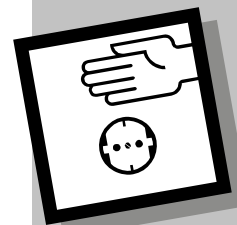


## Protective Engineering / Installation Technology



### Protective Engineering

Series 2300



The Protective Engineering series 2300 is used for measurements in the field of electrical safety engineering and installation engineering. The system is a demonstration system, but is very suitable as students working place, too. The training system consists of seven demonstration boards, an experimental manual and needs a common commercially-available measuring instrument. The measurements are performed at 230 V / 400 V; therefore the protective safety measures could be done due to the corresponding international regulations.

#### The system allows numerous experiments with problems and solutions for the following subjects:

- Effects of electric current on the human body
- Electrical resistance of the human body
- Behaviour in case of accidents Measuring the contact voltage and contact current
- Regulations for the protective engineering and installation technology Measures for the Electrical Safety
- Consumer installations and network systems: Current carrying capacity of lines and cables, Fault current and voltage, Earthing methods, Fuses, Circuit breakers, Faulty current devices (RCD's)

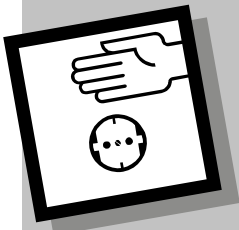
#### Network systems:

- TN-system, TT-system, IT-system
- Mains voltage, mains frequency, overvoltage protection
- Measuring conductivity of potential equalizer
- Measuring of the earth resistance and residual voltage
- Measuring loop impedance, short-circuit current and insulation resistance
- Measuring and testing of the phase sequence
- Testing of faulty current devices (RCD's)
- Professional testing of electric installations for the living area, preparing and recording reports & test reports
- Measuring directly earthed consumers / loads
- Measuring within the IT-system

#### Faults manual adjustable with switches:

- Service Line and Potential Equalisation: 12 different faults possible
- Apartment: 15 different faults possible
- For example: insulation faults, circuit-breaks, phase faults, loop resistance (loop impedance)

- Practice-oriented measuring with commercially available VDE test equipment, measurements at 230 V / 400 V
- For checking safety measures according to international regulations
- For measurements in the 1- and 3-phase mains
- TN / TT / IT system
- Practice-oriented and clearly arranged industrial components
- State-of-the-art technology industrial components
- Exchangeable RCD's: Type A, 30 mA (high sensitivity) or 300 mA (medium sensitivity) Type A selective: 300 mA Type B, universal current sensitive: 30 mA
- Simulation of frequently occurring faults in safety and installation engineering, lockable switch field for simulation of faults
- Ideally suitable for testing purposes
- Transformer separately safeguarded
- Pushbutton Emergency Off
- Uses safety connections and safety plugs

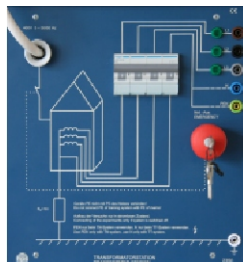


## Protective Engineering

Series 2300

# Protective Engineering / Installation Technology

## Demonstration boards for protection technology



Type 2350

### Transformer station

Type 2350

The Transformer station supplies all boards with voltage.

#### Specifications:

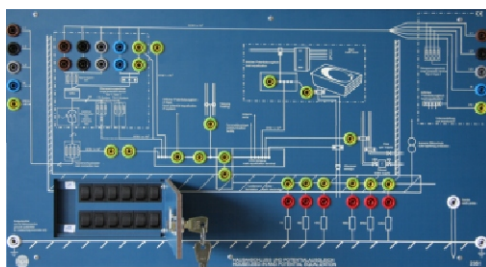
- Cekon Connector (CEE standard) for connection to the mains (alternatively supply able with 4 mm safety connectors)
- Four-Pole Line Circuit Breaker as protection device
- Key operated pushbutton emergency off
- Each phase with pilot LED

#### Technical data:

Mains Connection: 3-phase 230 V / 400 V; 50 ... 60 Hz,  
Cekon Connector (CEE standard)  
Four-Pole Line Circuit Breaker B6 (A)

Output voltage: 230 V (phase to neutral), 400 V (phase to phase)

Dimensions: 266 x 297 x 100 mm (w x h x d)  
Weight: approx. 2.5 kg



Type 2351

### Service Line and Potential Equalisation

Type 2351

This board is used for the reproduction of service lines and potential equalisation.

