



AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.

400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AMS 4612E

Superseding AMS 4612D

Issued 9-1-41

Revised 1-15-77

UNS C46400

BRASS RODS AND BARS, NAVAL

60.5Cu - 38.7Zn - 0.8Sn (CA 464)

Hard Temper

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 Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2221 - Tolerances, Copper and Copper Alloy Rods and Bars

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 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 E8 - Tension Testing of Metallic Materials

ASTM E18 - Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials

ASTM E36 - Chemical Analysis of Brasses

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

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Specifications:

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

3. TECHNICAL REQUIREMENTS:

SAE Technical Board rules provide that: "All technical reports, including standards approved by the Board, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard, recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

- 3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E36, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other approved analytical methods:

	min	max
Copper	59.00	62.00
Tin	0.50	1.00
Lead	--	0.20
Iron	--	0.10
Other Elements, each	--	0.05
Other Elements, total	--	0.10
Zinc	remainder	

- 3.2 Condition: Cold finished, hard temper.

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

- 3.3.1 Tensile Properties: Shall be as specified in Table 1, determined in accordance with ASTM E8:

TABLE I

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
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, min	Elongation in 50.8 mm or 4D %, min
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 1.00 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 the purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.

3.5 Tolerances: Unless otherwise specified, tolerances shall conform to AMS 2221 as applicable to nonrefractory alloys.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples 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 perform such confirmatory testing as he deems 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.

4.3 Sampling: Shall be in accordance with ASTM B249 and the following:

4.3.1 The axis of tensile test specimens shall be located approximately midway between center and surface of product over 1.500 in. (38.10 mm) in nominal diameter or distance between parallel sides.

4.3.2 Specimens for embrittlement test shall be full cross-section of the product and shall have length of approximately 6 in. or 150 mm or twice the diameter or least distance between parallel sides, whichever is greater.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report showing the results of tests on each lot to determine conformance to the technical requirements of this specification. This report shall include the purchase order number, lot number, material specification number and its revision letter, size, and quantity from each lot.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number and its revision letter, contractor or other direct supplier of material, part number, quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: If any specimen used in the above tests fails to meet the specified requirements, disposition of the product 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 product represented and no additional testing shall be permitted. Results of all tests shall be reported.