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400 Commonwealth Dr., Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

AMS 4345

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Submitted for recognition as an American National Standard

ALUMINUM ALLOY EXTRUSIONS
6.4Zn - 2.4Mg - 2.2Cu - 0.12Zr (7150-T77511)
Solution Heat Treated, Stress Relieved, and Overaged

UNS A97150

1. SCOPE:

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

1.2 Application: Primarily for structural applications requiring a combination of high tensile strength and compressive properties and good exfoliation-corrosion resistance.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications 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 Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
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

2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103.

ASTM B594 - Ultrasonic Inspection of Aluminum Alloy Products for Aerospace Applications
ASTM B660 - Packaging/Packing of Aluminum and Magnesium 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

3. TECHNICAL REQUIREMENTS:

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

	min	max
Zinc	5.9	6.9
Magnesium	2.0	2.7
Copper	1.9	2.5
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: Extruded, 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 may receive minor straightening after stretching of an amount necessary to meet the tolerance requirements of 3.6.

3.2.2 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.

3.3 Heat Treatment: Extrusions shall be solution heat treated by heating to 880° - 900°F (471° - 482°C), holding at heat for a time commensurate with section thickness, and rapidly cooling in a suitable quenching medium; overaging shall be performed at a temperature, for a time, and cooling as required to meet the requirements of 3.4 (See 8.1). Furnace surveys and calibration of temperature recorders and controllers shall be in accordance with MIL-H-6088.

3.4 Properties: Extrusions 2.000 inches (50.80 mm) and under in nominal Ø diameter or least thickness (wall thickness of tubing) with a maximum cross-sectional area of 20 square inches (129 cm^2), and a maximum circle size of 10 inches (254 mm) shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355; extrusions exceeding the above limits shall have properties as agreed upon by purchaser and vendor:

3.4.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

Nominal Diameter or Least Thickness (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Inches	Specimen Orientation	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 Inches or 4D %, min
Up to 0.250, excl	Longitudinal	85,000	78,000	7
0.250 to 0.499, incl	Longitudinal	87,000	82,000	8
	Long-Transverse	82,000	76,000	–
Over 0.499 to 0.750, excl	Longitudinal	88,000	83,000	9
	Long-Transverse	83,000	79,000	–
0.750 to 2.000, incl	Longitudinal	89,000	84,000	8
	Long-Transverse	83,000	78,000	–

TABLE I (SI)

Nominal Diameter or Least Thickness (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Millimetres	Specimen Orientation	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 6.35, excl	Longitudinal	586	538	7
6.35 to 12.67, incl	Longitudinal	600	565	8
	Long-Transverse	565	524	–
Over 12.67 to 19.05, excl	Longitudinal	607	572	9
	Long-Transverse	572	545	–
19.05 to 50.80, incl	Longitudinal	614	579	8
	Long-Transverse	572	538	–

3.4.2 Compressive Yield Strength: When specified, shall be as specified in Table II.

TABLE II

Nominal Diameter or Least Thickness (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Inches	Longitudinal Compressive Yield Strength psi, minimum
Up to 0.250, excl	78,000
0.250 to 0.499, incl	82,000
Over 0.499 to 0.750, excl	83,000
0.750 to 2.000, incl	84,000

TABLE II (SI)

Nominal Diameter or Least Thickness (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Millimetres	Longitudinal Compressive Yield Strength MPa, minimum
Up to 6.35, excl	538
6.35 to 12.67, incl	565
Over 12.67 to 19.05, excl	572
19.05 to 50.80, incl	579

3.4.3 Corrosion Resistance:

3.4.3.1 Exfoliation-Corrosion Resistance: Specimens from extrusions shall show exfoliation corrosion not greater than EB at a T/10 plane.

3.4.3.2 Stress-Corrosion Cracking: When specified, specimens cut from extrusions 0.750 inch (19.05 mm) and over in thickness and stressed in the short-transverse direction to 25,000 psi (172 MPa) shall show no evidence of stress-corrosion cracking.

3.4.4 Fracture Toughness: When specified, plane-strain fracture toughness (K_{Ic}) for the thickness range 0.750 - 2.000 inches (19.05 - 50.80 mm) shall be not less than 21 ksi$\sqrt{\text{inch}}$ (23.1 MPa$\sqrt{\text{m}}$) for the L-T test direction and 17 ksi$\sqrt{\text{inch}}$ (18.7 MPa$\sqrt{\text{m}}$) for the T-L test direction.

3.4.5 Electrical Conductivity: Should be not lower than 36.0% IACS (International Annealed Copper Standard) (20.9 MS/m), except that electrical conductivity shall be determined and reported but shall not be cause for rejection of the extrusions.

3.5 Quality: Extrusions, 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 extrusions.

3.5.1 When specified, bars, rods, and shapes shall be subjected to ultrasonic inspection in accordance with ASTM B594 and shall meet the following acceptance levels:

Nominal Diameter or Least Thickness		
Inches	Millimetres	Level
0.500 to 1.500, excl	12.70 to 38.10, excl	B
1.500 to 2.000, incl	38.10 to 50.80, incl	A

3.5.1.1 Standards for acceptance of bars, rods, and shapes over 2.000 inches (50.80 mm) in nominal diameter and for all tubing shall be as agreed upon by purchaser and vendor.

3.6 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: Tests to determine conformance to requirements for composition (3.1), longitudinal tensile properties (3.4.1), exfoliation-corrosion resistance (3.4.3.1), tolerances (3.6), and when specified, long-transverse tensile properties (3.4.1), compressive yield strength (3.4.2), stress-corrosion cracking (3.4.3.2), fracture toughness (3.4.4) and ultrasonic inspection (3.5.1) are classified as acceptance tests and shall be performed on each lot.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355.

4.4 Reports: The vendor of extrusions shall furnish with each shipment a report stating that the extrusions conform to the chemical composition and showing the results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, lot number, AMS 4345, size or section identification number, and quantity.

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