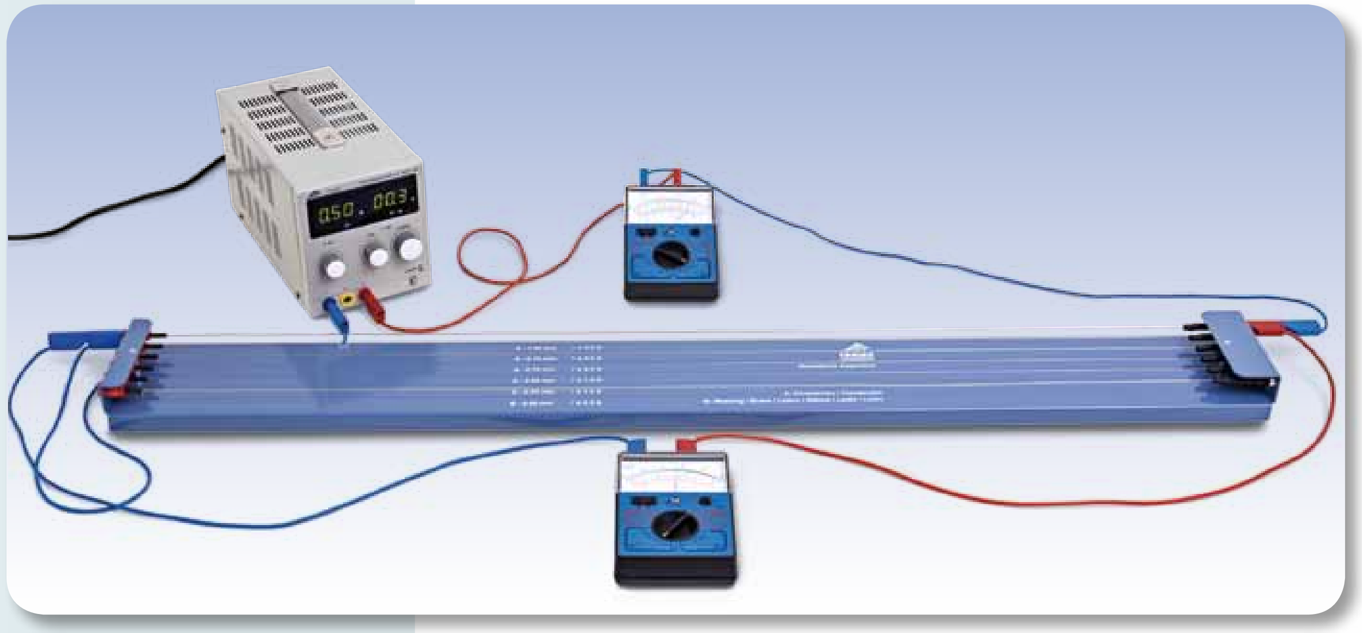

EXPERIMENT PROCEDURE

- **Verification of Ohm's law for a constantan wire and a brass wire.**
- **Verification of Ohm's law for constantan wires of various lengths.**
- **Verification of Ohm's law for constantan wires of various thickness.**

OBJECTIVE

Verification of Ohm's law.

SUMMARY

In simple electrical conductors, the current *I* which passes through the conductor is proportional to the applied voltage *U*. The constant of proportionality, the ohmic resistance *R*, is dependent on the length *x* of the conductor, its cross-sectional area *A* and the nature of the material. This relationship is to be investigated using constantan and brass wires.

REQUIRED APPARATUS

Quantity	Description	Number
1	Resistance Apparatus	**1009949**
1	DC Power Supply 0 – 20 V, 0 – 5 A (230 V, 50/60 Hz)	**1003312 or**
	DC Power Supply 0 – 20 V, 0 – 5 A (115 V, 50/60 Hz)	**1003311**
2	Analogue Multimeter AM50	**1003073**
1	Set of 15 Safety Experiment Leads, 75 cm	**1002843**

1

BASIC PRINCIPLES

Georg Simon Ohm **was the first in 1825 to show that the current flowing through a simple conductor is proportional to the voltage applied.**

This means that Ohm's law applies:

(1) $$U = R \cdot I$$

The constant of proportionality *R* is the resistance of the conductor. For a metal wire of length *x* and cross-sectional area *A*, the resistance *R* is given by the following formula:

(2) $$R = \rho \cdot \frac{x}{A} .$$

The specific resistivity ρ depends on the material of which the wire is made. In order to verify this fundamental relationship, an experiment is to be carried out to investigate the proportionality between current and voltage for metal wires of varying thickness, length and material. The resistivity will also be determined and compared with values quoted in literature

EVALUATION

The cross-sectional area *A* is calculated from the thickness *d* of the wires:

$$A = \frac{\pi}{4} \cdot d^2$$

The measurements are to be plotted in three graphs of *U* against *I*. In each of these, one of the parameters ρ, *x* or *d* will be varied.

