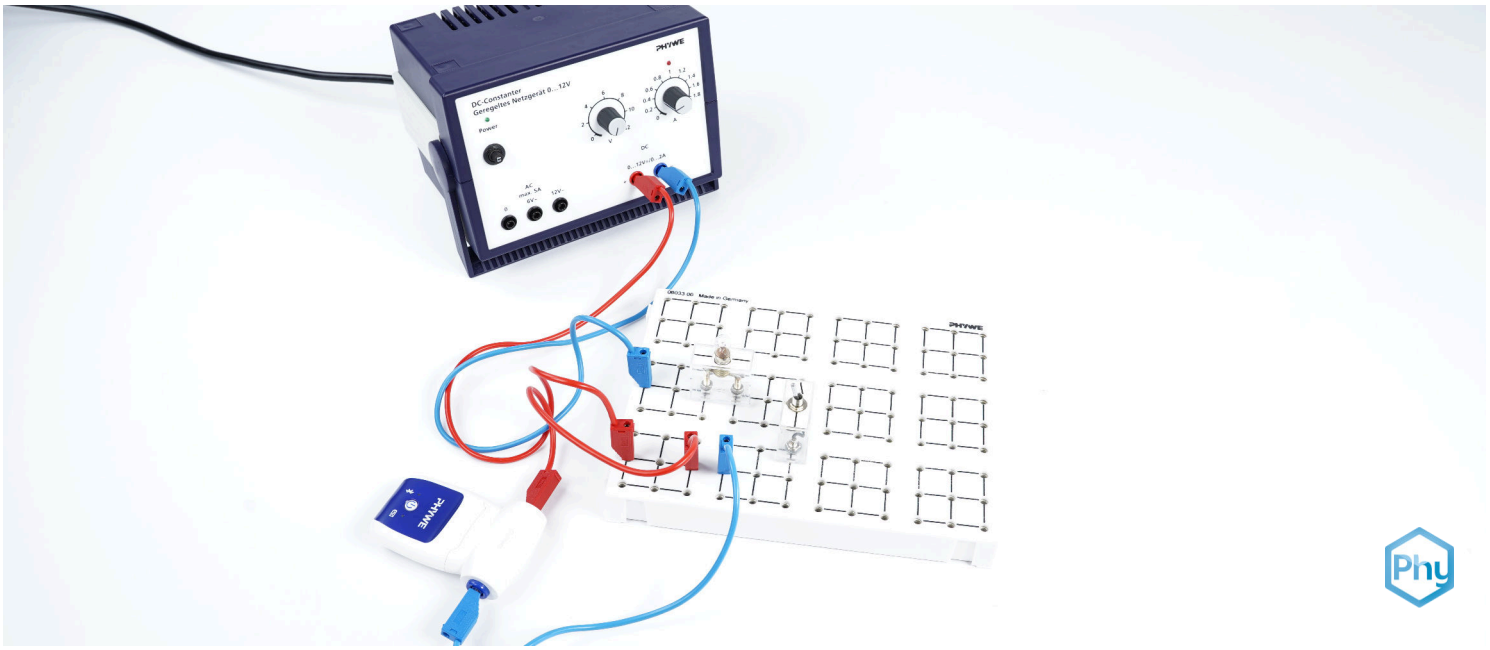
Current measurement with Cobra SMARTsense



Physics > Electricity & Magnetism > Simple circuits, resistors & capacitors

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	20 minutes

This content can also be found online at:

