

**AEROSPACE
MATERIAL
SPECIFICATION**

Submitted for recognition as an American National Standard

SAE AMS 4037L

Issued 6-14-40
Revised 10-1-86

Superseding AMS 4037K

**ALUMINUM ALLOY SHEET AND PLATE
4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate)
Solution Heat Treated**

UNS A9204

1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of sheet and plate.

1.2 Application: Primarily for formed structural parts of good strength. Plate is also suitable for structural machined parts where warpage, during machining, due to residual stresses must be minimized. Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP 823 recommends practices to minimize such conditions.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2202 - Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate

MAM 2202 - Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate

AMS 2350 - Standards and Test Methods

AMS 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings

MAM 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units

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2.1.2 Aerospace Recommended Practices:

ARP 823 - Minimizing Stress Corrosion Cracking in Wrought Heat Treatable Aluminum Alloy Products

2.2 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.2.2.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

2.2.2 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with AMS 2355 or MAM 2355:

	min	max
Copper	3.8	4.9
Magnesium	1.2	1.8
Manganese	0.30	0.9
Iron	--	0.50
Silicon	--	0.50
Zinc	--	0.25
Titanium	--	0.15
Chromium	--	0.10
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Sheet: Solution heat treated in accordance with MIL-H-6088 and cold worked.

3.2.2 Plate: Solution heat treated in accordance with MIL-H-6088 and stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%.

3.2.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties: The product shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.3.1 Tensile Properties: Shall be as specified in Table I and 3.3.1.1.

TABLE I

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
0.008 to 0.009, incl	63,000	42,000	10
Over 0.009 to 0.020, incl	63,000	42,000	12
Over 0.020 to 0.128, incl	63,000	42,000	15
Over 0.128 to 0.249, incl	64,000	42,000	15
Over 0.249 to 0.499, incl	64,000	42,000	12
Over 0.499 to 1.000, incl	63,000	42,000	8
Over 1.000 to 1.500, incl	62,000	42,000	7
Over 1.500 to 2.000, incl	62,000	42,000	6
Over 2.000 to 3.000, incl	60,000	42,000	4
Over 3.000 to 4.000, incl	57,000	41,000	4

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50 mm or 4D %, min
0.20 to 0.22, incl	435	290	10
Over 0.22 to 0.50, incl	435	290	12
Over 0.50 to 3.20, incl	435	290	15
Over 3.20 to 6.25, incl	440	290	15
Over 6.25 to 12.50, incl	440	290	12
Over 12.50 to 25.00, incl	435	290	8
Over 25.00 to 37.50, incl	425	290	7
Over 37.50 to 50.00, incl	425	290	6
Over 50.00 to 75.00, incl	415	290	4
Over 75.00 to 100.00, incl	395	285	4

3.3.1.1 Tensile property requirements for product under 0.008 in. (0.20 mm) or over 4.000 in. (100.00 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 Bending: Product 0.008 to 0.499 in. (0.20 to 12.50 mm), incl, in nominal thickness shall withstand, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to the bend factor times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

Nominal Thickness		Bend Factor
Inch	Millimetres	
0.008 to 0.020, incl	0.20 to 0.50, incl	4
Over 0.020 to 0.051, incl	Over 0.50 to 1.28, incl	5
Over 0.051 to 0.128, incl	Over 1.28 to 3.20, incl	6
Over 0.128 to 0.249, incl	Over 3.20 to 6.25, incl	8
Over 0.249 to 0.499, incl	Over 6.25 to 12.50, incl	10

3.3.2.1 Bending requirements for product under 0.008 in. (0.20 mm) or over 0.499 in. (12.50 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4 Quality: The product, 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 product.

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 the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile properties (3.3.1), and tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for bending (3.3.2) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment a report stating that the product conforms to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, AMS 4037L, size, and quantity.

- 4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 4037L, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification and shall include in the report either a statement that the material conforms or copies of laboratory reports showing the results of tests to determine conformance.
- 4.5 Resampling and Retesting: Shall be in accordance with AMS 2355 or MAM 2355.
5. PREPARATION FOR DELIVERY:
- 5.1 Identification: Each sheet and plate shall be marked on one face, in the respective location indicated below, with the alloy number and temper, AMS 4037 or applicable Federal specification designation, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be legible, shall be applied using a suitable marking fluid, and shall be sufficiently stable to withstand normal handling. The markings shall have no deleterious effect on the product or its performance.
- 5.1.1 Flat Sheet and Plate Under 6 In. (150 mm) Wide: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm).
- 5.1.2 Flat Sheet and Plate 0.375 In. (9.50 mm) and Under Thick, 6 - 60 In. (150 - 1500 mm), Incl, Wide, and 36 - 200 In. (900 - 5000 mm), Incl, Long: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (900 mm), the rows being spaced approximately 6 in. (150 mm) on centers across the width and staggered. Every third row shall show the manufacturer's identification and nominal thickness. The other rows shall show the alloy number and temper and AMS 4037 or applicable Federal specification designation.
- 5.1.3 Flat Sheet and Plate Over 0.375 In. (9.50 mm) Thick, or Over 60 In. (1500 mm) Wide, or Over 200 In. (5000 mm) Long: Shall be marked as in 5.1.2 or, at vendor's discretion, shall be marked in one or two rows of characters recurring at intervals not greater than 3 ft (900 mm) and running around the periphery of the piece. If one row is used, it shall show all information of 5.1. If two rows are used, one row shall show the alloy number and temper and AMS 4037 or applicable Federal specification designation; the second row shall show the manufacturer's identification and nominal thickness.
- 5.1.3.1 If peripheral marking is applied to the full piece as produced but partial sheets or plates are supplied, an arrow shall also be applied near one corner indicating the direction of rolling.