AEROSPACE MATERIAL SPECIFICATION

AMS4610	REV. N

Issued 1939-12
Revised 2003-10
Reaffirmed 2014-04

Superseding AMS4610M

Brass, Free-Cutting Bars and Rods
61.5Cu - 35Zn - 3.1Pb
Half Hard (H02)
(Composition similar to UNS C36000)

RATIONALE

AMS4610N has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE:

1.1 Form:

This specification covers one type of copper alloy (brass) in the form of bars and rods.

1.2 Applications:

These products have been used typically for automatic high-speed screw machine parts where free-cutting characteristics are desirable, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS:

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2221 Tolerances, Copper and Copper Alloy Bars and Rods

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 154 Mercurous Nitrate Test for Copper and Copper Alloys
ASTM B 249 General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMS4610N

2.1 (Continued):

ASTM B 249	General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings
ASTM B 858	Ammonia Vapor Test for Determination of Susceptibility to Stress Corrosion Cracking in Copper Alloys
ASTM E 8	Tension Testing of Metallic Materials
ASTM E 8M	Tension Testing of Metallic Materials (Metric)
ASTM E 478	Chemical Analysis of Copper Alloys

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 478, by spectrochemical methods, or by other analytical methods acceptable to purchaser.

TABLE 1 - Composition

Element (3.1.1)	min	max
Copper	60.0	63.0
Lead	2.5	3.7
Iron	--	0.35
Sum of Named Elements (3.1.3)	99.5	--
Zinc (See 3.1.2)	remainder	--

3.1.1 These composition limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements by agreement between the manufacturer or supplier and purchaser.

3.1.2 Zinc may be reported as “remainder”, as the difference between the sum of results for all elements and 100%, or as the result of direct analysis.

3.1.3 When all named elements in Table 1 are analyzed, the sum shall be 99.5 percent minimum, but such determination is not required for routine acceptance of each lot.

3.2 Condition:

Cold finished, half-hard (H02) temper (See 8.3).

3.3 Properties:

The product shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as shown in Table 2 or Table 3, determined in accordance with ASTM E 8 or ASTM E 8M except as specified in 4.3.2.1.

3.3.1.1 Rounds, Hexagons, and Octagons:

TABLE 2A - Minimum Tensile Properties, Inch/Pound Units

Nominal Diameter or Distance Between Parallel Sides Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.500, incl	60.0	28.0	10 (See 3.3.1.3)
Over 0.500 to 1.000, incl	55.0	25.0	15
Over 1.000 to 2.000, incl	50.0	20.0	20
Over 2.000	45.0	15.0	15

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Diameter or Distance Between Parallel Sides Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 12.70, incl	414	193	10 (See 3.3.1.3)
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	15

3.3.1.2 Squares and Rectangles:

TABLE 3A - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness Inches	Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.500, incl	Up to 1.000, incl	50.0	25.0	10 (See 3.3.1.3)
	Over 1.000 to 6.000, incl	45.0	17.0	15 (See 3.3.1.3)
Over 0.500 to 2.000, incl	Up to 2.000, incl	45.0	17.0	20
	Over 2.000 to 6.000, incl	40.0	15.0	20
Over 2.000	Over	40.0	15.0	20

TABLE 3B - Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 12.70, incl	Up to 25.40, incl	345	172	10 (See 3.3.1.3)
	Over 25.40 to 152.40, incl	310	117	15 (See 3.3.1.3)
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

3.3.1.3 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 B 154, Procedure A, or the Ammonia Vapor Test in accordance with ASTM B 858M.

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 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 the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to specified requirements.

4.2 Classification of Tests:

All technical requirements are acceptance tests and shall be performed on each lot.

4.3 Sampling and Testing:

Shall be in accordance with ASTM B 249 or ASTM B 249M 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: One sample from each lot, unless otherwise agreed upon by purchaser and vendor.

4.3.3.1 Specimens for embrittlement test shall be full cross-sections 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.