AEROSPACE MATERIAL SPECIFICATION

AMS4203™	REV. D

Issued 1982-07
Revised 2005-04
Reaffirmed 2017-09
Stabilized 2022-07

Superseding AMS4203C

Aluminum Alloy, Plate
6.2Zn - 1.8Cu - 2.4Mg - 0.13Zr (7010-T7351)
Solution Heat Treated, Stress Relieved, and Precipitation Heat Treated
(Composition similar to UNS A97010)

RATIONALE

AMS4203D has been declared "STABILIZED" by AMS Committee D Nonferrous Alloys Committee. This document will no longer be updated and may no longer represent standard industry practice. This document was stabilized because Committee D can find no users or producers for this document.

NOTE: Previously, this document was reaffirmed. The last technical update of this document occurred in April, 2005. Users of this document should refer to the cognizant engineering organization for disposition of any issues with reports/certifications to the specification, including exceptions listed on the certification. In many cases, the purchaser may represent a sub-tier supplier and not the cognizant engineering organization.

STABILIZED NOTICE

AMS4203D has been declared “STABILIZED” by SAE AMS Committee D Nonferrous Alloys and will no longer be subjected to periodic reviews for currency. Users are responsible for verifying references and continued suitability of technical requirements. Newer technology may exist.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS4203D/

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 issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific issue is specified. When the referenced document has been cancelled and no superceding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001or www.sae.org.

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
AMS 2772	Heat Treatment of Aluminum Alloy Raw Materials
AS1990	Aluminum Alloy Tempers

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or www.astm.org.

ASTM B 594	Ultrasonic inspection 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 B 666/B 666M	Identification of Aluminum and Magnesium Alloy Products
ASTM E 399	Plain-Strain Fracture Toughness of Metallic Materials
ASTM G 34	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)

2.3 ANSI Publications:

Available from ANSI, 25 West 43rd Street, New York, NY 10036 or www.ansi.org.

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.

TABLE 1 - Composition

Element	min	max
Silicon	--	0.12
Iron	--	0.15
Copper	1.5	2.0
Manganese	--	0.10
Magnesium	2.1	2.6
Chromium	--	0.05
Zinc	5.7	6.7
Titanium	--	0.06
Nickel	--	0.05
Zirconium	0.10	0.16
Other Elements, each	--	0.05
Other Elements, 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 (See AS1990). Solution and precipitation heat treatment shall be performed in accordance with AMS 2772.

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 on the mill product:

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 2% Offset ksi	Elongation in 2 inches or 4D %, min
Up to 2.0, incl	Longitudinal	67.0	55.0	9
	Long - Trans.	68.0	55.0	7
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
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
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
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 mm	Specimen Orientation	Tensile Strength MPa	Yield Strength at 2% Offset MPa	Elongation in 50.8 mm or 4D %, min
Up to 51, incl	Longitudinal	462	379	9
	Long - Trans.	469	379	7
51 to 76, incl	Longitudinal	462	379	9
	Long - Trans.	469	379	7
	Short - Trans	434	338	3
76 to 102, incl	Longitudinal	445	372	9
	Long - Trans.	462	372	7
	Short - Trans	427	331	3
102 to 127, incl	Longitudinal	448	365	9
	Long - Trans.	455	365	6
	Short - Trans	420	324	3
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 41.0% IACS (International Annealed Copper Standard) (23.8 MS/m), determined on specimens as in 4.3.1.

3.3.2.1 Plate not meeting the requirement of 3.3.2 may be given additional precipitation heat treatment or reheat treated. After such treatment, if the specified conductivity/property relationships conforming to 3.3.1 and 3.3.2 are met, the plate is acceptable.

3.3.3 Fracture Toughness: For plate 2.00 to 5.50 inches (51 to 140 mm) inclusive, in nominal thickness, plane-strain fracture toughness shall be performed in accordance with ASTM E 399 supplemented by ASTM B 645 and shall meet the requirements of Table 3. For L-T and T-L test orientations on plate 2.000 to 4.00 inches (51 to 102 mm), inclusive, in nominal thickness, use at least a 2.00-inch (51-mm) thick specimen centered at T/2; and for plate 4.00 to 5.50 inches (102 mm), inclusive, in nominal thickness, use at least a 2.00-inch (51-mm) thick specimen centered at T/4. For the S-L test orientations, the test specimen shall be centered at T/2. Required specimen orientations shall be specified by the purchaser. A valid K1c meeting the requirements of ASTM E 399, or an invalid Kq “meaningful” or “acceptable” for lot release purposes per ASTM B 645 equal to or greater than the minimum value in Table 3 shall be evidence of acceptable fracture toughness.

3.3.3.1 Fracture toughness test methods and minimum values for plate under 2 inches (51mm) thick shall be as agreed upon by the purchaser and supplier.

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

Nominal Thickness Inches	Test Direction	K_{1C} ksi $\sqrt{inch}$
Over 2 to 4, incl	L-T	29.0
	T-L	26.0
	S-L	23.0
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_{1C} MPa $\sqrt{m}$
Over 51 to 102, incl	L-T	31.9
	T-L	28.6
	S-L	25.3
102 to 140, incl	L-T	28.6
	T-L	26.4
	S-L	24.2

3.3.4 Exfoliation Resistance: Plate shall achieve an exfoliation rating of EA or better, as illustrated by Figure 2 in ASTM G 34 at theT/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 3.00, incl	38.10 to 76.20, incl	A
Over 3.00 to 4.500, incl	Over 76.20 to 114.30, incl	B

3.5 Tolerances:

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

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 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 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:

Shall be in accordance with AMS 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:

The vendor of plate shall furnish with each shipment a report 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 4203C, size, and quantity. The report shall also identify the producer, the product form, and the size of the mill product.

4.5 Resampling and Retesting:

Shall be in accordance with AMS 2355.