SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

AMS 4248B

Issued JAN 1987
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Superseding AMS 4248A

Aluminum Alloy Hand Forgings and Rolled Rings
1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-T652)
Solution Heat Treated, Stress Relief Compressed, and Precipitation Heat Treated

(Composition similar to UNS A96061)

RATIONALE

AMS 4248B is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of hand forgings and rolled rings.

1.2 Application

These products have been used typically for complex shaped parts requiring moderate strength and good forgeability of the alloy and where stability is required during machining, but usage is not limited to such applications. Corrosion resistance of this alloy is superior to that of aluminum alloys having copper as the principal alloying element.

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

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings AMS 2808Identification, Forgings
AMS 2772	Heat Treatment of Aluminum Alloy Raw Materials.
AS 1990	Aluminum Alloy Tempers

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

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 B 594	Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM E 1417	Liquid Penetrant Examination

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355.

TABLE 1 - COMPOSITION

Element	min	max
Silicon	0.40	0.8
Iron		0.7
Copper	0.15	0.40
Manganese		0.15
Magnesium	0.8	1.2
Chromium	0.04	0.35
Zinc	--	0.25
Titanium	--	0.15
Other Elements	--	0.05
Other Elements	--	0.15
Aluminum	remainder	

3.2 Condition

Solution heat treated, stress relieved by compression to produce 1 to 5% permanent set, and precipitation heat treated. Heat treatments shall be performed in accordance with AMS-2772 to the T652 temper. (See AS 1990)

3.2.1 Forge Stock As ordered by the forging manufacturer.

3.3 Properties

The product shall conform to the following requirements, determined in accordance with AMS 2355 on the mill produced size:

3.3.1 Tensile Properties

Shall be as follows:

3.3.1.1 Hand Forgings

Specimens, machined from forgings having an essentially square or rectangular cross-section heat treated in the indicated thickness, shall have the properties shown in Table 2A or 2B provided the as-forged thickness does not exceed 8 inches (203 mm) and the cross-sectional area is not over 256 square inches (1652 cm^2).

TABLE 2A - MINIMUM TENSILE PROPERTIES, HAND FORGINGS, INCH/POUNDS UNITS

Nominal Thickness at Time of Heat Treatment Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in or 4D %
Up to 2, incl	Longitudinal	38.0	35.0	10
	Long.-Trans.	38.0	35.0	8
Over 2 to 4, incl	Longitudinal	38.0	35.0	10
	Long.-Trans.	38.0	35.0	8
	Short-Trans.	37.0	33.0	5
Over 4 to 8, incl	Longitudinal	37.0	34.0	8
	Long.-Trans.	37.0	34.0	6
	Short-Trans.	35.0	32.0	4

TABLE 2B - MINIMUM TENSILE PROPERTIES, HAND FORGINGS, SI UNITS

Nominal Thickness at Time of Heat Treatment Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in or 4D %
Up to 51, incl	Longitudinal	262	241	10
	Long.-Trans.	262	241	8
Over 51 to 102, incl	Longitudinal	262	241	10
	Long.-Trans.	262	241	8
	Short-Trans.	255	228	5
Over 102 to 203, incl	Longitudinal	255	234	8
	Long.-Trans.	255	234	6
	Short-Trans.	241	221	4

3.3.1.2 Rolled Rings

Specimens, machined in the indicated orientation from rings 3.5 inches (89 mm) and under in nominal thickness at time of heat treatment and having an OD-to-wall thickness ratio of 10:1 or greater, shall have the properties show in Table 3A or 3B.

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

Specimen Orientation	Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 4D %
Tangential (Note 1)	Up to 3.5, incl	38.0	35.0	
	Up to 2.5, incl			10
	Over 2.5 to 3.5, incl			8
Axial (Note 2)	Up to 3.5, incl	38.0	35.0	
	Up to 2.5, incl			8
	Over 2.5 to 3.5, incl			6
Radial (Note 3)	Up to 3.5, incl	37.0	33.0	
	Up to 2.5, incl			5
	Over 2.5 to 3.5, incl			4

(Note 1) Tangential: Axis of specimen tangential to ring OD (axis parallel to direction of rolling).
(Note 2) Axial: Axis of specimen parallel to axis of ring (axis transverse to direction of rolling).
(Note 3) Radial: Axis of specimen parallel to radius of ring, when specified.

TABLE 3B - Minimum Tensile Properties, SI Units

Specimen Orientation	Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 4D %
Tangential (Note 1)	Up to 89, incl	262	241	
	Up to 64, incl			10
	Over 64 to 89, incl			8
Axial (Note 2)	Up to 89, incl	262	241	
	Up to 64, incl			8
	Over 64 to 89, incl			6
Radial (Note 3)	Up to 89, incl	255	228	
	Up to 64, incl			5
	Over 64 to 89, incl			4

(Note 1) Tangential: Axis of specimen tangential to ring OD (axis parallel to direction of rolling).
(Note 2) Axial: Axis of specimen parallel to axis of ring (axis transverse to direction of rolling).
(Note 3) Radial: Axis of specimen parallel to radius of ring, when specified.

3.3.1.3 Special Purpose Forgings

Tensile property requirements for specimens cut from special purpose forgings or from forgings or rolled rings beyond the size and configuration limits of 3.3.1.1 or 3.3.1.2 shall be as specified on the drawing or as agreed upon purchaser and vendor.

3.4 Quality

Forgings and rolled rings, 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 forgings and rolled rings.

3.4.1 Forgings and rolled rings shall be subjected to a caustic etch followed by visual examination of the product surfaces for unacceptable discontinuities, such as seams, laps, bursts, and quench cracks. Surface discontinuities which can be removed so that they do not reappear on etching and the required section thickness can be maintained are acceptable.

3.4.2 When specified, all forgings and rolled rings shall be subjected to ultrasonic inspection in accordance with ASTM B 594 and shall meet ultrasonic Class A.

3.4.3 When specified, forgings and rolled rings shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.5 Tolerances

Stock for forgings or rings shall conform to all applicable requirements of ANSI H 35.1 or ANSI H 35.2M and or customer requirements.