https://www.curriculab.de/c/686b7a52d7122b000255f73b

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Teacher information

Application

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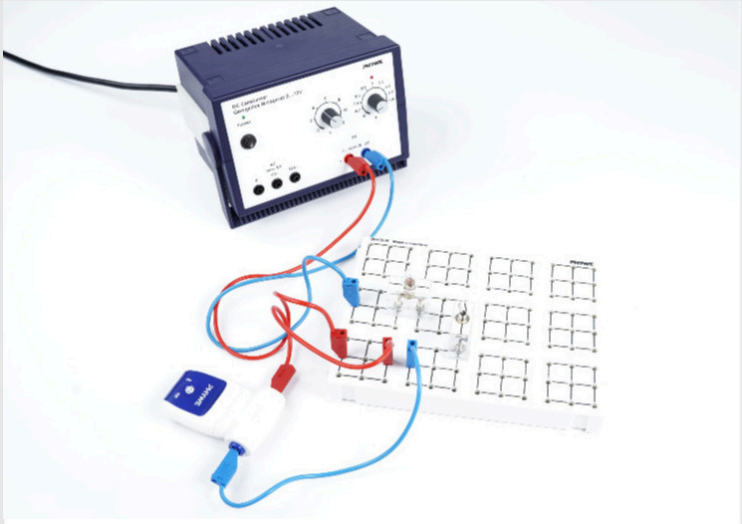

Experimental setup

In this experiment, students learn how to measure one of the most fundamental quantities in electricity: The current. To do this, the students measure how high the amperage is for different voltages and light bulbs.

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Other teacher information (1/2)

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Prior knowledge

Pupils should be able to build a simple circuit independently and know what a series and parallel circuit is.

Principle

Different mains voltages are applied to a simple circuit, and the current through a light bulb connected in series is measured. To prevent the bulbs from breaking, they must always be replaced when the voltage is increased.

Other teacher information (2/2)

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Learning objective

Students should be able to measure the current independently using the Cobra SMARTsense Current.

Tasks

Firstly, the students should set up the circuit according to the circuit diagram and the pictures. Then they measure the current for different voltages, repeatedly changing the light bulbs. Finally, they should observe what current is measured when the circuit is interrupted.

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Safety instructions

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The general instructions for safe working in science lessons apply.

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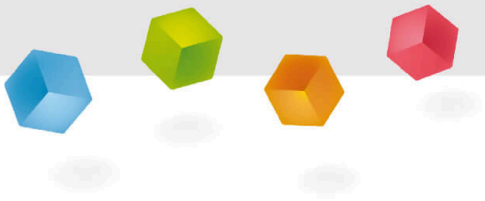

Student information

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Motivation

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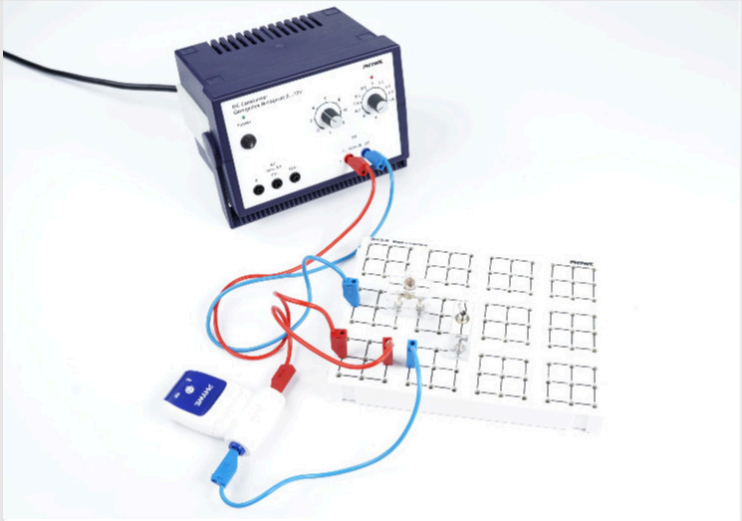

Experimental setup

In everyday life, we encounter many devices that run on electricity — from mobile phones to coffee machines. But how much electric current is actually flowing? And how can you find out?

In this experiment, you'll learn how to measure electric current. You'll discover why it's important to set up an electrical circuit correctly — and how to connect a measuring device the right way.

