



AEROSPACE MATERIAL SPECIFICATION

AMS 4159

Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

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Revised

ALUMINUM ALLOY EXTRUSIONS 7.7Zn - 2.45Mg - 1.55Cu - 0.16Cr (7049-T76511)

1. SCOPE:

1.1 **Form:** This specification covers an aluminum alloy in the form of extruded bars, rods, wire, shapes, and tubing.

1.2 **Application:** Primarily for structural applications requiring high strength, moderate fatigue strength, exfoliation-corrosion resistance, and good fracture toughness.

2. **APPLICABLE DOCUMENTS:** The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 **SAE Publications:** Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.

2.1.1 Aerospace Material Specifications:

AMS 2205 - Tolerances, Aluminum-Base and Magnesium-Base Alloy Extrusions

AMS 2350 - Standards and Test Methods

AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings

AMS 2770 - Heat Treatment of Aluminum and Aluminum-Base Alloys

2.2 **ASTM Publications:** Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.

ASTM G34 - Exfoliation-Corrosion Susceptibility in 7XXX Series Copper Containing Aluminum Alloys (EXCO Test)

3. TECHNICAL REQUIREMENTS:

3.1 **Composition:** Shall conform to the following percentages by weight, determined in accordance with AMS 2355:

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

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- 3.2 Condition: Solution heat treated, stress-relieved by stretching, and precipitation treated to develop the required mechanical properties, conductivity, and resistance to exfoliation-corrosion.
 - 3.2.1 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.
 - 3.2.2 The product shall be stretched in the solution heat treated condition to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%.
 - 3.2.3 The product may receive minor straightening, after stretching, of an amount necessary to meet the requirements of 3.6.
- 3.3 Heat Treatment: Shall be performed in accordance with AMS 2770.
- 3.4 Properties: Product up to 5.000 in. (127.00 mm) in nominal diameter or thickness (wall thickness of tubing) shall conform to the following requirements, determined in accordance with AMS 2355:
 - 3.4.1 Tensile Properties: Shall be as specified in Table I.

TABLE I

Nominal Diameter or Least Thickness (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Inches	Specimen Orientation	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 2.999, incl	Longitudinal	78,000	70,000	7
	Long Trans.	76,000	68,000	5
Over 2.999 to 5.000, incl	Longitudinal	76,000	68,000	7
	Long Trans.	74,000	66,000	5

TABLE I (SI)

Nominal Diameter or Least Thickness (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Millimetres	Specimen Orientation	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 76.17, incl	Longitudinal	538	483	7
	Long Trans.	524	469	5
Over 76.17 to 127.00, incl	Longitudinal	524	469	7
	Long Trans.	510	455	5

- 3.4.2 Conductivity: Shall be not lower than 38% IACS (International Annealed Copper Standard).
- 3.4.3 Exfoliation-Corrosion Resistance: Product shall show a level of exfoliation-corrosion less than that illustrated in Photo B, Fig. 2 of ASTM G34 at any surface or sub-surface plane.
- 3.5 Quality: The product shall be uniform in quality and condition, clean, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.

3.6 Tolerance: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2205.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to assure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to composition (3.1), tensile property (3.4.1), conductivity (3.4.2), and tolerance (3.6) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to exfoliation-corrosion resistance (3.4.3) requirements are classified as qualification or periodic control tests.

4.3 Sampling: Shall be in accordance with AMS 2355.

4.4 Reports:

4.4.1 The vendor of the product shall furnish with each shipment three copies of a report stating that the product conforms to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, material specification number, size or part number, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, part number, and quantity. When extrusions for making parts are produced or purchased by the parts vendor, that vendor shall inspect each lot of extrusions to determine conformance to the requirements of this specification and shall include in the report a statement that the extrusions conform, or shall include copies of laboratory reports showing the results of tests to determine conformance.

4.5 Resampling and Retesting: Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification: The product shall be identified as follows:

5.1.1 Each straight bar, rod, and tube 0.500 in. (12.70 mm) and over in OD or least width of flat surface and each straight shape with configuration allowing access to a flat surface at least 0.500 in. (12.70 mm) wide recessed not more than 1/8 in. (3.2 mm) below the outline of the shape shall be marked in a row of characters recurring at intervals not greater than 3 ft (914 mm) with the alloy number and temper, AMS 4159, and manufacturer's identification. The inspection lot number shall be included in the row marking or shall be marked near one end. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be sufficiently stable to withstand normal handling. The markings shall have no deleterious effect on the product or its performance.

5.1.2 All straight extrusions other than those of 5.1.1 shall be securely bundled, boxed, or secured on lifts and identified by two durable tags, marked with the information of 5.1.1, including the inspection lot number, and attached, not farther than 2 ft (610 mm) from each end, to the product in each bundle, box, or lift.