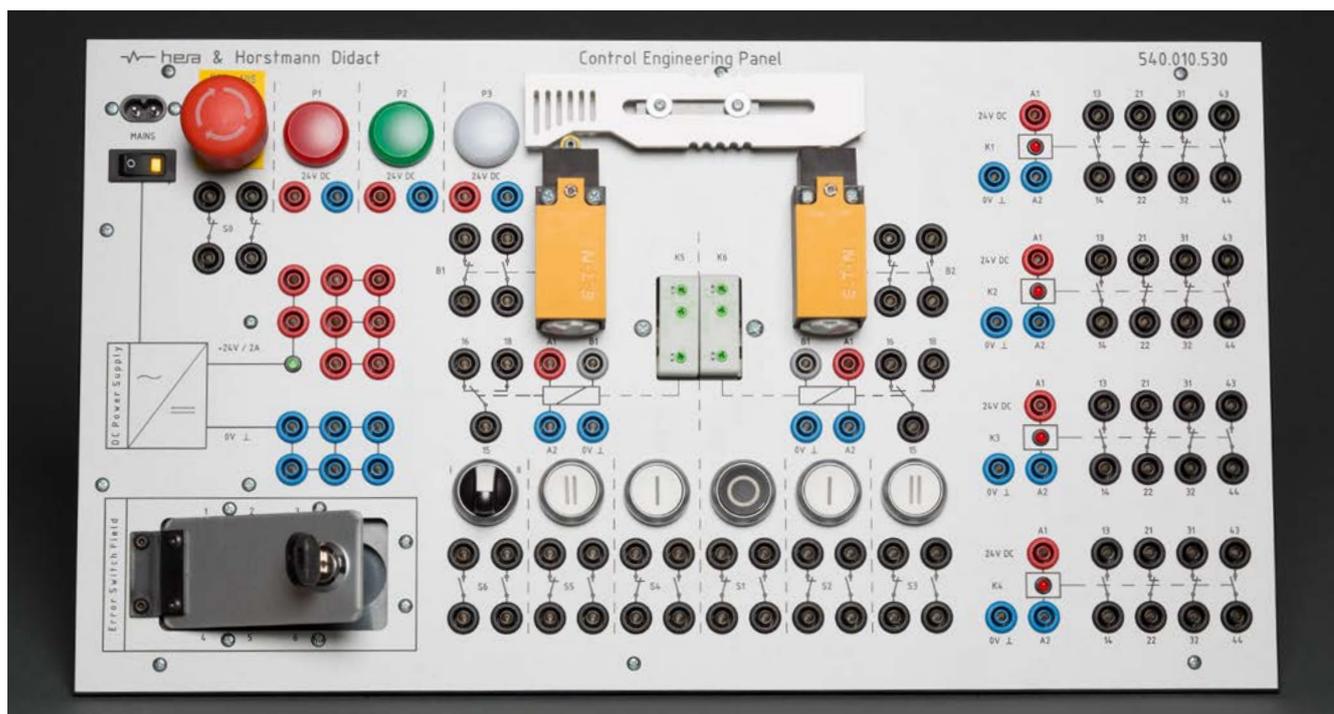
>> Operating voltage: 120V... 240V, 50/60Hz >>

Dimensions: 532 x 297mm (WxH)

**>> RECOMMENDED IN COMBINATION WITH THE CONTACTOR PANEL AND THE BASIC MOTOR PANEL!**

### Learning Content:

- Wiring diagrams
- Categories for switches and contactors
- And - / or circuits with and without selfholding
- Auxilliary contactors
- Interlocking pushbutton - and contactor circuits
- Circuits with switch on - switch off delay
- Flashing circuits
- Sequence control
- Directly switching on a motor
- Reverse contactor circuit
- Star-delta circuit
- Pole-changing of motors
- Trouble shooting in faulty circuits



