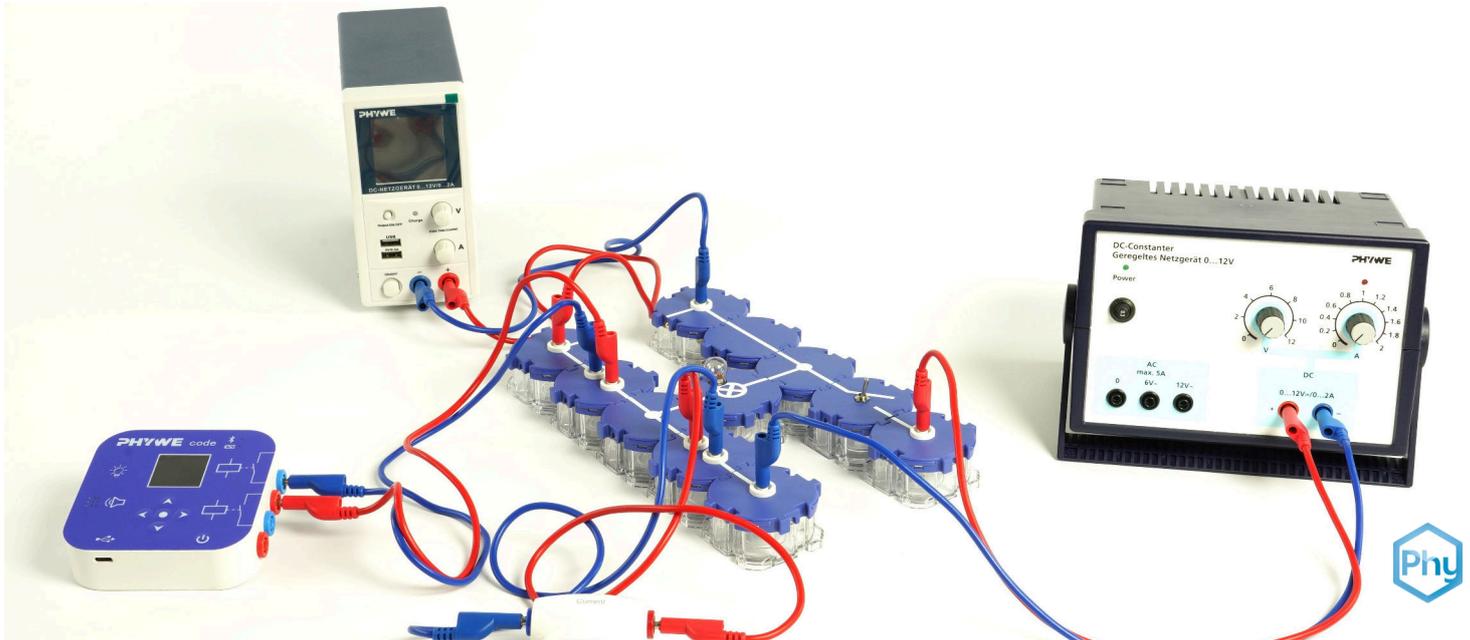


Emergency power supply with Cobra SMARTsense Code



Physics

Electricity & Magnetism

Use of electrical energy, energy supply



Difficulty level

easy



Group size

-



Preparation time

10 minutes



Execution time

10 minutes

This content can also be found online at:



<https://www.curriculab.de/c/67b45a38b22d2c0002239701>

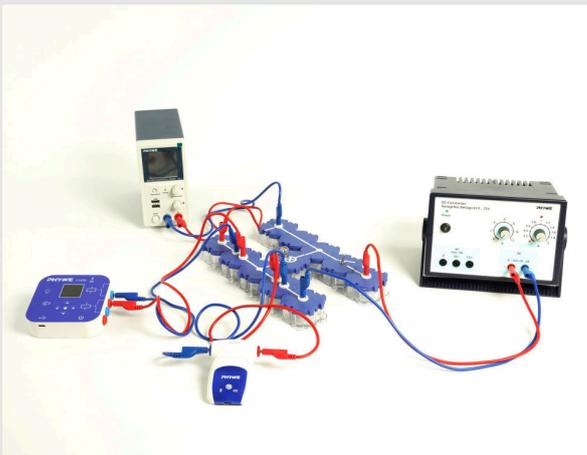
PHYWE



Teacher information

Application

PHYWE



Experimental setup

In this experiment, the principle of an emergency power supply is investigated. A lamp is operated by a main power source while a sensor monitors the current flow. In the event of a power failure, the system automatically switches to a battery-operated power supply unit.

Such emergency power systems are used in critical areas such as hospitals or data centres to ensure an uninterruptible power supply.

Other teacher information (1/2)

PHYWE

Prior knowledge



Students should have a basic knowledge of electrical circuits, including serial and parallel circuits. Basic knowledge of sensors and their function as well as basic programming skills are also helpful.

