



AEROSPACE MATERIAL SPECIFICATION

AMS4247™**REV. D**

Issued 1987-01
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Superseding AMS4247C

Aluminum Alloy, Hand Forgings
7.7Zn - 2.4Mg - 1.6Cu - 0.16Cr (7049-T7352)
Solution Heat Treated, Stress Relieved by Compression, and
Precipitation Heat Treated
(Composition similar to UNS A97049)

RATIONALE

AMS4247D results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (see 3.3.1.2 and 8.5), relocate Definitions (see 2.4), and update significant figures throughout document, Applicable Documents (see Section 2), provisions for special purpose forgings (see 3.3.1.1), Hardness (see 8.2), and Ordering Information (see 8.6).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of hand forgings up to 5.000 inches (127.00 mm), inclusive, in nominal thickness at the time of heat treatment, procured to inch/pound dimensions (see 8.6).

1.2 Application

These forgings have been used typically for parts requiring a combination of high strength and resistance to stress-corrosion cracking and for parts requiring stability during machining, 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 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.

AMS2355 Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

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<https://www.sae.org/standards/content/AMS4247D/>

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

AMS2808 Identification, Forgings

AS7766 Terms Used in Aerospace Metals Specifications

2.2 ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI H35.1/H35.1M Standard Alloy and Temper Designation System For Aluminum

2.3 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 B594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products

ASTM B660 Packaging/Packing of Aluminum and Magnesium Products

ASTM E1417/E1417M Liquid Penetrant Testing

2.4 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS2355.

Table 1 - Composition

Element	Min	Max
Silicon	--	0.25
Iron	--	0.35
Copper	1.2	1.9
Manganese	--	0.20
Magnesium	2.0	2.9
Chromium	0.10	0.22
Zinc	7.2	8.2
Titanium	--	0.10
Other Elements, each	--	0.05
Other Elements, total	--	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 to the T7352 condition (refer to ANSI H35.1/H35.1M). Heat treatments shall be performed in accordance with AMS2772.

3.3 Properties

Forgings shall conform to the following requirements, determined in accordance with AMS2355 on the mill product:

3.3.1 Tensile Properties

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 2 provided as-forged thickness does not exceed 5.000 inches (127.00 mm).

Table 2A - Minimum tensile properties, inch/pound units

Nominal Thickness at Time of Heat Treatment Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 2.000, incl	Longitudinal	71.0	59.0	9
	Long-Trans.	71.0	57.0	4
Over 2.000 to 3.000, incl	Longitudinal	71.0	59.0	9
	Long-Trans.	71.0	57.0	4
	Short-Trans.	69.0	56.0	3
Over 3.000 to 4.000, incl	Longitudinal	69.0	57.0	8
	Long-Trans.	69.0	54.0	3
	Short-Trans.	67.0	53.0	2
Over 4.000 to 5.000, incl	Longitudinal	67.0	54.0	7
	Long-Trans.	67.0	53.0	3
	Short-Trans.	66.0	51.0	2

Table 2B - Minimum tensile properties, SI units

Nominal Thickness at Time of Heat Treatment Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 51.00, incl	Longitudinal	490	407	9
	Long-Trans.	490	393	4
Over 51.00 to 76.00, incl	Longitudinal	490	407	9
	Long-Trans.	490	393	4
	Short-Trans.	476	386	3
Over 76.00 to 102.00, incl	Longitudinal	476	393	8
	Long-Trans.	476	372	3
	Short-Trans.	462	365	2
Over 102.00 to 127.00, incl	Longitudinal	462	372	7
	Long-Trans.	462	365	3
	Short-Trans.	455	352	2

3.3.1.1 Tensile specimens cut from special purpose forgings shall have tensile properties as specified on the drawing or as agreed upon by the purchaser and producer (see 8.6).

3.3.1.2 Mechanical property requirements for product outside of the range covered by 1.1 and 3.3.1 shall be agreed upon between the purchaser and producer and reported per 4.4.1 (see 8.6).

3.3.2 Conductivity

Shall be as follows:

- 3.3.2.1 If the conductivity is 40.0% IACS (International Annealed Copper Standard) or higher and tensile properties meet specified requirements, forgings are acceptable.
- 3.3.2.2 If the conductivity is 38.0 to 39.9% IACS, if the tensile properties meet specified requirements, and if the longitudinal yield strength does not exceed the specified minimum value by more than 9.9 ksi (68 MPa), the forgings are acceptable.
- 3.3.2.3 If the conductivity is below 40.0% IACS and the longitudinal yield strength exceeds the specified minimum value by more than 9.9 ksi (68 MPa), the forgings shall be given additional precipitation heat treatment. If, after such treatment, the forgings meet the requirements of 3.3.1 and 3.3.2.1 or 3.3.2.2, the forgings are acceptable.
- 3.3.2.4 If the conductivity is below 38.0% IACS, the forgings are not acceptable and shall be reprocessed regardless of tensile property level.

3.3.3 Stress-Corrosion Resistance

Specimens cut from forgings shall show no evidence of stress-corrosion cracking when stressed to 75% of the specified minimum long-transverse yield strength.

3.4 Quality

Forgings, 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 forgings.

- 3.4.1 All forgings shall be subjected to ultrasonic inspection in accordance with ASTM B594 and shall meet Class A.
- 3.4.2 When specified, forgings shall be subjected to fluorescent penetrant inspection in accordance with ASTM E1417/E1417M. Standards for acceptance shall be established by the cognizant engineering organization.

3.5 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of forgings 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 forgings conform to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (see 3.1), tensile properties (see 3.3.1), conductivity (see 3.3.2), ultrasonic soundness (see 3.4.1), and, when specified, fluorescent penetrant inspection (see 3.4.2) are acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests

Stress-corrosion resistance (see 3.3.3) is a periodic test and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.