1. Scope

1.1 This specification covers a wrought alloy containing gold and copper in the form of wire, rod, strip, and tubing for electrical contacts.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 The following precautionary statement pertains to the test method portion only, Section 7, of this standard: 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 become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

2.1 ASTM Standards:

B476 Specification for General Requirements for Wrought Precious Metal Electrical Contact Materials
E8 Test Methods for Tension Testing of Metallic Materials
E384 Test Method for Knoop and Vickers Hardness of Materials

3. Materials and Manufacture

3.1 Raw materials shall be of such quality and purity that the finished product will have the properties and characteristics prescribed in this specification.

3.2 The material shall be finished by such operations (cold working, heat treating, annealing, turning, grinding, pickling) as are required to produce the prescribed properties.

4. Chemical Composition

4.1 Materials produced under the specification shall meet the requirements of chemical composition shown in Table 1.

5. Mechanical Properties

5.1 The contract or order may specify ultimate tensile strength, elongation, microhardness (Knoop or Vickers), hardness (Rockwell or Rockwell Superficial), or a combination of these mechanical properties as temper criterion. If the contract or order does not specify a temper criterion, then the criterion for temper designation will be ultimate tensile strength.

5.2 The material shall conform to the mechanical properties shown in Table 2, Table 3, Table 4, or Table 5.

5.3 The material shall be free of stress corrosion (as tested) in accordance with 7.3.

6. General Requirements

6.1 Specification B476 shall apply to all materials produced to this specification.

7. Test Methods

7.1 Test methods shall be in accordance with Specification B476.

7.1.1 Knoop hardness tests shall be in accordance with Test Method E384. Material 0.005 in. (0.13 mm) in thickness (or diameter) and larger shall be tested using a 100-g indenter load. A minimum of five hardness indentations shall be made on each specimen. The hardness value reported shall be the average of the five indentations. Material less than 0.005 in. in thickness (or diameter) shall be tested with a 50-g indenter load.

7.1.2 All tension tests shall be in accordance with Test Methods E8 and test specimens shall be full cross section, when practical.

7.1.3 All tests shall be conducted at room temperature, 65 to 85°F (18 to 29°C).
7.2 Chemical analysis shall be performed by spectrochemical or wet analysis methods. Fire assay is an acceptable alternative method for gold analysis.

7.3 The stress corrosion test shall be performed as follows:

7.3.1 Immerse test samples in a test solution of the following proportions for 30 min at room temperature:

- Ferric Chloride (FeCl₃) — 20 g,
- Hydrochloric Acid (HCl) (conc) — 80 mL, and
- Distilled Water — 250 mL.

7.3.2 Remove the samples, thoroughly rinse, and dry. Discard the solution; do not reuse.

7.3.3 Examine for cracks visible to the naked eye.

7.3.4 If no cracks are visible, carry out the following procedure:

7.3.4.1 Compress the ring or tube samples with pliers over a mandrel whose outside diameter is approximately one half the inside diameter of the ring.

7.3.4.2 Bend wire, rod or tube or strip samples 180° around a pin whose diameter is approximately five times the wire or strip thickness.

7.3.4.3 The material shall be considered free of stress corrosion if the samples do not exhibit spontaneous cracking, and if the samples do not show a greater tendency to crack than samples that have not been immersed in the test solution but have been compressed in the same manner.

8. Inspection and Testing

8.1 Material furnished under this specification shall be inspected and tested by the manufacturer as listed below:

8.1.1 Visual inspection at 10× magnification.

8.1.2 Tension or hardness test, or both, for temper verification.

8.1.3 Dimensional inspection.

8.1.4 Chemical analysis when indicated by the purchase order.

8.1.5 Stress corrosion test.

9. Keywords

9.1 coin gold; contacts; electrical contacts; gold alloy; low contact resistance; low energy contact; non arcing contact
APPENDIX
(Nonmandatory Information)

XI. REFERENCE PROPERTIES FOR GOLD—COPPER ELECTRICAL CONTACT MATERIAL

X1.1 The following is a list of typical property values which are useful for engineering calculations in electrical contact design and application.

<table>
<thead>
<tr>
<th>Property</th>
<th>Annealed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistivity, $\Omega \cdot \text{cmil}/\text{ft}$</td>
<td>76.4</td>
</tr>
<tr>
<td>Resistivity, $\mu \Omega \cdot \text{cm}$</td>
<td>12.7</td>
</tr>
<tr>
<td>Density, g/cm$^3$</td>
<td>17.32</td>
</tr>
<tr>
<td>Solidus temperature, °C</td>
<td>930</td>
</tr>
</tbody>
</table>

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