AEROSPACE MATERIAL SPECIFICATION

AMS4448™

Issued 2020-08

Aluminum Alloy, Plate (7160-T7351)
7.0Zn - 2.2Cu - 1.5Mg - 0.10Zr
Solution Heat Treated, Stress Relieved, and Overaged

RATIONALE

AMS4448 is a new material specification which covers aluminum alloy 7160-T7351 in the form of plate.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of plate 1.000 to 6.000 inches (25.40 to 152.40 mm), inclusive, in nominal thickness (see 8.4).

1.2 Application

This plate 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

ARP1917 Clarification of 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/AMS4448/

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 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 K_{Ic} 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 High-Strength Aluminum Alloy Products

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 shown in Table 1, determined in accordance with AMS2355.

Table 1 - Composition

Element	Min	Max
Silicon		0.10
Iron	--	0.10
Copper	1.9	2.5
Manganese	--	0.05
Magnesium	1.0	2.0
Zinc	6.7	7.3
Titanium	--	0.06
Zirconium	0.04	0.15
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 1-1/2 to 3% and artificially aged to T7351 temper (refer to ANSI H35.1/H35.1M). Solution and precipitation heat treatment shall be performed in accordance with AMS2772 as applicable to 7XXX alloys. The actual practices are considered proprietary.

3.3 Properties

Plate shall conform to the following requirements, determined in accordance with AMS2355 on the mill produced product and as specified herein.

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, incl	Longitudinal	74.0	67.0	13
	Long-Trans.	74.0	65.0	11
Over 1.500 to 2.000, incl	Longitudinal	73.0	67.0	13
	Long-Trans.	73.0	65.0	11
Over 2.000 to 3.000, incl	Longitudinal	72.0	65.0	12
	Long-Trans.	73.0	64.0	10
	Short-Trans.	70.0	59.0	6
Over 3.000 to 4.000, incl	Longitudinal	71.0	64.0	12
	Long-Trans.	72.0	63.0	9
	Short-Trans.	70.0	58.0	5
Over 4.000 to 5.000, incl	Longitudinal	70.0	64.0	11
	Long-Trans.	72.0	62.0	8
	Short-Trans.	69.0	58.0	4
Over 5.000 to 6.000, incl	Longitudinal	70.0	63.0	11
	Long-Trans.	71.0	61.0	7
	Short-Trans.	68.0	58.0	3

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 %
25.40 to 38.10, incl	Longitudinal	510	462	13
	Long-Trans.	510	448	11
Over 38.10 to 50.80, incl	Longitudinal	503	462	13
	Long-Trans.	503	448	11
Over 50.80 to 76.20, incl	Longitudinal	496	448	12
	Long-Trans.	503	441	10
	Short-Trans.	483	407	6
Over 76.20 to 101.60, incl	Longitudinal	490	441	12
	Long-Trans.	496	434	9
	Short-Trans.	483	400	5
Over 101.60 to 127.00, incl	Longitudinal	483	441	11
	Long-Trans.	496	427	8
	Short-Trans.	476	400	4
Over 127.00 to 152.40, incl	Longitudinal	483	434	11
	Long-Trans.	490	421	7
	Short-Trans.	469	400	3

3.3.2 Electrical Conductivity

Shall be not lower than 39.0% IACS (International Annealed Copper Standard) (23 MS/m), determined on the surface of the tensile coupon.

3.3.3 Exfoliation-Corrosion Test

Material shall not exhibit exfoliation corrosion greater than that illustrated by Photograph EA of Figure 2 of ASTM G34.

3.3.4 Stress-Corrosion Test

Specimens shall show no evidence of stress-corrosion cracking when stressed in the short-transverse direction at 45.0 ksi (310 MPa) for 20 days in accordance with ASTM G47.

3.3.5 Fracture Toughness

When specified (see 8.4), plane strain fracture toughness shall be tested in accordance with ASTM E399 and ASTM B645. 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. For T-L and L-T test directions for plate over 4.000 inches (102.00 mm) in nominal thickness, use specimens 2.000 inches (51.00 mm) minimum thickness centered at T/4. For the S-L test direction, the test specimen shall be centered at T/2. Required specimen orientation(s) shall be specified by purchaser.

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	40	34	--
Over 2.000 to 3.000, incl	45	33	35
Over 3.000 to 4.000, incl	38	30	34
Over 4.000 to 5.000, incl	36	27	31
Over 5.000 to 6.000, incl	28	25	26

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	44	37	--
Over 50.80 to 76.20, incl	49	36	38
Over 76.20 to 101.60, incl	42	33	37
Over 101.60 to 127.00, incl	40	30	34
Over 127.00 to 152.40, incl	31	27	29

3.3.6 Mechanical property requirements for sheet and plate outside the thickness range of 1.1 shall be as agreed upon by purchaser and producer.

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 shall be ultrasonically inspected in accordance with ASTM B594 and shall meet the requirements for ultrasonic Class A for nominal thickness of 1.000 to 6.000 inches (25.40 to 152.40 mm).

3.5 Tolerances

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