AEROSPACE MATERIAL SPECIFICATION

AMS4478™	REV. B
Issued 2013-07 Revised 2023-03 Superseding AMS4478A	

Aluminum Alloy, Sheet and Plate, Alclad
4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024, -T81 Sheet, -T851 Plate)
Solution Heat Treated, Cold Worked and Artificially Aged
(Composition similar to UNS A82024)

RATIONALE

AMS4478B results from a Five-Year Review and update of this specification with changes to relocate definitions (2.4) and note regarding properties (3.3.3), update wording to prohibit unauthorized exceptions (3.3.2, 3.7, 8.4), update applicable documents (Section 2), and allow the use of the immediate prior specification revision (8.3).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of Alclad sheet and plate 0.010 to 0.499 inch (0.254 to 12.67 mm), inclusive, in thickness, supplied in the -T81/-T851 temper (see 8.5).

1.2 Application

These products have been used typically for high strength parts requiring higher yield strength than is afforded by naturally aged tempers of this alloy and maximum corrosion resistance and whose fabrication does not involve welding, 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

AS7766 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/AMS4478B/

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 B660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B666/B666M Identification of Aluminum and Magnesium Alloy Products

2.3 ANSI Accredited Publications

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

2.4 Definitions

Terms used in AMS are defined in AS7766.

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight as shown in Tables 1 and 2, determined in accordance with AMS2355.

Table 1 - Composition, core (2024)

Element	Min	Max
Silicon	--	0.50
Iron	--	0.50
Copper	3.8	4.9
Manganese	0.30	0.9
Magnesium	1.2	1.8
Chromium	--	0.10
Zinc	--	0.25
Titanium	--	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

Table 2 - Composition, cladding (1230)

Element	Min	Max
Iron + Silicon	--	0.70
Copper	--	0.10
Manganese	--	0.05
Magnesium	--	0.05
Zinc	--	0.10
Titanium	--	0.03
Vanadium	--	0.05
Other Elements, each	--	0.03
Aluminum	99.30	--

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Sheet

Solution heat treated, cold worked and artificially aged to the -T81 temper in accordance with AMS2772 (refer to ANSI H35.1/H35.1M).

3.2.2 Plate

3.2.2.1 Solution heat treated, stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3%, and artificially aged to the -T851 temper (refer to ANSI H35.1/H35.1M). Solution and precipitation heat treatment shall be in accordance with AMS2772. The recommended aging treatment is 365 to 385 °F for 12 hours. Plate shall receive no further straightening operations after stretching.

3.3 Properties

The product shall conform to the following requirements, determined in accordance with AMS2355 on the mill produced size.

3.3.1 Tensile Properties

Shall be as shown in Table 3 (see 3.3.3).

Table 3A - Minimum tensile properties, inch/pound units

Temper	Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
-T81	0.010 thru 0.062	62.0	54.0	5
	0.063 thru 0.249	65.0	56.0	5
-T851	0.250 thru 0.499	65.0	56.0	5

Table 3B - Minimum tensile properties, SI units

Temper	Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
-T81	0.254 thru 1.57	427	372	5
	1.60 thru 6.32	448	386	5
-T851	6.33 thru 12.67	448	386	5

3.3.2 Mechanical property requirements for product outside the range covered by 1.1 shall be agreed upon between purchaser and producer and reported per 4.4.1 (see 8.5).

3.3.3 The tensile properties in Tables 3 and 5 were taken directly from QQ-A-250/5F, Amendment 2 (AMS-QQ-A-250/5A) and have not been independently verified by AMS statistical procedures.

3.4 Cladding Thickness

3.4.1 Thickness of Cladding Plates

The aluminum alloy plates that are bonded to the two sides of the aluminum alloy (2024) ingot or slab, to form a composite that is to be rolled, shall each have a thickness as specified in Table 4.

Table 4 - Cladding thickness

Nominal Thickness Inches	Nominal Thickness Millimeters	Nominal Cladding Thickness Per Side % of Thickness	Average Cladding Thickness Per Side % of Thickness Minimum
0.010 thru 0.062	0.25 thru 1.57	5	4
0.063 and above	1.60 and above	2.5	2

3.5 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.

3.6 Tolerances

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

3.7 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 the product 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 product conforms to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.3.1), and tolerances (3.6) are acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests

Cladding thickness (3.4.1) is a periodic test and shall be performed at a frequency selected by the producer, unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2355.

4.4 Reports

The producer of the product shall furnish with each shipment a report stating that the product conforms to the composition and tolerances, and showing numerical results of tests for the other acceptance test requirements. This report shall include the purchase order number, lot number, AMS4478B, size, and quantity. The report shall also identify the producer, the product form, and the size of the mill product.