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AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4612G

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Superseding AMS 4612F

BRASS RODS AND BARS, NAVAL
60.5Cu - 38.5Zn - 0.75Sn
Hard Temper (H04)

UNS C46400

1. SCOPE:

- 1.1 Form: This specification covers one type of brass in the form of rods and bars.
- 1.2 Application: Primarily for automatic screw machine parts. This material has slightly higher strength and lower ductility than AMS 4611. It also has better corrosion resistance than AMS 4610 but is less readily machinable.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

- 2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2221 - Tolerances, Copper and Copper Alloy Bars and Rods
MAM 2221 - Tolerances, Metric, Copper and Copper Alloy Bars and Rods
AMS 2350 - Standards and Test Methods

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2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

- ASTM B154 - General Requirements for Mercurous Nitrate Test for Copper and Copper Alloys
- ASTM B249 - General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, and Shapes
- ASTM B249M - Wrought Copper and Copper-Alloy Rod, Bar, and Shapes (Metric)
- ASTM E8 - Tension Testing of Metallic Materials
- ASTM E8M - Tension Testing of Metallic Materials (Metric)
- ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
- ASTM E478 - Chemical Analysis of Copper Alloys

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-C-3993 - Copper and Copper-Base Alloy Mill Products, Packaging of

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, \emptyset determined by wet chemical methods in accordance with ASTM E478, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

	min	max
Copper	59.0	62.0
Tin	0.50	1.00
Lead	---	0.20
Iron	---	0.10
Zinc + Sum of Named Elements (3.1.2)	99.6	--
Zinc (3.1.1)		remainder

3.1.1 \emptyset Applicable when zinc is not determined by analysis. The reported (certified) value is the difference between the sum of all other specified elements and 100% and will, therefore, include unnamed elements. Limits for unnamed elements may be established by agreement between purchaser and manufacturer.

3.1.2 \emptyset Applicable only when zinc is determined by direct analysis.

3.2 Condition: Cold finished, hard (H04) temper (See 8.2).

3.3 Properties: The product shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as specified in Table I, determined in accordance with ASTM E8 or ASTM E8M:

TABLE I

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, minimum	Elongation in 4D %, minimum
Up to 1.000, incl	67,000	45,000	13
Over 1.000 to 2.500, incl	62,000	37,000	18
Over 2.500 to 3.500, incl	54,000	25,000	27
Over 3.500	54,000	22,000	30

TABLE I (SI)

Nominal Diameter or Distance Between Parallel Sides Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, minimum	Elongation in 4D %, minimum
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 Hardness: Should be as specified in Table II, or equivalent, determined in accordance with ASTM E18, but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.

TABLE II

Nominal Diameter or Distance Between Parallel Sides		Hardness, HRB	
Inches	Millimetres	Rounds	Hexagons Octagons
Up to 1.000, incl	Up to 25.40, incl	75 - 95	70 - 90
Over 1.000 to 2.500, incl	Over 25.40 to 63.50, incl	70 - 90	65 - 85
Over 2.500	Over 63.50	70 - 90	60 - 80

3.3.2.1 Hardness determinations shall be made on the surface, except on rounds where a flat, as necessary for accuracy, may be made.

3.3.3 Embrittlement: Specimens as in 4.3.2 shall withstand, without cracking, immersion in mercurous nitrate solution in accordance with ASTM B154, Procedure A.

- 3.4 Quality: The product, as received by 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 AMS 2221 or MAM 2221 as applicable to nonrefractory alloys.
4. QUALITY ASSURANCE PROVISIONS:
- 4.1 Responsibility for Inspection: The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.
- 4.2 Classification of Test: Tests to determine conformance to all technical requirements of this specification are classified as acceptance tests and shall be performed on each lot.
- 4.3 Sampling: Shall be in accordance with ASTM B249 or ASTM B249M and the following:
- 4.3.1 The axis of tensile specimens shall be parallel to grain flow. For product 1.500 inches (38.10 mm) and under in nominal diameter or distance between parallel sides, the axis of specimens shall be located at the center of the product; for product over 1.500 inches (38.10 mm) in nominal diameter or distance between parallel sides, the axis of specimens shall be located midway between surface and center.
- 4.3.2 Specimens for embrittlement 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, which is greater.
- 4.4 Reports: The vendor of the product shall furnish with each shipment a report showing the results of tests for chemical composition, tensile properties, and hardness of each lot and stating that the product conforms to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 4612G, size, and quantity.