AEROSPACE MATERIAL SPECIFICATION

AMS4458™	REV. B
Issued 2010-05 Revised 2022-11 Superseding AMS4458A	

Aluminum Alloy, Plate (2.7 Cu - 1.8 Li - 0.7 Zn) 2099-T86
Solution Heat Treated, Cold Worked, and Artificially Aged
(Composition similar to UNS A92099)

RATIONALE

AMS4458B is the result of a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.3.5, 3.6, 4.4.1, 5.1.1, 8.5), upate applicable documents (Section 2, 3.2), and stress-corrosion test (3.3.3), 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 plate 0.500 to 2.000 inches (12.70 to 50.80 mm), inclusive, in thickness (see 8.6).

1.2 Application

This plate has been used typically for parts requiring strength similar to that of 7050-T7451, good resistance to stress-corrosion cracking, and having 7.1% lower nominal density than that alloy, 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/AMS4458B/

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 B645 Linear-Elastic Plane-Strain Fracture Toughness Testing of Aluminum Alloys

ASTM B594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products

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

ASTM G85 Modified Salt Spray (Fog) Testing

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		0.05
Iron		0.07
Copper	2.4	3.0
Manganese	0.10	0.50
Magnesium	0.10	0.50
Zinc	0.40	1.0
Titanium		0.10
Lithium	1.6	2.0
Zirconium	0.05	0.12
Beryllium		0.0001
Other Elements, each		0.05
Other Elements, total		0.15
Aluminum	remainder	

3.2 Condition

Heat treatment shall be in accordance with AMS2772 to the T86 temper (refer to ANSI H35.1/H35.1M) and as follows: solution heat treated, stretched to produce a nominal permanent set of 6%, and precipitation heat treated to the T86 temper. Solution heat treatment and artificial age practices are proprietary.

3.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties

Product shall conform to the following requirements, determined 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 (ksi)	Elongation in 2 Inches or 4D (%)
0.500 to 2.000, incl	Longitudinal	71.0	63.0	6
	Long Transverse	72.0	62.0	5

Table 2B - Minimum tensile properties, SI units

Nominal Thickness (Millimeters)	Specimen Orientation	Tensile Strength (MPa)	Yield Strength (MPa)	Elongation in 50.8 mm or 4D (%)
12.70 to 50.80, incl	Longitudinal	490	434	6
	Long Transverse	496	427	5

3.3.2 Exfoliation Corrosion Resistance

Specimens shall not exhibit exfoliation corrosion at a T/10 plane greater than EB as illustrated by Figure 2 of ASTM G34, when specimens are exposed for 2 weeks according to the procedures in ASTM G85 Annex A2, using the dry-bottom MASTMAASIS Test Method.

3.3.3 Stress-Corrosion Test

Specimens from plate 0.750 inch (19.05 mm) and over in nominal thickness shall be tested in accordance with ASTM G47 shall show no evidence of stress-corrosion cracking when stressed in the short transverse direction at 50.0 ksi (345 MPa) and in the long transverse direction at 55.0 ksi (379 MPa) (see 8.3).

3.3.4 Fracture Toughness

When specified, plane strain fracture toughness shall be tested in accordance with ASTM E399 and ASTM B645. The required test orientations shall be specified by the purchaser (see 8.6). The test specimens shall meet the following requirements:

3.3.4.1 For L-T and T-L test orientations use a test specimen having a width (W) of 3.0 inches (76 mm). For plate 1.000 to 1.500 inches (25.40 to 38.10 mm) in nominal thickness, the test specimen thickness (B) is full plate thickness. For plate 1.501 to 2.000 inches (38.13 to 50.80 mm) in nominal thickness, the test specimen thickness (B) shall be 1.5 inches (38 mm) and the specimen is centered at the mid-thickness (T/2).

3.3.4.2 A valid K_{IC} meeting the requirements of ASTM E399 or a 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 K_{IC} or K_Q "useable for lot release" fracture toughness, inch/pound units

Nominal Thickness (Inches)	L-T ksi√inch	T-L ksi√inch
1.000-2.000	30	25

Table 3B - Minimum K_{IC} or K_Q "useable for lot release" fracture toughness, SI units

Nominal Thickness (Millimeters)	L-T MPa√m	T-L MPa√m
25.40-50.80	33	27

3.3.5 Mechanical property requirements for product outside the range covered by Tables 2 and 3 shall be agreed upon between purchaser and producer and reported in 4.4.1.

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 specified, each plate 0.500 to 2.000 inches (12.70 to 50.80 mm) in nominal thickness shall be ultrasonically inspected in accordance with ASTM B594 and shall meet the requirements of 3.4.1.1 (see 8.6).

3.4.1.1 Plates shall meet the requirements for ultrasonic class A for plate 0.500 to 2.000 inches (12.70 to 50.80 mm) in nominal thickness.

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.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of plate shall supply all samples for producer's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the plate conforms to the specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.3.1), tolerances (3.5), and, when specified, fracture toughness (3.3.4), and ultrasonic soundness (3.4.1) are acceptance tests and except for composition, shall be performed on each lot.

4.2.2 Periodic Tests

Exfoliation corrosion resistance (3.3.2) and stress-corrosion resistance (3.3.3) are periodic tests and shall be performed at a frequency selected by the producer unless frequency of testing is specified by purchaser.