SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS4462

Issued 2011-12

Aluminum Alloy, Sheet and Plate, Alclad
4.4Cu - 1.5Mg - 0.60Mn (Alclad 2024, -T3 Sheet, -T351 Plate)
Solution Heat Treated, Cold Worked and Naturally Aged

(Composition similar to UNS A82024)

RATIONALE

AMS4462 is a new specification for normal 2024-T3/-T351 alclad sheet and plate to facilitate cancellation of AMS-QQ-A-250/5.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of alclad sheet and plate supplied in the -T3/-T351 temper.

1.2 Application

These products have been used typically for medium strength parts requiring formability 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 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

AS1990 Aluminum Alloy Tempers

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**

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 B 594 Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications

ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B 666/B 666M Identification of Aluminum and Magnesium Alloy Products

2.3 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI H 35.2 Dimensional Tolerances for Aluminum Mill Products

ANSI H 35.2M Dimensional Tolerances for Aluminum Mill Products (Metric)

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
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 naturally aged to the T3 temper in accordance with AMS2772 (See AS1990).

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 naturally aged to the T351 temper in accordance with AMS2772 (See AS1990).

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 AMS2355 on the mill produced size.

3.3.1 Tensile Properties

Shall be as shown in Table 3 (See 8.3).

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, %
-T3	0.008 to 0.009, incl	58.0	39.0	10
	Over 0.009 to 0.020, incl	59.0	39.0	12
	Over 0.020 to 0.062, incl	59.0	39.0	15
	Over 0.062 to 0.128, incl	61.0	40.0	15
	Over 0.128 to 0.249, incl	62.0	40.0	15
-T351	0.250 to 0.499, incl	62.0	40.0	12
	Over 0.499 to 1.000, incl	63.0	42.0	8
	Over 1.000 to 1.500, incl	62.0	42.0	7
	Over 1.500 to 2.000, incl	62.0	42.0	6
	Over 2.000 to 3.000, incl	60.0	42.0	4
	Over 3.000 to 4.000, incl	57.0	41.0	4

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, %
-T3	0.203 to 0.229, incl	400	269	10
	Over 0.229 to 0.508, incl	407	269	12
	Over 0.508 to 1.575, incl	407	269	15
	Over 1.575 to 3.251, incl	421	276	15
	Over 3.251 to 6.325, incl	427	276	15
-T351	6.35 to 12.67, incl	427	276	12
	Over 12.67 to 25.40, incl	434	290	8
	Over 25.40 to 38.10, incl	427	290	7
	Over 38.10 to 50.80, incl	427	290	6
	Over 50.80 to 76.20, incl	414	290	4
	Over 76.20 to 101.60, incl	393	283	4

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, Inch	Nominal Thickness, mm	Nominal Cladding Thickness Per Side, % of Thickness	Average Cladding Thickness Per Side, % of Thickness, Minimum
0.010 to 0.062, incl	0.25 to 1.57, incl	5	4
Over 0.062	Over 1.57	2.5	2

3.5 Response to Heat Treatment (-T42, -T62, -T72, -T81 & -T851)

The product, as received by purchaser, shall meet the following properties shown in Table 5 after re-solution heat treatment and natural aging to the -T42 temper (See AS1990) in accordance with AMS2772. Additionally, material in the -T42 condition shall meet the properties shown in Table 5 after artifical aging to the -T62 and -T72 condition respectively in accordance with AMS2772. Additionally, product, as received from the purchaser, shall meet the following properties shown in Table 5 after artificial aging to the -T81 and -T851 tempers (See AS1990), respectively in accordance with AMS2772.

3.5.1 Tensile Properties

Shall be as shown in Table 5 (See 8.3).

TABLE 5A - 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, %
-T42	0.008 to 0.009, incl	55.0	34.0	10
	Over 0.009 to 0.020, incl	57.0	34.0	12
	Over 0.020 to 0.062, incl	57.0	34.0	15
	Over 0.062 to 0.249, incl	60.0	36.0	15
	Over 0.249 to 0.499, incl	60.0	36.0	12
	Over 0.499 to 1.000, incl	61.0	38.0	8
	Over 1.000 to 1.500, incl	60.0	38.0	7
	Over 1.500 to 2.000, incl	60.0	38.0	6
	Over 2.000 to 3.000, incl	58.0	38.0	4
-T62	0.010 to 0.062, incl	60.0	47.0	5
	Over 0.062 to 0.499, incl	62.0	49.0	5
-T72	0.010 to 0.062, incl	56.0	43.0	5
	Over 0.062 to 0.249, incl	58.0	45.0	5
-T81	0.010 to 0.062, incl	62.0	54.0	5
	Over 0.062 to 0.249, incl	65.0	56.0	5
-T851	Over 0.249 to 0.499, incl	65.0	56.0	5
	Over 0.499 to 1.000, incl	66.0	58.0	5

TABLE 5B - 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, %
-T42	0.203 to 0.229, incl	379	234	10
	Over 0.229 to 0.508, incl	393	234	12
	Over 0.508 to 1.575, incl	393	234	15
	Over 1.575 to 6.33, incl	414	248	15
	Over 6.33 to 12.68, incl	414	248	12
	Over 12.68 to 25.40, incl	421	262	8
	Over 25.40 to 38.10, incl	414	262	7
	Over 38.10 to 50.80, incl	414	262	6
	Over 50.80 to 76.20, incl	400	262	4
-T62	0.25 to 1.57, incl	414	324	5
	Over 1.57 to 12.67, incl	427	338	5
-T72	0.25 to 0.51, incl	386	296	5
	Over 1.57 to 6.32, incl	400	310	5
-T81	0.254 to 1.57, incl	427	372	5
	Over 1.57 to 6.32, incl	448	386	5
-T851	Over 6.32 to 12.67, incl	448	386	5
	Over 12.67 to 25.40, incl	455	400	5