Tasks

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1. Build the circuit according to the circuit diagrams and pictures
2. Connect the Cobra SMARTsense Current to the measureApp
3. Measure the current for different mains voltages. Change the light bulbs for the appropriate voltages.
4. Observe the current strength of an interrupted circuit

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Equipment

Position	Material	Item No.	Quantity
1	Cobra SMARTsense Current - Sensor for measuring electrical current ± 1 A (Bluetooth + USB)	12902-02	1
2	Plug-in board, for 4 mm plugs	06033-00	1
3	on-off switch, G1	39139-00	1
4	Lampholder E10, case G1	17049-00	1
5	Connecting cord,19 A,25cm, red	07313-01	2
6	Connecting cord,19 A,25cm, blue	07313-04	2
7	Filament lamps 4V/0.08A, E10, 10	06154-03	1
8	Filament lamp 6 V/3 W, E10, 10 pcs.	35673-03	1
9	Filament lamps 12V/0.1A, E10, 10 pieces	07505-03	1
10	PHYWE Power supply, 230 V,DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1

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Setup (1/4)

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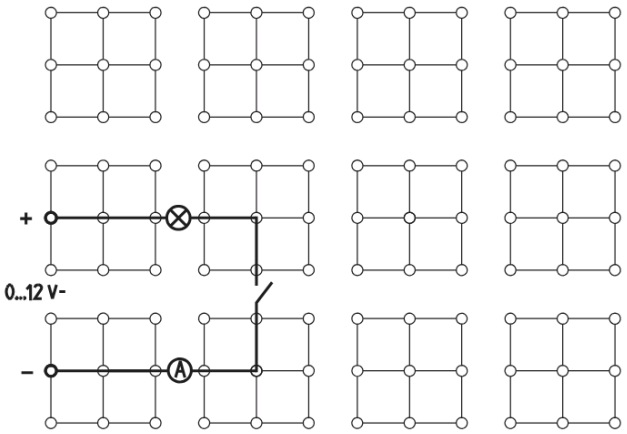

Circuit diagram of the experiment

- Build the circuit as shown in the sketch on the left. The Cobra SMARTsense Current is marked here by a circled A.
- When connecting the Cobra SMARTsense Current, make sure that the red connection is connected to the side of the lamp that is closer to the positive pole. The blue connection should be connected closer to the negative pole. It is best to use uniform cable colours (red for plus, blue for minus) to avoid confusion. You can see what the whole thing looks like when it is assembled by pressing the blue button.

Setup (2/4)

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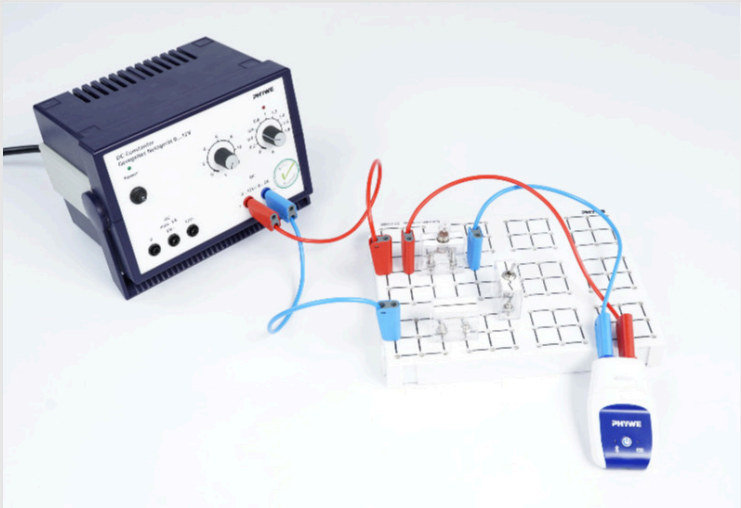

Experimental setup

- Make sure that the light bulb for $4\ \mathrm{V}$ is installed. You can recognise this by the fact that this value is engraved on the bulb.
- Now switch on the Cobra SMARTsense by pressing the on/off button for three seconds.

