



AEROSPACE MATERIAL

Society of Automotive Engineers, Inc.

TWO PENNSYLVANIA PLAZA, NEW YORK, N. Y. 10001

SPECIFICATION

AMS 4160C

Superseding AMS 4160B

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ALUMINUM ALLOY EXTRUSIONS 1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-O)

1. SCOPE:

- 1.1 Form: This specification covers an aluminum-base alloy in the form of extruded bars, rods, wire, shapes, and tubing.
- 1.2 Application: Primarily for parts requiring moderate strength especially where such parts and assemblies require brazing or welding during fabrication, which are to be subsequently solution and precipitation heat treated. May also be used as stock for flash welded rings.

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.

- 2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., Two Pennsylvania Plaza, New York, New York 10001.

2.1.1 Aerospace Material Specifications:

AMS 2205 - Tolerances, Aluminum and Magnesium Alloy Extrusions

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

3. TECHNICAL REQUIREMENTS:

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

	min	max
Magnesium	0.8	1.2
Silicon	0.40	0.8
Copper	0.15	0.40
Chromium	0.04	0.35
Iron	--	0.7
Zinc	--	0.25
Manganese	--	0.15
Titanium	--	0.15
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: Extruded and annealed.

- 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.

- 3.3 Properties: The product shall conform to the following requirements, determined in accordance with AMS 2355:

SAE Technical Board rules provide that: "All technical reports, including standards, approvals, and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against infringement of patents."

3.3.1 As Annealed:3.3.1.1 Tensile Properties: Shall be as follows:

Tensile Strength, max	22,000 psi (152 MPa)
Yield Strength at 0.2% Offset, max	16,000 psi (110 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	16%

3.3.2 After Solution and Precipitation Heat Treatment: The product, as received by the purchaser, after proper solution heat treatment at $985^{\circ}\text{F} \pm 10$ ($529.4^{\circ}\text{C} \pm 5.6$) and proper precipitation heat treatment at $350^{\circ}\text{F} \pm 10$ ($176.7^{\circ}\text{C} \pm 5.6$) for 8 hr $\pm$ 1 hr, shall have the following properties:3.3.2.1 Tensile Properties: Shall be as shown in Table I.

TABLE I

Nominal Diameter or Thickness, (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
Up to 0.250, excl	38,000	35,000	8
0.250 and over	38,000	35,000	10

TABLE I (SI)

Nominal Diameter or Thickness, (bars, rods, wire, shapes) or Nominal Wall Thickness (tubing) Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
Up to 6.35, excl	262	241	8
6.35 and over	262	241	10

3.3.2.2 Hardness: Should be not lower than 80 HB/10/500 or 80 HB/14.3/1000, or not lower than 85 HB/10/1000, but the product shall not be rejected on the basis of hardness if the tensile property requirements are met.3.4 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.3.5 Tolerances: 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 properties as annealed (3.3.1.1), tensile properties after solution and precipitation heat treatment (3.3.2.1), and tolerance (3.5) requirements are classified as acceptance or routine control tests.

4.2.2 Qualification Tests: Tests to determine conformance to hardness after solution and precipitation heat treatment (3.3.2.2) 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 and its revision letter, size, 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 and its revision letter, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, 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 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, AMS4160 or applicable Federal or Military specification designation, and manufacturer's identification. 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 Straight extrusions other than those of 5.1.1 shall be securely bundled, boxed, or secured on lifts and identified by two tags marked with the information of 5.1.1 and attached, not farther than 2 ft (610 mm) from each end to the product in each bundle, box, or lift.

5.1.3 Coiled rod, bar, wire, and tubing shall be identified with the information of 5.1.1 marked on a tag attached to each coil.

5.2 Packaging: The product shall be prepared for shipment in accordance with commercial practice to assure carrier acceptance and safe transportation to the point of delivery. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

6. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.