AEROSPACE MATERIAL SPECIFICATION

AMS4096™	REV. E
Issued 1969-11 Revised 2021-12 Superseding AMS4096D	

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)

RATIONALE

AMS4096E results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.3.3, 3.6, 4.4.1, 5.1.1, 8.5), update applicable documents (Section 2, 3.2, 3.3.2), and allow the use of the immediate prior specification revision (8.4).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet and plate 0.020 to 0.499 inch (0.50 to 12.50 mm), inclusive, in nominal thickness, clad on two sides (see 8.6).

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; ARP823 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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2355 Quality Assurance, Sampling and Testing, Aluminum Alloys and Magnesium Alloy, Wrought Products (Except Forging Stock), and Rolled, Forged, or Flash Welded Rings

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

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/AMS4096E

ARP823 Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products

ARP1917 Clarification of Terms Used in Aerospace Metals Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B666/B666M Identification Marking of Aluminum and Magnesium Products

2.3 ANSI Accredited Publications

Copies of these documents are available online at http://webstore.ansi.org/.

ANSI H35.1/H35.1M Standard Alloy and Temper Designation System for Aluminum

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 Tables 1 and 2, determined in accordance with AMS2355:

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 (refer to ANSI H35.1/H35.1M) in accordance with AMS2772.

3.3 Properties

The product shall conform to the following requirements, determined in accordance with AMS2355 on the mill product.

3.3.1 As Annealed

3.3.1.1 Tensile Properties

Product 0.020 to 0.499 inch (0.50 to 12.50 mm), inclusive, in nominal thickness shall meet the requirements of Table 3.

Table 3 - Tensile properties (-O temper)

Tensile Strength, max	32.0 ksi (220 MPa)
Yield Strength at 0.2% Offset, max	16.0 ksi (110 MPa)
Elongation in 2 Inches (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 degrees 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 (-O temper)

Nominal Thickness Inches	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 Response to Heat Treatment

Product in the -O temper shall have the properties shown in Tables 5 and 6 after solution and precipitation heat treatment in accordance with AMS2772 to -T62 temper (refer to ANSI H35.1/H35.1M):

3.3.2.1 Tensile Properties

Shall be as specified in Table 5:

Table 5A - Minimum tensile properties (-T62 temper), 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

Table 5B - Minimum tensile properties (-T62 temper), 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

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 degrees 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 (-T62 temper)

Nominal Thickness Inches	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 Property requirements for product outside the range covered by Tables 3, 4, 5, and 6 shall be agreed upon between purchaser and producer and reported in 4.4.1.

3.3.4 Cladding Thickness

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

Table 7 - Cladding thickness

Nominal Thickness Inches	Nominal Width Inches	Average Cladding Thickness Per Side % of Total Thickness Min	Average Cladding Thickness Per Side % of Total Thickness 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	--

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.

3.6 Exceptions

Any exceptions shall be authorized by the purchaser and reported as in 4.4.1.