



<b>AEROSPACE MATERIAL SPECIFICATION</b>	<b>AMS4089™</b>	<b>REV. G</b>
	Issued 1976-07 Reaffirmed 2008-05 Revised 2025-02	
Superseding AMS4089F		
Aluminum Alloy, Plate, 1.6Cu - 2.2Mg - 0.22Cr - 5.7Zn (7475-T7651), Solution Heat Treated, Stress Relieved by Stretching, and Precipitation Heat Treated (Composition similar to UNS A97475)		

RATIONALE

AMS4089G results from a Five-Year Review and update of this specification with changes to update standard language related to unauthorized exceptions (see 3.3.1.1, 4.4.1, and 8.4), relocate Definitions (see 2.4), and update Applicable Documents (see Section 2).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of plate 0.250 to 1.500 inches (6.35 to 38.10 mm), inclusive, in nominal thickness (see 8.5).

1.2 Application

This plate has been used typically for structural applications requiring material with high strength and resistance to exfoliation corrosion, moderate fatigue strength, and high fracture toughness, 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.

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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](http://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

## 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](http://www.astm.org).

ASTM B594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products

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

ASTM B660 Packaging/Packing 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 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	--	0.10
Iron	--	0.12
Copper	1.2	1.9
Manganese	--	0.06
Magnesium	1.9	2.6
Chromium	0.18	0.25
Zinc	5.2	6.2
Titanium	--	0.06
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

### 3.2 Condition

Solution heat treated, stress relieved by stretching to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and precipitation heat treated to the T7651 temper (refer to ANSI-H35.1/H35.1M) in accordance with AMS2772.

3.2.1 Plate shall receive no straightening operations after stretching.

### 3.3 Properties

Plate shall conform to the following requirements, determined in accordance with AMS2355:

#### 3.3.1 Tensile Properties

Shall be as shown 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 %
0.250 to 0.499, incl	Longitudinal	70.0	60.0	9
	Long-Transverse	71.0	60.0	9
Over 0.499 to 1.000, incl	Longitudinal	69.0	59.0	8
	Long-Transverse	70.0	59.0	8
Over 1.000 to 1.500, incl	Longitudinal	69.0	59.0	6
	Long-Transverse	70.0	59.0	6

**Table 2B - Minimum tensile properties, SI units**

Nominal Thickness Millimeters	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
6.35 to 12.67, incl	Longitudinal	483	414	9
	Long-Transverse	490	414	9
Over 12.67 to 25.40, incl	Longitudinal	476	407	8
	Long-Transverse	483	407	8
Over 25.40 to 38.10, incl	Longitudinal	476	407	6
	Long-Transverse	483	407	6

3.3.1.1 Mechanical property requirements for product outside the range covered by 1.1 shall be agreed upon between the purchaser and producer and reported per 4.4.1 (see 8.5).

### 3.3.2 Fracture Toughness

Plane-strain fracture toughness shall be tested in accordance with ASTM E399 and ASTM B645 for plate 1.000 to 1.500 inches (25.40 to 38.10 mm), inclusive, in nominal thickness. 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 Table 3.

**Table 3 - Minimum plane strain fracture toughness values,  
 $K_{IC}$  or  $K_Q$  “usable for lot release”**

Specimen Orientation	$K_{IC}$ ksi $\sqrt{\text{inch}}$	$K_{IC}$ MPa $\sqrt{\text{m}}$
L-T	33.0	36.3
T-L	30.0	33.0

### 3.3.3 Corrosion-Resistance Indicator Test

3.3.3.1 If the conductivity is 39.0% IACS (International Annealed Copper Standard) (22.6 MS/m) or higher and the long-transverse yield strength does not exceed the specified minimum by 9000 psi (60 MPa) or more, the plate is acceptable.

3.3.3.2 If the conductivity is 39.0% IACS (22.6 MS/m) or higher and the long-transverse yield strength exceeds the specified minimum by 9000 psi (62 MPa) or more, or if the conductivity is at least 38.0% IACS (22.0 MS/m) but less than 39.0% IACS (22.6 MS/m) and tensile properties meet specified requirements, plate may be given additional precipitation heat treatment and then retested.

3.3.3.3 If the conductivity is lower than 38.0% IACS (22.0 MS/m), the plate is not acceptable and shall be reheat treated or additionally precipitation heat treated and retested.

### 3.3.4 Exfoliation Resistance

Plate shall not exhibit exfoliation corrosion at the T/10 plane greater than that illustrated by Photo B, Figure 2 of ASTM G34.

### 3.3.5 Stress-Corrosion Resistance

Specimens cut from plate 0.750 inch (19.05 mm) and over in nominal thickness shall show no evidence of stress-corrosion cracking when tested in accordance with ASTM G47 and stressed in the short-transverse direction to 25.0 ksi (172 MPa).

### 3.4 Quality

Plate, 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 plate.

3.4.1 Each plate 0.500 inch (12.70 mm) and over in nominal thickness shall be ultrasonically inspected in accordance with ASTM B594 and shall meet ultrasonic Class A.

### 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.