

Aluminum Alloy, Sheet and Plate
6.3Cu - 0.30Mn - 0.06Ti - 0.10V - 0.18Zr
Solution Heat Treated, Cold Worked (8%) and Naturally Aged (2219 -T37)
(Composition similar to UNS A92219)

RATIONALE

AMS4600 is a new specification for 2219-T37 sheet and plate to facilitate cancellation of AMS4295 and AMS-QQ-A-250/30.

1. SCOPE

1.1 Form

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

1.2 Application

This product form has been used typically for structural parts requiring high strength up to 500 °F (260 °C) after proper precipitation heat treatment and which may require forming or welding during fabrication, 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; 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 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

AMS2770 Heat Treatment of Wrought Aluminum Alloy Parts

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

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<http://www.sae.org/technical/standards/AMS4600>**

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

AS1990 Aluminum Alloy Tempers

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 B 594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products for Aerospace Applications

ASTM B 666/B 666M Identification Marking of Aluminum Products

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, 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 AMS2355.

TABLE 1--COMPOSITION

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	

3.2 Condition

Product shall be supplied in one of the following conditions as specified by purchaser.

3.2.1 Sheet and Plate

Solution heat treated, cold worked to produce a nominal permanent set of 8%, and naturally aged to temper T37 (See AS1990).

3.2.1.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties

Product shall conform to the following requirements, determined on the mill produced size in accordance with AMS2355. In addition, test specimens in the T37 condition shall not be required to be tested within four days after completion of the heat treatment. If the manufacturer so elects, samples may be tested after less than four days aging, but if they fail to show the specified properties, the test samples may be discarded and additional specimens may be tested after four days aging. These specimens shall be taken from the same locations in the production lot or sample from which the prior specimens were taken.

3.3.1 As Received

3.3.1.1 Tensile Properties

Shall be as shown in Table 2 (See 8.2). All values are minimum, unless otherwise specified.

TABLE 2A - TENSILE PROPERTIES, INCH/POUND UNITS

Temper	Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches or 4D %
T37	0.020 to 0.039, incl	49.0	38.0	6
	Over 0.039 to 2.500, incl	49.0	37.0	6
	Over 2.500 to 3.000, incl	47.0	36.0	6
	Over 3.000 to 4.000, incl	45.0	35.0	5
	Over 4.000 to 5.000, incl	43.0	34.0	4

TABLE 2B - TENSILE PROPERTIES, SI UNITS

Temper	Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
T37	0.51 to 0.99, incl	338	262	6
	Over 0.99 to 63.50, incl	338	255	6
	Over 63.50 to 76.20, incl	324	248	6
	Over 76.20 to 101.60, incl	310	241	5
	Over 101.60 to 127.00, incl	296	234	4

3.3.2 After Precipitation Heat Treatment

3.3.2.1 Tensile Properties

Product, as received by purchaser in the -T37 condition, without the subsequent imposition of cold working or forming operations after precipitation heat treatment in accordance with time and temperature parameters of AMS2770 to -T87 condition, shall have the tensile properties shown in Table 3 (See 8.2). All values are minimum, unless otherwise specified.

TABLE 3A - TENSILE PROPERTIES, INCH/POUND UNITS

Temper	Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches or 4D %
T87	0.020 to 0.039, incl	64.0	52.0	5
	Over 0.039 to 0.249, incl	64.0	52.0	6
	Over 0.249 to 1.000, incl	64.0	51.0	7
	Over 1.000 to 3.000, incl	64.0	51.0	6
	Over 3.000 to 4.000, incl	62.0	50.0	4
	Over 4.000 to 5.000, incl	61.0	49.0	3

TABLE 3B - TENSILE PROPERTIES, SI UNITS

Temper	Nominal Thickness Millimeters		Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
T87	0.51 to	0.99, incl	441	359	5
	Over	0.99 to 6.32, incl	441	359	6
	Over	6.32 to 25.40, incl	441	352	7
	Over	25.40 to 76.20, incl	441	352	6
	Over	76.20 to 101.00, incl	427	345	4
	Over	101.00 to 127.00, incl	421	338	3

3.3.2.2 Stress-Corrosion Cracking Resistance

Specimens, cut from plate 0.750 inch (19.05 mm) and over in nominal thickness, supplied in the T351 condition, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse direction (perpendicular to grain flow) to 75% of the yield strength shown for that condition in Table 2 (See 8.1) after precipitation heat treatment in accordance with the time and temperature parameters of AMS2770 to -T87 condition..

3.4 Quality

Product, 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 product.

- 3.4.1 When specified, plate shall be subjected to ultrasonic inspection in accordance with ASTM B 594, and shall meet the requirements shown in Table 4. Ultrasonic requirements for plate exceeding 4.500 inches thick shall be agreed upon by purchaser and supplier.

TABLE 4 - ULTRASONIC CLASS

Nominal Thickness Inches	Nominal Thickness Millimeters	Class
0.500 to 1.499, incl	12.70 to 38.07, incl	B
Over 1.499 to 3.000, incl	Over 38.07 to 76.20, incl	A
Over 3.000 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.