

Electricity

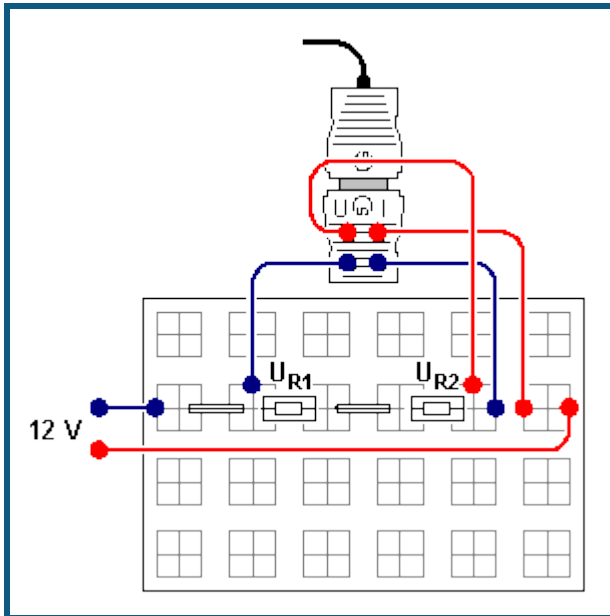
Fundamentals of electricity
Kirchhoff's laws

Measuring current and
voltage at resistors
connected in parallel and in
series

Description from CASSY Lab 2

For loading examples and settings,
please use the CASSY Lab 2 help.

Series connection of resistors



Task

Measure the voltages U_0 , U_{R1} , U_{R2} and the current I_0 at two series-connected resistors R_1 and R_2 , and establish the relation between R_1 , R_2 and the total resistance R_0 .

Equipment list

1	Pocket-CASSY	524 006
1	CASSY Lab 2	524 220
1	UIP sensor S	524 0621
1	Plug-in board A4	576 74
1	Set of 10 bridging plugs	501 48
1	Resistor 220 Ω STE 2/19	577 36
1	Resistor 330 Ω STE 2/19	577 38
1	Resistor 470 Ω STE 2/19	577 40
1	Resistor 1 k Ω STE 2/19	577 44
3	Connecting leads, red, 25 cm	500 411
3	Connecting leads, blue, 25 cm	500 412
1	Voltage source, 0...12 V, adjustable	e.g. 521 230
1	PC with Windows XP/Vista/7/8	

Experiment setup (see drawing)

- Set up the circuit for a combination of resistors, e.g. 220 Ω /330 Ω , as shown in the drawing.
- For measuring the voltage U_0 and the current I_0 , connect the connecting leads to the UIP sensor S as shown in the drawing.

Carrying out the experiment

■ Load settings

- Set a voltage of approx. 12 V at the power supply.
- Measure the voltage U_0 and the current I_0 . Using the mouse, transfer the measured values from the display instruments U and I into the prepared table (drag & drop).
- Connect the connecting leads for the voltage measurement of U_{R1} (see drawing), and measure the voltage U_{R1} . Using the mouse, transfer the measured value from the display instrument U into the prepared table, and enter the value of the resistance R_1 manually.
- Connect the connecting leads for the voltage measurement of U_{R2} (see drawing), and measure the voltage U_{R2} . Using the mouse, transfer the measured value from the display instrument U into the prepared table, and enter the value of the resistance R_2 manually.
- Repeat the experiment with other combinations of resistors.

Evaluation

For evaluating the experiment, the prepared table **Evaluation** is provided, from which the relations between the voltages U_0 , U_{R1} , U_{R2} and the resistances R_0 , R_1 , R_2 become obvious.

