

Operating instructions



A129 Measurement Set

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Your duty to supervise

These operating instructions are intended for the supervisor in charge.

- These operating instructions must be read and observed before use.
- These operating instructions must be available to refer to and must be stored in a safe place.
- All the safety instructions must be observed.
- This product may only be activated and operated under the direction of the supervisor in charge.

General safety instructions

The **general safety instructions** separately included with this product must be read before using the product and must be observed!

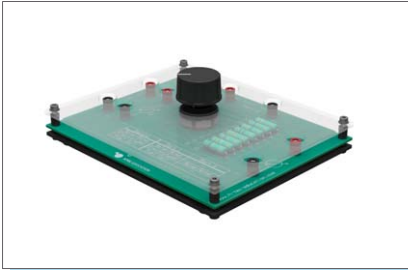
Function and intended use

The Measurement Set is exclusively for the purpose of determination of measured data of H-TEC EDUCATION products within the scope of training or demonstration activities.

Any other use is impermissible!

Please refer to the relevant operating instructions for information on the operation of the components to be measured, such as fuel cells, electrolysers or solar modules.

Content



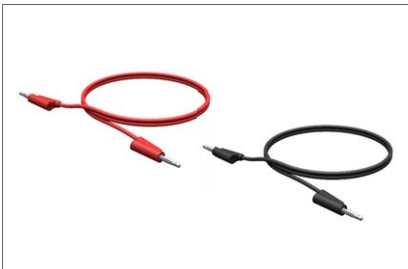
1× decade resistor
Decade Junior



2× mutimeter inc. operating instructions
Multimeter



1× stopwatch incl. operating instructions
Stopwatch



1× cable range
Cable Set,
consisting of:
4× connection cable, 2 mm,
length 50 cm, red
4× connection cable, 2 mm,
length 50 cm, black



2× battery (9 V) for multimeter
9V Battery



1× Operating instructions
Operating Instructions

Initial start-up

Initial start-up of multimeters

Read the operating instructions for the multimeters activating them as described there.

Initial start-up of stopwatch

Read the operating instructions for the stopwatch activating it as described there.

Use of the Measurement Set

The connections and use of the decade resistor are explained below.

Please refer to the relevant operating instructions and experimental templates for implementation of experiments, as well as the set-up and operation of the components to be measured.

Overview of the decade resistor

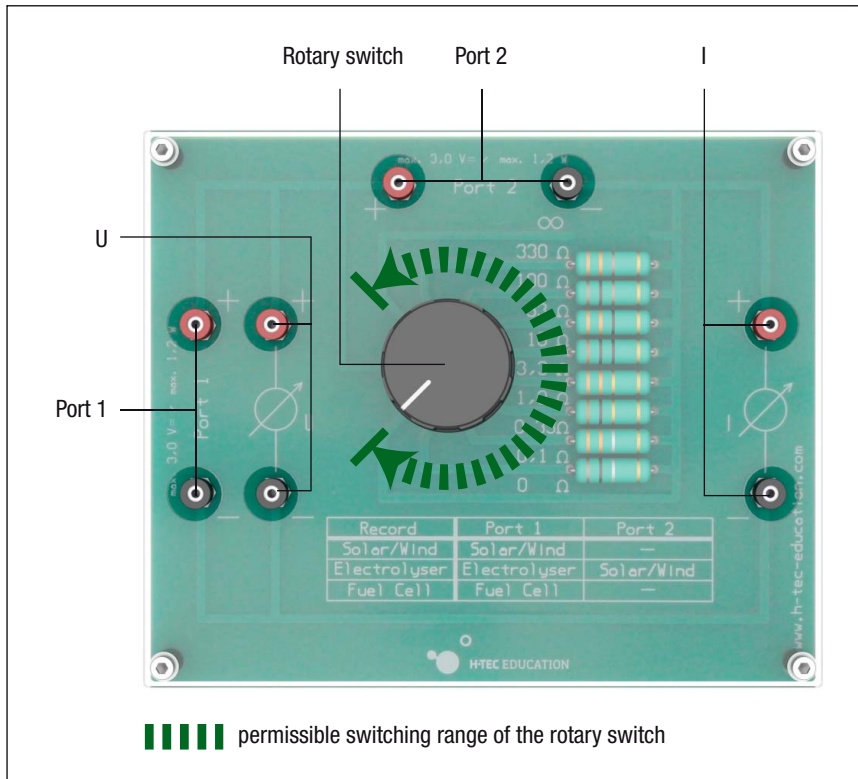


Fig. 1: Decade resistor, top view

General warning notices

CAUTION

Risk of damage to the equipment by applying any type of voltage. Applying any type of voltage to the “U” and “I” connections, may damage set-up components beyond repair. Never apply any voltage to the “U” and “I” connections!