Control Engineering Panel 540.010.530

Industrial Control Circuits			
540.010.530	Control Engineering Panel	540.018.001	Manual with CD „Control Engineering“
540.012.000	Set of Cables and Connectors		

## CONTROL ENGINEERING - LOAD CIRCUIT

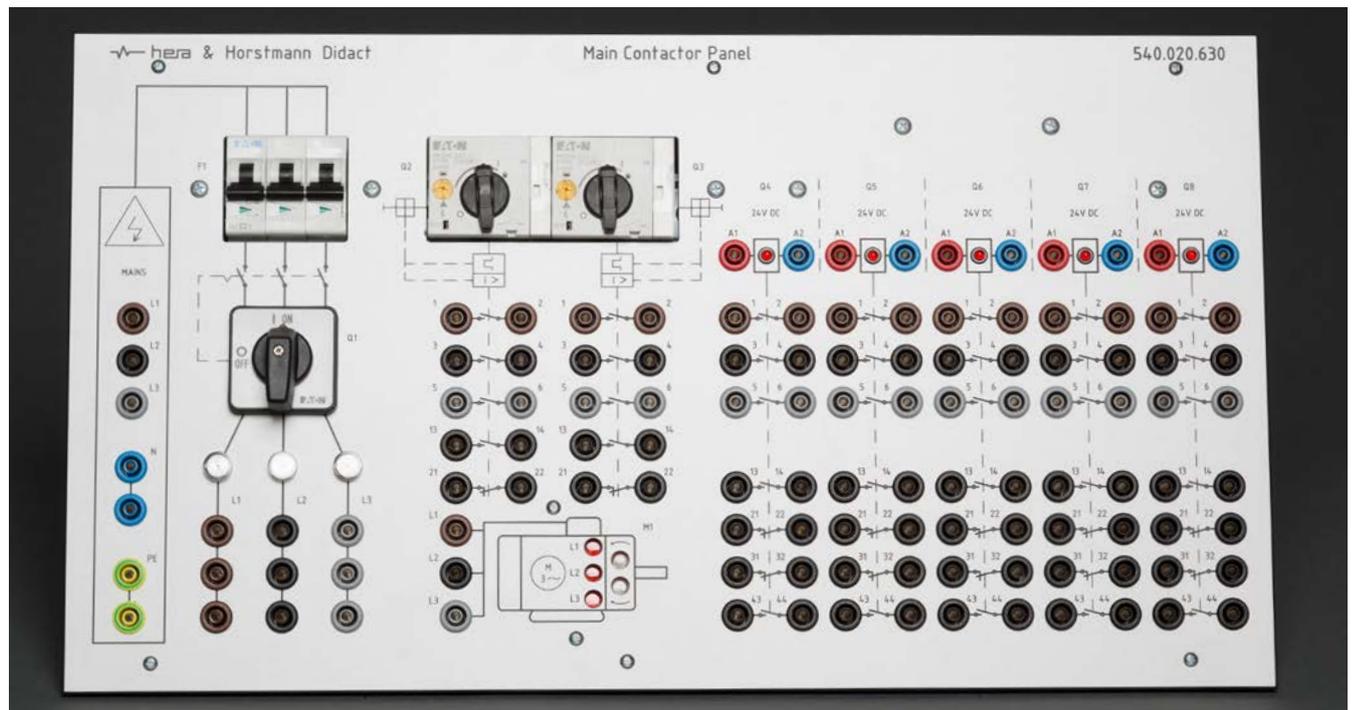
In combination with the Control Engineering Panel or the PLC Panel the Main Contactor Panel can be used to control a motor e.g. the Basic Motor Panel.  
The Main Contactor Panel includes a 3phase CEE to 4mm jacks.