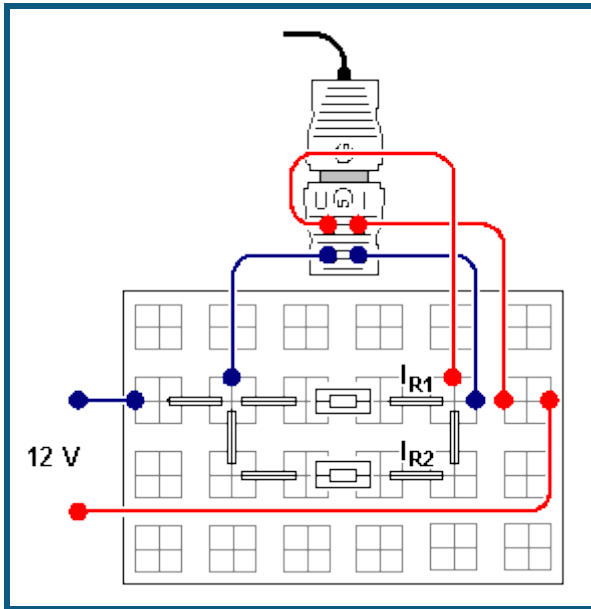
- The current which flows through the series-connected resistors R_1 and R_2 is

- What is the relation between the voltages U_{R1} and U_{R2} and the total voltage U_0 ?

- What is the relation between the ratio of the resistances R_1 and R_2 and the ratio of the voltages U_{R1} and U_{R2} ?

- What is the relation between the total resistance $R_0 = U_0/I_0$ and the resistances R_1 and R_2 ?

Parallel connection of resistors



Task

Measure the voltage U_0 and the currents I_0 , I_{R1} , I_{R2} at two parallel connected resistors R_1 and R_2 , and establish the relation between R_1 and R_2 and the total resistance R_0 .

Equipment list

1	Pocket-CASSY	524 006
1	CASSY Lab 2	524 220
1	UIP sensor S	524 0621
1	Plug-in board A4	576 74
1	Set of 10 bridging plugs	501 48
1	Resistor 220 Ω STE 2/19	577 36
1	Resistor 330 Ω STE 2/19	577 38
1	Resistor 470 Ω STE 2/19	577 40
1	Resistor 1 k Ω STE 2/19	577 44
3	Connecting leads, red, 25 cm	500 411
3	Connecting leads, blue, 25 cm	500 412
1	Voltage source, 0...12 V, adjustable	e.g. 521 230
1	PC with Windows XP/Vista/7/8	

Experiment setup (see drawing)

- Set up the circuit for a combination of resistors, e.g. 220 Ω /330 Ω , as shown in the drawing.
- For measuring the voltage U_0 and the current I_0 , connect the connecting leads to the UIP sensor S as shown in the drawing.

Carrying out the experiment

■ Load settings

- Set a voltage of approx. 12 V at the power supply.
- Measure the voltage U_0 and the current I_0 . Using the mouse, transfer the measured values from the display instruments U and I into the prepared table (drag & drop).
- Connect the connecting leads for the current measurement of I_{R1} (see drawing, plug the bridging plugs appropriately), and measure the current I_{R1} . Using the mouse, transfer the measured value from the display instrument I into the prepared table, and enter the value of the resistance R_1 manually.
- Connect the connecting leads for the current measurement of I_{R2} (see drawing, plug the bridging plugs appropriately), and measure the current I_{R2} . Using the mouse, transfer the measured value from the display instrument I into the prepared table, and enter the value of the resistance R_2 manually.
- Repeat the experiment with other combinations of resistors.

Evaluation

For evaluating the experiment, the prepared table **Evaluation** is provided, from which the relations between the currents I_0 , I_{R1} , I_{R2} and the resistances R_0 , R_1 , R_2 become obvious.

- The voltages U_{R1} and U_{R2} at the resistors R_1 and R_2 are equal to

- What is the relation between the currents I_{R1} and I_{R2} and the total current I_0 ?

- What is the relation between the ratio of the resistances R_1 and R_2 and the ratio between the currents I_{R1} and I_{R2} ?

- What is the relation between the total resistance $R_0 = U_0/I_0$ and the resistances R_1 and R_2 ?
