# AEROSPACE MATERIAL SPECIFICATION

| AMS4028™ | REV. J |
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Superseding AMS4028H


## Aluminum Alloy Sheet and Plate
## 4.4Cu - 0.85Si - 0.80Mn - 0.50Mg (2014-O)
## Annealed

UNS A92014

RATIONALE

AMS4028J results from a Five-Year Review and update of this specification with changes to prohibit unauthorized exceptions (3.3.1.1.1, 3.3.1.2.1, 3.3.2.1.1, 3.3.2.2.1, 3.6, 4.4.1, 5.1.1, 8.5, 8.6), revise applicable documents (Section 2, 3.3.2, 8.2), reorder elements in composition (Table 1) to match standard presentation without change to values, and allow use of the immediate prior revision of this specification (8.4).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet and plate from 0.020 to 1.000 inch (0.51 to 25.4 mm) thick (see 8.6).

1.2 Application

These products have been used typically for formed parts requiring high strength after heat treatment, 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 after heat treatment; 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 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.




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**For more information on this standard, visit**
https://www.sae.org/standards/content/AMS4028J/

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.

AMS2202 Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate

AMS2355 Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings

AMS2770 Heat Treatment of Wrought Aluminum Alloy Parts

AMS2772 Heat Treatment of Aluminum Alloy Raw Materials

ARP823 Minimizing Stress-Corrosion Cracking in Wrought High-Strength Aluminum Alloy Products

AS7766 Terms Used in Aerospace Metals Specifications

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 B660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B666/B666M Identification Marking of Aluminum and Magnesium 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

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 | 1.2 |
| Iron | -- | 0.7 |
| Copper | 3.9 | 5.0 |
| Manganese | 0.40 | 1.2 |
| Magnesium | 0.20 | 0.8 |
| Chromium | -- | 0.10 |
| Zinc | -- | 0.25 |
| Titanium | -- | 0.15 |
| Other Impurities, each | -- | 0.05 |
| Other Impurities, total | -- | 0.15 |
| Aluminum | remainder | |

3.2 Condition

Annealed in accordance with AMS2772.

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 and 3.3.1.1.1.

***Table 2A - Tensile properties, inch/pound units***

| Nominal Thickness Inches | Tensile Strength ksi, Max | Yield Strength at 0.2% Offset ksi, Max | Elongation in 2 Inches or 4D %, Min |
|---|---|---|---|
| 0.020 to 0.499, incl | 32.0 | 16.0 | 16 |
| Over 0.499 to 1.000, incl | 32.0 | -- | 10 |

***Table 2B - Tensile properties, SI units***

| Nominal Thickness Millimeters | Tensile Strength MPa, Max | Yield Strength at 0.2% Offset MPa, Max | Elongation in 50.8 mm or 4D %, Min |
|---|---|---|---|
| 0.51 to 12.67, incl | 221 | 110 | 16 |
| Over 12.67 to 25.40, incl | 221 | -- | 10 |

3.3.1.1.1 Tensile properties of sheet under 0.020 inch (0.51 mm) and plate over 1.000 inch (25.40 mm) in nominal thickness shall be as agreed upon by purchaser and producer and reported in 4.4.1 (see 8.6).

3.3.1.2 Bending

Product 0.020 to 0.499 inch (0.51 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 requirements***

| Nominal Thickness Inches | Nominal Thickness Millimeters | Bend Factor |
|---|---|---|
| 0.020 to 0.124, incl | 0.51 to 3.15, incl | 2 |
| Over 0.124 to 0.249, incl | Over 3.15 to 6.32, incl | 4 |
| Over 0.249 to 0.499, incl | Over 6.32 to 12.67, incl | 6 |

3.3.1.2.1 Bending requirements for product under 0.020 inch (0.51 mm) and over 0.499 inch (12.67 mm) in nominal thickness shall be as agreed upon by purchaser and producer and reported in 4.4.1 (see 8.6).

3.3.2 Response to Heat Treatment

The product after solution and precipitation heat treatment to the -T62 temper (refer to ANSI H35.1/H35.1M) in accordance with AMS2772 shall have the following properties:

3.3.2.1 Tensile Properties

Shall be as specified in Table 4 and 3.3.2.1.1.

***Table 4A - Tensile properties, inch/pound units***

| Nominal Thickness Inches | Tensile Strength ksi, Min | Yield Strength at 0.2% Offset ksi, Min | Elongation in 2 Inches or 4D %, Min |
|---|---|---|---|
| 0.020 to 0.039, incl | 64.0 | 57.0 | 6 |
| Over 0.039 to 0.249, incl | 66.0 | 58.0 | 7 |
| Over 0.249 to 0.499, incl | 67.0 | 59.0 | 7 |
| Over 0.499 to 1.000, incl | 67.0 | 59.0 | 6 |

***Table 4B - Tensile properties, SI units***

| Nominal Thickness Millimeters | Tensile Strength MPa, Min | Yield Strength at 0.2% Offset MPa, Min | Elongation in 50.8 mm or 4D %, Min |
|---|---|---|---|
| 0.51 to 0.99, incl | 441 | 393 | 6 |
| Over 0.99 to 6.32, incl | 455 | 400 | 7 |
| Over 6.32 to 12.67, incl | 462 | 407 | 7 |
| Over 12.67 to 25.40, incl | 462 | 407 | 6 |

3.3.2.1.1 Tensile properties of sheet under 0.020 inch (0.51 mm) and plate over 1.000 inch (25.40 mm) in nominal thickness shall be as agreed upon by purchaser and producer and reported in 4.4.1 (see 8.6).

3.3.2.2 Bending

Product 0.020 to 0.499 inch (0.51 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 5 times the nominal thickness of the product with axis of bend parallel to the direction of rolling.

***Table 5 - Bending requirements***

| Nominal Thickness Inches | Nominal Thickness Millimeters | Bend Factor |
|---|---|---|
| 0.020 to 0.039, incl | 0.51 to 0.99, incl | 5 |
| Over 0.039 to 0.050, incl | Over 0.99 to 1.27, incl | 6 |
| Over 0.050 to 0.124, incl | Over 1.27 to 3.15, incl | 8 |
| Over 0.124 to 0.249, incl | Over 3.15 to 6.32, incl | 10 |
| Over 0.249 to 0.499, incl | Over 6.32 to 12.67, incl | 12 |

3.3.2.2.1 Bending requirements for product under 0.020 inch (0.51 mm) over 0.499 inch (12.67 mm) in nominal thickness shall be as agreed upon by purchaser and producer and reported in 4.4.1 (see 8.6).

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 AMS2202.

3.6 Exceptions

Any exceptions shall be authorized by purchaser and reported as in 4.4.1.