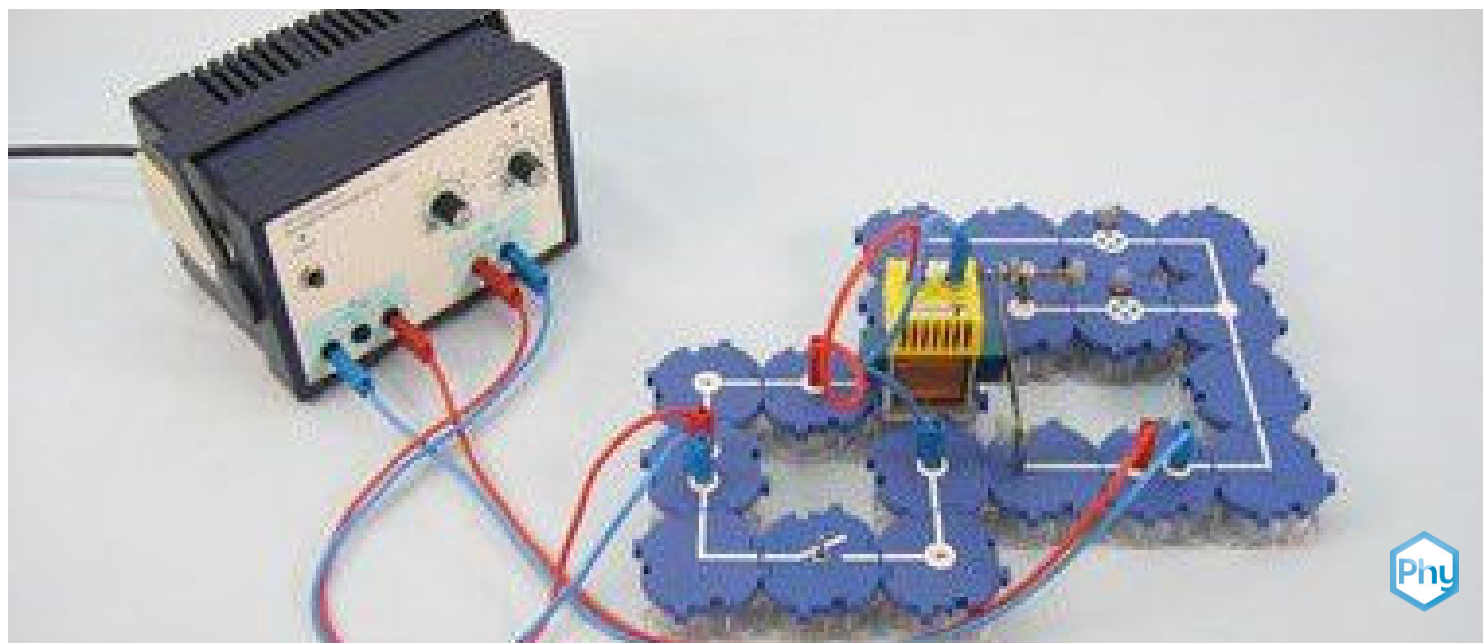


The electromagnetic relay



In this experiment, the students learn how electromagnetic relays work.

Physics

Electricity & Magnetism

Electromagnetism & Induction



Difficulty level

medium



Group size

2



Preparation time

10 minutes



Execution time

10 minutes

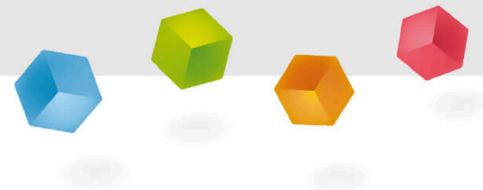
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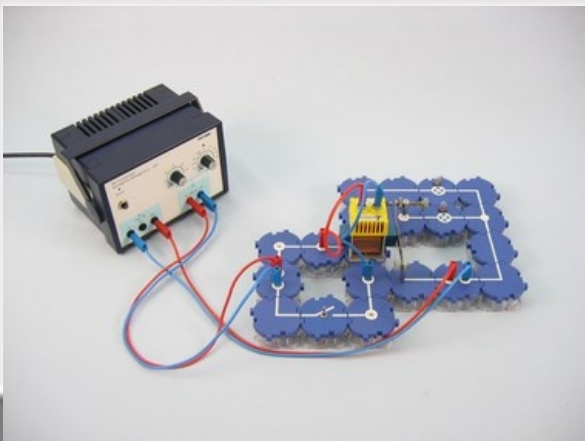
PHYWE

Teacher information



Application

PHYWE



Experimental setup

Relays of various types are frequently used in switching technology, e.g. to open or close electrical circuits that are far away or difficult to access.