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Setup (3/4)

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To measure with the **Cobra SMARTsense sensors**, the **PHYWE measureAPP** is required. The app can be downloaded free of charge from the respective app store (QR codes below). Please check that **Bluetooth is enabled** on your device (smartphone, tablet, desktop PC) before starting the app.

iOS

Android

Windows

Setup (4/4)

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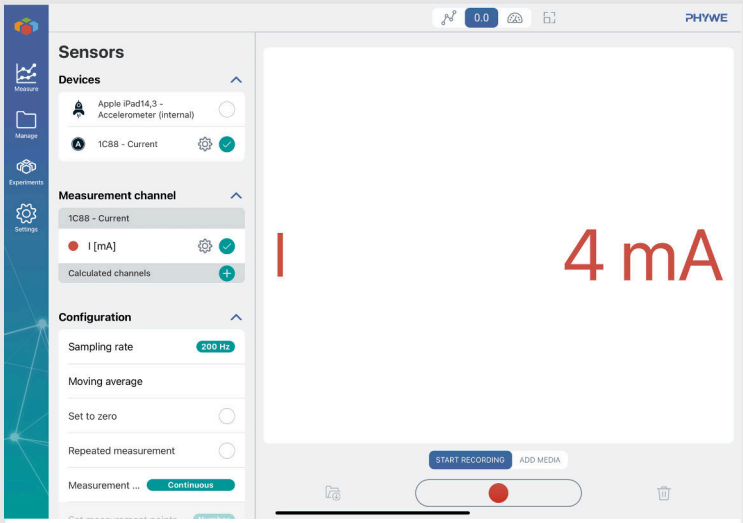

Example screenshot

- Now open the measureAPP and connect to the Cobra SMARTsense Current by clicking on the name.
- Press "0.0" at the top of the app to display the measured values as digitals.
- Even if the power supply unit has been switched off until now, you may still see fluctuating measurement results. This is due to the measurement errors of the measuring device. These always occur and must be taken into account for particularly accurate measurements. Today, however, you can ignore them.

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Procedure (1/4)

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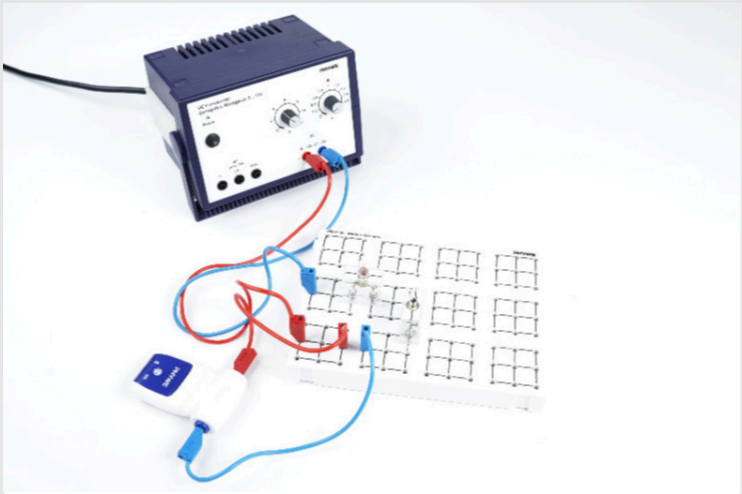

Experimental setup

- Switch on the power supply unit while the rotary head for the voltage is set to $0\ \mathrm{V}$.
- Now slowly turn the rotary knob to $4\ \mathrm{V}$ and then note the measured current in Table 1 in the report section.

Procedure (2/4)

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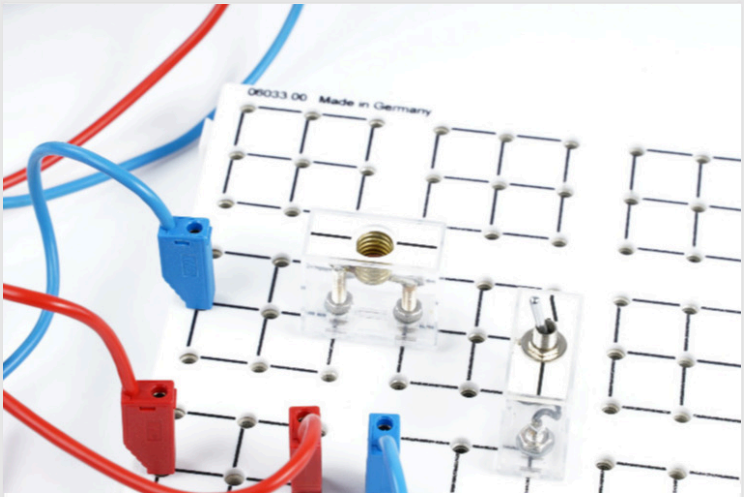

Socket without lamp

- Turn the voltage back to $0\ \mathrm{V}$ and switch off the power supply unit.
- Unscrew the light bulb from the socket and replace it with a $6\ \mathrm{V}$-light bulb.
- Switch the power supply on again, screw the voltage up to $6\ \mathrm{V}$ and note the measured current in Table 1 in the report section.

