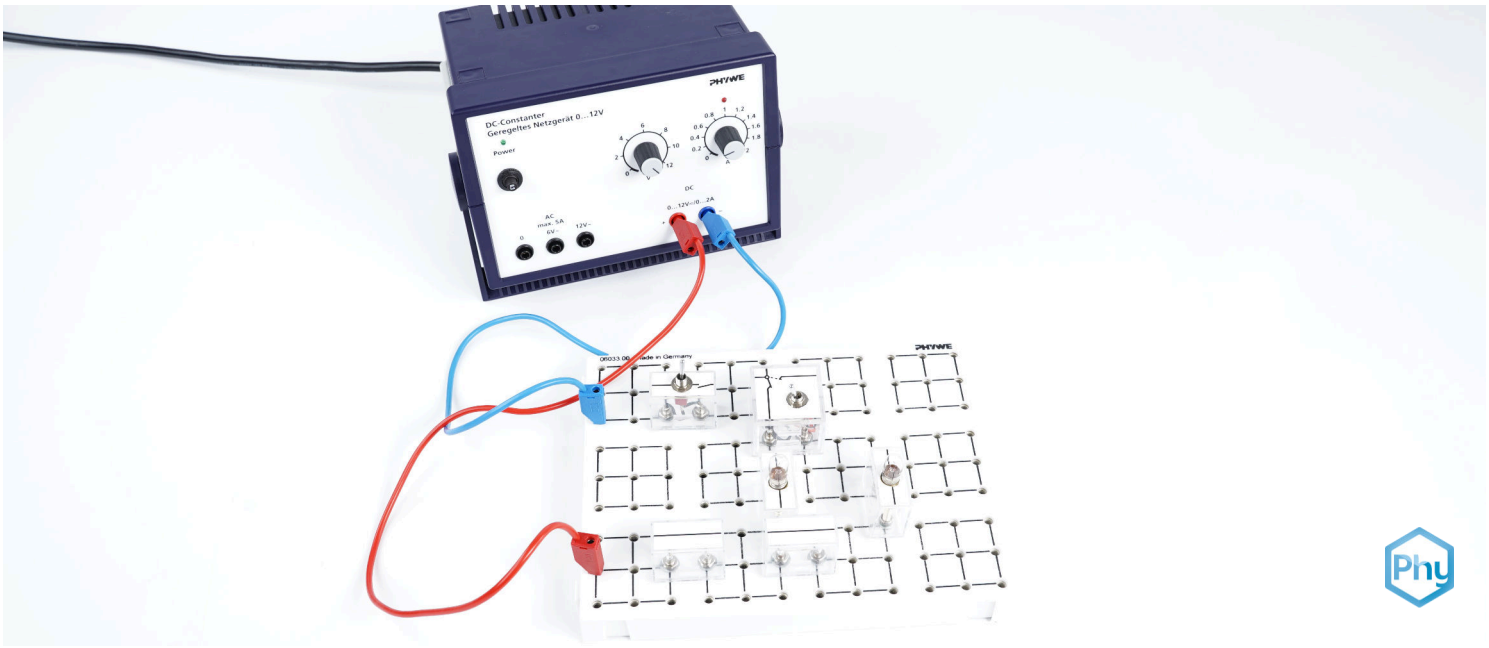
Changeover switches and alternating switches



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/6877636748347a000292b86a

PHYWE
Robert-Bosch-Breite 10
37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
www.phywe.de

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Teacher information

Application

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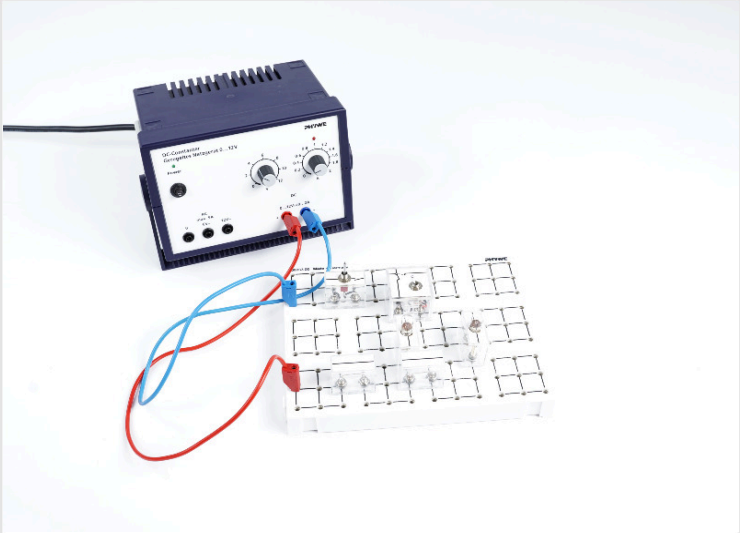