In this experiment, the students learn how electromagnetic relays work.

Other teacher information (1/2)

Prior knowledge



The students should have gained first experimental experience in using the power supply unit.

Principle



A mechanical relay usually works on the principle of the electromagnet. A current in the excitation coil generates a magnetic flux through the ferromagnetic core and a movable armature, which is also ferromagnetic. Force is applied to the armature at an air gap, causing it to switch one or more contacts. The armature is returned to its original position by spring force as soon as the coil is no longer energised.

Other teacher information (1/2)

PHYWE

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Other teacher information (2/2)

PHYWE

Learning objective



With this experiment, the students should learn how an electromagnetic relay works.

Tasks



Close and open a circuit using an electromagnetic switch.

Safety instructions

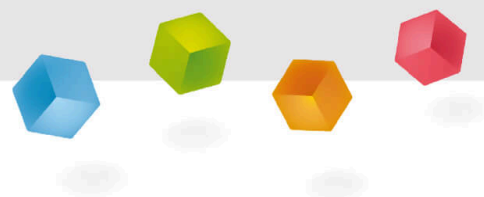
PHYWE



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

PHYWE

Student information



Equipment

Position	Material	Item No.	Quantity
1	Straight connector module, SB	05601-01	2
2	Angled connector module, SB	05601-02	4
3	T-shaped connector module, SB	05601-03	1
4	Interrupted connector module with sockets, SB	05601-04	2
5	Straight connector module with socket, SB	05601-11	2
6	Angled connector module with socket, SB	05601-12	2
7	On-off switch module, SB	05602-01	1
8	Universal holder module, SB	05603-00	1
9	Socket module for incandescent lamp E10, SB	05604-00	2
10	Coil holder module, SB	05672-00	1
11	Contact spring with armature	05673-00	1
12	Contact element on 4-mm-plug	05673-01	1
13	Coil, 400 turns	07829-01	1
14	Iron core, I-shaped, laminated	07833-00	1
15	Connecting cord, 32 A, 250 mm, red	07360-01	1
16	Connecting cord, 32 A, 250 mm, blue	07360-04	1
17	Connecting cord, 32 A, 500 mm, red	07361-01	2
18	Connecting cord, 32 A, 500 mm, blue	07361-04	2
19	PHYWE Power supply, 230 V, DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
20	Filament lamps 12V/0.1A, E10, 10 pieces	07505-03	1
21	Alligator clips, bare, 10 pcs	07274-03	1
22	Connecting plug, 2 pcs.	07278-05	1
23	Junction module, SB	05601-10	2

Equipment

PHYWE

Position	Material	Item No.	Quantity
1	Straight connector module, SB	05601-01	2
2	Angled connector module, SB	05601-02	4
3	T-shaped connector module, SB	05601-03	1
4	Interrupted connector module with sockets, SB	05601-04	2
5	Straight connector module with socket, SB	05601-11	2
6	Angled connector module with socket, SB	05601-12	2
7	On-off switch module, SB	05602-01	1
8	Universal holder module, SB	05603-00	1
9	Socket module for incandescent lamp E10, SB	05604-00	2
10	Coil holder module, SB	05672-00	1
11	Contact spring with armature	05673-00	1
12	Contact element on 4-mm-plug	05673-01	1

Set-up and Procedure (1/4)

1st experiment

- Set up the experiment according to Fig. 1 and Fig. 2.
- Place the coil on the coil holder, insert the iron core (yoke) and connect the coil via the connecting cords to the building blocks next to or below the coil as shown in Fig. 3.
- First insert the contact component into the connection module 1 and then clamp the contact spring into the universal holder so that the armature points to the contact component. Then make good contact with the screw on the contact component (remove the knurled nut if necessary).

