AEROSPACE MATERIAL SPECIFICATION

AMS4612™	REV. L

Issued 1941-09
Reaffirmed 2015-02
Revised 2023-10

Superseding AMS4612K

Brass, Naval, Bars and Rods
60.5Cu - 38.5Zn - 0.75Sn
Hard Temper (H04)
(Composition similar to UNS C46400)

RATIONALE

AMS4612L results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (see 3.6, 4.4.1, and 8.4), Residual Stress Test nomenclature previously Embrittlement (see 3.3.2, 4.3.2, and 4.4), update Applicable Documents (see Section 2 and 4.3), Composition (see 3.1), Sampling and Testing (see 4.3.1), and allow the use of the immediate prior specification revision (see 8.5).

1. SCOPE

1.1 Form

This specification covers a copper alloy (naval brass) in the form of bars and rods.

1.2 Application

These products have been used typically for automatic screw machine parts, but usage is not limited to such applications. This material has slightly higher strength and lower ductility than AMS4611. Also, it has better corrosion resistance than AMS4610 but is less readily machinable.

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.

AMS2221 Tolerances, Copper and Copper Alloy Bars and Rods

AMS4610 Brass, Free-Cutting Bars and Rods, 61.5Cu - 35Zn - 3.1Pb, Half Hard (H02)

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For more information on this standard, visit
https://www.sae.org/standards/content/AMS4612L/

AMS4611 Brass, Naval, Bars and Rods, 60.5Cu - 38.7Zn - 0.8Sn, Half Hard (H02)

AS7766 Terms Used in Aerospace Metals Specifications

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 B154 Mercurous Nitrate Test for Copper Alloys

ASTM B249/B249M General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes and Forgings

ASTM B601 Temper Designations for Copper and Copper Alloys—Wrought and Cast

ASTM B858 Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E18 Rockwell Hardness of Metallic Materials

ASTM E478 Chemical Analysis of Copper Alloys

2.3 Definitions

Terms used in AMS are defined in AS7766.

2.3.1 Copper temper designations are defined in ASTM B601.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM E478 or by other analytical methods acceptable to the purchaser.

Table 1 - Composition

Element (3.1.1)	Min	Max
Copper	59.0	62.0
Tin	0.50	1.0
Lead	--	0.20
Iron	--	0.10
Zinc (3.1.2)	remainder	--
Sum of Named Elements (3.1.3)	99.6	--

3.1.1 These composition limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements by agreement between the manufacturer or supplier and purchaser.

3.1.2 Zinc may be reported as “remainder,” as the difference between the sum of results for all elements and 100%, or as the result of direct analysis.

3.1.3 When all named elements in Table 1 are analyzed, the sum shall be 99.6% minimum, but such determination is not required for routine acceptance of each lot.

3.2 Condition

Cold finished, hard (H04) temper (see 2.3.1).

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3.3 Properties

The product shall conform to the following requirements:

3.3.1 Tensile Properties

Shall be as shown in Table 2, determined in accordance with ASTM E8/E8M.

Table 2A - Minimum tensile properties, inch/pound units

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 1.000, incl	67.0	45.0	13
Over 1.000 to 2.500, incl	62.0	37.0	18
Over 2.500 to 3.500, incl	54.0	25.0	27
Over 3.500	54.0	22.0	30

Table 2B - Minimum tensile properties, SI units

Nominal Diameter or Distance Between Parallel Sides Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 25.40, incl	462	310	13
Over 25.40 to 63.50, incl	427	255	18
Over 63.50 to 88.90, incl	372	172	27
Over 88.90	372	152	30

3.3.2 Residual Stress Test

Specimens as in 4.3.2 shall withstand, without cracking, the mercurous nitrate test performed in accordance with ASTM B154, Procedure A, or the Ammonia Vapor Test in accordance with ASTM B858.

3.4 Quality

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

3.5 Tolerances

Shall conform to AMS2221 as applicable to non-refractory 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 the product 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 product conforms to specified requirements.

4.2 Classification of Tests

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

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4.3 Sampling and Testing

Shall be in accordance with ASTM B249/B249M and E8/E8M.

4.3.1 The tensile specimen shall be prepared in accordance with ASTM E8/E8M.

4.3.2 Residual Stress Test

One sample from each lot, unless otherwise agreed upon by the purchaser and producer. Specimens for residual stress test shall be full cross section of the product and shall have length of approximately 6 inches (152 mm) or twice the diameter or least distance between parallel sides, whichever is greater.

4.4 Reports

The producer of the product shall furnish with each shipment a report showing the results of tests for chemical composition, tensile properties, and residual stress test and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS4612L, size, and quantity.

4.4.1 When material produced to this specification has exceptions taken to the technical requirements listed in Section 3 (see 5.1.1), the report shall contain a statement “This material is certified as AMS4612L(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 specified requirements, disposition of the product may be based on the results of testing two additional specimens for each original nonconforming specimen. Failure of any retest specimen to meet specified requirements shall be cause for rejection of the product represented. Results of all tests shall be reported.

5. PREPARATION FOR DELIVERY

5.1 Identification

Individual pieces or bundles shall have attached a durable tag legibly marked with not less than the purchase order number, lot number, AMS4612L, and nominal size or shall be boxed and the box marked with the same information.

5.1.1 When technical exceptions are taken, the material shall be marked with AMS4612L(EXC) (see 4.4.1).

5.2 Packaging

The product 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 product to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A producer shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Product not conforming to this specification, or to modifications authorized by the purchaser, will be subject to rejection.

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