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400 Commonwealth Dr., Warrendale, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

SAE AMS 4169G

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Superseding AMS 4169F

ALUMINUM ALLOY EXTRUSIONS
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T6511)
Solution Heat Treated, Stress Relieved by Stretching, and Precipitation Heat Treated
Straightened

UNS A97075

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 parts subject to excessive warpage during machining and for parts requiring high strength and whose fabrication does not involve welding or forming. Certain design and processing procedures may cause these products to become susceptible to stress-corrosion cracking; ARP 823 recommends practices to minimize such conditions.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications and Aerospace Recommended Practices 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
AMS 2630 - Ultrasonic Inspection

REAFFIRMED

10-91

2.1.2 Aerospace Recommended Practices:

ARP 823 - Minimizing Stress Corrosion Cracking in Wrought Heat Treatable Aluminum Alloy Products

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

2.2.1 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

2.2.2 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 or MAM 2355:

	min	max
Zinc	5.1	6.1
Magnesium	2.1	2.9
Copper	1.2	2.0
Chromium	0.18	0.28
Iron	--	0.50
Silicon	--	0.40
Manganese	--	0.30
Titanium	--	0.20
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: Solution heat treated, stress relieved by stretching to produce a nominal permanent set of 1.5%, but not less than 1% nor more than 3%, and precipitation heat treated. Heat treatments shall be performed in accordance with MIL-H-6088.

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

3.3.1 Tensile Properties:

3.3.1.1 Longitudinal: Shall be as specified in Table I and 3.3.1.3.

TABLE I

Nominal Diameter or Least Thickness, and Area (bars, rods, wire, shapes) or Nominal Wall Thickness and Area (tubing) Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min
Up to 0.250, excl, all areas	78,000	70,000	7
0.250 to 0.499, incl, all areas	81,000	73,000	7
Over 0.499 to 2.999, incl, all areas	81,000	72,000	7
Over 2.999 to 4.499, incl			
Area up to 20 sq in., incl	81,000	71,000	7
Area over 20 to 32 sq in., incl	78,000	70,000	6
Over 4.499 to 5.000, incl			
Area up to 32 sq in., incl	78,000	68,000	6

TABLE I (SI)

Nominal Diameter or Least Thickness, and Area (bars, rods, wire, shapes) or Nominal Wall Thickness and Area (tubing) Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min
Up to 6.25, excl, all areas	540	485	7
6.25 to 12.50, incl, all areas	560	505	7
Over 12.50 to 75.00, incl, all areas	560	495	7
Over 75.00 to 112.50, incl			
Area up to 130 cm^2, incl	560	490	7
Area over 130 to 205 cm^2, incl	540	485	6
Over 112.50 to 125.00, incl			
Area up to 205 cm^2, incl	540	470	6

3.3.1.2 Long-Transverse: Bars, rods, and shapes, tested in the long-transverse direction, shall meet the requirements of Table II and 3.3.1.3.

TABLE II

Nominal Diameter or Thickness and Area Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min
Up to 0.250, excl Area up to 20 sq in., incl	76,000	64,000	5
0.250 to 0.499, incl Area up to 20 sq in., incl	77,000	66,000	5
Over 0.499 to 0.749, incl Area up to 20 sq in., incl	73,000	63,000	4
Over 0.749 to 1.499, incl Area up to 20 sq in., incl	72,000	62,000	3
Over 1.499 to 2.999, incl Area up to 20 sq in., incl	66,000	57,000	1
Over 2.999 to 4.499, incl Area up to 20 sq in., incl	66,000	56,000	1
Area over 20 to 32 sq in., incl	65,000	55,000	1
Over 4.499 to 5.000, incl Area up to 32 sq in., incl	64,000	54,000	1

TABLE II (SI)

Nominal Diameter or Thickness and Area Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min
Up to 6.25, excl Area up to 130 cm^2, incl	525	440	5
6.25 to 12.50, incl Area up to 130 cm^2, incl	530	455	5
Over 12.50 to 18.75, incl Area up to 130 cm^2, incl	505	435	4
Over 18.75 to 37.50, incl Area up to 130 cm^2, incl	495	425	3
Over 37.50 to 75.00, incl Area up to 130 cm^2, incl	455	395	1
Over 75.00 to 112.50, incl Area up to 130 cm^2, incl	455	385	1
Area over 130 to 205 cm^2, incl	450	380	1
Over 112.50 to 125.00, incl Area up to 205 cm^2, incl	440	370	1

3.3.1.3 Tensile property requirements for product exceeding the size limits of 3.3.1.1 and 3.3.1.2 shall be as agreed upon by purchaser and vendor.

3.3.2 Hardness: Should be not lower than 135 HB/10/500 or 140 HB/10/1000 but extrusions shall not be rejected on the basis of hardness if the applicable tensile property requirements are met.

3.4 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.

3.4.1 When specified, extrusions shall be subjected to ultrasonic inspection in accordance with AMS 2630. Standards for acceptance shall be as agreed upon by purchaser and vendor.

3.5 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 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), longitudinal tensile properties (3.3.1.1), ultrasonic inspection (3.4.1) when specified, 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 transverse tensile properties (3.3.1.2) and hardness (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 or MAM 2355.

4.4 Reports:

4.4.1 The vendor of extrusions shall furnish with each shipment 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 4169G, 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 4169G, 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.