SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4252

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ALUMINUM ALLOY PLATE
6.4Zn - 2.4Mg - 2.2Cu - 0.12Zr (7150-T7751)
Solution Heat Treated, Stress Relieved, and Overaged

UNS A97150

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of plate.

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 2202 - Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate
MAM 2202 - Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate
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 B 594 - Ultrasonic Inspection of Aluminum Alloy Wrought Products for Aerospace Applications
ASTM B 660 - Packaging/Packing of Aluminum and Magnesium Products
ASTM E 9 - Compressive Testing of Metallic Materials at Room Temperature

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: Solution heat treated, stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and overaged.

3.3 Heat Treatment: Plate shall be solution heat treated by heating to 880° to 900°F (471° to 482°C), holding at heat for a time commensurate with section thickness, and rapid cooling in a suitable quenching medium; overaging shall be performed at a temperature, for a time, and cooling as required to meet 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: Plate shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355 except as specified in 3.4.2:

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

TABLE I

Nominal Thickness Inches	Specimen Orientation	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 Inches or 4D %, min
0.250 to 0.500, excl	Longitudinal	80,000	74,000	8
	Long-Transverse	80,000	74,000	8
0.500 to 0.750, excl	Longitudinal	83,000	77,000	8
	Long-Transverse	83,000	76,000	8
0.750 to 1.500, incl	Longitudinal	84,000	78,000	8
	Long-Transverse	84,000	77,000	8
Over 1.500 to 3.000, incl	Longitudinal	82,000	76,000	7
	Long-Transverse	82,000	75,000	6
	Short-Transverse	77,000	67,000	1

TABLE I (SI)

Nominal Thickness Millimetres	Specimen Orientation	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
6.35 to 12.70, excl	Longitudinal	552	510	8
	Long-Transverse	552	510	8
12.70 to 19.05, excl	Longitudinal	572	531	8
	Long-Transverse	572	524	8
19.05 to 38.10, incl	Longitudinal	579	538	8
	Long-Transverse	579	531	8
Over 38.10 to 76.20, incl	Longitudinal	565	524	7
	Long-Transverse	565	517	6
	Short-Transverse	531	462	1

3.4.2 Compressive Yield Strength: When specified, the longitudinal compressive strength, determined in accordance with ASTM E 9, shall be as follows:

Nominal Thickness		Compressive Yield Strength, min	
Inches	Millimetres	psi	MPa
0.500 to 0.750, excl	12.70 to 19.05, excl	76,000	524
0.750 to 1.500, incl	19.05 to 38.10, incl	77,000	531
Over 1.500 to 3.000, incl	Over 38.10 to 76.20, incl	75,000	517

3.4.3 Corrosion Resistance:

3.4.3.1 Exfoliation-Corrosion Resistance: Specimens from plate shall show exfoliation corrosion equal to or less than EB when tested at the T/10 plane.

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

3.4.4 Fracture Toughness: When specified, plane-strain fracture toughness (K_{Ic}) for the L-T and T-L specimen orientations shall be not lower than the values specified in Table II for plate 0.750 to 3.000 inches (19.05 to 76.20 mm) in nominal thickness. Fracture toughness values for plate 0.500 to 0.749 inch (12.70 to 19.02 mm) in nominal thickness shall be reported.

TABLE II

Nominal Thickness		Specimen Orientation	K_{Ic}	
Inches	Millimetres		ksi $\sqrt{in.}$	MPa $\sqrt{m}$
0.750 to 1.000, incl	19.05 to 25.40, incl	L-T	20	22.0
		T-L	18	19.8
Over 1.000 to 1.500, incl	Over 25.40 to 38.10, incl	L-T	22	24.2
		T-L	20	22.0
Over 1.500 to 3.000, incl	Over 38.10 to 76.20, incl	L-T	21	23.1
		T-L	19	20.9

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 plate.

3.5 Quality: Plate, 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 plate.

3.5.1 Each plate 0.500 inch (12.70 mm) and over in nominal thickness shall be ultrasonically inspected in accordance with ASTM B 594 and shall meet ultrasonic Class A requirements.

3.6 Tolerances: Shall conform to all applicable requirements of AMS 2202 or MAM 2202.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of plate 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 plate conforms to the requirements of this specification.

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

4.3 Sampling and Testing: Shall be in accordance with AMS 2355 or MAM 2355; the number of specimens to be sampled shall be the minimum number of specimens tested.

4.4 Reports: The vendor of plate shall furnish with each shipment a report stating that the plate conforms 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, inspection lot number, AMS 4252, size, and quantity.

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

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each plate shall be marked on one face, in the respective location indicated below, with the alloy number, temper, AMS 4252, inspection lot number, manufacturer's identification, and nominal thickness. The characters shall 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 plate or its performance.

5.1.1 Plate Under 6 Inches (152 mm) Wide: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 1 metre (914 mm). The inspection lot number may appear in the row marking or may appear at only one location on each plate.