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Procedure (3/4)

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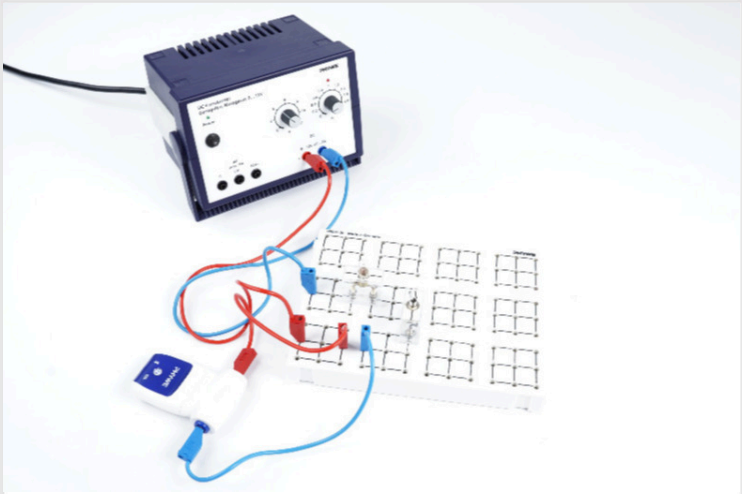

Experimental setup

- Repeat the steps from the last slide, but this time with a $12\ \mathrm{V}$ light bulb.
- Turn up the voltage accordingly at the end $12\ \mathrm{V}$.
- Note down the measured current again.

Procedure (4/4)

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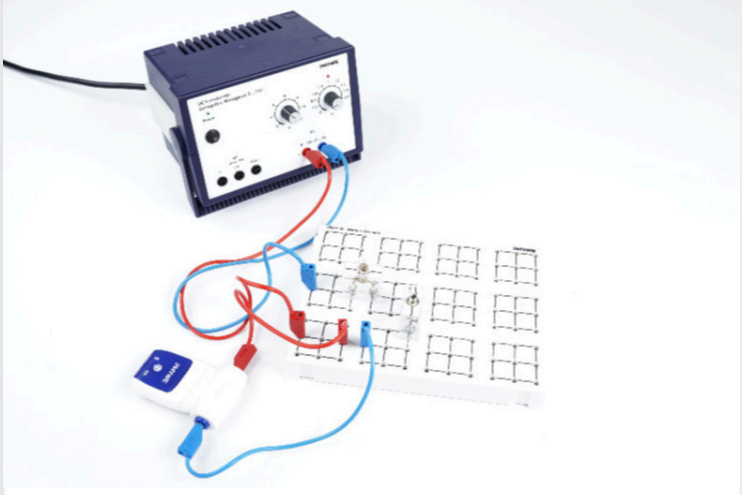

Experimental setup

- Now interrupt the circuit by closing the switch.
- What current do you measure?

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Report

Table 1

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Under the respective mains voltages, note the current in milliamperes (mA) that you measured at the lamp.

4 V	6 V	12 V

How must the measuring device be installed in the circuit?

- It doesn't matter
- The ammeter must be installed in the circuit (in series with the electrical device).
- The ammeter must be installed in parallel with the circuit

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Task 1

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Tick the correct answers

- [ ] The measuring device must have the current flowing through it that it is to measure
- [ ] The circuit may also be interrupted in order to measure the current.
- [ ] Pay attention to the polarity when connecting the measuring device.
- [ ] The polarity does not matter when the measuring device is connected.

Check

Slide	Score / Total
Slide 19: Installation of the ammeter	0/1
Slide 20: Tick the correct answers	0/2

Total amount 0 / 3

Solutions Repeat Export text

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