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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS-4344REV
A

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Superseding AMS-4344

ALUMINUM ALLOY EXTRUSIONS
5.6Zn - 2.5Mg - .1.6Cu - 0.23Cr (7175-T73511)
Solution Heat Treated, Stress Relieved, and Overaged

UNS A97175

1. SCOPE:

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

1.2 Application: Primarily for structural applications requiring a combination of high tensile properties, moderate fatigue strength, stress-corrosion resistance, and good fracture toughness.

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 publications shall be the issue in effect on the date of the purchase order.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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-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

AMS-2811 - Identification, Aluminum and Magnesium Alloy Wrought Products

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- 2.2 ASTM Publications: Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 645 - Plane Strain Fracture Toughness Testing of Aluminum Alloys
 ASTM B 660 - Packaging/Packing of Aluminum and Magnesium Products

- 2.3 U.S. Government Publications: Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

- 2.3.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

- 2.3.2 Military Standards:

MIL-STD-2154 - Inspection, Ultrasonic, Wrought Metals, Process for

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	5.1	6.1
Magnesium	2.1	2.9
Copper	1.2	2.0
Chromium	0.18	0.28
Iron	--	0.20
Silicon	--	0.15
Manganese	--	0.10
Titanium	--	0.10
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 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 Extrusions may receive minor straightening, after stretching, of an amount necessary to meet the tolerance requirements of 3.6.

- 3.3 Heat Treatment: Shall be performed as follows; furnace surveys and calibration of temperature controllers and recorders shall be in accordance with MIL-H-6088.

- 3.3.1 Solution Heat Treatment: Heat to $870^{\circ}\text{F} \pm 10$ ($466^{\circ}\text{C} \pm 6$); soaking times and quenching conditions should conform to MIL-H-6088.

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3.3.2 Overaging Heat Treatment: Heat to $250^{\circ}\text{F} \pm 10$ ($121^{\circ}\text{C} \pm 6$), hold at heat for 1 - 24 hours, increase temperature to $335^{\circ}\text{F} \pm 10$ ($168^{\circ}\text{C} \pm 6$), hold at heat for 10 hours ± 1 , and cool in air. Other temperatures and/or times for the second step may be necessary due to extrusion configuration, furnace equipment, load, etc.

3.4 Properties: Extrusions shall conform to the following requirements, determined in accordance with AMS-2355 or MAM-2355 and as specified in 3.4.2:

3.4.1 Tensile Properties: Shall be as specified in Table I, determined on specimens from extrusions 0.250 - 2.000 inches (6.35 - 50.80 mm) in nominal diameter or least thickness or nominal wall thickness and 32 - 65 square inches (206 - 419 cm^2) in cross-sectional area.

TABLE I

Specimen Orientation	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 Inches or 4D %, min
Longitudinal	69,000	59,000	8
Long Trans.	63,000	52,000	4

TABLE I (SI)

Specimen Orientation	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 5D %, min
Longitudinal	476	407	8
Long Trans.	434	359	4

3.4.1.1 Tensile properties for extrusions outside the size limitations of 3.4.1 shall be as agreed upon by purchaser and vendor.

3.4.2 Fracture Toughness: When specified, plane strain fracture toughness (K_{Ic}) shall be not lower than the values specified in Table II, determined in accordance with ASTM B 645.

TABLE II

Nominal Diameter or Least Thickness Inches	Specimen Orientation (See 8.2)	K_{Ic} ksi inch
Over 0.749 to 1.800, incl	L-T	30
Over 0.749 to 1.800, incl	T-L	22

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TABLE II (SI)

Nominal Diameter or Least Thickness Millimetres	Specimen Orientation (See 8.2)	K_{Ic}	
		MPa	m
Over 19.02 to 45.72, incl	L-T	33	
Over 19.02 to 45.72, incl	T-L	24	

3.4.2.1 When agreed upon by purchaser and vendor, alternate fracture toughness tests may be employed in lieu of the plane-strain fracture toughness test.

3.4.3 Conductivity:

3.4.3.1 If the conductivity is 40.0% IACS (International Annealed Copper Standard) (23.2 MS/m) or higher and the longitudinal tensile properties meet specified requirements, the extrusions are acceptable.

3.4.3.2 If the conductivity is 38.0 - 39.9% IACS (22.0 - 23.1 MS/m), the longitudinal tensile properties meet specified requirements, and the longitudinal yield strength does not exceed the specified minimum by more than 11,900 psi (82.0 MPa), the extrusions are acceptable.

3.4.3.3 If the conductivity is lower than 40.0% IACS (23.2 MS/m), and the longitudinal yield strength exceeds the specified minimum by more than 11,900 psi (82.0 MPa), the extrusions shall be given additional overaging heat treatment. If, after such treatment, the extrusions meet the requirements of 3.4.1, 3.4.2 (when specified), and 3.4.3.1 or 3.4.3.2, extrusion are acceptable.

3.4.3.4 If the conductivity is below 38.0% IACS (22.0 MS/m), the extrusions are not acceptable.

3.4.3.4.1 Extrusions found to be unacceptable may be given additional overaging heat treatment, and if, upon completion of such treatment, they develop conductivity/property relationships conforming to 3.4.1, 3.4.2 (when specified), and 3.4.3.1 or 3.4.3.2, they shall be acceptable.

3.4.4 Stress-Corrosion Resistance: Specimens, cut from extrusions 0.750 inch (19.05 mm) and over in nominal diameter or section thickness, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse (perpendicular to grain flow) direction to 44,000 psi (303 MPa).

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.