



AEROSPACE MATERIAL SPECIFICATION

AMS4037**REV. Q**Issued 1940-06
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Superseding AMS4037P

Aluminum Alloy, Sheet and Plate
4.4Cu - 1.5Mg - 0.60Mn (2024; -T3 Flat Sheet, -T351 Plate)
Solution Heat Treated
(Composition similar to UNS A92024)

RATIONALE

AMS4037Q removes response to heat treatment (-T81, -T851,-T42, -T62, -T72 Temper) capability testing (3.3.3, 4.2.2), and revises Properties (3.3.1, 3.3.3.1), Periodic Tests (4.2.2), and Reports (4.4.1).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet and plate from 0.008 to 4.000 inches (0.20 to 101.60 mm) in thickness, inclusive (See 8.4).

1.2 Application

These products have been used typically 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, but usage is not limited to such applications.

1.2.1 Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP823 recommends practices to minimize such conditions.

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 supplied 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

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ARP823 Minimizing Stress-Corrosion Cracking in Wrought Heat-Treatable Aluminum Alloy Products

AS1990 Aluminum Alloy Tempers

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 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 H35.2 Dimensional Tolerances for Aluminum Mill Products

ANSI H35.2M 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 | -- | 0.50 |
| 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 | |

3.2 Condition

The product shall be supplied in the following condition:

3.2.1 Sheet

Solution heat treated in accordance with AMS2772 and cold worked to the T3 temper (See AS1990).

3.2.2 Plate

Solution heat treated in accordance with AMS2772 and stretched to produce a nominal permanent set of 2% but not less than 1-1/2% nor more than 3% to the T351 temper (See AS1990).

3.2.2.1 Plate shall receive no further straightening operations after stretching.

3.3 Properties

3.3.1 Mechanical property requirements for product outside of the range covered by 1.1 shall be agreed upon between purchaser and producer.

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

3.3.2 Tensile Properties

Shall be as specified in Table 2.

TABLE 2A - 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 | Over 0.008 to 0.009, incl | 63.0 | 42.0 | 10 |
| | Over 0.009 to 0.020, incl | 63.0 | 42.0 | 12 |
| | Over 0.020 to 0.128, incl | 63.0 | 42.0 | 15 |
| | Over 0.128 to 0.249, incl | 64.0 | 42.0 | 15 |
| -T351 | Over 0.249 to 0.499, incl | 64.0 | 42.0 | 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 2B - 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 | Over 0.20 to 0.23, incl | 434 | 290 | 10 |
| | Over 0.23 to 0.51, incl | 434 | 290 | 12 |
| | Over 0.51 to 3.25, incl | 434 | 290 | 15 |
| | Over 3.25 to 6.32, incl | 441 | 290 | 15 |
| -T351 | Over 6.32 to 12.67, incl | 441 | 290 | 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 |

3.3.3 Bending

Product 0.008 to 0.499 inch (0.20 to 12.67 mm), inclusive, in nominal thickness 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 |
|---------------------------|----------------------------------|-------------|
| 0.008 to 0.020, incl | 0.20 to 0.51, incl | 4 |
| Over 0.020 to 0.051, incl | Over 0.51 to 1.30, incl | 5 |
| Over 0.051 to 0.128, incl | Over 1.30 to 3.25, incl | 6 |
| Over 0.128 to 0.249, incl | Over 3.25 to 6.32, incl | 8 |
| Over 0.249 to 0.499, incl | Over 6.32 to 12.67, incl | 10 |

3.3.3.1 Bending requirements for product under 0.008 inch (0.20 mm) and over 0.499 inches (12.67 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.

3.4.1 When specified, each plate 0.500 to 4.000 inches (12.70 to 101.60 mm) shall be ultrasonically inspected in accordance with ASTM B 594 and shall meet the requirements of 3.4.1.1, 3.4.1.2, and 3.4.1.3.

3.4.1.1 Plates shall meet the requirement for ultrasonic class B for plate 0.500 to 1.499 inches (12.70 to 38.07 mm) in nominal thickness.

3.4.1.2 Plates shall meet the requirement for ultrasonic class A for plates 1.500 to 3.000 inches (38.10 to 76.20 mm) in nominal thickness.

3.4.1.3 Plates shall meet the requirement for ultrasonic class B for plates 3.001 to 4.000 inches (76.23 to 101.60 mm) in nominal thickness.

3.5 Tolerances

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

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties (3.3.2), ultrasonic inspection (3.4.1) (when specified), and tolerances (3.5) are acceptance tests and, except for composition, shall be performed on each lot.

4.2.2 Periodic Tests

Bending (3.3.3) is a periodic test and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2355.

4.4 Reports

The vendor of the product shall furnish with each shipment a report stating that the product conforms to the composition requirements, tolerances and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number(s), AMS4037Q, size, and quantity. The report shall also identify the producer, the product form, and the size of the mill product.