Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 4610J
Superseding AMS 4610H

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UNS C36000

BRASS RODS AND BARS, FREE-CUTTING
61.5Cu - 3.1Pb - 35.4Zn
Half Hard

1. SCOPE:

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

1.2 Application: Primarily for automatic high-speed screw machine parts where free cutting characteristics are desirable.

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:

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	60.0 -	63.0
Lead	2.5 -	3.7
Iron	--	0.35
Other Elements, total	--	0.50
Zinc	remainder	

3.2 Condition: Cold finished, half-hard temper.

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

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

3.3.1.1 Rounds, Hexagons, and Octagons:

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 0.500, incl	60,000	28,000	10
Over 0.500 to 1.000, incl	55,000	25,000	15
Over 1.000 to 2.000, incl	50,000	20,000	20
Over 2.000	45,000	15,000	25

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 12.70, incl	414	193	10
Over 12.70 to 25.40, incl	379	172	15
Over 25.40 to 50.80, incl	345	138	20
Over 50.80	310	103	25

3.3.1.2 Squares and Rectangles:

TABLE II

Nominal Thickness Inches	Nominal Width Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 0.500, incl	Up to 1.000, incl	50,000	25,000	10
	Over 1.000 to 6.000, incl	45,000	17,000	15
Over 0.500 to 2.000, incl	Up to 2.000, incl	45,000	17,000	20
	Over 2.000 to 6.000, incl	40,000	15,000	20
Over 2.000	Over 2.000 to 4.000, incl	40,000	15,000	20

TABLE II (SI)

Nominal Thickness Millimetres	Nominal Width Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 12.70, incl	Up to 25.40, incl	345	172	10
	Over 25.40 to 152.40, incl	310	117	15
Over 12.70 to 50.80, incl	Up to 50.80, incl	310	117	20
	Over 50.80 to 152.40, incl	276	103	20
Over 50.80	Over 50.80 to 101.60, incl	276	103	20

3.3.2 Hardness: Should be as specified in Table III or equivalent, determined in accordance with ASTM E18, Ø but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.

TABLE III

Nominal Diameter or Distance Between Parallel Sides		Hardness, HRB		
Inches	Millimetres	Rounds	Hexagons Octagons	Squares Rectangles
Up to 1.000, incl	Up to 25.40, incl	65 - 85	60 - 80	50 - 80
Over 1.000 to 2.000, incl	Over 25.40 to 50.80, incl	60 - 80	50 - 70	40 - 70
Over 2.000	Over 50.80	60 - 80	45 - 65	40 - 70

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 4.3.3.1 shall withstand, without cracking, immersion in mercurous nitrate solution in accordance with ASTM B154, Procedure A.

3.4 Quality: The product, as received by the purchaser, shall be uniform in quality and condition, sound, Ø 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 Composition: One sample from each lot.

4.3.2 Tensile Properties: One sample from each lot.

4.3.2.1 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.

4.3.3 Embrittlement and Hardness: 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 in. (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 for chemical composition of each lot and the results of tests on each lot to determine conformance to the other 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, and 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.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Individual pieces or bundles shall have attached a durable tag marked with the purchase order number, AMS 4610J, and nominal size, or shall be boxed and the box marked with the same information.