About electrical resistance

Resisting the flow

If you touch a live wire you'll get an **electric shock**. So electrical wiring is protected by enclosing it in an insulating material. Switches are made of plastic. This prevents you getting a shock when you turn a light on, or any other electrical equipment for that matter. The reason is that plastic doesn't conduct electricity. It has a **high electrical resistance,** which means it resists the flow of electricity through it. We say it's an insulator. Metals, on the other hand, are good **conductors**. They have a **low resistance** to the flow of electricity.

Resistance varies from metal to metal, so some metals are better conductors than others. The resistance of a metal wire also depends upon its thickness and length. Thinner wires have a higher electrical resistance than thick ones, and the longer a wire, the greater its electrical resistance.

It's important to be able to measure electrical resistance. Using the Comparative Test CT 0004-1:2003 you can compare the resistance of different materials.

You can modify the test to find out about the way resistance for one material varies with:

(a) length (a really important property since it accounts for power loss down a long cable) and

(b) area (or thickness)

NOTE: for these modifications to work, the length or area of your test specimen would have to be increased dramatically or you won't notice any difference in resistance. For example, it would be no good increasing the length from 5 cm to 10 cm. Rather, you'd need to increase it to something like 50 metres! This would be possible if you used coils of wire to measure the relationship between electrical resistance and length.

CT 0004:2003 Methods of testing electrical properties -

Part 1: Comparing the electrical resistance of materials

COMPARATIVE TEST CT 0004-1:2003

Methods of testing electrical properties - Part 1: Comparing the electrical resistance of materials

1 Scope

This Comparative Test measures the electrical resistance of a material

2 Principle

Resistance can be calculated using the equation

$R = V/I$

where,

R is the resistance, in ohms;

V is the voltage, in volts;

I is the current, in amps.

By setting up an electrical circuit using a test specimen of the material under test as a component of that circuit, it is possible to use a voltmeter and ammeter to measure the voltage and current through the test specimen.

3 Apparatus

- Ammeter
- Voltmeter
- Battery, or batteries

4 Test specimens

The test specimen should be 50 mm long with a cross sectional area of 10 mm^2. Each test specimen should be prepared by soldering wires to either end (use *SP 0007-4:2003 - Procedure for making permanent electrical joints: soldering* for a soldering procedure).

5 Procedure

- set up the electrical circuit, as shown in figure 1
- record the voltage and the current, as shown on the voltmeter and ammeter

6 Expression of Results

Calculate the resistance of the test specimen using the equation:

$R = V/I$

where,

R is the resistance, in ohms;

V is the voltage, in volts;

I is the current, in amps.

7 Test Report

Your test report should include:

(a) reference to this Comparative Test

(b) The resistance of each test specimen

figure 1