Principle



The current flow is monitored by a sensor. If the current falls below a certain value, a programmable control unit automatically switches on a relay that diverts to an alternative power source to ensure the supply. As soon as the main source is active again, the control unit opens the circuit from the battery-operated power supply unit.

Other teacher information (2/2)

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Learning objective



Students learn how an emergency power supply works and understand how sensors and programmable control units are used for the automated control of an electrical circuit. They acquire practical skills in setting up electrical circuits and programming simple control sequences.

Tasks



1. Build an electrical circuit that can supply a lamp alternately from two power sources.
2. Programme the Cobra SMARTsense code device to enable control of the circuit.
3. Observe how the parallel circuit is automatically activated during the simulation of a power failure in order to continue operating the lamp.

Safety instructions

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

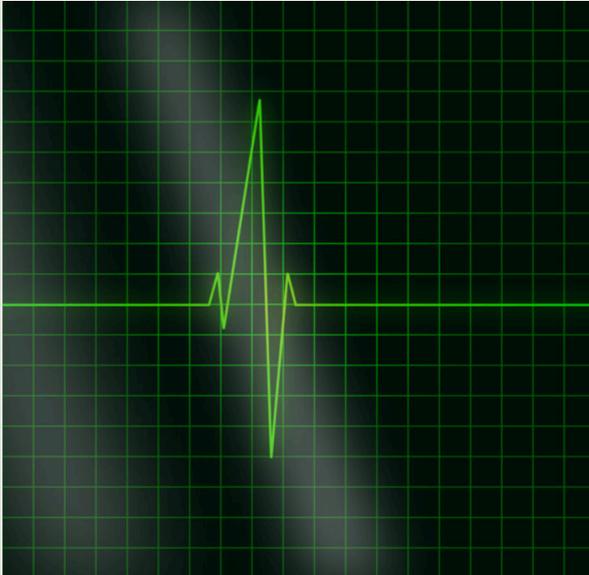
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Student information



Motivation

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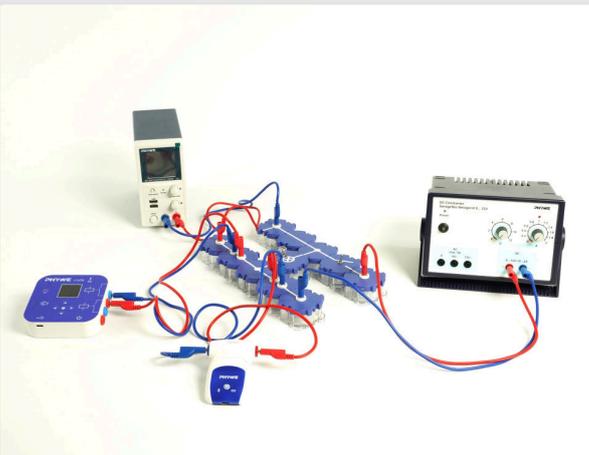


Imagine you are in a hospital and suddenly the power goes out - important equipment, such as ventilators or surveillance monitors, stop working. Or maybe not? This is exactly where emergency power supplies come into play!

In this experiment, you will learn how modern sensors and clever automation ensure that everything keeps running in an emergency. You will see how sensors and systems work together to immediately activate a backup power source - preventing critical processes from being interrupted.

Tasks

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Experimental setup

1. Build an electrical circuit that can supply a lamp alternately from two power sources.
2. Programme the Cobra SMARTsense code device to enable control of the circuit.
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Material

Position	Equipment	Item no.	Quantity
1	PHYWE power supply unit, RiSU 2023 DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
2	PHYWE rechargeable student power supply unit to go, RiSU 2023 DC 0...12 V / 0...2 A	13510-99	1
3	Cable module, straight, SB	05601-01	1
4	Cable module, T-shaped, SB	05601-03	2
5	Line module, interrupted with sockets, SB	05601-04	2
6	Cable module, angled with socket, SB	05601-12	2
7	Line module, connection module, SB	05601-10	2
8	Off switch, SB	05602-01	1
9	Lamp socket E10, SB	05604-00	1
10	Cobra SMARTsense Code - output device for switching relays, LEDs, display	12953-00	1
11	Cobra SMARTsense Current - Sensor for measuring electrical current ± 1 A (Bluetooth + USB)	12902-01	1
12	Bulbs 12 V/0.1 A/ 1.2 W, E10 base Set of 10 bulbs	07505-03	1
13	Connecting cable, 32 A, 50 cm, red Experiment cable, 4 mm plug	07361-01	2
14	Connecting cable, 32 A, 50 cm, blue Experiment cable, 4 mm plug	07361-04	2
15	Connecting cable, 32 A, 25 cm, blue Experiment cable, 4 mm plug	07360-04	2
16	Connecting cable, 32 A, 25 cm, red Experiment cable, 4 mm plug	07360-01	2

Setup (1/2)