#### Specifications:

- Each phase separately connectable
- Reproduction of different Network systems possible
- Local potential equalisation connectable
- Different values of earthing resistance switchable
- 12 different faults switchable (insulation faults, circuit-breaks, high resistance of transitional point, loop resistance / loop impedance)
- Probe for measuring of earth resistance with a common commercially-available measuring instrument

#### Technical data:

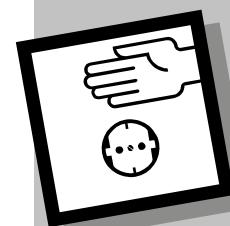
Mains Connection: 3-phase 230 V / 400 V; 50 ... 60 Hz,

Output voltage: 230 V (phase to neutral), 400 V (phase to phase)

Dimensions: 532 x 297 x 100 mm (w x h x d)  
Weight: approx. 2.9 kg

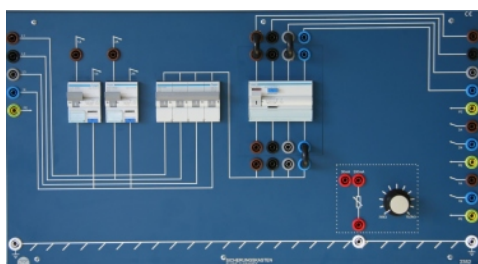
## Protective Engineering / Installation Technology

### Demonstration boards for protection technology



## Protective Engineering

### Series 2300



Type 2352

#### Fuse cabinet

#### Type 2352

This board reproduces a fuse cabinet in a consumer's installations.

##### Specifications:

- Two two-pole combined breaker (Circuit breaker, Faulty current devices)
  - One four-pole Circuit breaker
  - One four-pole Faulty current devices (RCD's), exchangeable supplied one Type A 30 mA RCD's;
- optional RCD's:
- Type A 300 mA, Type B 30 mA (universal current sensitive), Type A 300 mA (selective)
  - Test potentiometer for checking the faulty current devices (RCD's)

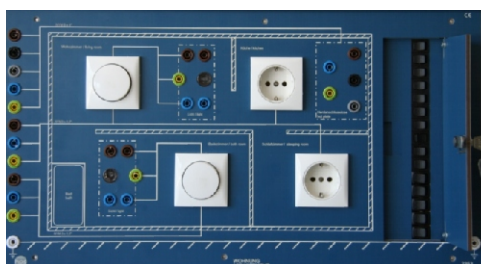
##### Technical data:

- Mains Connection:
- 3-phase 230 V / 400 V; 50 ... 60 Hz
  - Two two-pole combined breaker B13 (A), 30 mA Typ A
  - One Four-pole Circuit breaker B6 (A)
  - One Four-pole Faulty current devices (RCD's), 30 mA Typ A, (high sensitivity) optional e.g. Typ A 300 mA or other RCD's of you own choice
  - Test potentiometer for 30 mA, 100 mA and 300 mA faulty current devices (RCD's)

Output voltage: 230 V (phase to neutral), 400 V (phase to phase)

Dimensions: 532 x 297 x 100 mm (w x h x d)

Weight: approx. 3.8 kg



Type 2353

#### Apartment

#### Type 2353

This board reproduces an apartment fuse with four rooms as an example for consumer installations.

##### Specifications:

- Available rooms: living room, kitchen, bath, bedroom
- 15 different faults possible (insulation faults, circuit-breaks, phase faults, disconnection on phase, disconnection on PE (protective earth), Phase and PE wrong wired, loop resistance (loop impedance), wrong line impedance)
- Each phase separately connectable
- Heater simulation via 4 mm safety jacks
- Sockets, switches and lamps built-in

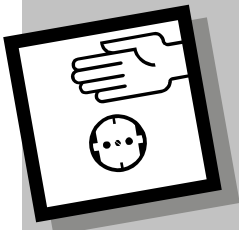
##### Technical data:

Mains Connection: 3-phase 230 V / 400 V; 50 ... 60 Hz

Output voltage: 230 V (phase to neutral), 400 V (phase to phase)

Dimensions: 532 x 297 x 100 mm (w x h x d)

Weight: approx. 3.0 kg



## Protective Engineering

Series 2300

# Protective Engineering / Installation Technology

## Demonstration boards for protection technology



Type 2354

### Isolating Transformer 3-phase

Type 2354

The 3-phase isolating transformer is used for the experiments if the IT-network system.

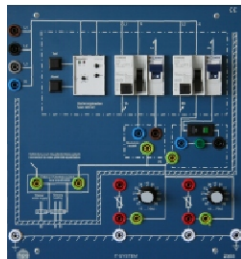
#### Specifications:

- Input voltage: 400 V / 50 ... 60 Hz (triangle)
- Output voltage: 230 V (phase to neutral), 400 V (phase to phase); (star)
- Shield winding for the connection of the PE (protective earth).
- Galvanic / electrically isolated

#### Technical data:

Mains Connection: 3-phase 400 V; 50 ... 60 Hz  
Output voltage: 3 x 230 V (phase to neutral), 400 V (phase to phase)  
Power Rate: 150 VA; 0.22 A each phase to neutral

Dimensions: 133 x 297 x 100 mm (w x h x d)  
Weight: approx. 2.7 kg



Type 2355

### IT-system

Type 2355

The board is used for the experiments and demonstration of the IT-network system. That network system is often used in hospital and for medical devices.