CAUTION

Risk of damage to the equipment due to electrical overload. Connecting components with too high an output voltage or power to the “Port 1” or “Port 2” connections may damage the decade resistor beyond repair. Never connect components to the “Port 1” or “Port 2” connections if their electrical output values exceed the maximum permissible input values at the connections.

CAUTION

Risk of damage to the equipment through improper handling. Using force to turn the rotary switch beyond the permissible switching range will damage the rotary switch beyond repair. Never use force to activate the rotary switch and only activate it within the permissible switching range.

Set-ups

1.) Set-up for experiments with solar modules or wind turbine

The components are connected as follows:

Port 1	Port 2	U	I
Solar module or wind turbine	-	Multimeter Voltage measurement	Multimeter Current measurement

Ensure the correct polarity (red = “+”, black = “-”)!

Ten different resistance values can be set using the rotary switch. Every rotary switch position produces another operating point.

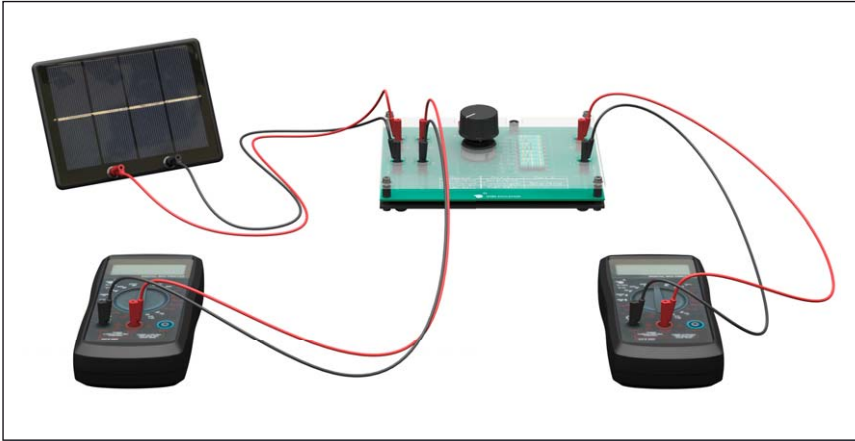


Fig. 2: Set-up example with solar module

2.) Set-up for experiments with electrolysers

The components are connected as follows:

Port 1	Port 2	U	I
Electrolyser	Solar module or wind turbine	Multimeter Voltage measurement	Multimeter Current measurement

Ensure the correct polarity (red = “+”, black = “-”)!

Ten different resistance values can be set using the rotary switch.

Every rotary switch position produces another operating point.

3.) Set-up for experiments with fuel cells

The components are connected as follows:

Port 1	Port 2	U	I
Fuel cell	-	Multimeter Voltage measurement	Multimeter Current measurement

Ensure the correct polarity (red = “+”, black = “-”)!

Ten different resistance values can be set using the rotary switch.

Every rotary switch position produces another operating point.

Troubleshooting

The determination of measured values is not working.

Possible cause:

- The components to be measured are not working properly.

Solution:

- Make sure that the components to be measured are working properly.
For instructions on troubleshooting with regard to the components to be measured, see the relevant operating instructions.

Possible cause:

- The components are not connected properly.

Solution:

- Make sure that all the components as described in chapter “Use of the Measurement Set” are connected.

Possible cause:

- The decade resistor is damaged.

Solution:

- Contact H-TEC EDUCATION.

The measured values determined are too low.

Possible cause:

- In the case of larger currents resulting in losses due to contact resistors.

Solution:

- However, the values measured using the Measurement Set and the resulting characteristics are correct in qualitative terms.

Should the above-mentioned solutions not remedy the cause of error, please contact H-TEC EDUCATION.

Technical data

Please refer to the relevant operating instructions for the technical data of the multimeters and stopwatch.

Decade resistor:

H × W × D: 50 × 160 × 132 mm

Connections:..... female connectors for 2 mm multilam plugs

U_{max} Port 1 and Port 2: 3.0 VDC

P_{max} Port 1 and Port 2: 1.20 W

Decommissioning

Before putting the product into storage, the following points must be observed:

- Before longer storage, the batteries should be removed from the devices.

Maintenance

The product's components do not need maintenance. The following points should, however, be observed:

- Only use a dry, lint-free cloth to clean the product.
- Ensure that the batteries in the multimeters and the stopwatch are renewed in a timely manner.

Transport and storage

With regard to transport and storage of the product, the following points should be observed to ensure a long service life. Transport and storage only:

- in the original package.
- dry and dust-free.
- at temperatures of 4 °C to 50 °C.
- protected against vibrations.

Disposal

According to European regulations, used electric and electronic devices must no longer be disposed of as unsorted household waste. The symbol of the crossed-out wheellie bin indicates the necessity of separate collection. Your local waste management company can provide you with additional information about disposal options.

Subject to technical changes