PHYWE

To measure currents, **Cobra SMARTsense sensors** and the **measureAPP** are required. The app can be downloaded for free from the App Store—see below for QR codes. Ensure Bluetooth is activated on your device (tablet, smartphone).



measureAPP for Android



measureAPP for iOS



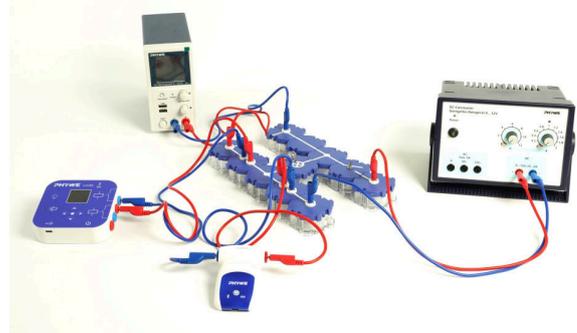
measureAPP for Windows 10

Setup (2/2)

PHYWE

Set up the experiment according to the illustrations.

Make sure that the upper relay of the Cobra SMARTsense Code device is connected to the circuit.



Procedure (1/4)

PHYWE



Cobra SMARTsense Current

Switch on your Cobra SMARTsense Current by pressing and holding the button on the sensor for 3 seconds.

Open the measureAPP on your tablet or smartphone and make sure that the end device can connect to Bluetooth devices.

Select the sensor "Current".

Procedure (2/4)

PHYWE



Cobra SMARTsense Code

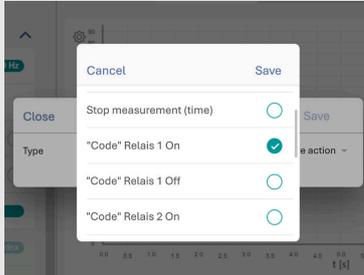
Switch on your Cobra SMARTsense code by pressing and holding the button on the sensor for 3 seconds.

Open the measureAPP on your tablet or smartphone and make sure that the end device can connect to Bluetooth devices.

Select the sensor "Code".

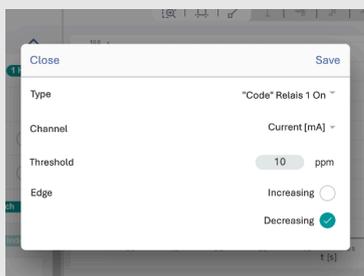
Procedure (3/4)

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Programme the Cobra SMARTsense code by selecting the actions of the code in the MeasureAPP under Trigger.

Select Relay 1 On as the "Code" action and the current [mA] as the measuring channel.

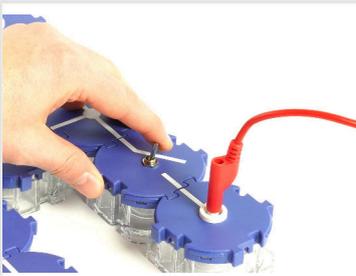


Set the threshold value as 10mA and tick the box for if the value falls below the threshold value.

Repeat this procedure and programme the "code" relay 1 so that it switches off when the threshold value of 10mA is exceeded.

Procedure (4/4)

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Start a measurement.

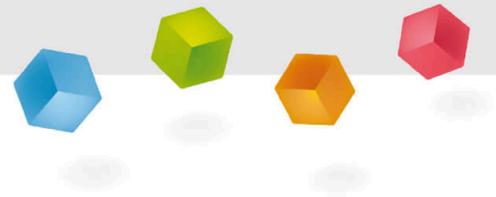
Simulate normal power supply and a power failure by switching the switch in the upper circuit on or off.

Track the detected currents in the MeasureApp.



Observe how the emergency power supply is switched on and the lamp continues to light up.

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Report

Task 1

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The simple emergency power supply:

A continuously measures the current flow. If the current falls below a certain value, the programmable recognises the failure and a relay. This relay switches on , which continues to supply the lamp with energy. As soon as the main power source is available again, the control unit the relay and the battery-operated power supply unit from the circuit.

Cobra SMARTsense code device opens a parallel circuit with a battery-powered power supply unit

Cobra SMARTsense Current Sensor activates disconnects

Check

Task 2

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Which factors influence when the relay is activated in the experiment?

- The power consumption of the lamp
- The circuit structure of the lamp
- The measured current flow through the sensor
- The programmed, fixed threshold value of the sensor

✓ Check



Task 3

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What happens when the main power source is available again after a power failure?

- The relay opens and disconnects the backup power source
- The power is switched off completely
- Nothing happens
- To compensate for the power deficit, the battery-powered power supply unit is only switched off after a longer period of time, while both the main power source and the backup power source supply the circuit during this phase.

✓ Check

Slide	Score / Total
Slide 17: The simple emergency power supply	0/6
Slide 18: Relay control	0/2
Slide 19: Return current	0/1

Total amount  0/9

 Solutions

 Repeat