#### Specifications:

- Monitoring of the Insulation Resistance with a Earth-Leakage Monitor
- Faulty current device (RCD), Circuit breaker
- Socket, switch and lamp
- Potentiometer for experiments with the faulty current device (RCD)
- Local potential equalisation connectable

#### Technical data:

Mains Connection: 3-phase 230 V / 400 V; 50 ... 60 Hz,  
(via Isolating Transformer)

Output voltage: 3 x 230 V (phase to neutral),

Earth-Leakage Monitor: iso monitor industrial type for one- and three-phase use with test und reset button

Two faulty current devices (RCD):

Type A with a rated residual current of 10 mA, high sensitivity (HS)

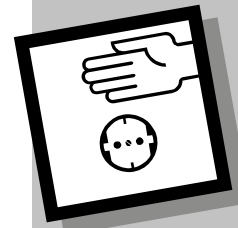
Two circuit breakers: B1 (A)

Potentiometer: two for RCD with a rated residual current of 10 mA

Dimensions: 266 x 297 x 100 mm (w x h x d)  
Weight: approx. 2.3 kg

# Protective Engineering / Installation Technology

## Demonstration boards for protection technology



### Protective Engineering

Series 2300



Type 2356

#### Shelter TT-system

Type 2356

The board Shelter TT-system is used as a load board for the net systems TN and TT.

##### Specifications:

- Simulation of a load / consumer 3-phase (e.g. a machine)
- Different values of earthing resistance
- Probe for measuring of earth resistance with a common commercially-available measuring instrument

##### Technical data:

Mains Connection: 3-phase 400 V; 50 ... 60 Hz

Earthing resistance: 1  $\Omega$ , 100  $\Omega$ , 470  $\Omega$ , 1 k  $\Omega$ , 4,7 k  $\Omega$

Dimensions: 133 x 297 x 100 mm (w x h x d)

Weight: approx. 0.7 kg



Type 2352.1

#### RCD - Faulty current devices 300 mA - Type A

Type 2352.1

RCD-Faulty current devices 300 mA is usable with Fuse cabinet Type 2352.

##### Specifications:

- Four-pole RCD connectable via 4 mm safety jacks
- Exchangeable with RCD of the Fuse cabinet Type 2352
- That module could be used with other RCD's of your own choice (E.g. B-Type or super resistant RCD)

##### Technical data:

RCD-Faulty current devices: four-pole RCD 300 mA / 25 A Type A or own choice

Dimensions: 95 x 123 x 76 mm (w x h x d)

Weight: approx 0.5 kg



Type 2352.2

#### RCD - Faulty current device 30 mA - Type B

Type 2352.2

RCD-Faulty current devices 30 mA Type B (universal current sensitive) is usable with Fuse cabinet Type 2352.

##### Specifications:

- Universal current sensitive
- Exchangeable with RCD of the Fuse cabinet Type 2352
- Four-pole RCD connectable via 4 mm safety jacks



Type 2352.3

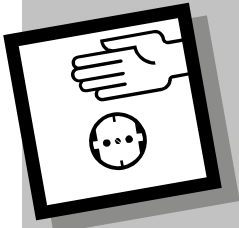
#### RCD - Faulty current device 300 mA - Type A, selective

Type 2352.3

##### Specifications:

- Selective
- Separate board, connectable with the fuse cabinet
- For checking of series connected residual current protective devices

Dimensions: (w x h x d) 133 x 297 x 100 mm



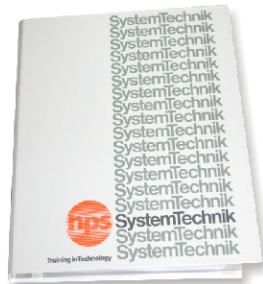
## Protective Engineering

Series 2300

### Protective Engineering / Installation Technology

### Demonstration boards for protection technology

### Accessories Recommended



#### Experiment manual with CD "Electric Safety Technology", English

Type V 0117-GB

The manual has the following content:

- Introduction
- General part
- Regulations and standards
- Exercises and measurements
- Solutions part



#### Set of connections for the protective engineering

Type 2350.1

For the measurements of the experiment manual use the following safety connection leads and safety connectors:

Set of connections for the protective engineering

- 12 safety connections, 4 mm, 75 cm
- 6 safety connections, 4 mm, 150 cm
- 2 safety connections, 4 mm, 25 cm (different colours)

30 safety connectors, 4 mm

Weight: approx ca. 1.5 kg



#### Measuring instruments

Any common commercially-available measuring instrument for protective safety measures (European regulations) could be used.

Recommended measuring instrument:

Profitest SII+ / 0100 (Brand: Gossen Metrawatt)  
(For the experiments of the manual the Profitest SII+ / 0100 was used)

Any commercially-available multimeter with following rates could be used.

Voltage: 600 V (AC)  
Current: 4 A (AC)