>> Operating voltage: 3x 220...240V 50/60Hz >>  
Dimensions: 532 x 297mm (WxH)

**consisting of:**

- Load Switch
- 2x Motor Circuit Breaker 0...0,63A
- Automatic Circuit Breaker 2A
- 5x Load Contactors 3kW
- 5x Auxiliary Contactors
- 3phase Motor Simulation
- 3phase CEE Adapter to 4mm Safety Jacks

**>> RECOMMENDED ACCESSORY:  
BASIC MOTOR PANEL**



Main Contactor Panel 540.020.630



3ph CEE adapter to 4mm safety jacks

Industrial Load Circuit			
540.020.630	Main Contactor Panel	540.099.007	3ph CEE Adapter to 4mm Jacks
540.022.000	Cables and Connectors		

## UNIVERSAL THREE-PHASE MOTOR

The Basic Motor Panel can be used as load panel either for the Control Engineering Panel in combination with the Main Contactor Panel or the PLC Panel with Frequency Converter.

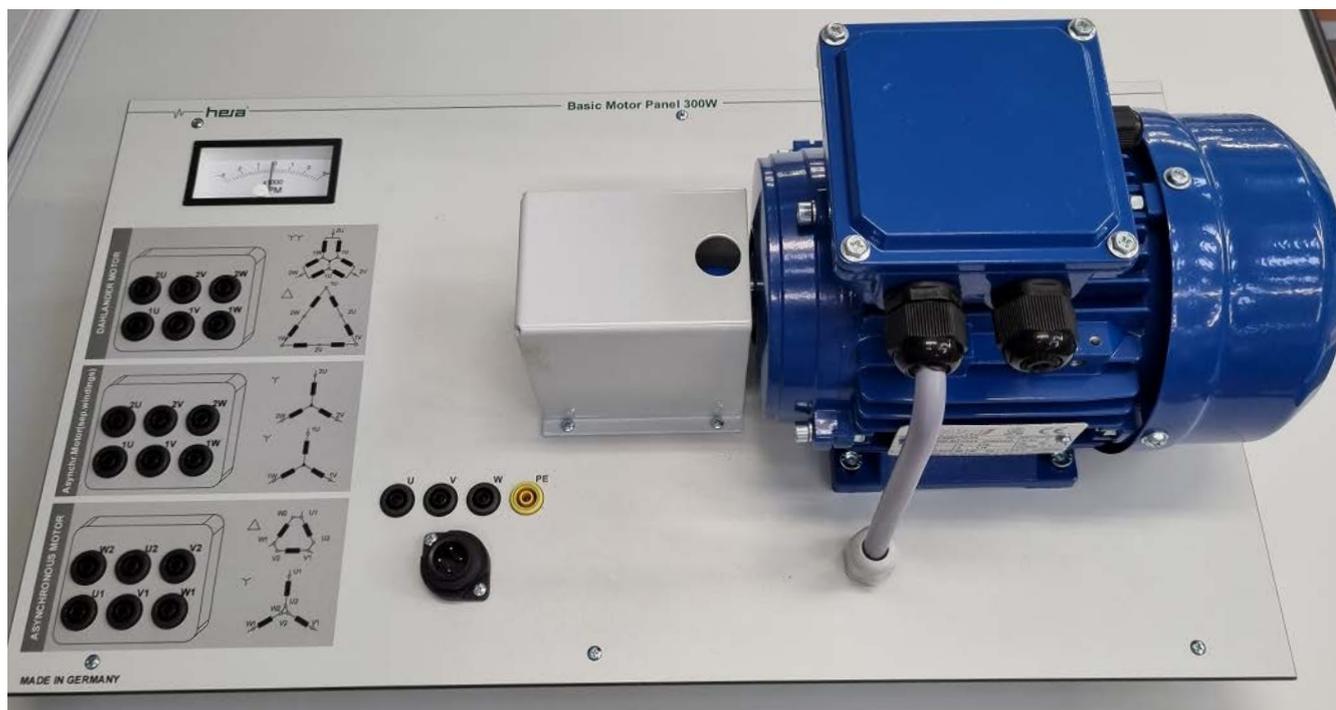
The motor can be connected as asynchron motor, asynchron motor with separate windings or in star-delta.

