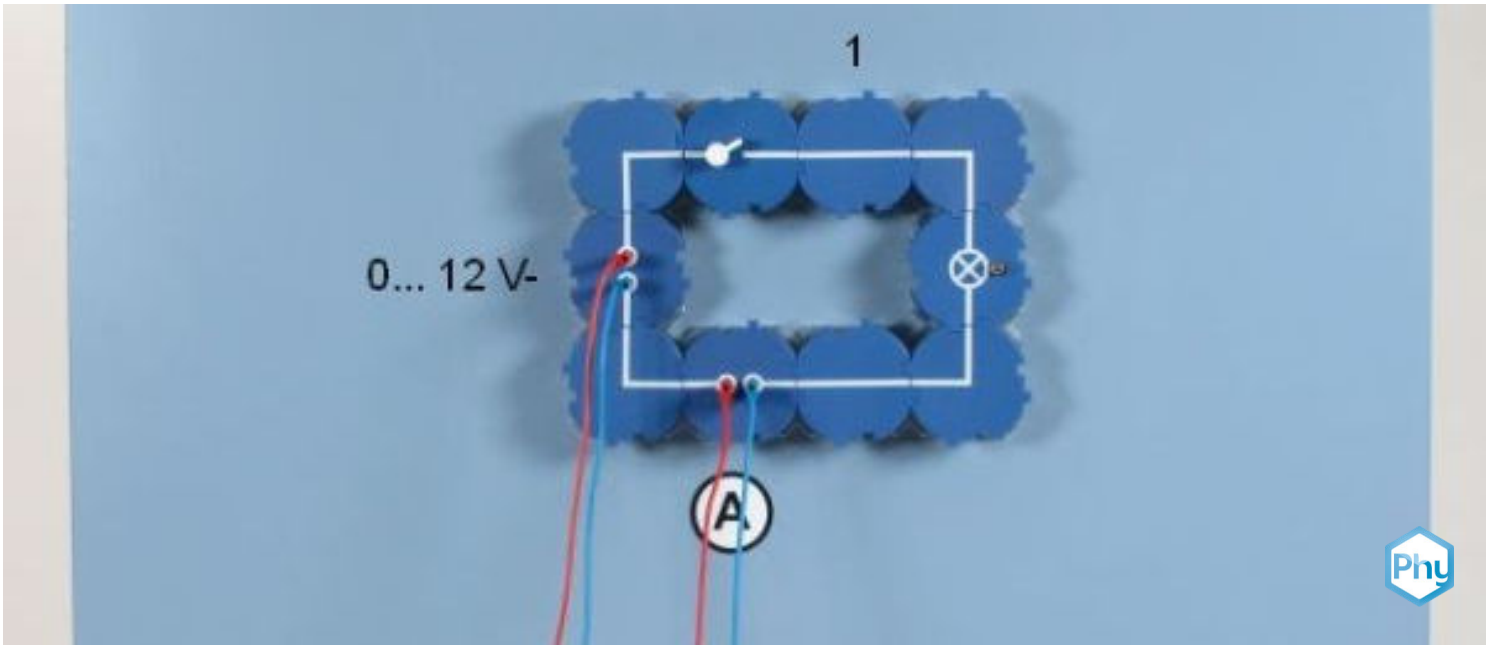
Current measurement



First, a simple circuit is to be set up and then various measurements are to be carried out with the ammeter.

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

Difficulty level	Group size	Preparation time	Execution time
easy	-	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/6474a07721530f000293d6be

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General information

Application

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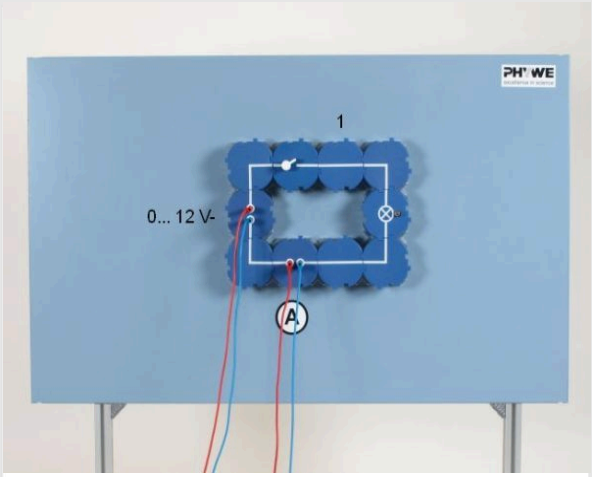

Experimental setup

An ammeter can be used to measure the electric current. It is important to understand how the measuring device must be switched.

Colloquially, an ammeter is also called an ammeter because the measured quantity is converted into a multiple of the unit ampere.

There are also measuring devices that can measure both voltage and current. These are called multimeters.

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Other information (1/2)

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Prior knowledge

Students should be familiar with the definition of "current" and "voltage" and be able to construct a simple circuit.

Principle

With an ammeter you can measure the electric current (in A or mA). To do this, the measuring device must be connected in the circuit, i.e. in series with the electrical device. It does not matter at which point the current intensity is measured, because it is the same everywhere in the circuit.

Other information (2/2)

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Learning objective

The students should be familiarised with the ammeter. In particular, the focus should be on correct operation and integration into the circuit.

Tasks

First, a simple circuit is to be set up and then various measurements are to be carried out with the ammeter.

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Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

Theory

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In this experiment, the simple circuit to demonstrate the functioning of an ammeter is used.

