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THERMISTOR SYSTEM

LA40-010

INSTRUCTIONS FOR USE

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INTRODUCTION

This apparatus provides a simple and effective method for students to investigate the properties of a familiar device, the thermistor. The bead thermistor is enclosed in a sealed glass tube with electrical connections brought out to two 4mm flying leads. There is thermally conducting compound around the thermistor to give good thermal contact through the tube to the surroundings.

APPLICATIONS

- Temperature monitoring
- Resistance measurement
- Open investigations

SETTING UP

In most applications the resistance of the thermistor would be measured. This is most easily carried out using a multimeter set to a suitable resistance range. The thermistor is a negative temperature coefficient device with nominal resistance 4.7kW at 25°C. At 0°C this resistance would rise to about 15kW and at 100°C the resistance would be in the region of 300W. Alternatives to the multimeter would be a traditional voltage /current measurement and calculation. The thermistor would be connected in series with an ammeter to a low voltage d.c. supply and the voltage across the device monitored with a voltmeter. Resistance can be calculated from V/I. If this system is used then the maximum voltage should be limited to 6V as the maximum power dissipation is 500mW and heating of the device is to be avoided for obvious reasons.

PRECAUTIONS

- The apparatus should be treated with the same care as a glass thermometer. It should only be used in situations where the temperature is well controlled, normally in a beaker of liquid. **It must never be placed directly in a flame.** If it is used in a heated metal block the temperature must not be allowed to rise above 100°C.
- The top of the glass tube is left open to allow for expansion and ingress of liquids should be avoided.
- It is advisable to clamp the apparatus when in use to keep connecting leads safe.
- To keep flames etc. away from leads a sensible procedure is to heat the liquid first, extinguish flames and monitor cooling rather than vice versa. The cooling process can be accelerated by adding cold water in small amounts if required.

RESOURCES

A selection of resources are available for this product and can be downloaded from the resource centre on our website.

Typical results

The thermistors used have a 5% tolerance on the quoted value of 4.7kW at 25°C. The variation of resistance is not proportional to the temperature and therefore when used at GCSE level students might predict a proportionality, or inverse proportionality, and be expected to find that the prediction was not true.

At A-level a graph of temperature against resistance should lead to consideration of how a straight line can be obtained from the results. The results of 1/R against T^4 give a good approximation to a straight line graph.

Experiment gave the following results:

Temperature °C	Resistance W
1	13,400
13	7,700
20	5,700
30	3,750
35	3,100
40	2,500
45	2,050
50	1,700
55	1,410
60	1,185
65	1,000
70	840
75	725
80	620
85	530
90	450
95	390
100	335

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