AEROSPACE MATERIAL SPECIFICATION

AMS4208™	REV. D

Issued 1985-07
Reaffirmed 2016-03
Revised 2021-12

Superseding AMS4208C

Aluminum Alloy Sheet
6.0Cu - 0.40Zr (2004-F)
As Rolled

(Composition similar to UNS A92004)

RATIONALE

AMS4208D results from a Five-Year Review and update of this specification, with changes to prohibit unauthorized exceptions (3.3.1, 3.6, 4.4.1, 5.1.1, 8.5), update form (1.1) and applicable documents (2.1, 2.3, 3.2), and allow the use of the immediate prior specification revision (8.4).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of sheet, less than 0.250 inch (6.35 mm) thick.

1.2 Application

This product has been used typically for parts requiring a high degree of formability (super-plasticity) and response to heat treatment, 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
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/AMS4208D

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

ASTM E21 Elevated Temperature Tension Tests of Metallic Materials

2.3 ANSI Accredited Publications

Copies of these documents are available online at http://webstore.ansi.org/.

ANSI H35.1/H35.1M Standard Alloy and Temper Designation System 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 (2004-F)

Element	Min	Max
Silicon	--	0.20
Iron	--	0.20
Copper	5.5	6.5
Manganese	--	0.10
Magnesium	--	0.50
Zinc	--	0.10
Titanium	--	0.05
Zirconium	0.30	0.50
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

As-rolled to the -F temper (refer to ANSI H35.1/H35.1M). Sheet shall not be flattened, leveled, or straightened.

3.3 Properties

Sheet shall conform to the following requirements, determined in accordance with AMS2355 on the mill product size, except as specified in 3.3.2.

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

3.3.2 As-Rolled (Super-Plasticity)

Specimens, conforming to Figure 1, shall have the properties shown in Table 2 after being heated to 840 °F ± 10 °F (450 °C ± 6 °C), held at heat for 20 to 30 minutes before testing, and tested in accordance with ASTM E21 at 840 °F ± 10 °F (450 °C ± 6 °C) using a constant crosshead speed of 0.5 in/min (12.5 mm/min).

Table 2 - Minimum as-rolled elongation

Property	Value
Elongation in 0.5 inch (12.7 mm)	
Individual Tests	350%
Average of All Tests	400%

3.3.3 Pseudo As-Formed

Sheet shall have the room temperature properties shown in Table 3 after being heated to 840 °F ± 10 °F (450 °C ± 6 °C), held at heat for 20 minutes ± 2 minutes, and cooled in air.

Table 3 - Tensile properties (pseudo as-formed)

Property	Value
Tensile Strength	32.0 to 39.0 ksi (200 to 255 MPa)
Yield Strength at 0.2% Offset	16.0 to 25.0 ksi (90 to 152 MPa)
Elongation in 2 Inches (50.8 mm)	10 to 20%

3.3.4 After Solution and Precipitation Heat Treatment

Sheet shall have the properties shown in Table 4 after being solution heat treated by heating to 985 °F ± 10 °F (529 °C ± 6 °C), holding at heat for 30 to 60 minutes, and quenching in warm (approximately 105 °F [41 °C]) water, with quenching being completed within 20 seconds, and precipitation heat treated by heating to 330 °F ± 10 °F (166 °C ± 6 °C), holding at heat for 16 to 20 hours, and cooling in air or, when permitted by purchaser, heating to 365 °F ± 10 °F (185 °C ± 6 °C), holding at heat for 3.5 to 5 hours, and cooling in air.

Table 4 - Tensile properties after solution and precipitation heat treatment

Property	Value
Tensile Strength	54.0 to 68.0 ksi (352 to 448 MPa)
Yield Strength at 0.2% Offset	39.0 to 48.0 ksi (228 to 310 MPa)
Elongation in 2 Inches (50.8 mm)	8 to 20%

3.4 Quality

Sheet, as received by purchaser, shall be uniform in quality and condition, sound, free from foreign materials and free from edge cracking and any imperfections detrimental to usage of the sheet.

3.5 Tolerances

Shall be as follows:

3.5.1 Thickness

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

3.5.2 Length and Width

±0.5 inch (±12.7 mm).

3.6 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 producer of sheet shall supply all samples for producer'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 sheet conforms to specified requirements.

4.2 Classification of Tests

All technical requirements are acceptance tests and, except for composition, shall be performed on each lot.

4.3 Sampling and Testing

Shall be in accordance with AMS2355 and the following.

4.3.1 A lot shall be all sheet produced from one ingot processed and rolled to the same nominal thickness in one series of operations.

4.3.2 Specimens for as-rolled (super-plasticity) elongation (3.3.2) shall be taken and tested in duplicate in the longitudinal direction and also in the transverse direction from sheet 2.25 inches (57.1 mm) and over in nominal width.

4.4 Reports

The producer of sheet shall furnish with each shipment a report stating that the sheet conforms to the composition, tolerances, and including the numerical values of mechanical properties. The report shall also state that the specification conforms to the other technical requirements. This report shall include the purchase order number, lot number, AMS4208D, size, and quantity. The identity of the producer and the size of the mill product shall be included.

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 AMS4208D(EXC) because of the following exceptions:" and the specific exceptions shall be listed (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 AMS4208(EXC).

5.2 Protective Treatment

Product shall be protected from damage during storage and shipment by a method determined by producer unless specified by purchaser. An example of a typical protective method includes, but is not limited to, interleaving with paper.

PRODUCT PRODUCED UNDER THIS SPECIFICATION SHALL NOT BE OILED.