Standard Procedure SP 0009:2005

Method for measuring the resistance of metal wires

1 Scope

This procedure measures the resistance of a thin metal wire. It can be used for wires with no joins or kinks, and with a resistance of at least 0.2 ohms between the points of contact, normally 1 metre apart. It can also be used for thicker and/or shorter conductors with a higher resistivity, provided the resistance is at least 0.2 ohms.
[Note: Resistivity is a property that, like density, is constant and characteristic for a given material. Unlike resistance, it does not depend on size or shape. Resistivity is calculated from the resistance, length and cross-sectional area of a sample.]

2 Definitions

resistance
the ability of a material to resist or obstruct the flow of electricity. It causes some of the electrical energy to be transformed into heat. According to Ohm's Law, the current I flowing through a conductor is proportional to the voltage V. That is, V/I is constant, and is called the resistance R. Resistance varies with the size and shape of the material.

3 Principle

A low voltage is applied across the ends of the sample. The voltage and the resulting current flowing are measured between contact points near each end of the sample. The resistance is calculated as the voltage divided by the current.

4 Apparatus

- 1.5 V cell
- voltmeter capable of measuring 1.5 V DC
- ammeter capable of measuring 10 A DC
- metre rule
- connecting wires

5 Test Specimens

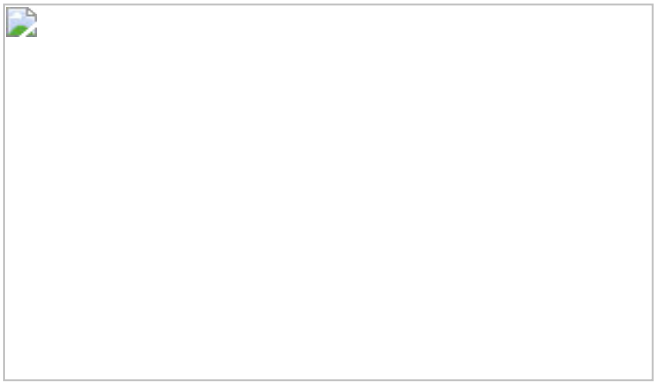
Specimens must have a resistance of at least 0.2Ω (ohms). For good conductors this means using thin wires at least 1 metre long. (For thicker specimens the resistance would be too low to measure.) For metals with higher resistivity, thicker wires may be used. However, to compare different metals, specimens must be of equal length and the same cross-section.

6 Procedure

- Pull the specimen wire out straight and mark two points 1 m apart
- Set up the circuit shown in figure 1, connecting the cell and ammeter across the ends of the specimen wire. Connect the voltmeter between the two marked points using crocodile clips. Alternatively, use plug leads or meter test probes, pressing firmly on the wire to ensure good contact.
- Close the switch, and record the meter readings of voltage and current.
- Open the switch. (Leaving the circuit 'on' may cause the specimen to heat up and the current to change, since resistance increases with temperature.)

Note: If the current is too high (off the ammeter scale), use a longer specimen wire. For comparison, other wires must also be this new length.

Figure 1



7 Expression of Results

Calculate the resistance R of the specimen using the formula:

R = V/I

where

R is the resistance, in ohms;

V is the voltage, in volts;

I is the current, in amps.

8 Test Report

Your test report should include:

(a) reference to this Standard Procedure;

(b) the resistance of each specimen;

(c) details of any differences in length or cross-sectional area between the specimens.

Note: To compare different materials, specimens must be the same size. Standard procedure **SP0010:2005**shows how resistance varies with size. This allows resistances of equal sized specimens to be calculated from results for unequal specimens.