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400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

**SAE**

**AMS 4101B**

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Superseding AMS 4101A

Submitted for recognition as an American National Standard

ALUMINUM ALLOY, PLATE  
4.4Cu - 1.5Mg - 0.60Mn (2124-T851)  
Solution Heat Treated, Stretched, and Precipitation Heat Treated

UNS A92124

## 1. SCOPE:

### 1.1 Form:

This specification covers an aluminum alloy in the form of plate.

### 1.2 Application:

This plate has been used typically for parts requiring a high level of mechanical properties up to 300 °F (149 °C), but usage is not limited to such applications.

## 2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

### 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

- AMS 2202 Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate
- MAM 2202 Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate
- AMS 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings
- MAM 2355 Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings, Metric (SI) Units
- AMS 2811 Identification, Aluminum and Magnesium Alloy Wrought Products

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AMS 4101B

SAE

AMS 4101B

## 2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

- ASTM B 594 Ultrasonic Examination of Aluminum-Alloy Wrought Products for Aerospace Applications
- ASTM B 645 Plane Strain Fracture Toughness Testing of Aluminum Alloys
- ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products
- ASTM E 602 Sharp-Notch Tension Testing with Cylindrical Specimens
- ASTM G 47 Determining Susceptibility to Stress-Corrosion Cracking of High-Strength Aluminum Alloy Products.

## 2.3 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-6088 Heat Treatment of Aluminum Alloys

## 3. TECHNICAL REQUIREMENTS:

## 3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355 or MAM 2355.

TABLE 1 - Composition

Element	min	max
Copper	3.8	4.9
Magnesium	1.2	1.8
Manganese	0.30	0.9
Iron	--	0.30
Zinc	--	0.25
Silicon	--	0.20
Titanium	--	0.15
Chromium	--	0.10
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

## 3.2 Condition:

Solution heat-treated, stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and precipitation heat-treated. Heat treatments shall be performed in accordance with MIL-H-6088 as applicable to 2024-T851 plate.

AMS 4101B

SAE

AMS 4101B

3.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties:

Plate shall conform to the following requirements:

3.3.1 Tensile Properties: Shall be as shown in Table 2, determined in accordance with AMS 2355 or MAM 2355.

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 %
1.5 to 2, incl	Longitudinal	66.0	57.0	6
	Long-Trans.	66.0	57.0	5
	Short-Trans.	64.0	55.0	1.5
Over 2 to 3, incl	Longitudinal	65.0	57.0	6
	Long-Trans.	65.0	57.0	4
	Short-Trans.	63.0	55.0	1.5
Over 3 to 4, incl	Longitudinal	65.0	56.0	5
	Long-Trans.	65.0	56.0	4
	Short-Trans.	62.0	54.0	1.5
Over 4 to 5, incl	Longitudinal	64.0	55.0	5
	Long-Trans.	64.0	55.0	4
	Short-Trans.	61.0	53.0	1.5
Over 5 to 6, incl	Longitudinal	63.0	54.0	5
	Long-Trans.	63.0	54.0	4
	Short-Trans.	58.0	51.0	1.5

AMS 4101B

SAE

AMS 4101B

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 %
38 to 51, incl	Longitudinal	455	393	6
	Long-Trans.	455	393	5
	Short-Trans.	441	379	1.5
Over 51 to 76, incl	Longitudinal	448	393	6
	Long-Trans.	448	393	4
	Short-Trans.	434	379	1.5
Over 76 to 102, incl	Longitudinal	448	386	5
	Long-Trans.	448	386	4
	Short-Trans.	427	372	1.5
Over 102 to 127, incl	Longitudinal	441	379	5
	Long-Trans.	441	379	4
	Short-Trans.	421	365	1.5
Over 127 to 152, incl	Longitudinal	434	372	5
	Long-Trans.	434	372	4
	Short-Trans.	400	352	1.5

- 3.3.2 Stress-Corrosion Resistance: Specimens cut from plate shall show no evidence of stress-corrosion cracking when stressed in the short-transverse direction to 50% of the specified minimum long-transverse yield strength, determined in accordance with ASTM G 47.  
(R)
- 3.3.3 Ultrasonic Soundness: Each plate, 1.5 to 4.5 inches (38 to 114 mm) in nominal thickness, shall be inspected in accordance with ASTM B 594 and shall meet Class A ultrasonic requirements.  
(R)
- 3.3.4 Fracture Toughness: When specified, plate, 1.5 to 6 inches (38 to 152 mm), inclusive, in nominal thickness, shall meet the values of  $K_{IC}$ , shown in Table 3, determined in accordance with ASTM B 645. The required test directions shall be as specified by purchaser.

TABLE 3 - Minimum Fracture Toughness Values

Test Direction	$K_{IC}$ ksi $\sqrt{\text{inch}}$	$K_{IC}$ MPa $\sqrt{\text{m}}$
L - T	24	26.4
T - L	20	22.0
S - L	18	19.8

AMS 4101B

SAE

AMS 4101B

3.3.5 Notch Tensile Strength/Tensile Yield Strength (NTS/TYS) Ratio: If acceptable to purchaser, the (R) producer may guarantee that the plate meets the fracture toughness  $K_{IC}$  requirements, based on correlation with NTS/TYS ratio, in lieu of determining fracture toughness, provided that correlation has been established between the two by that vendor.

3.3.5.1 For plate 1.5 to 6 inches (38 to 152 mm), inclusive, in nominal thickness, notch tensile strength shall be determined in accordance with ASTM E 602.

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.

3.5 Tolerances:

Shall conform to all applicable requirements of AMS 2202 or MAM 2202..

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

The vendor of plate shall supply all samples for vendor's tests and shall be responsible for performing 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 requirements of this specification.

4.2 Classification of Tests:

(R)

All technical requirements are acceptance tests and shall be performed on each lot.

4.3 Sampling and Testing:

(R)

Shall be in accordance with AMS 2355 or MAM 2355 and the following:

4.3.1 Specimens for tensile tests shall be taken in the longitudinal, long-transverse, and short-transverse directions. (R)

4.3.2 Specimens for stress-corrosion testing shall be taken parallel to the short-transverse grain direction from the center width of at least one plate from each lot.

4.3.3 Specimens for fracture-toughness testing shall be taken from the center width of at least one plate in each lot for each test direction specified. If purchaser does not specify a direction, the S - L orientation shall be tested. (R)