Designation: F180 – 94 (Reapproved 2020)

Standard Test Method for Density of Fine Wire and Ribbon Wire for Electronic Devices[1]

This standard is issued under the fixed designation F180; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the determination of, to an accuracy of 1.0 %, the density of fine wires ranging from 0.25 to 0.02 mm in diameter, or ribbons of similar thicknesses, for electronic devices.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 4.

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Terminology

2.1 *Definitions:*

2.1.1 *density*—the weight per unit volume, expressed in grams per cubic centimetre, in accordance with the following equation:

$$\Delta = W/V$$

where:

Δ = density of the specimen
W = weight of the specimen, g, and
V = volume of the specimen, cm^3.

3. Apparatus

3.1 *Balance*—A suitable chemical balance capable of being read to 0.1 mg.

3.2 *Micrometer,* capable of being read to 0.002 mm.

3.3 *Standard Volume Cylinder*—A cylinder of standard volume made from corrosion-resistant material such as nickel, cylindrical in shape to within 0.0025 mm and of uniform diameter and length. The length of the cylinder shall be approximately the same as the diameter and about 12.7 to 25.4 mm. The surface of the cylinder shall be smooth and free from defects, pits, or cracks. The corners of the cylinder shall not be rounded.

3.4 *Thermometer,* capable of being read to 0.2°C within the range from 10 to 35°C.

3.5 *Vacuum Pump and Desiccator*—A vacuum pump capable of producing a vacuum of 0.1 mm Hg and a vacuum desiccator.

3.6 *Hook* suspended by a fine wire about 0.08 mm in diameter, both made of corrosion-resistant material, for supporting the test specimen while weighing it in the liquid.

3.7 *Cradle* suspended by a fine wire about 0.08 mm in diameter, both made of corrosion-resistant material, for supporting the standard volume cylinder while weighing it in the test liquid.

4. Test Liquid

4.1 The test liquid in which the test specimen and standard volume cylinder are to be immersed while being weighed shall be pure, stable, and shall have a low viscosity, low surface tension, low vapor pressure and a density of not less than 2 g/cm^3. Tetrabromoethane and tribromomethane have been found satisfactory for this purpose.

4.2 **Precaution**[2] These liquids are moderately toxic and should only be used by those familiar with the hazards involved.

4.2.1 Tests should be carried out under a fume hood. The fluids used should be considered potentially dangerous.

4.2.2 *Hazard*—When treated, highly toxic fumes are given off. Prolonged inhalation can cause unconsciousness.

4.2.3 *Treatment*—Fresh air; artificial respiration if unconscious; oxygen if required.

[1] This test method is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.03 on Metallic Materials, Wire Bonding, and Flip Chip.

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[2] See Sax, N. I., *Handbook of Dangerous Materials,* 1951.