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

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4203B

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Superseding AMS 4203A

Submitted for recognition as an American National Standard

ALUMINUM ALLOY, PLATE
6.2Zn - 1.8Cu - 2.4Mg - 0.13Zr (7010-T7351)
Solution Heat Treated, Stress Relieved, and Precipitation Heat Treated

UNS A97010

1. SCOPE:

1.1 Form:

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

1.2 Application:

This plate has been used typically for parts requiring a combination of good tensile properties, resistance to stress-corrosion cracking, resistance to exfoliation-corrosion, and fracture toughness, 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 2811 Identification, Aluminum and Magnesium Alloy Wrought Products

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 660 Packaging/Packing of Aluminum and Magnesium Products
ASTM G 34-72 Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)

2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-6088 Heat Treatment of Aluminum Alloys

2.4 ANSI Publications:

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

ANSI H35.2 Dimensional Tolerances for Aluminum Mill Products
ANSI H35.2M 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	5.7	6.7
Copper	1.5	2.0
Magnesium	2.1	2.6
Zirconium	0.10	0.16
Iron	--	0.15
Silicon	--	0.12
Manganese	--	0.10
Titanium	--	0.06
Nickel	--	0.05
Chromium	--	0.05
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Solution heat-treated, stress relieved by stretching to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and precipitation heat treated to the T7351 temper. Heat treatments shall be performed at the proper temperatures and for the proper times to produce plate meeting the requirements of 3.3 using equipment and procedural controls in accordance with MIL-H-6088.

3.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties:

Plate shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.3.1 Tensile Properties: Shall be as specified in Table 2.

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

Nominal Thickness Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 2.0, incl	Longitudinal	67.0	55.0	9
	Long-Trans.	68.0	55.0	7
Over 2.0 to 3.0, incl	Longitudinal	67.0	55.0	9
	Long-Trans.	68.0	55.0	7
	Short-Trans.	63.0	49.0	3
Over 3.0 to 4.0, incl	Longitudinal	66.0	54.0	9
	Long-Trans.	67.0	54.0	7
	Short-Trans.	62.0	48.0	3
Over 4.0 to 5.0, incl	Longitudinal	65.0	53.0	9
	Long-Trans.	66.0	53.0	6
	Short-Trans.	61.0	47.0	3
Over 5.0 to 5.5, incl	Longitudinal	64.0	52.0	9
	Long-Trans.	65.0	52.0	5
	Short-Trans.	60.0	46.0	3

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 51, incl	Longitudinal	462	379	9
	Long-Trans.	469	379	7
Over 51 to 76, incl	Longitudinal	462	379	9
	Long-Trans.	469	379	7
	Short-Trans.	434	338	3
Over 76 to 102, incl	Longitudinal	455	372	9
	Long-Trans.	462	372	7
	Short-Trans.	427	331	3
Over 102 to 127, incl	Longitudinal	448	365	9
	Long-Trans.	455	365	6
	Short-Trans.	420	324	3
Over 127 to 140, incl	Longitudinal	440	358	9
	Long-Trans.	448	358	5
	Short-Trans.	414	317	3

3.3.2 Conductivity: Shall be not lower than 41.O% IACS (International Annealed Copper Standard) (23.8 MS/m), determined on specimens as in 4.3.1.

3.3.2.1 If the conductivity is below 41 .O% IACS (23.8 MS/m), the plate is not acceptable but may be re-heat treated as in 3.2 or given additional precipitation heat treatment and if, upon completion of such treatment, it develops tensile property/conductivity relationships conforming to 3.3.1 and 3.3.2, it shall be acceptable.

3.3.3 Fracture Toughness: Plate shall meet the values of K_{Ic} specified in Table 3, determined on specimens as in 4.3.1. The required test directions shall be as specified by purchaser.

TABLE 3A - Minimum Fracture Toughness, Inch/Pound Units

Nominal Thickness Inches	Test Direction	K_{IC} ksi √inch
Over 2 to 4, incl	L-T	29.0
	T-L	26.0
	S-L	23.0
Over 4 to 5.5, incl	L-T	26.0
	T-L	24.0
	S-L	22.0

TABLE 3B - Minimum Fracture Toughness, SI Units

Nominal Thickness Millimeters	Test Direction	K_{IC} MPa√m
Over 51 to 102, incl	L-T	31.9
	T-L	28.6
	S-L	25.3
Over 102 to 140, incl	L-T	28.6
	T-L	26.4
	S-L	24.2

3.3.4 (R) Exfoliation Resistance: Plate shall achieve an exfoliation rating of EA or better, as illustrated in ASTM G 34-72 at the T/10 plane.

3.3.5 Stress-Corrosion Resistance: 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 75% of the specified minimum long-transverse yield strength.

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 When specified, each plate weighing 2000 pounds (907 kg) and under, inspected in accordance with ASTM B 594, shall meet the requirements for ultrasonic class specified in Table 4.

TABLE 4 - Ultrasonic Requirements

Nominal Thickness Inches	Nominal Thickness Millimeters	Ultrasonic Class
0.500 to 1.500, excl	12.70 to 38.10, excl	B
1.500 to 3.000; incl	38.10 to 76.20, incl	A
Over 3.000 to 4.500, incl	Over 76.20 to 114.30, incl	B

3.5 Tolerances:

(R) Shall conform to all applicable requirements of ANSI H35.2 or ANSI H35.2M.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

(R) The vendor of plate shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the plate conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 (R) Acceptance Tests: Composition (3.1), tensile properties (3.3.1), conductivity (3.3.2), fracture toughness (3.3.3) ultrasonic soundness (3.4.1) when specified, and tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.2.2 Periodic Tests: Exfoliation resistance (3.3.4) and stress-corrosion resistance (3.3.5) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing:

(R) Shall be in accordance with AMS 2355 or MAM 2355 and the following:

4.3.1 When fracture toughness testing is required, specimens for testing shall be taken from the center width of at least one plate in each inspection lot for each test direction specified.

4.4 Reports:

(R) The vendor of plate shall furnish with each shipment a repot stating that the plate conforms to the chemical composition and tolerances (and ultrasonic inspection when required) and showing the numerical 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 4203B, size, and quantity.