



AEROSPACE MATERIAL SPECIFICATION

AMS4599™**REV. B**Issued 2011-07
Revised 2023-05

Superseding AMS4599A

Aluminum Alloy, Sheet, and Plate
6.3Cu - 0.30Mn - 0.06Ti - 0.10V - 0.18Zr
Solution and Precipitation Heat Treated (2219 -T81/-T851)
(Composition similar to UNS A92219)

RATIONALE

AMS4599B results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.3.1.1, 3.6, 4.4.1, 5.1.1, and 8.4), update applicable documents (Section 2) and plate (3.2.2) temper definition, relocate definitions (2.4) and statement regarding properties (3.3.2), and allow the use of the immediate prior specification revision (8.3).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet and plate from 0.020 to 6.000 inches (0.51 to 152.40 mm), inclusive, in thickness (see 8.5).

1.2 Application

These products have been used typically for parts requiring high strength up to 500 °F (260 °C), but usage is not limited to such applications. Product may be welded in the specified condition, but properties are improved by reheat treatment after welding. Reheat treatment after welding, however, may reduce resistance to stress-corrosion cracking.

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.

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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 B594	Ultrasonic Inspection of Aluminum-Alloy Wrought Products
ASTM B666/B666M	Identification Marking of Aluminum and Magnesium 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 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 the purchaser. All heat treatment shall be performed in accordance with AMS2772.

3.2.1 Sheet

Solution and precipitation heat treated to temper T81 (refer to ANSI H35.1/H35.1M).

3.2.2 Plate

Solution heat treated, stretched to produce a permanent set of 1-1/2 to 3%, and precipitation heat treated to temper T851 (refer to ANSI H35.1/H35.1M).

3.2.2.1 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:

3.3.1 Tensile Properties

Shall be as shown in Table 2 (see 3.3.2). 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 %
T81	0.020 to 0.039, incl	62.0	46.0	6
	Over 0.039 to 0.249, incl	62.0	46.0	7
T851	0.250 to 1.000, incl	62.0	46.0	8
	Over 1.000 to 2.000, incl	62.0	46.0	7
	Over 2.000 to 3.000, incl	62.0	45.0	6
	Over 3.000 to 4.000, incl	60.0	44.0	5
	Over 4.000 to 5.000, incl	59.0	43.0	5
	Over 5.000 to 6.000, incl	57.0	42.0	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 %
T81	0.51 to	0.99, incl	427	317	6
	Over	0.99 to 6.32, incl	427	317	7
T851	6.35 to	25.40, incl	427	317	8
	Over	25.40 to 50.80, incl	427	317	7
	Over	50.80 to 76.20, incl	427	310	6
	Over	76.20 to 101.60, incl	414	303	5
	Over	101.60 to 127.00, incl	407	296	5
	Over	127.00 to 152.40, incl	393	290	4

3.3.1.1 Mechanical property requirements for product outside of the range covered by Table 2 shall be agreed upon between the purchaser and producer and reported per 4.4.1 (see 8.5).

3.3.2 Properties in Table 2 were not substantiated according to AMS statistical analysis procedures, but were taken from the U.S. Federal Specification QQ-A-250/30.

3.3.3 Stress-Corrosion Cracking Resistance

Specimen, cut from plate 0.750 inch (19.05 mm) and over in nominal thickness, supplied in the T851 conditions, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse direction to 75% of the yield strength shown in Table 2.

3.4 Quality

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.

3.4.1 When specified, plate shall be subjected to ultrasonic inspection in accordance with ASTM B594, Class A (see 8.5).

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.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of the product shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The 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 (3.3.1), ultrasonic inspection (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

Stress-corrosion cracking resistance (3.3.2) is a periodic test and shall be performed at a frequency selected by the producer unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2355.