Experimental setup

Switches are very important in electrical engineering because they allow us to intervene manually in a circuit without endangering ourselves. Two relevant types of switches that are frequently used are the changeover switch and the alternating switch.

In this experiment, students will learn how to use these two switches so that they can apply this knowledge independently in the future.

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Other teacher information (1/2)

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Prior knowledge

The students should be able to construct an electric circuit with the help of a circuit diagram and photos.

Principle

A branched circuit consisting of two simple circuits is set up. The path the current takes —and thus which of the two light bulbs lights up—depends on the position of the changeover switches. This allows pupils to explore independently how the switches must be set to guide the current along the desired path.

Other teacher information (2/2)

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Learning objective

Pupils should learn how the changeover switches work and develop safe handling skills.

Tasks

The experiment is divided into two parts. In both parts, the circuit should first be set up according to the sketches and then the behaviour of the light bulbs for the different switch positions should be observed.

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Safety instructions

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The general instructions for safe experimentation in science lessons apply.

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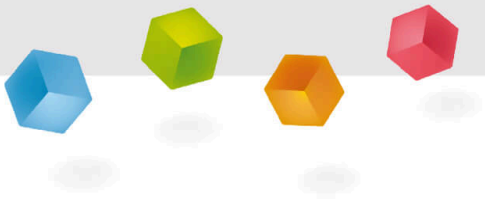

Student information

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Robert-Bosch-Breite 10
37079 Göttingen

Tel.: 0551 604 - 0
Fax: 0551 604 - 107

info@phywe.de
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Motivation

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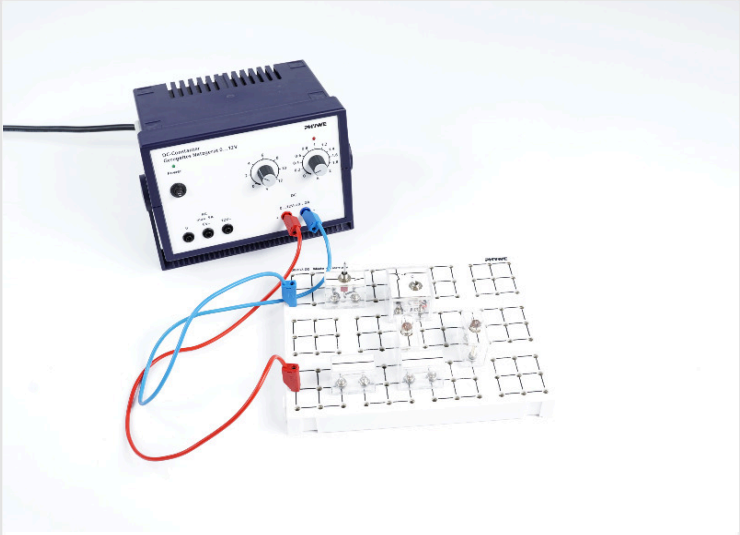

Experimental setup

- Switches are very important in electrical engineering because they allow us to intervene manually in a circuit without endangering ourselves. Two relevant types of switches that are frequently used are the changeover switch and the alternating switch.
- In this experiment, students will learn how to use these two switches so that they can apply this knowledge independently in the future.

