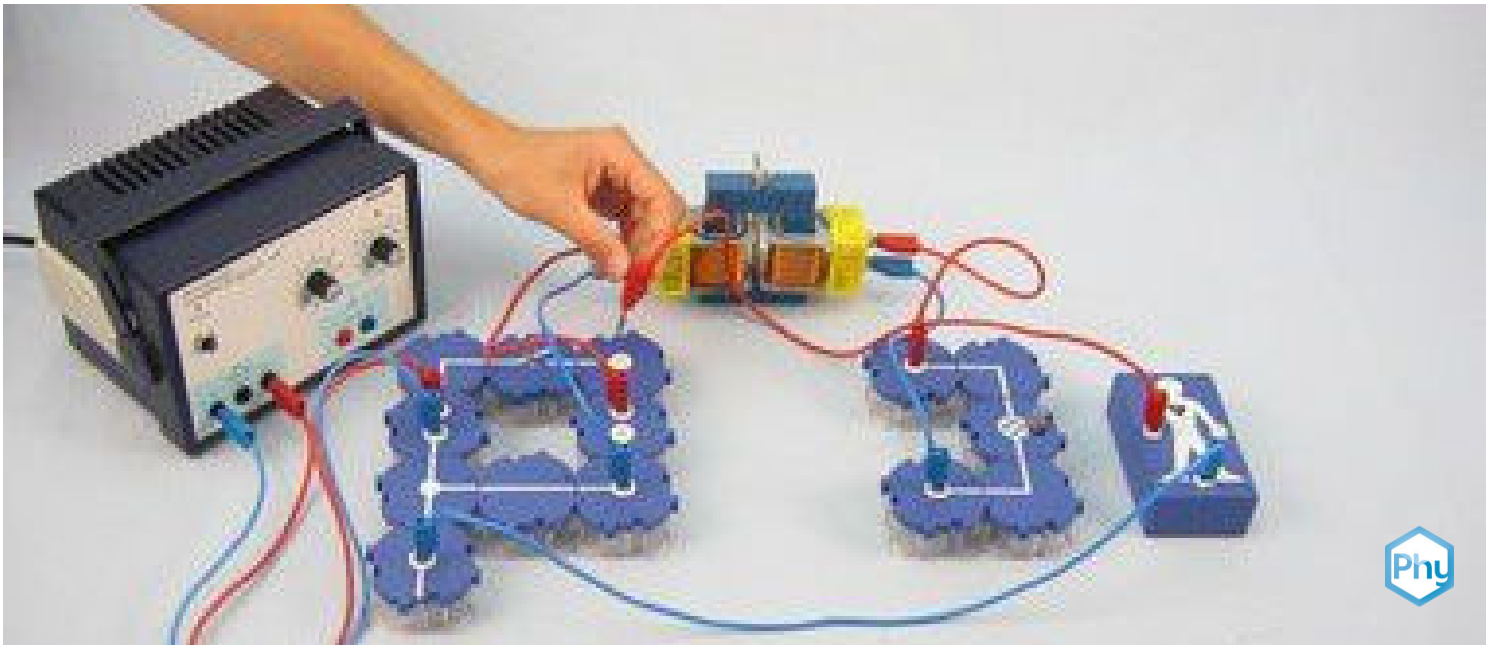
The protective isolation transformer



The students should use the experiment to see how a protective isolating transformer works.

Physics > Electricity & Magnetism > Use of electrical energy, energy supply

Difficulty level	Group size	Preparation time	Execution time
medium	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/63146e08971a9300037ff679

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Teacher information

Application

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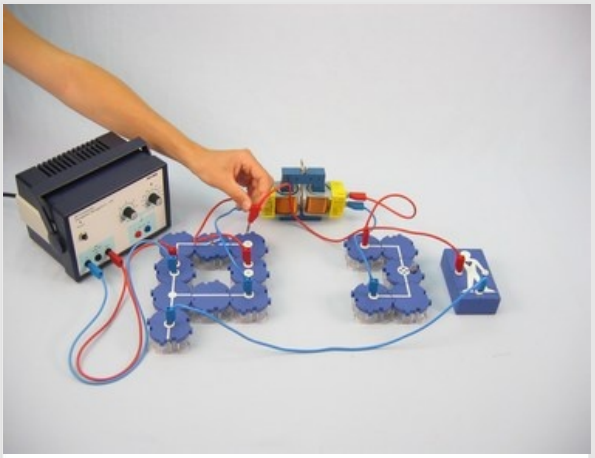

Experimental setup

Defective insulation can energise parts of the appliance that are not intended for the power line.

Dangerous voltages occur most frequently on the metallic housings of electrical appliances. In order to exclude a hazard to humans, a protective isolating transformer can be installed, which prevents a connection between the touched circuit and the earth.

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Other teacher information (1/2)

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Prior knowledge

No prior knowledge is necessary.

Principle

When using an isolating transformer, there is no conductive connection between the primary circuit (mains circuit) and the secondary circuit (consumer circuit). There is no voltage between the consumer circuit and earth. If a person touches non-insulated live lines in the consumer circuit, he or she is protected by this transformer (protective isolating transformer).

Other teacher information (2/2)

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Learning objective

The students should use the experiment to see how a protective isolating transformer works.

Tasks

Set up a power supply with a protective isolating transformer and investigate its behaviour.

