

AEROSPACE MATERIAL SPECIFICATION

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Superseding AMS 4096A

Aluminum Alloy Sheet and Plate, Alclad
6.3Cu - 0.30Mn- 0.18Zr - 0.10V - 0.06Ti (Alclad 2219-O)
Annealed

(Composition similar to UNS A92219)

1. SCOPE:

1.1 Form:

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

1.2 Application:

This specification has been used typically for parts requiring high strength up to 600 °F (315 °C). These products are also well suited for cryogenic applications and where welding and maximum corrosion resistance are required, but usage is not limited to such applications.

- 1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking after heat treatment; ARP 823 recommends practices to minimize such conditions.

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 document issue is specified. When the referenced document has been cancelled and no superseding 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 15096-0001 or www.sae.org.

AMS 2355 Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash-Welded Rings

AMS 2272 Heat Treatment of Aluminum Alloy Raw Materials

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2.1 (Continued):

ARP 823	Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products
AS1990	Aluminum Alloy Tempers

2.2 ASTM Publications:

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

ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B 666M	Identification Marking of Aluminum and Magnesium Products

2.3 ANSI Publications:

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

ANSI H35.2	Dimensional Tolerance for Aluminum Mill Products
ANSI H35.2M	Dimensional Tolerances for Aluminum Mill Products, Metric

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the following percentages by weight shown in Table 1 and Table 2, determined in accordance with AMS 2355:

TABLE 1 – Composition, Core (2219)

Elements	min	max
Silicon	--	0.20
Iron	--	0.30
Copper	5.8	6.8
Manganese	0.20	0.40
Magnesium	--	0.02
Zinc	--	0.10
Titanium	0.02	0.10
Vanadium	0.05	0.15
Zirconium	0.10	0.25
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

TABLE 2 – Composition, Cladding (7072)

Elements	min	max
Silicon + Iron	--	0.7
Copper	--	0.10
Manganese	--	0.10
Magnesium	--	0.10
Zinc	0.8	1.3
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition:

Annealed to the -O condition (See AS1990) in accordance with AMS 2772.

3.3 Properties:

The product shall conform to the following requirements, determined in accordance with AMS 2355 on the mill product.

3.3.1 As Annealed:

- 3.3.1.1 Tensile Properties: Product 0.020 to 2.000 inch (0.50 to 50.00 mm), inclusive, in nominal thickness shall meet the requirements of Table 3.

TABLE 3 – Tensile Properties

Tensile Strength, max	32.0 ksi (220 MPa)
Yield Strength at 0.2% Offset, max	16.0 ksi (110 MPa)
Elongation in 2 in. (50 mm) or 4D, min	12%

- 3.3.1.2 Bending: Product 0.020 to 0.499 inch (0.50 to 12.50 mm) in nominal thickness shall withstand, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to the bend factor shown in Table 4 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 4 – Bend Factors

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.020 to 0.249, incl	0.50 to 6.25, incl	4
Over 0.249 to 0.499, incl	Over 6.25 to 12.50, incl	6

3.3.2 After Solution and Precipitation Heat Treatment: The product, as received by purchaser, shall have the following properties after solution and precipitation heat treatment in accordance with AMS 2772 to -T62 temper (See AS1990):

3.3.2.1 Tensile Properties: Shall be as specified in Table 5.

TABLE 5A – Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness Inches	Tensile Strength ksi, min	Yield Strength at 0.2% Offset ksi, min	Elongation in 2 Inches or 4D %, min
0.020 to 0.039, incl	44.0	29.0	6
Over 0.039 to 0.099, incl	49.0	32.0	7
Over 0.099 to 0.249, incl	51.0	34.0	7
Over 0.249 to 0.499, incl	51.0	34.0	8
Over 0.499 to 1.000, incl	54.0	36.0	8
Over 1.000 to 2.000, incl	54.0	36.0	7

TABLE 5B – Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50 mm or 4D %, min
0.50 to 1.00, incl	303	200	6
Over 1.00 to 2.50, incl	338	221	7
Over 2.50 to 6.25, incl	352	234	7
Over 6.25 to 12.50, incl	352	234	8
Over 12.50 to 25.00, incl	372	248	8
Over 25.00 to 50.00, incl	372	248	7

3.3.2.2 Bending: Product 0.020 to 0.499 inch (0.50 to 12.50 mm) in nominal thickness shall withstand, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to the bend factor shown in Table 6 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 6 – Bend Factors

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.020 to 0.062, incl	0.50 to 1.55, incl	8
Over 0.062 to 0.249, incl	Over 1.55 to 6.25, incl	12
Over 0.249 to 0.499, incl	Over 6.25 to 12.50, incl	16

3.3.3 Cladding Thickness: After rolling, the average cladding thickness shall conform to the requirements shown in Table 7.

TABLE 7 – Cladding Thickness

Nominal Thickness Inch	Nominal Width Inches	Average Cladding Thickness Per Side % of Total Thickness	Average Cladding Thickness Per Side % of Total Thickness
		min	max
0.020 to 0.039, incl	0.50 to 1.00, incl	8	--
Over 0.039 to 0.099, incl	Over 1.00 to 2.50, incl	4	--
Over 0.099 to 0.499, incl	Over 2.50 to 12.50, incl	2	--
Over 0.499	Over 12.50	2	3

3.4 Quality:

The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the product.

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 the product 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 product conforms to specified requirements.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Composition (3.1), tensile properties as annealed (3.3.1.1) and after solution and precipitation heat treatment (3.3.2.1), and tolerances (3.5) are classified as acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests: Bending as annealed (3.3.1.2) and after solution and precipitation heat treatment (3.3.2.2) and cladding thickness (3.3.3) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling:

Shall be in accordance with AMS 2355.