Tasks

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1. Set up the first experimental section with the help of a circuit diagram and photos.
2. Note the behaviour of the light bulb for the different switch settings
3. Repeat these two steps for the second experimental setup

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Equipment

Position	Material	Item No.	Quantity
1	Plug-in board, for 4 mm plugs	06033-00	1
2	on-off switch, G1	39139-00	1
3	Change over switch, G3	39169-00	2
4	Wire building block, housing G1	39120-00	3
5	Lampholder E10, case G1	17049-00	2
6	Connecting cord,19 A,25cm, red	07313-01	1
7	Connecting cord,19 A,25cm, blue	07313-04	1
8	Filament lamps 12V/0.1A, E10, 10 pieces	07505-03	1
9	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 I (1/2)

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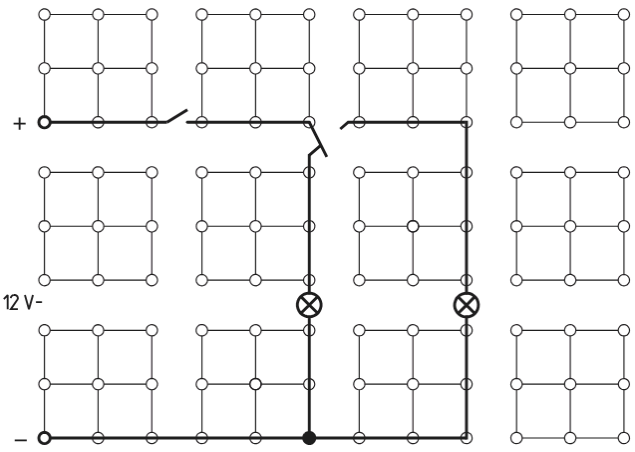

Circuit diagram 1

- Assemble the circuit according to the sketch on the left. You can view a photo of the assembled circuit by pressing the blue button. The switch should be open at the beginning.
- Make sure that the $12\ \mathrm{V}$-bulb is connected. You can recognize it by the fact that this value is engraved on the lamp.

Setup I (2/2)

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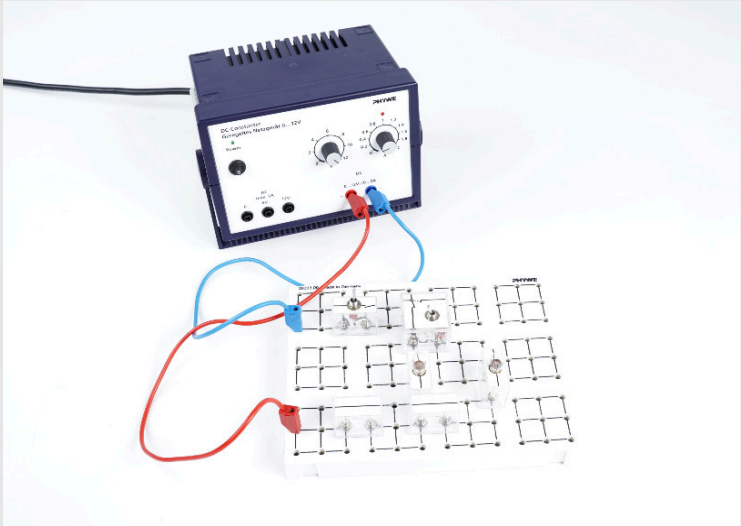

Experimental setup

- Now connect the power supply unit and set it to the voltage of $12\ \mathrm{V}$.

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info@phywe.de
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Procedure I

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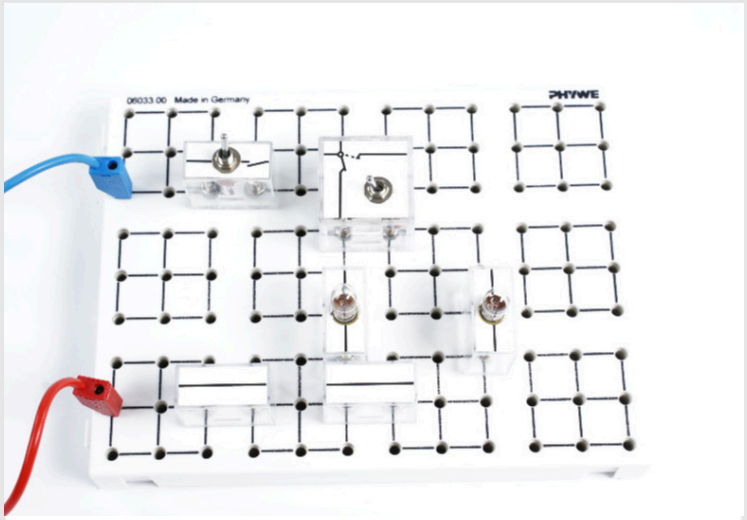

Circuit

- Now close the switch, observe the light bulbs, and record your observations under Observation 1 in the report section.
- While the switch is closed, press the changeover switch several times and record the behaviour of the light bulbs under Observation 2 in the report section.
- Then switch off the power supply unit.

Setup II

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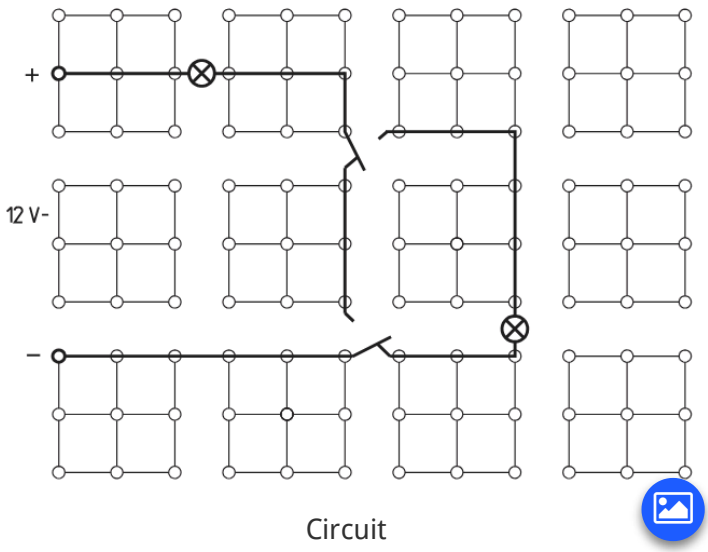

Circuit

- Make sure that the power supply unit is switched off.
- Rebuild the circuit on the breadboard according to the circuit diagram shown on the left. If it helps, you can display a photo of the breadboard by pressing the blue button.
- The circuit you are building here is also called an alternating circuit.

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Fax: 0551 604 - 107

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Procedure II

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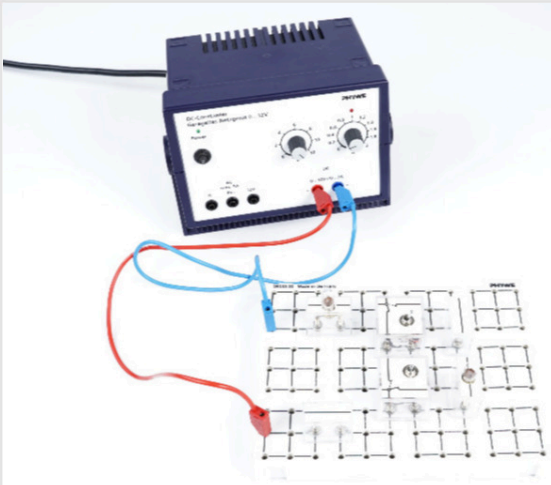

Experimental setup

- Switch on the power supply unit and set it to the voltage of $12\ \mathrm{V}$.
- Try different positions of the alternating switches and record your observations under Observation 3 in the report section.
- Then set the power supply unit to $0\ \mathrm{V}$ and switch it off.

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Report

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Observations

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Observation 1

Observation 2

Observation 3

Task 1

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Drag the correct words into the gaps

A changeover switch has _____ connections. One of these can be connected alternately to one of the other two connections by switching. A changeover switch can therefore be used to _____ from one electrical device to another within a circuit.

In the second part of the experiment, an _____ was set up. Its advantage is that you can switch an electrical device on and off at _____. Such a circuit is required for corridor lighting, for example.

- series circuit
- two
- three
- two arbitrarily distant locations
- switch
- alternating circuit
- only one location

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37079 Göttingen

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Slide	Score / Total
Slide 17: Changeover and alternating switches	0/7

Total amount 0 / 7

Solutions | Repeat | Export text

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37079 Göttingen
Tel.: 0551 604 - 0
Fax: 0551 604 - 107
info@phywe.de
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