Technical data: 230V/400V 50Hz, 0,45 / 0,30kW, 2790/1380 U<sub>min</sub>.

The analogue reading indicates the rotation direction and rotation speed. For a safe operation the shaft is with protective hood.

The run capacitor panel is to study operation of a 3phase motor in case of phase failure or in case of 1phase supply.

Dimensions: 532 x 297mm (WxH)



Basic Motor Panel for Control Engineering and Frequency Converter



Steinmetz-Circuit

### Universal Three-Phase Motor

540.030.630	Basic Motor Panel	540.031.610	Run Capacitor (Panel 133 x 297mm)
540.032.000	Set of Cables and Connectors		

## COMPONENT PANELS FOR CONTROL ENGINEERING

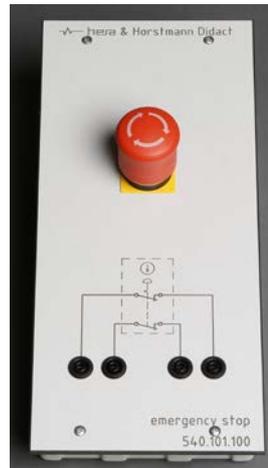
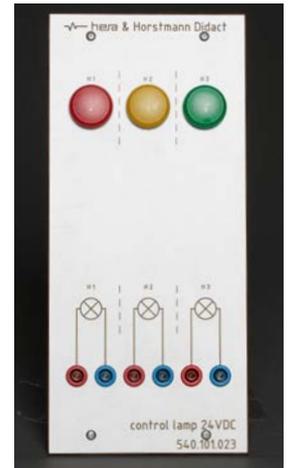
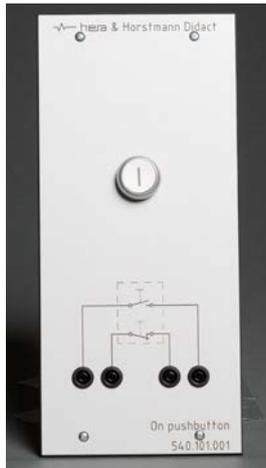
Instead of the Control Engineering Panel and the Main Contactor Panel you can select your own choice of component panels. The full set is available either as 230V<sub>AC</sub> version or as 24V<sub>DC</sub> version.

Dimensions: 133 x 297mm (WxH)

### 540.000.100 Set of Panels: Control Engineering

(according to manual 540.018.001)

- 2x Auxiliary Contactors 24V
- 1x Time Relay 24V on delay
- 1x Time Relay 24V off delay
- 1x Pushbutton 0-I-II
- 1x Control Lamps 24V 3-fold
- 1x Limiting Switch 1S/ 1O
- 1x Emergency Off
- 1x Power Supply 24V<sub>DC</sub>



#### Component Panels - Control Engineering

540.000.100	Set of Panels according to Manual 540.018.001	540.100.207	Auxiliary Contactor 24V, 4 NOC, 4 NCC
540.100.103	Reversing Switch	540.100.208	Auxiliary Contactor 230V, 4 NOC, 4 NCC
540.100.104	Star-Delta Switch	540.100.334	Load Contactor 24V, 3 Load Contacts + 2 NOC + 2 NCC
540.100.105	Star-Delta Reversing Switch	540.100.234	Load Contactor 230V, 3 Load Contacts + 2 NOC + 2 NCC
540.100.106	Pole-Changing Switch, Dahlander Motors	540.100.706	Overcurrent Relay 0,4...0,6A
540.100.107	Pole-Changing Switch, Motor with Seperate Windings	540.100.710	Overcurrent Relay 0,6...1,0A
540.101.100	Emergency Off Button	540.100.716	Overcurrent Relay 1,0...1,6A
540.101.005	Pushbutton Off	540.100.911	Time Relay 24V drop-out delay
540.101.001	Pushbutton On	540.100.912	Time Relay 24V switch-on delay
540.101.002	Pushbutton, 2fold	540.100.913	Time Relay 230V drop-out delay
540.101.003	Pushbutton, 3fold, 0-I-II	540.100.914	Time Relay 230V switch-on delay
540.101.004	Pushbutton, 3fold, I-O-II	540.100.910	Multifunctional Relay 8-230V, Changeover, 0,1s-40h drop-out - / switch-on delay / clock generator / wiper
540.101.023	Control Lamp 24V, 3fold	540.100.806	Motor Circuit Breaker 0,4...0,6A
540.101.024	Control Lamp 230V, 3fold	540.100.810	Motor Circuit Breaker 0,6...1,0A
540.101.031	Limit Switch, 1 NOC, 1 NCC	540.100.816	Motor Circuit Breaker 1,0...1,6A
590.500.010	DC Power Supply Panel 24V / 4A		