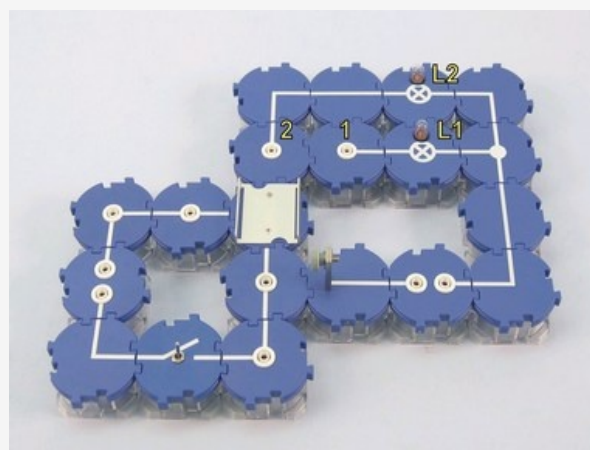


Fig. 1

Set-up and Procedure (1/4)

PHYWE

1st experiment

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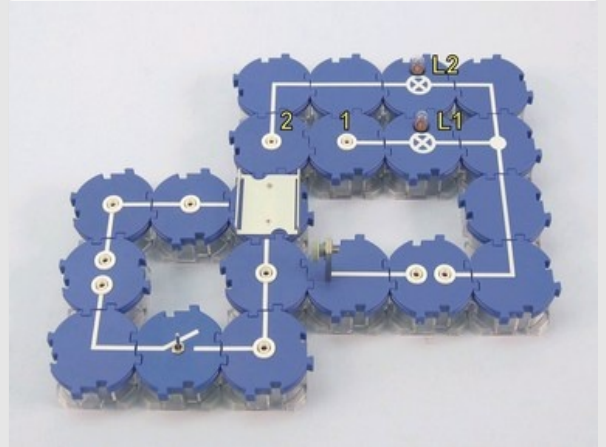


Fig. 1

Set-up and Procedure (2/4)

PHYWE

- Set the power supply to about 4 V, the current limit to 1 A and then switch on the power supply.
- Open and close the switch several times. Observe the armature spring and the bulb L1.
- Set the power supply unit to 0 V and switch it off.
- Write down your observations in the report.

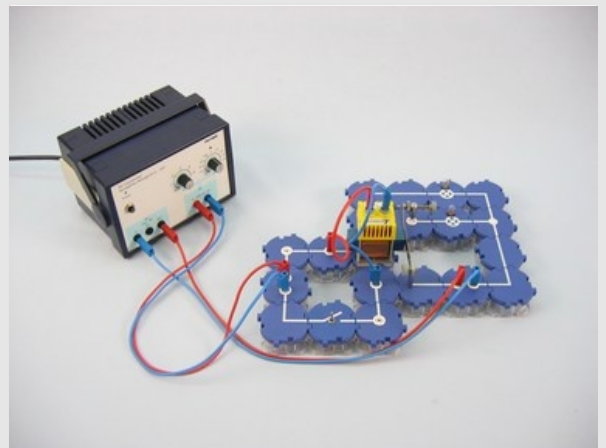


Fig. 2

Set-up and Procedure (3/4)

PHYWE

2nd experiment

- Insert the contact component into the connection module 2 and then clamp the contact spring into the universal holder so that the armature points to the contact component. Then make good contact with the screw on the contact component (cf. fig. 4).



Fig. 3

Set-up and Procedure (4/4)

PHYWE

- Set the power supply to about 5 V and switch it on.
- Open and close the switch several times. Observe the armature spring and the bulb L2.
- Set the power supply unit to 0 V and switch it off.
- Write down your observations in the report.

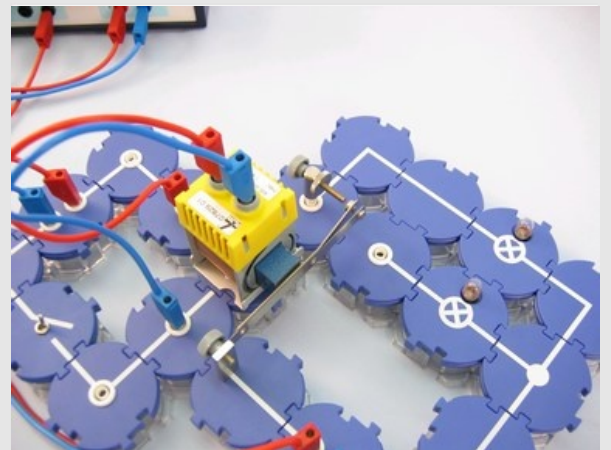
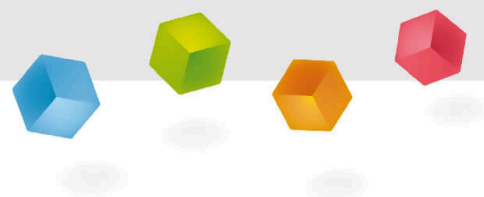


Fig. 4

PHYWE

Report



Observation (1/2)

PHYWE

Write down your observations about the first experiment.

Observation (2/2)

PHYWE

Write down your observations about the second experiment.