

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 4342A

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Superseding AMS 4342

ALUMINUM ALLOY EXTRUSIONS
6.2Zn - 2.3Cu - 2.2Mg - 0.12Zr (7050-T74511) (Formerly -T736511)
Solution Heat Treated, Stress Relieved, and Overaged

UNS A97050

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of extruded bars, rods, wire, shapes, and tubing.

1.2 Application: Primarily for structural applications requiring high mechanical properties and good resistance to stress-corrosion cracking.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS and MAM) 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 2205 - Tolerances, Aluminum Alloy and Magnesium Alloy Extrusions

MAM 2205 - Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Extrusions

AMS 2350 - Standards and Test Methods

AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings

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- 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

ASTM G34 - Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)

ASTM G47 - Determining Susceptibility to Stress-Corrosion Cracking of High-Strength Aluminum Alloy Products

- 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

MIL-STD-1537 - Electrical Conductivity Test for Measurement of Heat Treatment of Aluminum Alloys, Eddy Current Method

3. TECHNICAL REQUIREMENTS:

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

	min	max
Zinc	5.7	- 6.7
Copper	2.0	- 2.6
Magnesium	1.9	- 2.6
Zirconium	0.08	- 0.15
Iron	--	0.15
Silicon	--	0.12
Manganese	--	0.10
Titanium	--	0.06
Chromium	--	0.04
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

- 3.2 Condition: Solution heat treated, stress-relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, and overaged.

- 3.2.1 Extrusions shall be supplied with an as-extruded surface finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within the dimensional tolerances.

3.2.2 The product may receive minor straightening, after stretching, of an amount necessary to meet the requirements of 3.6.

3.3 Heat Treatment: Shall be performed as follows, using equipment and exercising controls specified in MIL-H-6088:

3.3.1 Solution Heat Treatment: Heat to $890^{\circ}\text{F} \pm 10$ ($475^{\circ}\text{C} \pm 5$), hold at heat for a time commensurate with thickness but not less than 15 min. and quench in water.

3.3.2 Overaging Heat Treatment: No specific heat treatment is specified but it is recommended that extrusions be overaged by heating to $250^{\circ}\text{F} \pm 10$ ($120^{\circ}\text{C} \pm 5$), holding at heat for 1 - 24 hr, further heating to $350^{\circ}\text{F} \pm 10$ ($175^{\circ}\text{C} \pm 5$), holding at heat for 10 hr ± 1 , and cooling in air.

3.4 Properties: Extrusions, other than tubing, 5.000 in. (125.00 mm) and under in nominal diameter or thickness and 32 sq in. (205 cm²) and under in cross-sectional area and tubing 3.000 in. (75.00 mm) and under in wall thickness and 20 sq in. (130 cm²) and under in cross-sectional area shall conform to the following requirements; tensile properties and exfoliation corrosion resistance shall be determined in accordance with AMS 2355; requirements for sizes over these limits shall be as agreed upon by purchaser and vendor:

3.4.1 Tensile Properties: Shall be as follows, determined on specimens taken in the longitudinal direction:

Tensile Strength, min	73,000 psi (505 MPa)
Yield Strength at 0.2% Offset, min	63,000 psi (435 MPa)
Elongation in 4D, min	7%
Elongation in 5D, min	6%

3.4.2 Corrosion Resistance: Resistance to stress-corrosion cracking and to exfoliation corrosion shall be acceptable if the extrusions conform to the requirements of 3.4.2.1 and 3.4.2.2.

3.4.2.1 Electrical Conductivity: Shall be not lower than 38.0% IACS (International Annealed Copper Standard) (22.0 MS/m), determined in accordance with MIL-STD-1537 on the surface of the test coupon prior to turning.

3.4.2.2 Stress-Corrosion Susceptibility Factor: Shall be not greater than 32.0 (220), determined by subtracting the electrical conductivity, AA.A IACS (12 x BB.B MS/m) from the longitudinal yield strength, XX.X ksi (YYY MPa).

Examples:

Inch/Pound Units	68.2 ksi - 38.1% IACS = 30.1	Acceptable
	71.5 ksi - 38.2% IACS = 33.3	Unacceptable
SI Units	470 MPa - 12 x 22 MS/m = 206	Acceptable
	493 MPa - 12 x 22 MS/m = 229	Unacceptable

3.4.2.3 Extrusions not conforming to 3.4.2.1 and 3.4.2.2 may be given additional overaging heat treatment and retested to determine conformance to 3.4.1, 3.4.2.1, and 3.4.2.2.

3.4.3 Exfoliation Corrosion Resistance: Specimens cut from extrusions shall show a level of exfoliation corrosion, at a T/10 plane, not greater than that pictured in Photo B, Fig. 2, of ASTM G34-72.

3.4.4 Stress-Corrosion Resistance: Specimens cut from extrusions 0.750 in. (18.75 mm) and over in nominal thickness shall meet the requirements of ASTM G47 when stressed in the short-transverse direction at 35,000 psi (24 MPa).

3.5 Quality: Extrusions, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign material and from internal and external imperfections detrimental to usage of the extrusions.

3.5.1 When specified, each bar, rod, and shape shall be subjected to ultrasonic inspection in accordance with ASTM B594 and shall meet the following requirements:

3.5.1.1 Each bar, rod, and shape weighing 600 lb (300 kg) and under and having a maximum width-to-thickness ratio of 10:1 shall meet the following ultrasonic class requirements:

Nominal Thickness		Ultrasonic Class
Inches	Millimetres	
0.500 - 1.500, excl	12.50 - 37.50, excl	B
1.500 and over	37.50 and over	A

3.5.1.2 The ultrasonic class for extrusions weighing over 600 lb (300 kg) or in excess of 10:1 maximum width-to-thickness ratio shall be as agreed upon by purchaser and vendor.

3.6 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2205 or MAM 2205.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of extrusions 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 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the extrusions 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 (3.4.1), corrosion resistance (3.4.2), and tolerances (3.6) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for exfoliation-corrosion resistance (3.4.3) and stress-corrosion resistance (3.4.4) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355.

4.4 Reports:

4.4.1 The vendor of extrusions shall furnish with each shipment a report stating that the extrusions conform to the chemical composition specified, showing results of tests on each lot to determine conformance to the other acceptance test requirements, and stating that the extrusions conform to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 4342A, size or section identification number and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 4342A, contractor or other direct supplier of extrusions, part number, and quantity. When extrusions for making parts are produced or purchased by the parts vendor, that vendor shall inspect each lot of extrusions to determine conformance to the requirements of this specification and shall include in the report either a statement that the extrusions conform or copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Extrusions shall be identified as follows:

5.1.1 Each straight bar, rod, and tube 0.500 in. (12.50 mm) and over in nominal OD or least width of flat surface and each straight shape with configuration allowing access to a flat surface at least 0.500 in. (12.50 mm) wide recessed not more than 1/8 in. (3 mm) below the outline of the shape shall be marked in a row of characters recurring at intervals not greater than 3 ft (900 mm) with the alloy number and temper, AMS 4342A, and manufacturer's identification. The inspection lot number shall be included in the row marking or shall be marked near one end. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be sufficiently stable to withstand normal handling. The markings shall have no deleterious effect on the extrusions or their performance.