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Safety instructions

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

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Student information

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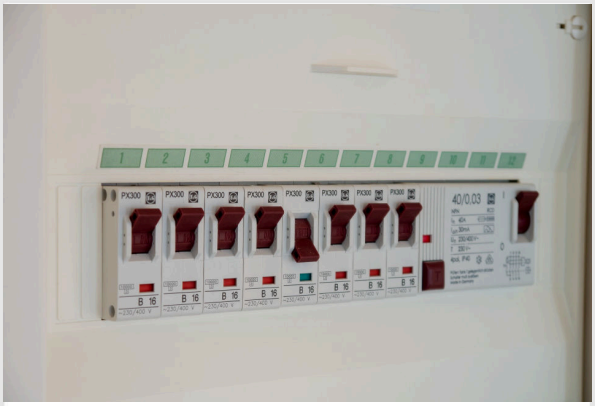
Motivation

Defective insulation can energise parts of the appliance that are not intended for the power line. Hazardous voltages occur most frequently on the metal housings of electrical appliances.

In order to exclude any danger to people, a protective isolating transformer can be installed, which prevents a connection between the touched circuit and the earth.



Fuse box

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Equipment

Position	Material	Item No.	Quantity
1	Straight connector module, SB	05601-01	1
2	Angled connector module, SB	05601-02	3
3	T-shaped connector module, SB	05601-03	1
4	Interrupted connector module with sockets, SB	05601-04	2
5	Junction module, SB	05601-10	2
6	Straight connector module with socket, SB	05601-11	1
7	Angled connector module with socket, SB	05601-12	2
8	On-off switch module, SB	05602-01	1
9	Socket module for incandescent lamp E10, SB	05604-00	1
10	Model person for electrical safety	05680-00	1
11	Coil, 400 turns	07829-01	2
12	Iron core, U-shaped, laminated	07832-00	1
13	Iron core, I-shaped, laminated	07833-00	1
14	Tightening screw	07834-00	1
15	Connecting cord, 32 A, 250 mm, red	07360-01	2
16	Connecting cord, 32 A, 250 mm, blue	07360-04	2
17	Connecting cord, 32 A, 500 mm, red	07361-01	2
18	Connecting cord, 32 A, 500 mm, blue	07361-04	2
19	Filament lamps 12V/0.1A, E10, 10 pieces	07505-03	1
20	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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Set-up

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- Set up the experiment according to Fig. 1 and Fig. 2.
- Insert the lamp socket so that the socket thread is connected to the upper pipe.
- Assemble the transformer with two coils of 400 turns each, pull the yoke and the U-core tightly together using the tension screw.

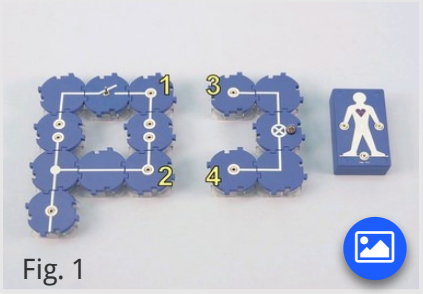

Fig. 1

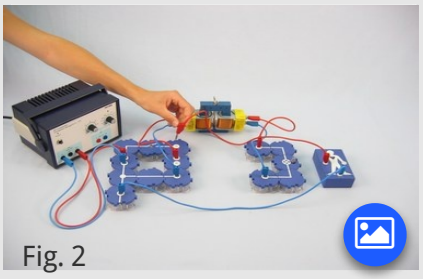
Fig. 2

Procedure (1/2)

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- Close the switch.
- Connect one hand of the model man to the measuring points 1,2 in the primary circuit one after the other.
- Observe the model human being and write down the observations in the report (1).
- Connect the model man's hand to measuring point 3 in the secondary circuit.
- Write down the observations in the report (2).
- Connect the model man's hand to measuring point 4 in the secondary circuit or the lamp socket.

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Procedure (2/2)

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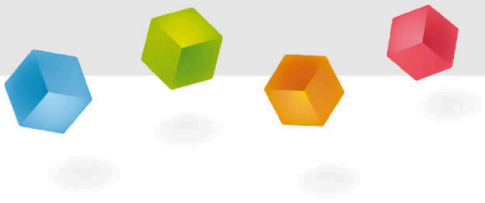
- Write down the observations in the report (3).
- Remove the connecting line between the feet of the model human and the earth.
- Connect one hand of the model person to the measuring point 3 in the secondary circuit, the other to the measuring point 4.
- Write down the observations in the report (4).

PHYWE



Report

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Observation (1/4)

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Write down your observation.

Observation (2/4)

PHYWE

Write down your observation.

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Observation (3/4)

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Write down your observation.

Observation (4/4)

PHYWE

Write down your observation.

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Task (1/3)

PHYWE

Drag the words into the correct boxes!

The feet of the _____ are connected to the N conductor of the _____ via the _____. Therefore, the _____ light up when in contact with the _____ (measuring point 1), they do not light up when in contact with the _____ (measuring point 2).

primary circuit
earth conductor
diodes
L conductor
N conductor
model man

Check

Task (2/3)

PHYWE

Drag the words into the correct boxes!

The _____ is not connected to the _____. Therefore, no _____ flows as long as the _____ is only touched at one point.

current circuit
earth line
secondary circuit
current

Check

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Task (3/3)

PHYWE

Drag the words into the correct boxes!

Simultaneously _____ both _____ in the _____ (i.e. from and behind the lamp) is life-threatening. Current flows through the _____ because of the 12 V _____ generated by the transformer.

conductors
touching
model man
secondary circuit
voltage

Check

Slide	Score / Total
Slide 17: Model people	0/6
Slide 18: Earth wire	0/4
Slide 19: Secondary circuit	0/5

Total score 0 / 15

Show solutions | Repeat | Export text

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