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

AEROSPACE MATERIAL SPECIFICATION

AMS 4167D
Superseding AMS 4167C
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UNS A97075

ALUMINUM ALLOY EXTRUSIONS
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73511)
Stress-Relief Stretched and Straightened

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 resistance to stress-corrosion cracking.

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.

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 2630 - Ultrasonic Inspection

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

ASTM G47 - Testing Susceptibility to Stress Corrosion Cracking of High Strength 7XXX Aluminum Alloy Products

2.3 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

2.3.2 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:

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	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
Zirconium + Titanium	--	0.25
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 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:

3.3.1 Tensile Properties:

3.1.1.1 Longitudinal: Shall be as specified in Table I and 3.3.1.4.

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
0.062 to 0.249, incl Area up to 20 sq in., incl	68,000	58,000	7
Over 0.249 to 1.499, incl Area up to 25 sq in., incl	70,000	61,000	8
Over 1.499 to 2.999, incl Area up to 25 sq in., incl	69,000	59,000	8
Over 2.999 to 4.499, incl Area up to 20 sq in., incl	68,000	57,000	7
Area over 20 to 32 sq in., incl	65,000	55,000	7

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
1.57 to 6.32, incl			
Area up to 129 cm^2, incl	469	400	7
Over 6.32 to 38.07, incl			
Area up to 161 cm^2, incl	483	421	8
Over 38.07 to 76.17, incl			
Area up to 161 cm^2, incl	476	407	8
Over 76.17 to 114.27, incl			
Area up to 129 cm^2, incl	469	393	7
Area over 129 to 206 cm^2, incl	448	379	7

3.3.1.2 Long-Transverse: Rectangular bars and shapes, tested in the long-transverse direction, shall meet the requirements of Table II and 3.3.1.4.

TABLE II

Nominal Thickness and Area Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min
0.062 to 0.249, incl			
Area up to 20 sq in., incl	63,000	55,000	3
Over 0.249 to 0.499, incl			
Area up to 20 sq in., incl	66,000	58,000	4
Over 0.499 to 0.749, incl			
Area up to 25 sq in., incl	66,000	57,000	4
Over 0.749 to 1.499, incl			
Area up to 25 sq in., incl	66,000	56,000	4
Over 1.499 to 2.999, incl			
Area up to 25 sq in., incl	63,000	51,000	4
Over 2.999 to 4.499, incl			
Area up to 20 sq in., incl	60,000	47,000	3
Area over 20 to 32 sq in., incl	57,000	44,000	3

TABLE II (SI)

Nominal Thickness and Area Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min
1.57 to 6.32, incl			
Area up to 129 cm^2, incl	434	379	3
Over 6.32 to 12.67, incl			
Area up to 129 cm^2, incl	455	400	4
Over 12.67 to 19.02, incl			
Area up to 161 cm^2, incl	455	393	4
Over 19.02 to 38.07, incl			
Area up to 161 cm^2, incl	455	386	4
Over 38.07 to 76.17, incl			
Area up to 161 cm^2, incl	434	352	4
Over 76.17 to 114.27, incl			
Area up to 129 cm^2, incl	414	324	3
Area over 129 to 206 cm^2, incl	393	303	3

3.3.1.3 Short-Transverse: Bars, rods, and shapes, tested in the short-transverse direction, shall meet the requirements of Table III and 3.3.1.4.

TABLE III

Nominal Diameter or Least Thickness, and Area Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 4D %, min
1.500 to 2.999, incl			
Area up to 25 sq in., incl	60,000	48,000	2
Over 2.999 to 4.499, incl			
Area up to 20 sq in., incl	57,000	44,000	2
Area over 20 to 32 sq in., incl	54,000	41,000	2

TABLE III (SI)

Nominal Diameter or Least Thickness, and Area Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min
38.10 to 76.17, incl			
Area up to 161 cm^2, incl.	414	331	2
Over 76.17 to 114.27, incl			
Area up to 129 cm^2, incl	393	303	2
Area over 129 to 206 cm^2, incl	372	283	2

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

3.3.2 Hardness: Should be not lower than 125 HB/10/500, 125 HB/14.3/1000, or 130 HB/10/1000 but extrusions shall not be rejected on the basis of hardness if the applicable tensile property requirements are met.

3.3.3 Conductivity:

3.3.3.1 If the conductivity is 40% IACS (International Annealed Copper Standard) or higher and the longitudinal tensile properties meet specified requirements, the product is acceptable.

3.3.3.2 If the conductivity is 38 - 39.9% IACS, the longitudinal tensile properties meet specified requirements, and the longitudinal yield strength does not exceed the specified minimum by more than 11,900 psi (82 MPa), the product is acceptable.

3.3.3.3 If the conductivity is lower than 40% IACS and the longitudinal yield strength exceeds the specified minimum by more than 11,900 psi (82 MPa), the product is suspect.

3.3.3.3.1 When the product is suspect, it may be reprocessed or a sample of the product may be solution heat treated for not less than 30 min. at 870°F ± 10 (465°C ± 5) and quenched in cold water. Conductivity shall be measured within 15 min. after quenching. If this measurement exceeds the original measurement on the product by 6% IACS or more, the product is acceptable. If the difference is less than 6% IACS, the product shall be reprocessed.

3.3.3.4 If the conductivity is below 38% IACS, the product is not acceptable and shall be reprocessed, regardless of property level.

3.3.4 Stress-Corrosion Resistance: Specimens, cut from product 0.750 in. (19 mm) and over in nominal thickness processed to meet the requirements of 3.3.3 and stressed in the short-transverse (perpendicular to grain flow) direction to 75% of the specified minimum longitudinal (parallel to grain flow) yield strength shall meet the requirements of ASTM G47.

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.

3.4.1 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: 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 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 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 composition (3.1), tensile properties (3.3.1), conductivity (3.3.3), ultrasonic inspection (3.4.1) when specified, and tolerance (3.5) requirements are classified as acceptance tests.

4.2.2 Periodic Tests: Tests to determine conformance to hardness (3.3.2) and to stress-corrosion resistance (3.3.4) requirements are classified as periodic tests.

4.3 Sampling: Shall be in accordance with AMS 2355; frequency and extent of sampling for periodic tests shall be as agreed upon by purchaser and vendor.