AEROSPACE MATERIAL SPECIFICATION

AMS4634™	REV. E

Issued 1993-01
Reaffirmed 2004-06
Revised 2025-02

Superseding AMS4634D

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

(Composition similar to UNS C64200)

RATIONALE

AMS4634E results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (see 3.3.1.1.2, 4.4.2, and 8.4), remove redundant wording (see 3.3.1.1.1), update nomenclature related to Residual Stress previously identified as Embrittlement (see 3.3.1.3, 4.2.2, 4.3.1.2, and 4.3.2.1), relocate Definitions (see 2.3), and update Applicable Documents (see Section 2), Composition (see 3.1), Hardness (see 3.3.1.2), and Ordering Information (see 8.5).

1. SCOPE

1.1 Form

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

1.1.1 This specification covers products up to 3.000 inches (76.20 mm) in diameter or distance between parallel sides and forging stock of any size (see 8.5).

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 cancelled and no superseding document has been specified, the last published issue of that document shall apply.

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**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS4634E/

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2808 Identification, Forgings

AS7766 Terms Used in Aerospace Metals Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B154 Mercurous Nitrate Test for Copper Alloys

ASTM B249/B249M General Requirements for Wrought Copper and Copper-Alloy Rod, Bar, Shapes, and Forgings

ASTM B601 Temper Designations for Copper and Copper Alloys -- Wrought and Cast

ASTM B858 Ammonia Vapor Test for Determining Susceptibility to Stress Corrosion Cracking in Copper Alloys

ASTM E8/E8M Tension Testing of Metallic Materials

ASTM E10 Brinell Hardness of Metallic Materials

ASTM E18 Rockwell Hardness of Metallic Materials

ASTM E478 Chemical Analysis of Copper Alloys

2.3 Definitions

Terms used in AMS are defined in AS7766.

2.3.1 Copper temper designations are defined in ASTM B601.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with ASTM E478 or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element (see 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)	remainder	
Sum of Named Elements (see 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 the purchaser (see 8.5).

3.1.2 Copper may be reported as “remainder,” as the difference between the sum of results for all analyzed 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 conditions:

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 2.3.1).

3.2.2 Forgings

Stress relieved.

3.2.3 Forging Stock

As ordered by the forging manufacturer (see 8.5).

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 E8/E8M.

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 Mechanical property requirements for product outside of the range covered by 1.1.1 or Table 2 shall be agreed upon between the purchaser and producer and reported per 4.4.2. (see 8.5)

3.3.1.1.3 Forgings

Shall be as agreed upon by the purchaser and producer (see 8.5).

3.3.1.2 Hardness

Shall be as follows:

3.3.1.2.1 Surface

Not lower than 130 HB/10/1000, determined in accordance with ASTM E10; on rounds, a flat, as necessary for accuracy, may be made.

3.3.1.2.2 Internal

Not lower than 80 HRB, determined in accordance with ASTM E18, at mid-radius or quarter thickness.

3.3.1.3 Residual Stress

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 B154, Procedure A, or the Ammonia Vapor Test in accordance with ASTM B858.

3.3.2 Forging Stock

Shall be as agreed upon by the purchaser and producer (see 8.5).

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 imperfections detrimental to usage of the product.

3.5 Tolerances

Bars and rods shall conform to ASTM B249/B249M as applicable.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The 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 (see 3.1), tensile properties (see 3.3.1.1), hardness (see 3.3.1.2), and tolerances (see 3.5) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests

Residual stress (see 3.3.1.3) is a periodic test and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Shall be in accordance with the following:

4.3.1 Bars and Rods

ASTM B249/B249M 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 residual stress testing 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 the producer's inspection at one time.

4.3.2.1 Specimens for residual stress testing shall be of any convenient size and shape agreed upon by the purchaser and producer or an entire forging may be used (see 8.5).

4.4 Reports

4.4.1 The producer of bars, rods, and forgings shall furnish with each shipment a report showing the results of tests for composition of each melt and for tensile properties and hardness of each lot. The report shall state that the product conforms to the other technical requirements and shall include the purchase order number, lot number, AMS4634E, 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 When material produced to this specification is outside the size range specified in 1.1, or has exceptions taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS4634E(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.4.3 The producer 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, AMS4634E, size, and quantity.