

SAE Inc. Standard No. 114

Electrical Resistivity of Thermoplastic Products

ABSTRACT

This test method is used to evaluate the electrical resistivity of SAE's thermoplastic products, such as the ConduWire. Samples have copper wire embedded in the thermoplastic and connected to a multimeter. The resistance, resistivity, and conductivity of the material are measured.

1. EQUIPMENT REQUIRED

- 1.1 Multimeter
- 1.2 Vernier caliper
- 1.3 Oven
- 1.4 12-ton press

2. SAMPLE PREPARATION

- 2.1 Prepare a thermoplastic test plaque using the steel mold. Place a layer of the thermoplastic being tested on the bottom of the mold, place two pieces of copper wire parallel in the mold and place a layer of the thermoplastic being tested on top of the copper.
- 2.2 Place the steel mold in the oven for 1 hour at 200 °C.
- 2.3 After 1 hour remove the mold from the oven and place in the 12-ton press until the thermoplastic has fully cooled.
- 2.4 Trim the test plaque so that the copper wires are exposed.

3. TEST SETUP

- 3.1 Set up the multimeter so that the leads are two alligator clips.
- 3.2 Place the test plaque on a flat surface.
- 3.3 Attach the leads of the multimeter to the copper wires in the thermoplastic test plaque.

4. PROCEDURE

- 4.1 Turn the multimeter on and set it to the “200 Ω” setting.
- 4.2 Record the reading on the multimeter once it has stabilized.

5. CALCULATIONS

- 5.1 Determine the resistivity of the sample:

$$\rho = R \times \frac{A}{d}$$

where,

ρ = Resistivity (ohm·cm)

R = Resistance (ohms)

A = Surface area in cm² (A = L x W), where the L is length of the sample
and W is the thickness of the sample

d = Distance between the copper wires in cm

- 5.2 The conductivity of the sample is the inverse of the resistivity:

$$\sigma = \frac{1}{\rho}$$

where,

σ = Conductivity (S/cm)

ρ = Resistivity (ohm·cm)

Published Date: September 2022