AEROSPACE MATERIAL SPECIFICATION

AMS4468™	REV. A

Issued 2012-01
Reaffirmed 2017-09
Revised 2022-10

Superseding AMS4468

Aluminum Alloy, Plate
5.0Cu - 0.4Mn - 0.5Mg - 0.4Ag (2139-T84)
Solution Heat Treated, Cold Worked, and Artificially Aged
(Composition similar to UNS A92139)

RATIONALE

AMS4468A results from a SAE 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, 8.4), update form (1.1), applicable documents (Section 2, 3.2), ordering information (8.5), 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 plate with nominal thickness from 1.000 to 5.000 inches (25.40 to 127.00 mm), inclusive (see 8.5).

1.2 Application

This product has been used typically for parts requiring a high level of mechanical properties and good resistance to stress-corrosion cracking, but usage is not limited to such applications.

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

AS7766 Terms Used in Aerospace Metals Specifications

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/AMS4468A/

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 B645	Linear-Elastic Plain-Strain Fracture Toughness Testing of Aluminum Alloys
ASTM B660	Packing/Packaging of Aluminum and Magnesium Products
ASTM B666/B666M	Identification Marking of Aluminum and Magnesium Products
ASTM E399	Linear-Elastic Plane-Strain Fracture Toughness of Metallic Materials
ASTM G34	Exfoliation Corrosion Susceptibility in 2XXX and 7XXX Series Aluminum Alloys (EXCO Test)
ASTM G47	Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products

2.3 ANSI Accredited Publications

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

ANSI H35.1/H35.1M	Alloy and Temper Designation Systems 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	--	0.10
Iron	--	0.15
Copper	4.5	5.5
Manganese	0.20	0.6
Magnesium	0.20	0.8
Chromium	--	0.05
Zinc	--	0.25
Titanium	--	0.15
Silver	0.15	0.6
Vanadium	--	0.05
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Solution heat treated, stretched to produce a nominal permanent set of 4%, but not less than 3% nor more than 6%, and precipitation heat treated to the T84 temper (refer to ANSI H35.1/H35.1M).

Solution and precipitation heat treatment shall be performed in accordance with AMS2772 as applicable to 2XXX alloys. The actual practices are proprietary.

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 specified in Table 2.

Table 2A - Minimum tensile properties, inch/pound units

Nominal Thickness Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
1.000 to 1.500	Longitudinal	65.0	62.0	11
	Long-Trans.	67.0	61.0	8
	Short-Trans.	63.0	55.0	5
1.501 to 3.750	Longitudinal	66.0	62.0	9
	Long-Trans.	68.0	61.0	7
	Short-Trans.	62.0	55.0	4
3.751 to 5.000	Longitudinal	65.0	59.0	8
	Long-Trans.	67.0	59.0	6
	Short-Trans.	61.0	53.0	4

Table 2B - Minimum tensile properties, SI units

Nominal Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 5D or 5.65 √A %
25.40 to 38.10, incl	Longitudinal	448	427	10
	Long-Trans.	462	421	7
	Short-Trans.	434	379	4
Over 38.10 to 95.25, incl	Longitudinal	455	427	8
	Long-Trans.	469	421	6
	Short-Trans.	427	379	3
Over 95.25 to 127.00, incl	Longitudinal	448	407	7
	Long-Trans.	462	407	5
	Short-Trans.	421	365	3

3.3.1.1 Mechanical property requirements for product outside of the range covered by 1.1.1 shall be agreed upon between purchaser and producer and reported per 4.4.1 (see 8.5).

3.3.2 Corrosion-Resistance

Resistance to stress-corrosion cracking and to exfoliation-corrosion shall be acceptable if the plate conforms to the requirements of 3.3.2.1 and 3.3.2.2.

3.3.2.1 Exfoliation-Corrosion Test

Plate shall not exhibit exfoliation-corrosion greater than that illustrated by Photo B, Figure 2, of ASTM G34.

3.3.2.2 Stress-Corrosion Test

Specimens cut from plate 0.750 inch (19.05 mm) and over in nominal thickness, machined and tested in accordance with ASTM G47 shall show no evidence of stress-corrosion cracking when stressed in the short- transverse direction at 40.0 ksi (276 MPa) when exposed for 30 days.

3.3.3 Fracture Toughness

When required by purchaser, plane strain fracture toughness shall be tested in accordance with ASTM E399 and ASTM B645. The required specimen orientation(s) shall be specified by purchaser (see 8.5).

3.3.3.1 The specimens shall meet the following requirements:

3.3.3.1.1 For T-L and L-T test directions on plate 2 inches (51 mm) and under in nominal thickness, use full-thickness specimens; for plate over 2 to 4 inches (51 to 102 mm), inclusive, in nominal thickness, use specimens 2-inch (51-mm) minimum thickness centered at T/2; and for plate over 4 inches (102 mm) in nominal thickness, use specimens 2-inch (51-mm) minimum thickness centered at T/4. For the S-L test direction, the test specimen shall be centered at T/2.

3.3.3.2 A valid K_{1C} meeting the requirements of ASTM E399 or K_Q "usable for lot release" in accordance with ASTM B645 shall meet or exceed the values shown in Tables 3A and 3B.

Table 3A - Minimum fracture toughness parameters, inch/pound units

Nominal Thickness Inches	L-T ksi √inch	T-L ksi √inch	S-L ksi √inch
1.000 to 2.000, incl	35	32	
Over 2.000 to 3.750, incl	35	32	27
Over 3.750 to 5.000, incl	32	30	27

Table 3B - Minimum fracture toughness parameters, SI units

Nominal Thickness Millimeters	L-T MPa √m	T-L MPa √m	S-L MPa √m
25.40 to 50.80, incl	38	35	
Over 50.80 to 95.25, incl	38	35	30
Over 95.25 to 127.00, incl	35	33	30

3.4 Quality

Plate, 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 plate.

3.4.1 When required by purchaser, each plate 1.000 to 5.000 inches (25.40 to 127.00 mm) in nominal thickness shall be ultrasonically inspected in accordance with ASTM B594 and shall meet the requirements for ultrasonic class A (see 8.5)

3.5 Tolerances

Shall conform to all applicable requirements of ANSI H35.2 or H35.2M.

3.6 Exceptions

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