P3.2.3

Prawa Kirchhoffa

P3.2.3.1
Pomiar napięcia oraz natężenia
w rezystorach połączonych szeregowo i równolegle

P3.2.3.2
Podział napięcia za pomocą potencjometru

P3.2.3.3
Zasada mostka Wheatstona

Pomiar napięcia oraz natężenia w rezystorach połączonych szeregowo i równolegle (P3.2.3.1)

Nr kat..	Opis	P 3.2.3.1	P 3.2.3.2	P 3.2.3.3
576 74	Wtyczka na stole DIN A4	1	1	1
577 36	Opornik 220 Ohm, STE 2/19	1		1
577 38	Opornik 330 Ohm, STE 2/19	1		2
577 40	Opornik 470 Ohm, STE 2/19	1	1	1
577 44	Opornik 1 kOhm, STE 2/19	1		1
577 53	Opornik 5.6 kOhm, STE 2/19	1		
577 56	Opornik 10 kOhm, STE 2/19	1		
577 68	Opornik 100 kOhm, STE 2/19	1		
501 48	Wtyczka zmostkowana, zestaw 10 szt.	1	1	1
521 45	Zasilacz DC , 0 ... ±15 V	1	1	1
531 120	Miernik LDanalog 20	2	2	1
501 45	Kable, 50 cm, czerwono/niebieski, para	3	3	2
577 28	Opornik 47 Ohm, STE 2/19		1	
577 32	Opornik 100 Ohm, STE 2/19		2	
577 34	Opornik 150 Ohm, STE 2/19		1	
577 90	Potencjometr 220 Ohm, STE 4/50		1	
577 92	Potencjometr 1 kOhm, STE 4/50			1

Kirchhoff's laws are of fundamental importance in calculating the component currents and voltages in branching circuits. The so-called "node rule" states that the sum of all currents flowing into a particular junction point in a circuit is equal to the sum of all currents flowing away from this junction point. The "mesh rule" states that in a closed path the sum of all voltages through the loop in any arbitrary direction of flow is zero. Kirchhoff's laws are used to derive a system of linear equations which can be solved for the unknown current and voltage components.

The experiment P3.2.3.1 examines the validity of Kirchhoff's laws in circuits with resistors connected in parallel and in series. The result demonstrates that two resistors connected in series have a total resistance R

$$R = R_1 + R_2$$

while for parallel connection of resistors, the total resistance R is

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

In the experiment P3.2.3.2, a potentiometer is used as a voltage divider in order to tap a lower voltage component U_1 from a voltage U. U is present at the total resistance of the potentiometer. In a no-load, zero-current state, the voltage component

$$U_1 = \frac{R_1}{R} \cdot U$$

can be tapped at the variable component resistor R_1. The relationship between U_1 and R_1 at the potentiometer under load is no longer linear.

The experiment P3.2.3.3 examines the principle of a Wheatstone bridge, in which "unknown" resistances can be measured through comparison with "known" resistances.
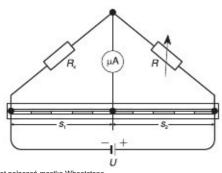
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Prawa Kirchhoffa

P3.2.3.4
Określanie oporności za pomocą mostka Wheatstone

Określanie oporności za pomocą mostka Wheatstone   (P3.2.3.4)

Nr kat.	Opis	P3.2.3.4
536 02	Mostek demonstracyjny	1
536 121	Opornik pomiarowy 10 Ohm	1
536 131	Opornik pomiarowy 100 Ohm	1
536 141	Opornik pomiarowy 1 kOhm	1
536 776	Opornik dekadowy 0 ... 1 kOhm	1
536 777	Opornik dekadowy 0 ... 100 Ohm	1
536 778	Opornik dekadowy 0 ... 10 Ohm	1
536 779	Opornik dekadowy 0 ... 1 Ohm	1
521 45	Zasilacz DC , 0 ... ±15 V	1
531 13	Galwanometr C.A 403	1
501 28	Przewód łączący , 50 cm, czarny	3
501 46	Kabel, 100 cm, czerwono/niebieski, para	1

In modern measuring practice, the bridge configuration developed in 1843 by Ch. Wheatstone is used almost exclusively.

In the experiment P3.2.3.4, a voltage U is applied to a 1 m long measuring wire with a constant cross-section. The ends of the wire are connected to an unknown resistor R_x and a variable resistor R arranged behind it, whose value is known precisely. A sliding contact divides the measuring wire into two parts with the lengths s_1 and s_2. The slide contact is connected to the node between R_x and R via an ammeter which is used as a zero indicator. Once the current has been regulated to zero, the relationship

$$R_x = \frac{s_1}{s_2} \cdot R$$

applies. Maximum accuracy is achieved by using a symmetrical experiment setup, i. e. when the slide contact over the measuring wire is set in the middle position so that the two sections s_1 and s_2 are the same length.

Schemat połączeń mostka Wheatstone