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Fig. 1: Resistance board, metal, 06108.00.

## Operating instructions

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- Only use the experimental set-up for the use it is intended for.

## 2 CORRECT APPLICATION

The resistor wires on a metal strip are used to work out Ohm's law and to investigate the relation between resistance and length, section and material of a wire. The voltage applied to a wire may not be higher than 1 V.

## 3 DESCRIPTION

Six wires of equal length (1 m) are extended next to each other on a base plate (1065 mm x 90 mm). The ends of the wires are fitted with 4 mm connectors.

The following table lists the diameter  $d$  and the resistance  $R$  of the wires:

No.	Material	$d/mm$	$R/\Omega$
1	CuNi (Constantan)	1,0	0,637
2	CuNi (Constantan)	0,7	1,30
3	CuNi (Constantan)	0,7	1,30
4	CuNi (Constantan)	0,5	2,55
5	CuNi (Constantan)	0,35	5,21
6	Brass	0,5	(0,38)

The indicated resistance values are only approximate: diameter or alloy tolerances due to manufacturing of the wires (the latter is especially the case for the resistivity of brass wires) may cause fluctuations in the resistance values. The calculation of  $R$  for CuNi is based on  $\rho = 5,0 \cdot 10^{-5} \Omega \cdot m$ , and for brass on  $\rho = 0,75 \cdot 10^{-5} \Omega \cdot m$ .

## 1 SAFETY PRECAUTIONS



- Carefully read these operating instructions completely before operating this instrument. This is necessary to avoid damage to it, as well as for user-safety.
- Only use the instrument for the purpose for which it was designed.
- Only use the instrument in dry rooms in which there is no risk of explosion.

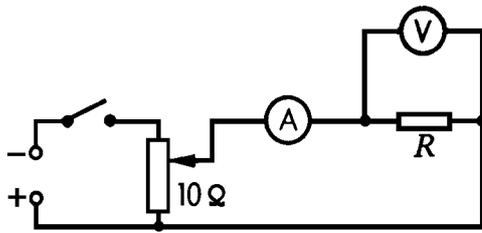


Fig. 2: Example of wiring diagram for the experiment  
(R = resistor wire).

#### 4 HANDLING

The objective of the experiment with resistor wires is to measure voltage  $U$  and current intensity  $I$  on a wire and to calculate the corresponding resistance value  $R = U/I$ . Fig. 2 shows a proven wiring diagram for this. A suitable direct current source is, for example, regulating transformer with rectifier 13530.93. In order to obtain a sensitive voltage regulation in the area 0... 1 V, the tapping of 10 W slide rheostat 06110.02 used here is adjusted in such a way that the voltmeter indicates approximately 1 V for the maximum initial voltage of the regulating transformer. The voltmeter must be connected directly to the resistor wire, so that the drop of voltage across the ammeter will not influence the measurement. Voltages higher than 0.8 V (1 V for a short period of time) must be avoided, as in this case the wires will sag due to heating up.



**Caution! the wires must basically be connected to an adequate low voltage power supply over a protective resistor, e.g. as in fig. 2, in order to avoid overloads which might cause the wires to melt. Never lay flammable materials on the wires, because this may cause a fire in case of overload.**

With the assistance of the measured resistance values  $R$ , the formula

$$R = \rho \cdot \frac{l}{A}$$

is verified and the resistivity of the different alloys is calculated. In order to verify the proportionality between  $R$  and  $l$  at constant section, wire no. 2 ( $l = 1$  m) is used to start with, and then the equivalent wire no. 3 is connected in series ( $l = 2$  m). Wires 1, 2, 4 and 5 are available to verify the proportionality between  $R$  and  $1/A$ .

#### 5 LITERATURE REFERENCES

Measurements of wire resistors with the assistance of a Wheatstone bridge are described in:

Handbook Laboratory Experiments Physics,  
experiment LEP 4.1.02-00, Order No. 16502.32

#### 6 NOTES ON THE GUARANTEE

We guarantee the instrument supplied by us for a period of 24 months within the EU, or for 12 months outside of the EU. Excepted from the guarantee are damages that result from disregarding the Operating Instructions, from improper handling of the instrument or from natural wear.

The manufacturer can only be held responsible for the function and technical safety characteristics of the instrument, when maintenance, repairs and alterations to the instrument are only carried out by the manufacturer or by personnel who have been explicitly authorized by him to do so.

#### 7 WASTE DISPOSAL

The packaging consists predominately of environmentally compatible materials that can be passed on for disposal by the local recycling service.

Please contact your municipal administration for information on the disposal of instruments.