Electricity with the Modular System

Basic Electric Circuits

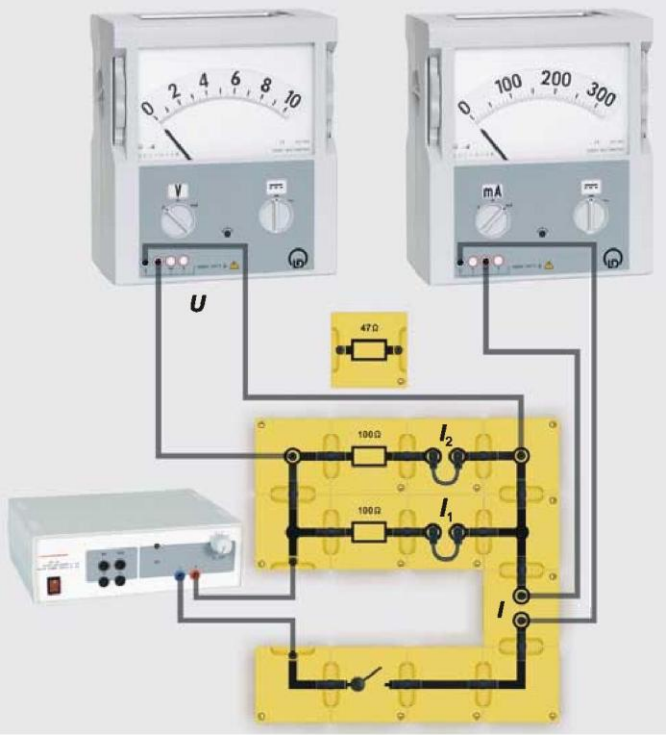
Electrical resistance

Connecting resistors in parallel

Objective of the experiment

1. To investigate the relationship between the total current I and the currents I_1 and I_2.
2. To determine the relationship between the total resistance R and the resistors R_1 and R_2.
3. To determine the relationship between the currents I_1 and I_2, and the resistances R_2 and R_1.

Setup



Apparatus

1	539 008	Resistor, 47 Ω, BST
2	539 009	Resistors, 100 Ω, BST
1	539 025	Toggle switch, BST
1	539 001	Connector block BST, straight
3	539 003	Connector blocks BST, straight, 2 sockets
2	539 004	Connector blocks BST, 90° angle
2	539 005	Connector blocks BST, 90° angle with socket
2	539 006	Connector blocks BST, T branch
13	539 000	Bridging plug, BST
2	531 906	Demo multimeter, passive
1	521 49	Power supply, 12 V DC, 230 V
6	500 644	Safety connection lead, 100 cm
2	500 604	Safety connection lead, 10 cm
1	301 300	Demonstration experiment frame
1	301 301	Adhesive magnetic board

BST 2012-02-24

Carrying out the experiment

- Set up the circuit.
- Adjust a voltage of approx. 10 V at the power supply.
- Measure the currents I_1 , I_2 , I and the voltage U.
- Replace resistor R_2 = 100 Ω by the 47 Ω resistor and repeat the measurement.
- Calculate the total resistance R, the reciprocals of the resistances R_1, R_2 and R, and the quotients $\frac{I_1}{I_2}$ and $\frac{R_2}{R_1}$. Enter the results into the table.

Measuring example

Resistance R_1 / Ω	100	100
Resistance R_2 / Ω	100	47
Current I_1/ A	0.095	0.095
Current I_2 / A	0.095	0.205
Total current I / A	0.190	0.300
Voltage U / V	10.0	10.0
Total resistance R / Ω	52.6	33.3
$\frac{1}{R_1} / \frac{1}{\Omega}$	0.01	0.01
$\frac{1}{R_2} / \frac{1}{\Omega}$	0.01	0.02
$\frac{1}{R} / \frac{1}{\Omega}$	0.02	0.03
$\frac{1}{R_1} + \frac{1}{R_2} / \frac{1}{\Omega}$	0.02	0.03
$\frac{I_1}{I_2}$	1	0.46
$\frac{R_2}{R_1}$	1	0.47

Evaluation

In a parallel circuit of resistances, the total current I is equal to the sum of the currents I_1 and I_2:
$I = I_1 + I_2$.

The reciprocal of the total resistance R is equal to the sum of the reciprocals of resistances R_1 and R_2:

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

The currents I_1 and I_2 relate to each other the same as the resistances R_1 and R_2:

$$\frac{I_1}{I_2} = \frac{R_2}{R_1}$$