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Standard Specification for Gold Wire for Semiconductor Lead Bonding[1]

This standard is issued under the fixed designation F 72; 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 specification covers round drawn/extruded gold wire for internal semiconductor device electrical connections. Four classifications of wire are distinguished, (*1*) copper-modified wire, (*2*) beryllium-modified wire, (*3*) high-strength wire, and (*4*) special purpose wire.

NOTE 1—Trace metallic elements have a significant effect upon the mechanical properties and thermal stability of high-purity gold wire. It is customary in manufacturing to add controlled amounts of selected impurities to gold to modify or stabilize bonding wire properties or both. This practice is known variously as "modifying,"" stabilizing," or "doping." The first two wire classifications denoted in this specification refer to wire made with either of two particular modifiers, copper or beryllium, in general use. In the third and fourth wire classifications, "high-strength" and "special purpose" wire, the identity of modifying additives is not restricted.

1.2 The values stated in SI units shall be regarded as the standard.

1.2.1 A mixed system of metric and inch-pound units is in widespread use for specifying semiconductor lead-bonding wire. SI-equivalent values of other commonly used units are denoted by parentheses in text and tables.

1.3 The following hazard caveat pertains only to the test method portion, Section 9, of this specification. *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

F 16 Test Methods for Measuring Diameter or Thickness of Wire and Ribbon for Electronic Devices and Lamps[2]

F 205 Test Method for Measuring Diameter of Fine Wire by Weighing[2]

F 219 Test Methods of Testing Fine Round and Flat Wire for Electron Devices and Lamps[2]

F 584 Practice for Visual Inspection of Semiconductor Lead-Bonding Wire[2]

3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 Classification: copper-modified, beryllium-modified, high strength, or special purpose,

3.1.2 Quantity,

3.1.3 Purity (Section 4),

3.1.4 Type, hard, stress relieved, or annealed (Section 5),

3.1.5 Breaking load and percentage elongation range (Section 5),

3.1.6 Wire diameter (Section 6),

3.1.7 Spool type, length of wire per spool, and type of wind (Section 11),

3.1.8 Despooling, left-handed unwind or right-handed unwind (Section 11), and,

3.1.9 Packaging and marking (Section 12).

4. Chemical Composition

4.1 Copper-modified material shall conform to the chemical requirements specified in Table 1.

4.2 Beryllium-modified material shall conform to the chemical requirements specified in Table 2.

4.3 High-strength material shall conform to the chemical requirements specified in Table 3.

4.4 Special purpose material shall be in accordance with Table 4.

NOTE 2—Copper-modified wire is used on thermocompression wire bonding machines. Beryllium-modified material is often preferred on high-speed automated thermocompression or thermosonic bonding equipment. High-strength wire was developed for use on some very high speed automated thermosonic bonders.

5. Mechanical Properties

5.1 Material specified by this standard may be either of two types:

5.1.1 *Hard*—Wire, as drawn/as extruded.

5.1.2 *Annealed*—Wire, annealed after drawing/extruding.

5.2 *Breaking Load and Elongation*—The tension test shall be the standard test for determining the mechanical properties, and acceptance or rejection shall depend on the breaking load and percent elongation at failure of a 254-mm (10.0-in.) length of wire.

5.2.1 Hard wire shall conform to the requirements of Table 5 for copper-modified gold wire and to the requirements of Table 6 for beryllium-modified gold wire.

[1] This specification is under the jurisdiction of ASTM Committee F01 on Electronics and is the direct responsibility of Subcommittee F01.07 on Wire Bonding.

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[2] *Annual Book of ASTM Standards,* Vol 10.04.

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