



AEROSPACE MATERIAL SPECIFICATION	AMS4700™	REV. F
	Issued 1969-11 Reaffirmed 2014-12 Revised 2024-09 Superseding AMS4700E	
Copper Wire, Bare, High Purity (Composition similar to UNS C10100)		

RATIONALE

AMS4700F results from a Five-Year Review and update of this specification with changes to update general agreement language to prohibit unauthorized exceptions (see 4.4.1, 5.2.3, and 8.4), relocate Definitions (see 2.3), and update Applicable Documents (see Section 2), Composition (see 3.1), Tolerances (see 3.5), and Ordering Information (see 8.5).

1. SCOPE

1.1 Form

This specification covers one type of copper in the form of wire (see 8.5).

1.2 Application

This wire has been used typically as electronic component leads which must be resistance welded to produce high-quality weld joints, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

- AMS2224 Tolerances, Copper and Copper Alloy Wire
- AS7766 Terms Used in Aerospace Metals Specifications

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<https://www.sae.org/standards/content/AMS4700F/>

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B170 ANNEX	Oxygen-Free Electrolytic Copper—Refinery Shapes
ASTM B193	Resistivity of Electrical Conductor Materials
ASTM B250/B250M	General Requirements for Wrought Copper-Alloy Wire
ASTM B577	Detection of Cuprous Oxide (Hydrogen Embrittlement Susceptibility) in Copper (Test Method C)
ASTM E3	Preparation of Metallographic Specimens
ASTM E478	Chemical Analysis of Copper Alloys

2.3 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E478, ASTM B170 ANNEX, or by other analytical methods acceptable to the purchaser (see 8.5).

Table 1 - Composition

Element	Min	Max
Copper (see 3.1.1)	99.99	--
Sulfur	--	0.0015 (15 ppm)
Lead	--	0.0005 (5 ppm)
Bismuth (see 3.1.2)	--	0.0001 (1 ppm)
Selenium (see 3.1.2)	--	0.0003 (3 ppm)
Tellurium (see 3.1.2)	--	0.0002 (2 ppm)
Phosphorus	--	0.0003 (3 ppm)
Zinc	--	0.0001 (1 ppm)
Cadmium	--	0.0001 (1 ppm)
Mercury	--	0.0001 (1 ppm)
Arsenic (see 3.1.2)	--	0.0005 (5 ppm)
Antimony (see 3.1.2)	--	0.0004 (4 ppm)
Tin (see 3.1.2)	--	0.0002 (2 ppm)
Manganese (see 3.1.2)	--	0.00005 (0.5 ppm)
Iron	--	0.0010 (10 ppm)
Nickel	--	0.0001 (1 ppm)
Oxygen	--	0.0005 (5 ppm)

3.1.1 Copper shall be determined by taking the difference between 100% and the sum of the other elements listed.

3.1.2 The sum of the bismuth, selenium, tellurium, arsenic, antimony, tin, and manganese shall not exceed 0.0022% (22 ppm).

3.2 Condition

Cold drawn or cold rolled, annealed, and cleaned.

3.3 Properties

Wire shall conform to the following requirements:

3.3.1 Resistivity

The weight resistivity, determined in accordance with ASTM B193, shall not exceed $0.15328 \Omega \cdot \text{g}/\text{m}^2$ at $68^\circ\text{F} \pm 4^\circ\text{F}$ ($20^\circ\text{C} \pm 2^\circ\text{C}$), which corresponds to a conductivity of not less than 100% IACS (International Annealed Copper Standard) (58 MS/m).

3.3.2 Hydrogen Embrittlement

Wire shall withstand a minimum of 10 bends without cracking or breaking when tested in accordance with ASTM B577 and 3.3.2.1 and then be subjected to additional bending until failure occurs.

3.3.2.1 Specimens shall be cleaned by any suitable method and then heated at $1562^\circ\text{F} \pm 45^\circ\text{F}$ ($850^\circ\text{C} \pm 25^\circ\text{C}$) for not less than 30 minutes in an atmosphere containing not less than 10% hydrogen. The specimen shall then be clamped between jaws having edge radii equal to 2.5 times the nominal diameter of the wire. The specimen, held under a tension of approximately 3000 psi (21 MPa), shall be bent 90 degrees over the edge of one jaw and returned to its initial position; this constitutes one bend. The specimen shall then be bent 90 degrees in the reverse direction and returned to its initial position; this constitutes another bend. Each bend shall be made in the opposite direction from that of the preceding bend.

3.3.2.1.1 Specimens shall be examined at the bend after 10 bends and at the broken area after failure under 10X magnification. The bend shall have no surface cracks or blisters. The break shall show a necked-down section, characteristic of a ductile material, with no evidence of grain faces or boundaries.

3.3.3 Microstructure

Specimens, prepared as specified in ASTM E3, from wire heated as in 3.3.2.1, when suitably etched to reveal the structure and examined at 100X magnification, shall show no evidence of copper oxide or other inclusions.

3.4 Quality

Wire, as received by the purchaser, shall be uniform in quality and condition, sound, smooth, and free from foreign materials and from imperfections detrimental to usage of the wire.

3.5 Tolerances

Shall conform to AMS2224 as applicable to nonrefractory alloys.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of wire shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the wire conforms to the specified requirements.

4.2 Classification of Tests

All technical requirements are acceptance tests and shall be performed on each lot.

4.3 Sampling and Testing

Shall be in accordance with ASTM B250/B250M.

4.4 Reports

The producer of wire shall furnish with each shipment a report showing the results of tests to determine conformance to all technical requirements. This report shall include the purchase order number, lot number, AMS4700F, size, and quantity.

4.4.1 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS4700F(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.5 Resampling and Retesting

If any specimen used in the above tests fails to meet the specified requirements, disposition of the wire may be based on the results of testing three additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet the specified requirements shall be cause for rejection of the wire represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY

5.1 Wire shall be supplied on spools or in coils except when straight lengths are ordered.

5.2 Identification

5.2.1 Spools and Coils

Shall be legibly marked, by a durable tag or label, with not less than the manufacturer's identification, purchase order number, AMS4700F, nominal size, and quantity; boxes or drums shall be marked with the same information.

5.2.2 Straight Lengths

Shall have attached to each bundle or enclosed in each box a durable tag or label legibly marked with the information of 5.2.1; when boxed, the box shall be marked with the same information.

5.2.3 When technical exceptions are taken (see 4.4.1), the material shall be identified with AMS4700F(EXC).

5.3 Packaging

5.3.1 Spools and Coils

Coils shall be individually wrapped with waterproof paper or packed in waterproof drums. Spools, when ordered, shall be boxed.

5.3.2 Straight Lengths

Shall be bundled or boxed.

5.3.3 Wire shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the wire to ensure carrier acceptance and safe delivery.