Coefficient of Resistance of Copper
20 Ohms, Cold

EM3020-001

Description:

A heat resisting resin tube is wound with a fine winding of enamelled copper wire. The wire is terminated to large cables that pass under the insulated handle for connection to an accurate ohm meter. Resistance at room temperature is approximately 20 ohms.

The winding element has been protected with a special varnish, however it is very fine wire and can easily be damaged.

The resistance of the wire is measured accurately both when cold and when hot. The temperature coefficient of resistance for copper can then be calculated.

Other designs available are often integrated with containers for paraffin oil or similar. The advantage if the IEC design is that it can be plunged into any materials being held in any container. This makes the uses and experiments more flexible.

The attached cable is of heavy wire with a very low resistance so it cannot affect the resistance value of the element.

Length: 230mm	Diameter: 25mm	Weight: 120g

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The Experiment:

- Connect the wires of the instrument to an accurate resistance measuring device or digital multimeter set to OHMS.

- Prepare a vessel of iced water large enough to accept the full length of the copper wire winding. Insert a thermometer to monitor the temperature. If iced water is difficult to arrange, ordinary cold tap water can be used.

- While holding the insulated handle, plunge the tube carrying the copper wire winding into the cold water and move it around a little to be sure the wire achieves the same temperature as the water.

- After a short time, read and note the temperature of the water and read and note the resistance of the winding in ohms.

- Remove the instrument and replace the iced water with very hot (close to boiling) water. Repeat the above steps measuring both the temperature and the resistance.

- Knowing the temperature difference and also the resistance difference, the temperature coefficient of resistance (α) for copper can be calculated.

The formula is: $R_t = R_0 (1 + \alpha\, t)$, where:

R_t = ohms hot R_0 = ohms cold α = temperature coefficient

t = temperature difference in $^{\circ}$C

Caution:

Using heating devices and using very hot water can be a serious hazard in the classroom. If students are to be close to very hot water, be sure to supervise them closely to avoid accidents.

Designed and Manufactured in Australia