SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS4338 | REV. A

Issued 2001-09
Revised 2007-08
Reaffirmed 2012-09

Superseding AMS4338

Aluminum Alloy, Extrusions
4.0Cu - 1.3Mg - 0.60Mn (2026-T3511)
Solution Heat Treated and Stress Relieved by Stretching
(Composition similar to UNS A92026)

RATIONALE

AMS4338A has been reaffirmed to comply with the SAE five-year review policy.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of extruded bars, rods, and profiles (shapes).

1.2 Application

These extrusions have been used typically for machined parts requiring dimensional stability during machining processes and for parts requiring high strength and damage tolerance, where fabrication does not normally involve welding, but usage is not limited to such applications.

1.3 Certain processing procedures may cause this product 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 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.

AMS 2355	Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock and Rolled, Forged, or Flash Welded Rings
AMS 2772	Heat Treatment of Aluminum Alloy Raw Materials
ARP823	Minimizing Stress-Corrosion in Wrought Heat Treatable Aluminum Alloy Products
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 Wrought Products for Aerospace Applications
ASTM B 660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B 666/B666M	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, 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 AMS 2355.

TABLE 1 - COMPOSITION

Element	min	max
Silicon	--	0.05
Iron	--	0.07
Copper	3.6	4.3
Manganese	0.30	0.80
Magnesium	1.0	1.6
Zinc	--	0.10
Titanium	--	0.06
Zirconium	0.05	0.25
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Extruded, solution heat treated and stress relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, to the T3511 temper. Solution heat treatment shall be performed in accordance with AMS 2772 (See AS1990).

3.2.1 Product shall be supplied with an as-extruded surface finish; light polishing to remove minor surface conditions is permissible provided such conditions can be removed within specified dimensional tolerances.

3.2.2 Product may receive minor straightening, after stretching, of an amount necessary to meet the requirements of 3.5.

3.3 Properties

Product shall conform to the following requirements, determined in accordance with AMS 2355 on the mill produced size:

3.3.1 Tensile properties of extrusions with a maximum cross-sectional area of 25 square inches (161 cm^2) and a maximum circle size of 12 inches (305 mm) shall meet the following requirements:

3.3.1.1 Longitudinal

Shall be as shown in Table 2.

TABLE 2A - MINIMUM LONGITUDINAL TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches or 4D %
Up to 0.249, incl	66.0	48.0	11
Over 0.249 to 0.499, incl	70.0	52.0	12
Over 0.499 to 1.499, incl	72.0	53.0	11
Over 1.499 to 2.249, incl	73.0	54.0	11
Over 2.249 to 3.250, incl	73.0	54.0	10

TABLE 2B - MINIMUM LONGITUDINAL TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 6.34, incl	455	331	11
Over 6.34 to 12.68, incl	483	359	12
Over 12.68 to 38.09, incl	496	365	11
Over 38.09 to 57.14, incl	503	372	11
Over 57.14 to 82.54, incl	503	372	10

3.3.1.2 Long-Transverse

Shall be as shown in Table 3.

TABLE 3A - MINIMUM LONG-TRANSVERSE TENSILE PROPERTIES, INCH/POUND UNITS

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 inches or 4D %
Over 0.499 to 1.499, incl	66.0	46.0	8
Over 1.499 to 2.249, incl	64.0	44.0	8
Over 2.249 to 3.250, incl	61.0	42.0	8

TABLE 3B - MINIMUM LONG-TRANSVERSE TENSILE PROPERTIES, SI UNITS

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Over 12.68 to 38.09, incl	455	317	8
Over 38.09 to 57.14, incl	441	303	8
Over 57.14 to 82.54, incl	421	290	8

3.4 Quality

Products, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from conditions detrimental to usage of the extrusions.

3.4.1 When specified, each extrusion shall be subjected to ultrasonic inspection in accordance with ASTM B 594. Extrusions, 0.50 inch (12.7 mm) and over in nominal diameter or least distance between parallel sides, weighing 600 pounds (272 kg) and under, and having a maximum width-to-thickness ratio of 10:1 shall meet ultrasonic Class B requirements, as described in ASTM B 594.

3.5 Tolerances

Shall conform to all applicable requirements of ANSI H35.2 or ANSI H35.2M except that surface roughness tolerances shall be twice those specified therein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of the products 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 products conform to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), longitudinal tensile properties (3.3.1.1), ultrasonic inspection when specified (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

Long-transverse tensile properties (3.3.1.2) are periodic tests 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 AMS 2355.

4.4 Reports

The vendor of product shall furnish with each shipment a report stating that the product conforms to the composition, ultrasonic inspection when specified, and tolerances and showing the numerical results of tests on each inspection lot to determine conformance to the other acceptance test requirements and stating that the final product conforms to the other technical requirements. This report shall include the purchase order number, inspection lot number, AMS 4338A, size or section identification number, and quantity. This report shall also identify the producer, the product form, and the size of the mill product.

4.5 Resampling and Retesting

Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY

5.1 Identification

Shall be in accordance with ASTM B 666/B 666M.

5.2 Packaging

Products shall be prepared for shipment in accordance with ASTM B 660 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.