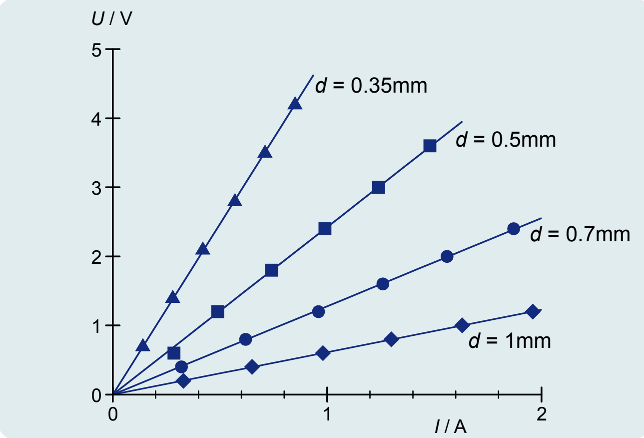

Fig. 3: Graph of *U* against *I* for constantan wires of various thickness

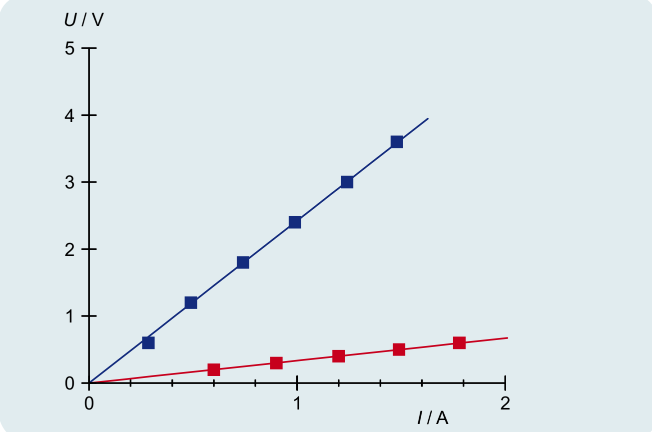

Fig. 1: Graph of *U* against *I* for constantan wire (blue) and brass wire (red)

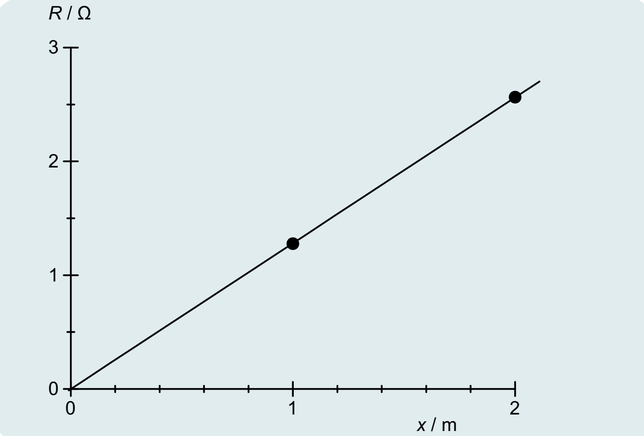

Fig. 4: Resistance *R* as a function of length

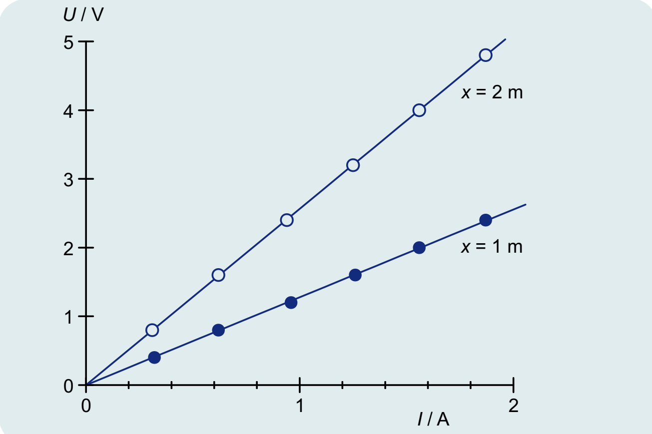

Fig. 2: Graph of *U* against *I* for constantan wires of various lengths

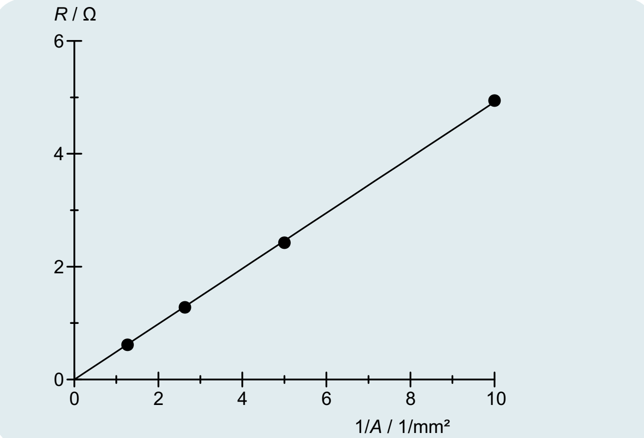

Fig. 5: Resistance *R* as a function of the inverse of the cross-sectional area *A*