

Submitted for recognition as an American National Standard

ALUMINUM ALLOY SHEET AND PLATE  
4.5Cu - 0.85Si - 0.80Mn - 0.50Mg (2014; -T6 Sheet, -T651 Plate)  
Solution and Precipitation Heat Treated

UNS A92014

1. SCOPE:

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

1.2 Application: Primarily for structural parts of good strength. 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	3.9	5.0
Silicon	0.50	1.2
Manganese	0.40	1.2
Magnesium	0.20	0.8
Iron	--	0.7
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; heat treatments shall be performed in accordance with MIL-H-6088:

3.2.1 Sheet: Solution and precipitation heat treated.

3.2.2 Plate: 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.

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
0.020 to 0.039, incl	64,000	57,000	6
Over 0.039 to 0.249, incl	66,000	58,000	7
Over 0.249 to 0.499, incl	67,000	59,000	7
Over 0.499 to 1.000, incl	67,000	59,000	6
Over 1.000 to 2.000, incl	67,000	59,000	4
Over 2.000 to 2.500, incl	65,000	58,000	2
Over 2.500 to 3.000, incl	63,000	57,000	2
Over 3.000 to 4.000, incl	59,000	55,000	1

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
0.50 to 1.00, incl	440	395	6
Over 1.00 to 6.25, incl	455	400	7
Over 6.25 to 12.50, incl	460	405	7
Over 12.50 to 25.00, incl	460	405	6
Over 25.00 to 50.00, incl	460	405	4
Over 50.00 to 62.50, incl	450	400	2
Over 62.50 to 75.00, incl	435	395	2
Over 75.00 to 100.00, incl	405	380	1

3.3.1.1 Tensile property requirements for product under 0.020 in. (0.50 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 0.020 to 0.499 in. (0.50 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	
0.020 to 0.039, incl	0.50 to 1.00, incl	5
Over 0.039 to 0.050, incl	Over 1.00 to 1.25, incl	6
Over 0.050 to 0.124, incl	Over 1.25 to 3.10, incl	8
Over 0.124 to 0.249, incl	Over 3.10 to 6.25, incl	10
Over 0.249 to 0.499, incl	Over 6.25 to 12.50, incl	12

3.3.2.1 Bending requirements for product under 0.020 in. (0.50 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 4029G, lot number, 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 4029G, 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.