

UNS C36000

BRASS BARS AND RODS, 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 bars and rods. Rods 0.50 in. (12.5 mm) and under in nominal diameter or distance between parallel sides may be furnished in coils, when so ordered.

1.2 Applications: 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 SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2221 - Tolerances, Copper and Copper Alloy Bars and Rods
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 E478 - Chemical Analysis of Copper Alloys

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AMS 4610K

2.3 U.S. 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 478, by spectrographic methods in accordance with Federal Test Method Standard No. 151, Method 112, or by other analytical methods approved by purchaser:

| | 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 and 4.3.2.1.

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 (See 3.3.1.1.3) |
| 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 | 15 |

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 mm or 4D , min |
|---|---------------------------------|--|---------------------------------------|
| Up to 12.50, incl | 415 | 195 | 10 (See 3.3.1.1.3) |
| Over 12.50 to 25.00, incl | 380 | 170 | 15 |
| Over 25.00 to 50.00, incl | 345 | 140 | 20 |
| Over 50.00 | 310 | 105 | 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 (See 3.3.1.3) |
| | Over 1.000 to 6.000, incl | 45,000 | 17,000 | 15 (See 3.3.1.3) |
| 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 Millimeters | Tensile Strength MPa, min | Yield Strength at 0.2% Offset MPa, min | Elongation in 50 mm or 4D %, min |
|----------------------------------|------------------------------|---------------------------------|--|--|
| Up to 12.50, incl | Up to 25.00, incl | 345 | 170 | 10 (See 3.3.1.3) |
| | Over 25.00 to 150.00, incl | 310 | 115 | 15 (See 3.3.1.3) |
| Over 12.50 to 50.00, incl | Up to 50.00, incl | 310 | 115 | 20 |
| | Over 50.00 to 150.00, incl | 275 | 105 | 20 |
| Over 50.00 | Over 50.00 to 100.00, incl | 275 | 105 | 20 |

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

3.3.2 Hardness: Should be as specified in Table III 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 III

| Nominal Diameter or Distance Between Parallel Sides | | Hardness, HRB | | |
|--|---------------------------|---------------|----------------------|-----------------------|
| Inches | Millimetres | Rounds | Hexagons Octagons | Squares Rectangles |
| Up to 1.000, incl | Up to 25.00, incl | 65 - 85 | 60 - 80 | 50 - 80 |
| Over 1.000 to 2.000, incl | Over 25.00 to 50.00, incl | 60 - 80 | 50 - 70 | 40 - 70 |
| Over 2.000 | Over 50.00 | 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 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 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 heat or lot as applicable.

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.