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400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

AMS 4303

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Submitted for recognition as an American National Standard

ALUMINUM ALLOY PLATE
2.7Cu - 2.2Li - 0.12Zr (2090-T81)
Solution Heat Treated, Cold Worked, and Aged

1. SCOPE:

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

1.2 Application: Primarily for aerospace structural parts requiring strength similar to that of 7075-T651 but having 7.8% lower nominal density.

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 2202 - Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate
- MAM 2202 - Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate
- 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

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

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

ASTM B 645 – Plane Strain Fracture Toughness Testing of Aluminum Alloys

ASTM B 660 – Packaging/Packing of Aluminum and Magnesium Products

ASTM E 399 – Plane Strain Fracture Toughness of Metallic Materials

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

ASTM G 38 – Making and Using C-Ring Stress Corrosion Cracking Test Specimen

ASTM G 44 – Alternate Immersion Stress Corrosion Testing in 3.5% Sodium Chloride Solution

ASTM G 85 – Modified Salt Spray (Fog) Testing

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
Copper	2.4	3.0
Lithium	1.9	2.6
Zirconium	0.08	0.15
Magnesium	--	0.25
Titanium	--	0.15
Iron	--	0.12
Silicon	--	0.10
Zinc	--	0.10
Manganese	--	0.05
Chromium	--	0.05
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: Solution heat treated, cold worked, and precipitation heat treated (see 8.1). Heat treatments shall be performed using furnace surveys and calibration of temperature controllers and recorders in accordance with MIL-H-6088.

3.3 Properties: The product shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.3.1 Tensile Properties: Shall be as follows:

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
0.500 - 1.500, incl	Longitudinal	75,000	70,000	4
0.500 - 1.500, incl	Long-Trans.	75,000	68,000	3

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
12.70 - 38.10, incl	Longitudinal	517	483	4
12.70 - 38.10, incl	Long-Trans.	517	469	3

3.3.1.1 Tensile property requirements for plate under 0.500 inch (12.70 mm) or over 1.500 inches (38.10 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 Exfoliation Corrosion Resistance: Plate shall not show exfoliation corrosion more severe than rating EB in accordance with Figure 4 of ASTM G 34, when exposed for two weeks to test conditions of ASTM G 85, Annex A2.

3.3.3 Stress-Corrosion Resistance: C-Ring specimens machined and used in accordance with ASTM G 38, cut from plate 0.750 inch (19.05 mm) and over in nominal thickness, shall show no evidence of stress corrosion failure when stressed in the short-transverse direction at 20,000 psi (138 MPa) and exposed for 20 days to test conditions of ASTM G 44.

3.3.4 Fracture Toughness: Plate, 1.000 to 1.500 inches (25.40 to 38.10 mm) in nominal thickness, shall have fracture toughness not lower than 25 ksi inch (27.5 MPa m), determined in accordance with ASTM B 645 using specimen orientation L-T in accordance with ASTM E 399. L-T stress is applied in the longitudinal grain direction with crack propagating in the long-transverse direction.

3.3.4.1 Fracture toughness requirements for plate under 1.000 inch (25.40 mm) or over 1.500 inches (38.10 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4 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.

3.4.1 Each plate weighing 2000 pounds (907 kg) or under shall be ultrasonically inspected in accordance with ASTM B 594 and shall meet the Class B acceptance limits of that specification.

3.4.1.1 The ultrasonic class for plate weighing over 2000 pounds (907 kg) shall be as agreed upon by purchaser and vendor.

3.5 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 all technical requirements 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 and the following; the number of specimens to be sampled shall be the minimum number of specimens tested:

4.3.1 The size, type, and number of replicate specimens tested for exfoliation corrosion resistance shall be as agreed upon by purchaser and vendor.

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 of this specification. This report shall include the purchase order number, inspection lot number, AMS 4303, 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 alloy number, temper, AMS 4303, inspection lot number, manufacturer's identification, and nominal thickness. 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 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 40 inches (one metre). The inspection lot number may appear in the row marking or may appear at only one location on each piece.