AEROSPACE MATERIAL SPECIFICATION

AMS4095™	REV. F

Issued 1969-11
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Superseding AMS4095E

Aluminum Alloy, Alclad Sheet and Plate, 6.3Cu - 0.30Mn - 0.18Zr - 0.10V - 0.06Ti, Alclad 2219-T31; Sheet, Solution Heat Treated and Cold Worked, Alclad 2219-T351; Plate, Solution Heat Treated and Stress Relieved

(Composition similar to UNS A82219)

RATIONALE

AMS4095F results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (see 3.3.3 and 8.4), relocate Definitions (see 2.4), and update Response to Heat Treatment (see 3.3.2) and Applicable Documents (see Section 2).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet and plate 0.020 to 0.499 inch (0.51 to 12.67 mm), inclusive, in nominal thickness alclad two sides (see 8.5).

1.2 Application

These products have been used typically for parts requiring high strength up to 600 °F (316 °C) and 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.

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS4095F/

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

ARP823 Minimizing Stress-Corrosion Cracking in Wrought High-Strength Aluminum Alloy Products

AS7766 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 Products

2.3 ANSI Accredited Publications

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

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

ANSI H35.2 Dimensional Tolerances for Aluminum Mill Products

ANSI H35.2M Dimensional Tolerances for Aluminum Mill Products (Metric)

2.4 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Tables 1 and 2, determined in accordance with AMS2355.

Table 1 - Composition, core (2219)

Element	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)

Element	Min	Max
Silicon and 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

The product shall be supplied in the following condition; heat treatment shall be performed in accordance with AMS2772:

3.2.1 Sheet

Solution heat treated and cold worked to the T31 temper (refer to ANSI H35.1/H35.1M).

3.2.2 Plate

Solution heat treated and stress relieved by stretching to produce a permanent set of 1-1/2 to 3% to the T351 temper (refer to ANSI H35.1/H35.1M).

3.3 Properties

The product shall conform to the following requirements, determined in accordance with AMS2355 on the mill-produced size:

3.3.1 As Solution Heat Treated and Cold Worked or Stress Relieved

3.3.1.1 Tensile Properties

Shall be as specified in Table 3.

Table 3A - Minimum tensile properties, inch/pound units

Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.040 to 0.099, incl	42.0	25.0	10
Over 0.099 to 0.499, incl	44.0	26.0	10

Table 3B - Minimum tensile properties, SI units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
1.02 to 2.51, incl	290	172	10
Over 2.51 to 12.67, incl	303	179	10

3.3.1.2 Bending

The product 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 - Bending parameters

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.020	0.51	8
Over 0.020 to 0.249, incl	Over 0.51 to 6.32, incl	12
Over 0.249 to 0.499, incl	Over 6.32 to 12.67, incl	16

3.3.2 Response to Precipitation Heat Treatment

Product shall have the following properties after being precipitation heat treated in accordance with AMS2772 to the T8/T851 temper (refer to ANSI H35.1/H35.1M):

3.3.2.1 Tensile Properties

The product shall have the properties shown in Table 5.

Table 5A - Minimum tensile properties, inch/pound units

Nominal Thickness Inch	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.020 to 0.039, incl	49.0	37.0	6
Over 0.039 to 0.099, incl	55.0	41.0	7
Over 0.099 to 0.249, incl	58.0	43.0	7
Over 0.249 to 0.499, incl	58.0	42.0	8

Table 5B - Minimum tensile properties, SI units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
0.51 to 0.99, incl	338	255	6
Over 0.99 to 2.51, incl	379	283	7
Over 2.51 to 6.32, incl	400	296	7
Over 6.32 to 12.67, incl	400	290	8

3.3.3 Mechanical property requirements for sheet and plate outside the thickness range of 1.1 shall be as agreed upon by the purchaser and producer and reported per 4.4.1 (see 8.5).

3.3.4 Cladding Thickness

After rolling, the average cladding thickness shall conform to the requirements shown in Table 6.

Table 6 - Average cladding thickness

Nominal Thickness Inch	Nominal Thickness Millimeters	Average Cladding Thickness Per Side % of Total Thickness Min
0.020 to 0.039, incl	0.51 to 0.99, incl	8
Over 0.039 to 0.099, incl	Over 0.99 to 2.51, incl	4
Over 0.099 to 0.499, incl	Over 2.51 to 12.67, incl	2

3.4 Quality

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