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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4204B

Issued JUL 1982
Revised NOV 1995

Superseding AMS 4204A

Aluminum Alloy, Plate
6.2Zn - 1.8Cu - 2.4Mg - 0.13Zr (7010-T7651)
Solution Heat Treated, Stress Relieved, and Precipitation Heat Treated

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 higher tensile strength than AMS 4203 or AMS 4205, 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 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, 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
AMS 4203	Aluminum Alloy Plate, 6.2Zn - 1.8 Cu - 2.4 Mg - 0.13Zr (7010-T351), Solution Heat Treated, Stress Relieved, and Precipitation Heat Treated

QUESTIONS REGARDING THIS DOCUMENT: (724) 772-7161 FAX: (724) 776-0243
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2.1 (Continued):

AMS 4205 Aluminum Alloy, Plate 6.2Zn - 1.8 Cu - 2.4Mg - 0.13Zr (7010-T3651), Solution Heat Treated, Stress Relieved, and Precipitation Heat Treated

2.2 ASTM Publications:

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

ASTM B 594 Ultrasonic Examination of Aluminum-Alloy Wrought 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 G 34 Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)

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.

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 and as specified herein.

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 2.000, incl	Longitudinal	76.0	66.0	8
	Long-Trans.	76.0	66.0	6
Over 2.000 to 2.500, incl	Longitudinal	75.0	65.0	8
	Long-Trans.	75.0	65.0	6
	Short-Trans.	71.0	59.0	2.5
Over 2.500 to 3.000, incl	Longitudinal	73.0	64.0	7
	Long-Trans.	74.0	64.0	5
	Short-Trans.	70.0	58.0	2.5
Over 3.000 to 4.000, incl	Longitudinal	72.0	64.0	7
	Long-Trans.	73.0	63.0	5
	Short-Trans.	69.0	56.0	2
Over 4.000 to 5.000, incl	Longitudinal	72.0	63.0	7
	Long-Trans.	72.0	62.0	5
	Short-Trans.	68.0	55.0	2
Over 5.000 to 5.500, incl	Longitudinal	71.0	62.0	6
	Long-Trans.	72.0	61.0	4
	Short-Trans.	66.0	53.0	2

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 50.80, incl	Longitudinal	524	455	8
	Long-Trans.	524	455	6
Over 50.80 to 63.50, incl	Longitudinal	517	448	8
	Long-Trans.	517	448	6
	Short-Trans.	490	407	2.5
Over 63.50 to 76.20, incl	Longitudinal	503	441	7
	Long-Trans.	510	441	5
	Short-Trans.	483	400	2.5
Over 76.20 to 101.60, incl	Longitudinal	496	441	7
	Long-Trans.	503	434	5
	Short-Trans.	476	386	2
Over 101.60 to 127.00, incl	Longitudinal	496	434	7
	Long-Trans.	496	427	5
	Short-Trans.	469	379	2
Over 127.00 to 139.70, incl	Longitudinal	490	427	6
	Long-Trans.	496	421	4
	Short-Trans.	455	365	2

3.3.2 Conductivity: Shall be not lower than 39.0% IACS (International Annealed Copper Standard) (22.6 MS/m), determined on specimens as in 4.3.1.

3.3.2.1 If the conductivity is below 39.0% IACS (22.6 MS/m), the plate is not acceptable.

3.3.2.2 Plate, found to be unacceptable, may be given additional precipitation heat treatment and if, upon completion of such treatment, plate develops conductivity/property relationships conforming to 3.3.1 and 3.3.2, plate shall be acceptable.

3.3.3 Fracture Toughness: When specified, plate shall meet the values of K_{IC} specified in Table 3, determined in accordance with ASTM B 645 on specimens as in 4.3.2. The required test directions shall be specified by purchaser.

TABLE 3A - Minimum K_{IC} Values, Inch/Pound Units

Nominal Thickness Inches	Test Direction	ksi $\sqrt{inch}$
Over 1 to 2, incl	L-T	25.0
	T-L	23.0
Over 2 to 3, incl	L-T	24.0
	T-L	22.0
	S-L	20.0
Over 3 to 5, incl	L-T	22.0
	T-L	20.0
	S-L	18.0
Over 5 to 5.5, incl	L-T	20.0
	T-L	18.0
	S-L	17.0

TABLE 3B - Minimum K_{IC} Values, SI Units

Nominal Thickness Millimeters	Test Direction	MPa $\sqrt{m}$
Over 25 to 51, incl	L-T	27.5
	T-L	25.3
Over 51 to 76, incl	L-T	26.4
	T-L	24.2
	S-L	22.0
Over 76 to 127, incl	L-T	24.2
	T-L	22.0
	S-L	19.8
Over 127 to 140, incl	L-T	22.0
	T-L	19.8
	S-L	18.7

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

3.3.5 Stress-Corrosion Cracking Resistance: Specimens 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 25.0 ksi (172 MPa).

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 Plate weighing 2000 pounds (907 kg) and under, inspected in accordance with ASTM B 594, shall meet the ultrasonic class shown in Table 4.

TABLE 4 - Ultrasonic Class

Nominal Thickness Inches	Nominal Thickness Millimeters	Ultrasonic Class
0.500 to 1.500, excl	12.70 to 38.10, excl	B
1.500 to 2.000, incl	38.10 to 50.80, incl	A

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. 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:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties (3.3.1), conductivity (3.3.2), fracture toughness (3.3.3) when specified, ultrasonic soundness (3.4.1), 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 cracking 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:

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

4.3.1 Specimens for conductivity testing shall be taken from the samples used for tensile testing.