## TRAINING BOXES - CONTROL ENGINEERING

The topic of Control Engineering can alternatively be taught with training boxes. For trainings with boxes you will need either a training system frame with installation wall or an installation cabin. The boxes are completely closeded with detachable cover and replacable hooks.

For a safe training environment the wirings are only possible with 4mm touch-protected safety laboratory cables.

### 303.000.100 Set of Panels: Control Engineering (according to manual 540.018.001)

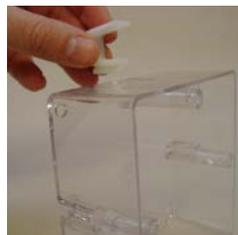
- 1x DC Power Supply 24 VDC / 4A
- 2x Auxiliary Contactor 4 NOC + 4 NCC, Coil 24VDC
- 1x Pushbutton, 3fold, 0 - I - II
- 1x Emergency Off Button
- 2x End Switch, 1 NOC, 1 NCC
- 1x Control Lamp, 3fold, 24V (red, yellow, green)
- 1x Time Relay, switch-on delay, 24VDC
- 1x Time Relay, drop-out delay, 230VAC



replacable 4mm for safety lab cables



completely housed, with detachable cover



replacable hooks and locks



suitable for hera installation walls and universal installation walls

#### Training Boxes for Control Engineering

303.000.100	Set of Boxes „Control Engineering“ according to manual	303.117.100	Multifunctional Relays 8 ... 230V UC
303.100.100	3x Resistors 50Ω, 100Ω, 220Ω, 0,5A each	303.120.100	Pushbutton, 3fold
303.101.100	Neozed Fuse Element 3x 6A	303.120.500	Emergency Off Button
303.103.100	Motor Circuit Breaker 1...1,6A	303.122.100	Control Lamps, 3fold 230V
303.105.100	Motor Protection Relay 1...1,6A	303.124.100	End Switch, 1 NOC + 1 NCC
303.105.200	Motor Protection Relay 0,6 ... 1A	303.125.100	Proximity Switch, inductive
303.105.300	Motor Protection Relay 0,4 ... 0,6A	303.125.200	Proximity Switch, capacitive
303.110.100	Main Switch, 3poles	303.156.100	Pushbutton Off, red
303.111.100	Reversing Switch	303.157.100	Pushbutton On, green
303.112.100	Star-Delta Switch	303.166.100	Control Lamps, 3fold, 24V
303.113.100	Motor Simulation, 3phase	303.177.800	Time Relay, switch-on delay 230V
303.115.100	Load Contactor 230V 3 Auxiliary + 2NOC - 2 NCC	303.177.810	Time Relay, drop-out delay 230V
303.115.110	Auxiliary Contactor 24V 3 Auxiliary + 2 NOC + 2 NCC	303.177.820	Time Relay, switch-on delay 24V
303.115.200	Auxiliary Contactor 230V 4 NOC+ 4NCC	303.177.830	Time Relay, drop-out delay 24V
303.115.210	Auxiliary Contactor 24V 4 NOC+ 4NCC		