AEROSPACE MATERIAL SPECIFICATION

AMS4157™	REV. F

Issued 1974-12
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Superseding AMS4157E

Aluminum Alloy Extrusions, 7.7Zn - 2.4Mg - 1.6Cu - 0.16Cr (7049-T73511), Solution Heat Treated, Stress Relieved, and Overaged

(Composition similar to UNS A97049)

RATIONALE

AMS4157F results from a Five-Year Review and update of this specification with changes to update wording to prohibit unauthorized exceptions (see 3.3.1.1, 3.6, and 8.4), relocate Definitions (see 2.4), and update Applicable Documents (see Section 2) and Ordering Information (see 8.5).

1. SCOPE

1.1 Form

This specification covers an aluminum alloy in the form of extruded bars, rods, wire, shapes, and tubing 5.000 inches (127.00 mm) and under in nominal diameter or least thickness (wall thickness of tubing) (see 8.5).

1.2 Application

These products have been used typically for parts in structural applications requiring a combination of high strength and good stress-corrosion resistance, 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
AS7766	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/AMS4157F

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 B594 Ultrasonic Inspection of Aluminum-Alloy Wrought Products

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 H35.2 Dimensional Tolerances for Aluminum Mill Products

ANSI H35.2M Dimensional Tolerances for Aluminum Mill Products (Metric)

2.4 Definitions

Terms used in AMS are defined in AS7766.

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	--	0.25
Iron	--	0.35
Copper	1.2	1.9
Manganese	--	0.20
Magnesium	2.0	2.9
Chromium	0.10	0.22
Zinc	7.2	8.2
Titanium	--	0.10
Other Elements, each	--	0.05
Other Elements, total	--	0.15
Aluminum	remainder	

3.2 Condition

Solution heat treated, stress relieved by stretching to produce a permanent set of 1 to 3%, and overaged. Heat treatments shall be in accordance with AMS2772.

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

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

3.3 Properties

Extrusions 5.000 inches (127.00 mm) and under in nominal diameter or least thickness (wall thickness of tubing) shall conform to the following requirements, determined in accordance with AMS2355:

3.3.1 Tensile Properties

Shall be as specified in Table 2.

3.3.1.1 Mechanical property requirements for product outside the thickness range of 1.1 shall be as agreed upon by the purchaser and the producer and reported per 4.4.1 (see 8.5).

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

Nominal Diameter or Least Thickness (Bars, Rods, Wire, Shapes) or Nominal Wall Thickness (Tubing) Inches	Specimen Orientation	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
Up to 3.000, excl	Longitudinal	74.0	64.0	7
	Long-Trans.	70.0	60.0	5
3.000 to 5.000, incl	Longitudinal	72.0	62.0	7
	Long-Trans.	68.0	58.0	5

Table 2B - Minimum tensile properties, SI units

Nominal Diameter or Least Thickness (Bars, Rods, Wire, Shapes) or Nominal Wall Thickness (Tubing) mm	Specimen Orientation	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
Up to 76.20, excl	Longitudinal	510	441	7
	Long-Trans.	483	414	5
76.20 to 127.00, incl	Longitudinal	496	427	7
	Long-Trans.	469	400	5

3.3.2 Stress-Corrosion Cracking Resistance

Specimens cut from extrusions shall meet the conductivity test of 3.3.2.1 and shall exhibit no evidence of stress-corrosion cracking when tested in accordance with 3.3.2.2. The test of 3.3.2.2 need not be performed on extrusions meeting the requirements of 3.3.2.1.

3.3.2.1 Conductivity

Shall be not lower than 40.0% IACS (International Annealed Copper Standard) (23.2 MS/m).

3.3.2.1.1 If the conductivity is below 40.0% IACS (23.2 MS/m), the extrusions may be given additional overaging heat treatment as in 3.2, and if, upon completion of such treatment, extrusions develop conductivity/tensile property relationships conforming to 3.3.1 and 3.3.2.1, extrusions shall be acceptable.

3.3.2.2 Stress-Corrosion Cracking Resistance

Specimens, cut from extrusions 0.750 inch (19.05 mm) and over in nominal diameter or least thickness, shall show no evidence of stress-corrosion cracking when stressed in the short-transverse (perpendicular to grain flow) direction to 65% of the specified minimum longitudinal (parallel to grain flow) yield strength.

3.4 Quality

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

3.4.1 When specified by the purchaser, extrusions shall be subjected to ultrasonic inspection in accordance with ASTM B594 and shall meet Class A acceptance limits of that specification (see 8.5).

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 the purchaser and reported as in 4.4.1.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The producer of extrusions shall supply all samples for the producer's tests and shall be responsible for the performance of all required tests. The 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 (see 3.1), tensile properties (see 3.3.1), conductivity (see 3.3.2.1), ultrasonic inspection (see 3.4.1) when specified, and tolerances (see 3.5) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests

Stress-corrosion resistance (see 3.3.2.2) is a periodic test and shall be performed at a frequency selected by the producer, unless frequency of testing is specified by the purchaser.

4.3 Sampling and Testing

Shall be in accordance with AMS2355 and the following:

4.3.1 For Electrical Conductivity

Specimens for electrical conductivity testing (see 3.3.2.1) shall be the samples used for tensile testing. Electrical conductivity shall be determined on the surface of test specimens 0.100 inch (2.54 mm) and under in nominal diameter and subsurface on test specimens over 0.100 inch (2.54 mm) in nominal thickness.

4.4 Reports

The producer of extrusions shall furnish with each shipment a report stating that the extrusions conform to the composition and showing the results of tests to determine conformance to the other acceptance tests and, when performed, to the periodic test requirements. This report shall include the purchase order number, lot number, AMS4157F, size or section identification, 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 (see 5.1.1), the report shall contain a statement "This material is certified as AMS4157F(EXC) because of the following exceptions:" and the specific exceptions shall be listed.

4.5 Resampling and Retesting

Shall be in accordance with AMS2355.