A current meter is used to measure the amperage in an electrical circuit. While the measuring device is connected in parallel to the component when measuring voltage, the current measuring device is connected in series. In a simple circuit, it is irrelevant at which point the ammeter is installed, as the current strength is identical in the entire circuit.

To increase the current strength I To be able to measure correctly, attention must be paid to both the polarity and the corresponding setting of the measuring range of the ammeter. As an aid to remembering the colour assignment for the poles, the word pair red - positive is recommended.

The electric current is a measure of the number of freely moving electrons that pass through a (random) conductor cross-section per unit of time. The current in a direct current circuit always flows in the same direction (definition: from the positive to the negative pole) and the direction of the current determines the direction of the pointer deflection.

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Equipment

Position	Material	Item No.	Quantity
1	PHYWE Demo Physics board with stand	02150-00	1
2	Connector, straight, module DB	09401-01	2
3	Connector, angled, module DB	09401-02	4
4	Connector interrupted, module DB	09401-04	2
5	Switch on/off, module DB	09402-01	1
6	Socket for incandescent lamp E10 ,module DB	09404-00	1
7	Connecting cord, 32 A, 1000 mm, red	07363-01	2
8	Connecting cord, 32 A, 1000 mm, blue	07363-04	2
9	PHYWE Power supply, universal, analog display DC: 18 V, 5 A / AC: 15 V, 5 A	13503-93	1
10	PHYWE Demo Multimeter ADM 3: current, voltage, resistance, temperature	13840-00	1
11	Filament lamps 4V/0.04A, E10, 10	06154-03	1
12	Filament lamps 12V/0.1A, E10, 10 pieces	07505-03	1
13	Electr.symbols f.demo-board,12pcs	02154-03	1
14	G-clamp	02014-01	2

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Set-up and Procedure

Set-up

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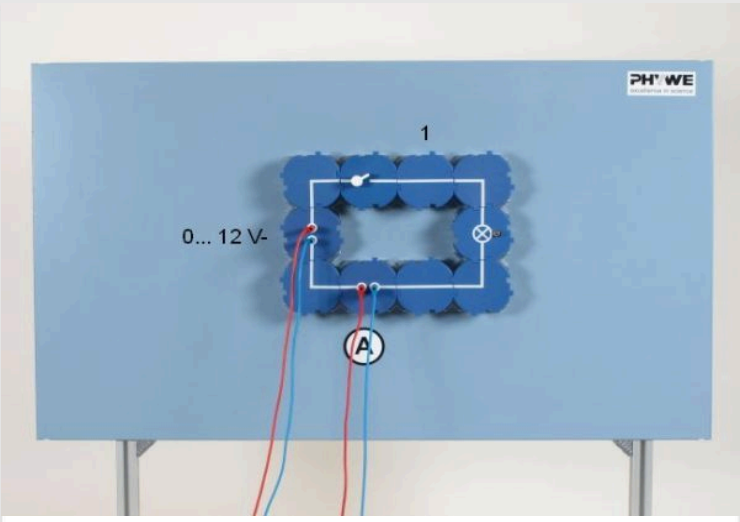

Experimental setup

- Set up the experiment according to the illustration on the left.
- The switch is initially open and the $4V$ Bulb is screwed into the lamp socket; select a measuring range of $300mA$.

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Procedure (1/2)

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- Switch the power supply unit to $0V$ and switch on.
- Close the switch and slowly increase the voltage at the power supply unit to $4V$; while doing so, observe the bulb and the meter.
- Measure the current I reached at the operating voltage of $4V$; note the measured value.
- Open the switch; swap the interrupted line module, in which the connecting lines to the meter end, with the module marked in the illustration of the Experimental set-up; make sure that the polarity is correct; close and open the switch while observing the lamp and meter.

Example picture of a multimeter

Procedure (2/2)

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- Choose the measuring range $3A$ and replace the $4V$ bulb with the $12V$ bulb.
- Close the circuit, increase the voltage on the power supply unit to $12V$, read the current intensity I and note the measured value.
- Select a measuring range of $300mA$, measure the current again and note the reading.
- With the switch open, select measuring range $3A$, swap connections on the meter and close the switch; observe lamp and meter.

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Evaluation (1/3)

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Complete the text based on the observations made during the experiment:

As the amperage increases, the light bulb glows _____.
The amperage and the brightness of the lamp are _____ when the meter was switched elsewhere in the circuit.
The light bulb glows _____, but the pointer of the ammeter swings _____; the amperage I cannot be measured.

left
brighter
as before
as great as before

Check

Evaluation (2/3)

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Which statements are correct?

- [ ] The polarity of the meter is irrelevant when measuring the current.
- [ ] To measure the current, the measuring device must be connected in parallel to the component.
- [ ] To measure the current, the meter must be connected in series with the component.
- [ ] The current strength is the same everywhere in the circuit.
- [ ] With an ammeter you can measure the electrical voltage.

Check

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Evaluation (3/3)

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Why must the ammeter be connected with correct polarity?

- Because otherwise it is not the current strength but the voltage that is measured.
- Because the current in the DC circuit always flows in the same direction and the direction of the current determines the direction of the pointer deflection.
- Because otherwise the ammeter will be irreparably damaged.

Slide	Score / Total
Slide 12: Incandescent lamp current	0/4
Slide 13: Multiple tasks	0/2
Slide 14: Correct connection of the ammeter	0/1

Total score 0 / 7

Show solutions Repeat

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