AEROSPACE MATERIAL SPECIFICATION

AMS4090™	REV. G

Issued 1976-01
Reaffirmed 2006-04
Revised 2020-08

Superseding AMS4090F

Aluminum Alloy, Plate
5.7Zn - 2.2Mg - 1.6Cu - 0.22Cr (7475-T651)
Solution Heat Treated, Stress Relieved, and Precipitation Heat Treated
(Composition similar to UNS A97475)

RATIONALE

AMS4090G prohibits unauthorized exceptions (3.6), revises condition (3.2), properties (3.3.1.1), reports (4.4.1), and identification (5.1.1), and results from a Five-Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of plate from 0.250 to 1.500 inches (6.35 to 38.10 mm) in thickness (see 8.6).

1.2 Application

This plate has been used typically for structural applications requiring plate with high strength, 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.

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

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https://www.sae.org/standards/content/AMS4090G/

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 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 K_{Ic} of Metallic Materials

2.3 ANSI Accredited Publications

Copies of these documents are available online at http://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)

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight as 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 -T651 temper (refer to ANSI H35.1/35.1M). Heat treatment shall be performed in accordance with AMS2772.

3.2.1 Plate shall receive no straightening operations after stretching.

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3.3 Properties

Plate shall conform to the following requirements, determined in accordance with AMS2355 on the mill produced product:

3.3.1 Tensile Properties

Shall be as shown in Table 2.

3.3.1.1 Mechanical property requirements for product outside of the range covered by 1.1 shall be agreed upon between purchaser and producer.

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	77.0	69.0	10
	Long-Transverse	78.0	67.0	10
Over 0.499 to 1.500, incl	Longitudinal	77.0	70.0	9
	Long-Transverse	78.0	68.0	9

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	531	476	10
	Long-Transverse	538	462	10
Over 12.67 to 38.10, incl	Longitudinal	531	483	9
	Long-Transverse	538	469	9

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3.3.2 Fracture Toughness

Plane strain fracture toughness shall be tested in accordance with ASTM E399 and ASTM B645 for plate 0.750 to 1.500 inches (19.05 to 38.10 mm) inclusive in nominal thickness. Specimens in the L-T and T-L orientations shall be tested on the first production lot shipped to a purchaser. Specimens in the T-L orientation shall be tested on subsequent lots, unless otherwise specified. A valid K_{Ic} meeting the requirements of ASTM E399 or a K_Q "useable for lot release" in accordance with ASTM B645 shall meet or exceed the values specified in Table 3.

Table 3 - Minimum K_{Ic} or K_Q "useable for lot release" fracture toughness

Specimen Orientation	ksi $\sqrt{\text{inch}}$	MPa $\sqrt{\text{m}}$
L-T	30	33
T-L	28	31

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 Each plate 0.5 inch (13 mm) and over in nominal thickness shall be ultrasonically inspected in accordance with ASTM B594 and shall meet ultrasonic Class B.

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 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 specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition, tensile properties (3.3.1), fracture toughness (3.3.2), ultrasonic inspection (3.4.1), and tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each inspection lot.

4.3 Sampling and Testing

Shall be in accordance with AMS2355.

4.4 Reports

The producer of plate shall furnish with each shipment a report stating that the product conforms to the chemical composition, tolerances, and ultrasonic inspection and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number(s), AMS4090G, size, and quantity. The report shall also identify the producer, the product form, and the size of the mill product.

4.4.1 When material produced to this specification is outside the size range specified in 1.1 or has exceptions authorized by purchaser taken to the technical requirements listed in Section 3, the report shall contain a statement “This material is certified as AMS4090G(EXC) because of the following exceptions:” and the specific exceptions shall be listed.

4.4.2 When the product size is outside the range covered by Table 2, the report shall contain a statement to that effect.

4.5 Resampling and Retesting

Shall be in accordance with AMS2355.

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