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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

# AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4156G

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Superseding AMS 4156F

## ALUMINUM ALLOY EXTRUSIONS
## 0.68Mg - 0.40Si (6063-T6)
## Solution and Precipitation Heat Treated

UNS A96063

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 trim strips, window frames, sills, moldings, and hinges where good surface finish is required. Also may be used to advantage for hollow, partially enclosed, and intricate shapes for which an alloy having good extruding characteristics is required.

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

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2205 - Tolerances, Aluminum Alloy and Magnesium Alloy Extrusions
MAM 2205 - Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Extrusions
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings
MAM 2355 - Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units

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

ASTM B594 - Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications
ASTM B660 - Packaging/Packing of Aluminum and Magnesium Products

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

3. TECHNICAL REQUIREMENTS:

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

| | min | max |
|---|---|---|
| Magnesium | 0.45 | 0.9 |
| Silicon | 0.20 | 0.6 |
| Iron | - | 0.35 |
| Copper | - | 0.10 |
| Chromium | - | 0.10 |
| Manganese | - | 0.10 |
| Titanium | - | 0.10 |
| Zinc | - | 0.10 |
| Other Impurities, each | - | 0.05 |
| Other Impurities, total | - | 0.15 |
| Aluminum | remainder | |

3.2 Condition: Solution heat treated and precipitation heat treated.

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 Heat Treatment: Shall be as specified in 3.3.1 and 3.3.2. Furnace surveys Ø and calibration of temperature controllers and recorders shall be in accordance with MIL-H-6088.

3.3.1 Solution Heat Treatment: Heat to 970°F ± 10 (521°C ± 6) and quench Ø directly from the extrusion press.

3.3.2 Precipitation Heat Treatment: Heat to 350°F ± 10 (177°C ± 6) and hold at heat for 8 hours ± 0.5.

3.4 Properties: Extrusions shall conform to the following requirements, determined in accordance with AMS 2355 or MAM 2355:

3.4.1 Tensile Properties: Shall be as specified in Table I and 3.4.1.1.

TABLE I

| Nominal Diameter or Least Thickness (rods, bars, wire, shapes) or Nominal Wall Thickness (tubing) Inches | Tensile Strength psi, minimum | Yield Strength at 0.2% Offset psi, minimum | Elongation in 2 Inches or 4D %, minimum |
|---|---|---|---|
| Up to 0.125, excl | 30,000 | 25,000 | 8 |
| 0.125 to 1.000, incl | 30,000 | 25,000 | 10 |

TABLE I (SI)

| Nominal Diameter or Least Thickness (rods, bars, wire, shapes) or Nominal Wall Thickness (tubing) Millimetres | Tensile Strength MPa, minimum | Yield Strength at 0.2% Offset MPa, minimum | Elongation in 50.8 mm or 4D %, minimum |
|---|---|---|---|
| Up to 3.18, excl | 207 | 172 | 8 |
| 3.18 to 25.40, incl | 207 | 172 | 10 |

3.4.1.1 Tensile property requirements for extrusions over 1.000 inch (25.40 mm) in nominal diameter or least thickness (wall thickness of tubing) shall be as agreed upon by purchaser and vendor.

3.4.2 Hardness: Should be not lower than 60 HB/10/500 or 66 HB/10/1000 but the extrusions shall not be rejected on the basis of hardness if the tensile property requirements are met.

3.5 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.

3.5.1 Ø When specified, extrusions shall be subjected to ultrasonic inspection in accordance with ASTM B594. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.6 Tolerances: Shall conform to all applicable requirements of AMS 2205 or MAM 2205.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of extrusions shall supply all Ø samples for vendor's tests 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 sample and to perform any confirmatory testing deemed necessary to ensure that the extrusions conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile properties (3.4.1), ultrasonic inspection (3.5.1) when specified, and tolerances (3.6) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for hardness (3.4.2) are classified as periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.3 Sampling: Shall be in accordance with AMS 2355 or MAM 2355.

4.4 Reports:

4.4.1 The vendor of extrusions shall furnish with each shipment a report stating Ø that the extrusions conform to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, AMS 4156G, lot number, size or section identification number, and quantity.

4.4.2 The vendor of finished or semi-finished parts shall furnish with each shipment a report showing the purchase order number, AMS 4156G, contractor or other direct supplier of extrusions, 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 either a statement that the extrusions conform or copies of laboratory reports showing the results of tests to determine conformance.

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