# AEROSPACE MATERIAL SPECIFICATION

| AMS4412™ | REV. B |
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Revised 2021-08

Superseding AMS4412A

# Aluminum Alloy, Sheet
# 3.2Cu - 0.52Mg - 0.30Ag - 0.95 Li - 0.12Zr (2198-T8)
# Solution Heat Treated, Cold Worked, and Artificially Aged
# (Composition similar to UNS A92198)

RATIONALE

AMS4412 is the result of a Five Year Review and update of the specification. The revision prohibits unauthorized exceptions (1.1, 3.4.2, 3.7, 4.4.1, 5.1.1, 8.5, 8.7), updates title composition, Composition (3.1, Table 1), Condition (3.2.1, 8.2), allows the use of prior revisions (8.6), and SI unit tensile tests (8.4).



## 1. SCOPE

### 1.1 Form

This specification covers an aluminum alloy in the form of sheet from 0.063 to 0.249 inches (1.60 to 6.30 mm) in nominal thickness (see 8.7).

### 1.2 Application

This product has been used for aircraft applications where it offers a combination of high strength and low density, 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 |
| ARP1917 | Clarification of 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/AMS4412B/

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 http://webstore.ansi.org/.

ANSI H35.1/H35.1M Alloy and Temper Designation Systems for Aluminum

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 | -- | 0.08 |
| Iron | -- | 0.10 |
| Copper | 2.9 | 3.5 |
| Manganese | -- | 0.50 |
| Magnesium | 0.25 | 0.8 |
| Chromium | | 0.05 |
| Zinc | -- | 0.35 |
| Titanium | -- | 0.10 |
| Silver | 0.10 | 0.50 |
| Lithium | 0.8 | 1.1 |
| Zirconium | 0.04 | 0.18 |
| Other Elements, each | -- | 0.05 |
| Other Elements, total | -- | 0.15 |
| Aluminum | remainder | |



3.2 Condition

Product shall be supplied in the following condition:

3.2.1 Solution heat treated, cold worked sufficiently to meet the requirements of 3.4 after aging (see 8.2), and artificially aged to T8 temper (refer to ANSI H35.1/H35.1M).

3.3 Heat Treatment

Shall be performed in accordance with AMS2772 and as follows:

3.3.1 Solution Heat Treatment Temperature

930 to 950 °F (500 to 510 °C).

3.3.2 Aging Heat Treatment

Aging shall be performed at a specific temperature and time as required to meet requirements of 3.4 (see 8.2).

3.4 Properties

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

3.4.1 Tensile Properties

Shall be as shown in Table 2.

***Table 2A - Minimum tensile properties, inch/pound units***

| Nominal Thickness Inches | Specimen Orientation | Tensile Strength ksi | Yield Strength at 0.2% Offset ksi | Elongation in 2 Inches or 4D % |
|---|---|---|---|---|
| 0.063 to 0.124 | Longitudinal | 68.0 | 62.0 | 8 |
| | Long-Trans. | 67.0 | 59.0 | 9 |
| 0.125 to 0.249, incl | Longitudinal | 71.0 | 64.0 | 8 |
| | Long-Trans. | 69.0 | 62.0 | 9 |

***Table 2B - Minimum tensile properties, SI units***

| Nominal Thickness Millimeters | Specimen Orientation | Tensile Strength MPa | Yield Strength at 0.2% Offset MPa | Elongation in 50 mm or 4D % |
|---|---|---|---|---|
| 1.60 to 3.15 | Longitudinal | 469 | 427 | 8 |
| | Long-Trans. | 462 | 407 | 9 |
| 3.20 to 6.30, incl | Longitudinal | 490 | 441 | 8 |
| | Long-Trans. | 476 | 427 | 9 |

3.4.2 Mechanical property requirements for product outside the size range covered by 1.1 shall be agreed upon between purchaser and producer and reported per 4.4.1.

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 or ANSI H35.2M.

3.7 Exceptions

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

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 (3.4.1), and tolerances (3.6) are acceptance tests, and except for composition, shall be performed on each inspection lot.

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 and tolerances and showing the numerical results of tests to determine conformance to the other acceptance test requirements. This report shall include the purchase order number, inspection lot number(s), AMS4412B, size, and quantity. The report shall also identify the producer, the product form, and the mill produced size.

4.4.1 When material produced to this specification is beyond the sizes allowed in the scope or tables, or other exceptions are taken to the technical requirements listed in Section 3, the report shall contain a statement "This material is certified as AMS4412(EXC) because of the following exceptions:" and the specific exceptions shall be listed (also see 5.1.1).

4.5 Resampling and Retesting

Shall be in accordance with AMS2355.

5. PREPARATION FOR DELIVERY

5.1 Identification

Shall be in accordance with ASTM B666/B666M.

5.1.1 When technical exceptions are taken (see 4.4.1), the material shall be identified with AMS4412(EXC).

5.2 Packaging

5.2.1 Product shall be protected from damage during storage and shipment by a method determined by vendor, unless specified by purchaser. Examples of typical protective methods include, but not limited to, interleaving with paper or oiling of the surface.

5.2.2 Sheet shall be prepared for shipment in accordance with ASTM B660 and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

6. ACKNOWLEDGMENT

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS

Product not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.