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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4634A

Issued JAN 1993
Revised APR 2001
Reaffirmed APR 2006

Superseding AMS 4634

Aluminum Bronze Bars, Rods, and Forgings
90.5Cu - 7.5Al - 1.9Si
Stress Relieved

(Composition similar to UNS C64200)

1. SCOPE:

1.1 Form:

This specification covers an aluminum bronze alloy in the form of bars, rods, forgings, and forging stock.

1.2 Application:

These products have been used typically for parts requiring strength and wear resistance at moderate temperatures, 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 canceled 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.

AMS 2808 Identification, Forgings

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
TO PLACE A DOCUMENT ORDER: (724) 776-4970 FAX: (724) 776-0790
SAE WEB ADDRESS: http://www.sae.org

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

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
ASTM B 249M	General Requirements for Wrought Copper and Copper Alloy Rod, Bar, Shapes, and Forgings (Metric)
ASTM B 858M	Determination of Susceptibility to Stress Corrosion Cracking in Copper Alloys Using an Ammonia Vapor Test
ASTM E 8	Tension Testing of Metallic Materials
ASTM E 8M	Tension Testing of Metallic Materials (Metric)
ASTM E 10	Brinell Hardness of Metallic Materials
ASTM E 18	Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials
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
Aluminum	6.3	7.6
Silicon	1.5	2.2
Iron	--	0.30
Nickel (incl Cobalt)	--	0.25
Manganese	--	0.10
Tin	--	0.20
Zinc	--	0.50
Lead	--	0.05
Copper (incl Silver)		(See 3.1.2)
Sum of Named Elements (3.1.3)	99.5	--

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 Copper may be reported as “remainder”, or 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% minimum, but such determination is not required for routine acceptance of each lot.

3.2 Condition:

The product shall be supplied in the following condition:

3.2.1 Bars and Rods: Hot rolled or drawn, or extruded, cold finished if necessary, and stress relieved or stress relief annealed to meet the requirements of 3.3.1.1. (HR50) (See 8.2).

3.2.2 Forgings: Stress relieved.

3.2.3 Forging Stock: As ordered by the forging manufacturer.

3.3 Properties:

The product shall conform to the following requirements:

3.3.1 Bars, Rods, and Forgings:

3.3.1.1 Tensile Properties:

3.3.1.1.1 Bars and Rods: Shall be as specified in Table 2, determined in accordance with ASTM E 8 or ASTM E 8M.

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

Nominal Diameter or Distance Between Parallel Sides, Inches	Tensile Strength ksi	Yield Strength at 0.5% Extension Under Load ksi	Elongation in 4D %
Up to 0.500, incl	90.0	45.0	9
Over 0.500 to 1.000, incl	85.0	45.0	12
Over 1.000 to 2.000, incl	80.0	42.0	12
Over 2.000 to 3.000, incl	75.0	35.0	15

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Diameter or Distance Between Parallel Sides, Millimeters	Tensile Strength MPa	Yield Strength at 0.5% Extension Under Load MPa	Elongation in 4D %
Up to 12.70, incl	621	310	9
Over 12.70 to 25.40, incl	586	310	12
Over 25.40 to 50.80, incl	552	290	12
Over 50.80 to 76.20, incl	517	241	15

3.3.1.1.2 Forgings: Shall be as agreed upon by purchaser and vendor.

3.3.1.2 Hardness: Shall be as follows:

3.3.1.2.1 Surface: Not lower than 130 HB/10/1000, or equivalent, (See 8.3) determined in accordance with ASTM E 10; on rounds; a flat, as necessary for accuracy, may be made.

3.3.1.2.2 Internal: Not lower than 80 HRB, or equivalent, (See 8.3) determined in accordance with ASTM E 18 at mid-radius or quarter thickness.

3.3.1.3 Embrittlement: Specimens as in 4.3.1.2 and 4.3.2.1 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.

3.3.2 Forging Stock: Shall be as agreed upon by purchaser and vendor.

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:

Bars and rods shall conform to ASTM B 249 or ASTM B 249M as applicable.

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 the specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.3.1.1), hardness (3.3.1.2), and tolerances (3.5) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Embrittlement (3.3.1.3) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

Shall be in accordance with the following:

4.3.1 Bars and Rods: ASTM B 249 or ASTM B 249M and the following:

4.3.1.1 Specimens for tensile testing of bars and rods over 1.500 inches (38.10 mm) in nominal diameter or distance between parallel sides shall have their axes located approximately midway between center and surface.

4.3.1.2 Specimens for embrittlement test shall be full cross-section of the product and shall have a length of approximately 6 inches (152 mm) or twice the diameter or least distance between parallel sides, whichever is greater.

4.3.2 Forgings: Two samples from each lot; a lot shall be all forgings of one part number processed consecutively and presented for vendor's inspection at one time.

4.3.2.1 Specimens for embrittlement test shall be of any convenient size and shape agreed upon by purchaser and vendor or an entire forging may be used.

4.4 Reports:

4.4.1 The vendor of bars, rods, and forgings shall furnish with each shipment a report showing the results of tests for chemical composition of each melt and for tensile properties and hardness of each lot and stating that the product conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS 4634A, size or part number, and quantity. If forgings are supplied, the part number and the size and melt source of stock used to make the forgings shall also be included.

4.4.2 The vendor of forging stock shall furnish with each shipment a report stating that the chemical composition of the stock conforms to the specified requirements. This report shall include the purchase order number, melt number, AMS 4634A, size, and quantity.

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. Results of all tests shall be reported.