

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

MAM 4247

Issued 1-1-87

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

UNS A97049

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of hand forgings procured to metric dimensions. AMS 4247 is the equivalent, specified in inch/pound units, of this MAM.

1.2 Application: Primarily for parts requiring a combination of high strength and resistance to stress-corrosion cracking and where stability is required during machining.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

MAM 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units

AMS 2375 - Control of Forgings Requiring First Article Approval

AMS 2645 - Fluorescent Penetrant Inspection

AMS 2808 - Identification, Forgings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B594 - Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications

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2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

2.3.2 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with MAM 2355:

	min	max
Zinc	7.2	8.2
Magnesium	2.0	2.9
Copper	1.2	1.9
Chromium	0.10	0.22
Iron	--	0.35
Silicon	--	0.25
Manganese	--	0.20
Titanium	--	0.10
Other Impurities, each	--	0.05
Other Impurities, 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. Heat treatments shall be performed in accordance with MIL-H-6088.

3.3 Properties: Forgings shall conform to the following requirements, determined in accordance with MAM 2355:

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 I provided the as-forged thickness does not exceed 125 millimetres.

TABLE I

Nominal Thickness at Time of Heat Treatment Millimetres	Specimen Orientation	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 5D, %, min
Up to 50, incl	Longitudinal	490	405	8
	Long-Trans.	490	395	3
Over 50 to 75, incl	Longitudinal	490	405	8
	Long-Trans.	490	395	3
	Short-Trans.	475	385	2
Over 75 to 100, incl	Longitudinal	475	395	7
	Long-Trans.	475	370	2
	Short-Trans.	460	365	1
Over 100 to 125, incl	Longitudinal	460	370	6
	Long-Trans.	460	365	2
	Short-Trans.	455	350	1

3.3.1.1 Tensile specimens cut from special purpose forgings or from forgings beyond the size and configuration limits of 3.3.1 shall have tensile properties as specified on the drawing or as agreed upon by purchaser and vendor.

3.3.2 Hardness: Should be not lower than 135 HB/10/500 or 140 HB/10/1000 but forgings shall not be rejected on the basis of hardness if the tensile property requirements are met.

3.3.3 Conductivity: Shall be as follows:

3.3.3.1 If the conductivity is 23.2 MS/m or higher and tensile properties meet specified requirements, forgings are acceptable.

3.3.3.2 If the conductivity is 22.0 - 23.1 MS/m, if the tensile properties meet specified requirements, and if the longitudinal yield strength does not exceed the specified minimum by more than 70 MPa, the forgings are acceptable.

3.3.3.3 If the conductivity is below 23.2 MS/m and the longitudinal yield strength exceeds the specified minimum value by more than 70 MPa, the forgings shall be given additional precipitation heat treatment. If, after such treatment, the forgings meet the requirements of 3.3.1 and 3.3.3.1 or 3.3.3.2, the forgings are acceptable.

3.3.3.4 If the conductivity is below 22.0 MS/m, the forgings are not acceptable and shall be reprocessed regardless of tensile property level.

3.3.4 Stress-Corrosion Resistance: Specimens cut from forgings shall show no evidence of stress-corrosion cracking when stressed to 75% of the specified minimum longitudinal yield strength.

3.4 Quality: Forgings, 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.

3.4.1 All forgings shall be subjected to ultrasonic inspection in accordance with ASTM B594 and shall meet Ultrasonic Class A.

3.4.2 When specified, forgings shall be subjected to fluorescent penetrant inspection in accordance with AMS 2645. Standards for acceptance shall be as agreed upon by purchaser and vendor.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of forgings shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the forgings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile properties (3.3.1), conductivity (3.3.3) and ultrasonic soundness (3.4.1) and, when specified, fluorescent penetrant inspection (3.4.2) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for hardness (3.3.2) and stress-corrosion resistance (3.3.4) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification when AMS 2375 is specified are classified as preproduction tests and shall be performed prior to or on the first-article shipment of a forging to a purchaser, when a change in material, processing, or both requires reapproval as in 4.4, and when purchaser deems confirmatory testing to be required.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling: Shall be in accordance with MAM 2355.

4.4 Approval: When specified, approval and control of forgings shall be in accordance with AMS 2375.

4.5 Reports: