SAE Aerospace
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS4031 REV. H

Issued 1962-06
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Superseding AMS4031G

Aluminum Alloy, Sheet and Plate
6.3Cu - 0.30Mn - 0.18Zr - 0.10V - 0.06Ti (2219-0) Annealed

or when specified, “As Fabricated” (2219-F)

(Composition similar to UNS A92219)

RATIONALE

AMS4031H revises condition (3.2.2) to include F temper requirements, Quality (3.4) to include ultrasonic inspection requirements, and Classification of Tests (4.2), to facilitate cancellation of AMS4295 and AMS-QQ-A-250/30.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet and plate supplied in the annealed (O) condition. When specified, product shall be supplied in the “as fabricated” (F) temper.

1.2 Application

These products have been used typically for parts requiring high strength up to 500°F (260°C) after heat treatment, but usage is not limited to such applications. May be welded and formed in the specified condition but properties are improved by heat treatment.

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 Marking of Aluminum and Magnesium-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 35.2 Dimensional Tolerances for Aluminum Mill Products

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

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS2355.

TABLE 1 - COMPOSITION

Element	min	max
Silicon	--	0.20
Iron	--	0.30
Copper	5.8	6.8
Manganese	0.20	0.40
Magnesium	--	0.02
Zinc	--	0.10
Titanium	0.02	0.10
Vanadium	0.05	0.15
Zirconium	0.10	0.25
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 CondItion

3.2.1 Annealed in accordance with AMS2772.

3.2.2 When specified, material may be provided in the “as fabricated” (F) temper. Requirements of 3.3.1 do not apply to the F temper.

3.3 Properties

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

3.3.1 As Annealed

3.3.1.1 Tensile Properties

Shall be as specified in Table 2 for product 0.020 to 2.000 inches (0.51 to 50.80 mm), inclusive, in nominal thickness.

TABLE 2 - TENSILE PROPERTIES

Property	Value
Tensile Strength, max	32.0 ksi (221 MPa)
Yield Strength at 0.2% Offset, max	16.0 ksi (110 MPa)
Elongation in 2 Inches (50.8 mm) or 4D, min	12%

3.3.1.2 Bending

Product shall withstand, without cracking, bending at room temperature through an angle of 180 degrees around a diameter equal to the bend factor shown in Table 3 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 3 - BENDING PARAMETERS

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.020 to 0.250, incl	0.51 to 6.35, incl	4
Over 0.250 to 0.750, incl	Over 6.35 to 19.05, incl	6
Over 0.750 to 1.000, incl	Over 19.05 to 25.40, incl	8

3.3.2 After Solution and Precipitation Heat Treatment

The product, as received by purchaser, shall have the following properties after solution and precipitation heat treatment to the -T62 condition (See AS1990) in accordance with AMS2772:

3.3.2.1 Tensile Properties

Shall be as specified in Table 4.

TABLE 4A - MINIMUM TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.020 to 0.039, incl	54.0	36.0	6
Over 0.039 to 0.249, incl	54.0	36.0	7
Over 0.249 to 1.000, incl	54.0	36.0	8
Over 1.000 to 2.000, incl	54.0	36.0	7

TABLE 4B - MINIMUM TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
0.51 to 0.99, incl	372	248	6
Over 0.99 to 6.32, incl	372	248	7
Over 6.32 to 25.40, incl	372	248	8
Over 25.40 to 50.80, incl	372	248	7

3.3.2.2 Bending

Product shall withstand, without cracking, bending at room temperature through an angle of 180 degrees around a diameter equal to the bend factor shown in Table 5 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

TABLE 5 - BENDING PARAMETERS

Nominal Thickness Inch	Nominal Thickness Millimeters	Bend Factor
0.020 to 0.062, incl	0.51 to 1.57, incl	8
Over 0.062 to 0.250, incl	Over 1.57 to 6.35, incl	12
Over 0.250 to 0.499, incl	Over 6.35 to 12.67, incl	16

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.

3.4.1 When specified, each plate 0.500 to 2.000 inches, incl. (12.70 to 50.80 mm, incl.) shall be ultrasonically inspected in accordance with ASTM B 594 and shall meet the requirements of 3.4.1.1 or 3.4.1.2.

3.4.1.1 Plates shall meet the requirement for ultrasonic class B for plate 0.500 to 1.500 inches, incl., (12.70 to 38.10 mm, incl.) in nominal thickness.

3.4.1.2 Plates shall meet the requirement for ultrasonic class A for plates over 1.500 to 2.000 inches, incl. (over 38.10 to 50.80 mm, incl.) in nominal thickness.

3.5 Tolerances

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

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 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 as annealed (3.3.1.1) (not applicable to F temper), properties after solution and precipitation heat treatment (3.3.2), and, when specified by purchaser, the ultrasonic quality (3.4.1), and tolerances (3.5) are acceptance tests and except for composition shall be performed on each lot.

4.2.2 Periodic Tests

Bending (3.3.1.2) in the annealed condition (not applicable to F temper) and bending (3.3.2.2) in the solution and precipitation heated treated condition are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.