



# AEROSPACE MATERIAL SPECIFICATION

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

**AMS 4389D**  
Superseding AMS 4389C

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UNS M13312

MAGNESIUM ALLOY EXTRUSIONS  
3.0 Th - 1.5Mn (HM31A-T5)  
Precipitation Heat Treated

1. SCOPE:

- 1.1 Form: This specification covers a magnesium alloy in the form of extruded bars, rods, wire, and shapes.
- 1.2 Application: Primarily for parts requiring weldability and good strength-to-weight ratio up to 600°F (315°C).
- 1.3 Precautions: Alloy covered by this specification is radioactive. All applicable rules and regulations, including those of the Nuclear Regulatory Agency, pertaining to handling of radioactive material and all licensing provisions for use of such material should be observed.

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, PA 15096.

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

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

ASTM E9 - Compression Testing of Metallic Materials at Room Temperature

- 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 Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

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

	min	max
0		
Thorium	2.5	3.5
Manganese	1.2	--
Other Impurities, each	--	0.10
Other Impurities, total	--	0.30
Magnesium	remainder	

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3.2 Condition: 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 Properties: Extrusions up to 4 sq in. (25.8 cm<sup>2</sup>), excl, in cross-sectional area shall conform to the following requirements; property requirements for product 4 sq in. (25.8 cm<sup>2</sup>) and over in cross-sectional area shall be as agreed upon by purchaser and vendor:

3.3.1 Tensile Properties: Shall be as follows, determined in accordance with AMS 2355 on specimens from bars, rods, wire, and solid shapes:

Tensile Strength, min	37,000 psi (255 MPa)
Yield Strength at 0.2% Offset, min	26,000 psi (179 MPa)
Elongation in 4D, min	4%

3.3.2 Compressive Properties: Shall be as follows, determined in accordance with ASTM E9 on specimens taken in the longitudinal direction from bars, rods, and solid shapes:

Compressive Yield Strength at 0.2% Offset, min	19,000 psi (131 MPa)
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3.4 Quality: Extrusions, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the extrusions.

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 extrusions shall supply all 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 such confirmatory testing as he deems 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 (3.3.1), and tolerances (3.5) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for compressive properties (3.3.2) 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.

#### 4.4 Reports:

4.4.1 The vendor of extrusions shall furnish with each shipment three copies of a report stating that the extrusions conform to the chemical composition and other technical requirements of this specification. This report shall include the purchase order number, AMS 4389D, size or section identification 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, AMS 4389D, 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 a statement that the extrusions conform, or shall include copies of laboratory reports showing the results of tests to determine conformance.

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

5. PREPARATION FOR DELIVERY:

5.1 Identification: Extrusions shall be identified as follows:

5.1.1 Each straight bar and rod 0.500 in. (12.70 mm) and over in nominal 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 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 4389 or applicable Federal or Military specification designation, 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 extrusions or their 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 extrusions in each bundle, box, or lift.

5.1.3 Coiled bar, rod, and wire and spooled wire shall be identified with the information of 5.1.1, including the inspection lot number, marked on a durable tag attached to each coil or directly on one flange of each spool.

5.2 Protective Treatment: Extrusions shall be oiled, prior to shipment, with a light corrosion-inhibiting oil.

5.3 Packaging:

5.3.1 Extrusions shall be prepared for shipment in accordance with commercial practice 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. Packaging shall conform to carrier rules and regulations applicable to the mode of transportation.

5.3.2 For direct U.S. Military procurement, packaging shall be in accordance with MIL-STD-649, Level A or Level C, as specified in the request for procurement. Commercial packaging as in 5.3.1 will be acceptable if it meets the requirements of Level C.

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.

8. NOTES:

8.1 Marginal Indicia: The phi (Ø) symbol is used to indicate technical changes from the previous issue of this specification.