

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard



AMS 4345A

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(R)

Aluminum Alloy, Extrusions
6.4Zn - 2.4Mg - 2.2Cu - 0.12Zr (7150-T77511)
Solution Heat Treated, Stress-Relieved, Straightened, and Overaged

UNS A97150

1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of extruded bars, rods, wire, profiles, and tubing.

1.2 Application:

These extrusions have been used typically for structural applications requiring a combination of high tensile strength and compressive properties and good exfoliation-corrosion resistance, but usage is not limited to such applications.

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.

- AMS 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
- MAM 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings, Metric (SI) Units
- AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials

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2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM B 594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products for Aerospace Applications

ASTM B 666/B 666M Identification Marking of Aluminum and Magnesium Products

ASTM G 34 Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (Exco Test)

2.3 ANSI Publications:

Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

ANSI H 35.2 Dimensional Tolerances for Aluminum Mill Products

ANSI H 35.2M Dimensional Tolerances for Aluminum Mill Products (Metric)

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355 or MAM 2355.

TABLE 1 - Composition

Element	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 to the T77511 temper.

3.2.1 Extrusions may receive minor straightening, after stretching, of an amount necessary to meet 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 specified dimensional tolerances.

3.3 Heat Treatment:

Shall be performed in accordance with AMS 2772, except that overaging shall be performed at a temperature, held for a time, and cooled as required to meet the requirements of 3.4 (See 8.2).

3.4 Properties:

Extrusions, 2.000 inches (50.80 mm) and under in nominal diameter or least thickness (wall thickness of tubing) with a maximum cross-sectional area of 20 square inches (129 cm²), 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.

3.4.1 Tensile Properties: Shall be as shown in Table 2.

TABLE 2A - Minimum Tensile Properties, Inch/Pound Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.250, excl	Longitudinal	85.0	78.0	7
0.250 to 0.499, incl	Longitudinal	87.0	82.0	8
	Long-Trans	82.0	76.0	-
Over 0.499 to 0.750, excl	Longitudinal	88.0	83.0	9
	Long-Trans	83.0	79.0	-
0.750 to 2.000, incl	Longitudinal	89.0	84.0	8
	Long-Trans	83.0	78.0	-

TABLE 2B - Minimum Tensile Properties, SI Units

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

3.4.2 Compressive Yield Strength: When specified, shall be as shown in Table 3.

TABLE 3A - Minimum Longitudinal Compressive Yield Strength, Inch/Pound Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Inches	Longitudinal Compressive Yield Strength ksi
Up to 0.250, excl	78.0
0.250 to 0.499, incl	82.0
Over 0.499 to 0.750, excl	83.0
0.750 to 2.000, incl	84.0

TABLE 3B - Minimum Longitudinal Compressive Yield Strength, SI Units

Nominal Diameter or Least Thickness (bars, rods, wire, profiles) or Nominal Wall Thickness (tubing) Millimeters	Longitudinal Compressive Yield Strength MPa
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, cut from extrusions, shall not exhibit exfoliation corrosion, at a T-10 plane, greater than that exhibited by Photo B, Figure 2 of ASTM G 34-72.

3.4.3.2 Stress-Corrosion Cracking: When specified, specimens cut from extrusions 0.750 inch (19.05 mm) and over in diameter or thickness shall show no evidence of stress-corrosion cracking when stressed in the short-transverse direction (perpendicular to grain flow) to 25.0 ksi (172 MPa).

3.4.4 Fracture Toughness: When specified, plane-strain fracture toughness (K_{IC}) for the thickness range 0.750 to 2.000 inches (19.05 to 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, wire, and profiles shall be subjected to ultrasonic inspection in accordance with ASTM B 594. Extrusions, 0.500 to 1.499 inches (12.70 to 38.07 mm), inclusive, in nominal thickness, not exceeding 600 pounds (272 kg) in weight per piece, or a 10 to 1 width-to-thickness ratio, shall meet ultrasonic Class B. Extrusions, 1.500 inches (38.10 mm) and over in nominal thickness, not exceeding 600 pounds in weight (272 kg) per piece, or a 10 to 1 width-to-thickness ratio, shall meet ultrasonic Class A.