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SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Dr., Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4611F

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Superseding AMS 4611E

BRASS BARS AND RODS, NAVAL
60.5Cu - 38.7Zn - 0.8Sn
Half Hard (H02)

UNS C46400

1. SCOPE:

1.1 Form: This specification covers one type of brass in the form of bars and rods.

1.2 Application: Primarily for automatic screw machine parts. These products have better corrosion resistance than AMS 4610 but are 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

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

ASTM B154 - Mercurous Nitrate Test for Copper and Copper Alloys
ASTM B249 - General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, and Shapes
ASTM B249M - General Requirements for 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 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, Ø 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	1.0
Lead	--	0.20
Iron	--	0.10
Zinc + Sum of Named Elements (3.1.2)	99.6	--
Zinc (3.1.1)	remainder	

3.1.1 Applicable when zinc is not determined by analysis. The reported Ø (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 Applicable only when zinc is determined by direct analysis. Ø

3.2 Condition: Cold finished, half-hard (H02) temper (See 8.2). Ø

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 and 4.3.2.1.

TABLE I

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, minimum	Elongation in 2 Inches or 4D %, minimum
Up to 0.500, incl	60,000	27,000	22 (See 3.3.1.1)
Over 0.500 to 1.000, incl	60,000	27,000	25
Over 1.000 to 2.500, incl	58,000	26,000	25
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 50.8 mm or 4D %, minimum
Up to 12.70, incl	414	186	22 (See 3.3.1.1)
Over 12.70 to 25.40, incl	414	186	25
Over 25.40 to 63.50, incl	400	179	25
Over 63.50 to 88.90, incl	372	172	27
Over 88.90	372	152	30

3.3.1.1 In no case shall the gage length be less than 1 inch (25 mm).

3.3.2 Embrittlement: Specimens as in 4.3.3.1 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 Tests: 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 Composition: One sample from each lot.

4.3.2 Tensile Properties: One sample from each lot.

4.3.2.1 Tensile tests shall be performed on full-section specimens when practicable. When machined specimens are required, the axis of the specimen shall coincide with the central axis of the piece except that for bars and rods over 1.50 inches (38.1 mm) in nominal diameter or distance between parallel sides, the axis shall be midway between center and surface of the piece. The longitudinal axis of the tensile specimen shall be parallel to the direction of rolling or drawing.

4.3.3 Embrittlement: As agreed upon by purchaser and vendor.

4.3.3.1 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 nominal diameter or least distance between parallel sides, whichever is greater.