AEROSPACE MATERIAL SPECIFICATION

AMS4160™	REV. J

Issued 1974-01
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Revised 2020-08

Superseding AMS4160H

Aluminum Alloy, Extrusions
1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-O)
Annealed
(Composition similar to UNS A96061)

RATIONALE

AMS4160J prohibits unauthorized exceptions (3.6), revises Condition (3.2, 3.3.2.1), Reports (4.4.1), and Identification (5.1.1), and results from a Five-Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of extruded bars, rods, wire, profiles, and tubing.

1.1.1 Tubing

Tubing shall be additionally classified as follows:

Type I - Tubing extruded from hollow billets using die and mandrel
Type II - Tubing extruded from solid billets using porthole or spider die or similar tooling

When no Type is specified, Type I shall apply.

1.2 Application

These products have been used typically for parts requiring moderate strength, especially where such parts require brazing or welding during fabrication, and for parts which are to be subsequently solution and precipitation heat treated, but usage is not limited to such applications. Product may also be used as stock for flash welded rings.

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.

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/AMS4160J/

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

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 E10 Brinell Hardness 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

Element	Min	Max
Silicon	0.40	0.8
Iron	--	0.7
Copper	0.15	0.40
Manganese	--	0.15
Magnesium	0.8	1.2
Chromium	0.04	0.35
Zinc	--	0.25
Titanium	--	0.15
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Extruded and annealed in accordance with AMS2772 to the O temper (refer to ANSI H35.1/H35.1M).

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

3.3 Properties

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

3.3.1 As Annealed

Shall be as shown in Table 2.

Table 2 -Tensile properties

Property	Value
Tensile Strength, max	22.0 ksi (152 MPa)
Yield Strength at 0.2% Offset, max	16.0 ksi (110 MPa)
Elongation in 2 Inches (50.8 mm) or 4D, min	16%

3.3.2 Response to Heat Treatment

3.3.2.1 After Heat Treatment to the -T62 Temper

Extrusions, as received by purchaser in the Annealed (O) or As Fabricated (F) condition, shall have the properties of Table 3, after solution heat treatment and artificial aging to the -T62 temper (refer to ANSI H35.1/H35.1M) in accordance with AMS2772.

3.3.2.2 Tensile Properties

Shall be as shown in Table 3.

Table 3A - Minimum tensile properties, inch/pound units

Nominal Diameter or Least Thickness (Bars, Rods, Wire, Shapes) or Nominal Wall Thickness (Tubing), Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 0.250, excl	38.0	35.0	8
0.250 and over	38.0	35.0	10

Table 3B - Minimum tensile properties, SI units

Nominal Diameter or Least Thickness (Bars, Rods, Wire, Shapes) or Nominal Wall Thickness (Tubing), Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 6.35, excl	262	241	8
6.35 and over	262	241	10

3.4 Quality

Extrusions, 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 extrusions.

3.5 Tolerances

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

3.6 Exceptions

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

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of extrusions 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 extrusions conform to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Composition (3.1), tensile properties as annealed (3.3.1.1) and after solution and precipitation heat treatment (3.3.2.1), and tolerances (3.5) 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 product shall furnish with each shipment a report stating that the product conforms to the composition and tolerances and showing 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, AMS4160J, size or section identification number, extrusion type, 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 has exceptions authorized by purchaser taken to the technical requirements listed in Section 3, the report shall contain a statement “This material is certified as AMS4160J(EXC) because of the following exceptions:” and the specific exceptions shall be listed.

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 marked with AMS4160(EXC).

5.2 Packaging

Extrusions 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 extrusions 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

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