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400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

AMS 4167F

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Superseding AMS 4167E

ALUMINUM ALLOY EXTRUSIONS
5.6Zn - 2.5Mg - 1.6Cu - 0.23Cr (7075-T73511)
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 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 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

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

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
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:

3.1.1.1 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
1.55 to 6.25 incl Area up to 130 cm^2, incl	470	400	7
Over 6.25 to 37.50, incl Area up to 160 cm^2, incl	485	420	8
Over 37.50 to 75.00, incl Area up to 160 cm^2, incl	475	405	8
Over 75.00 to 112.50, incl Area up to 130 cm^2, incl	470	395	7
Area over 130 to 205 cm^2, incl	450	380	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
1.55 to 6.25, incl			
Area up to 130 cm^2, incl	435	380	3
Over 6.25 to 12.50, incl			
Area up to 130 cm^2, incl	455	400	4
Over 12.50 to 18.75, incl			
Area up to 160 cm^2, incl	455	395	4
Over 18.75 to 37.50, incl			
Area up to 160 cm^2, incl	455	385	4
Over 37.50 to 75.00, incl			
Area up to 160 cm^2, incl	435	350	4
Over 75.00 to 112.50, incl			
Area up to 130 cm^2, incl	415	325	3
Area over 130 to 205 cm^2, incl	395	305	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 Thickness and Area Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 4D %, min
37.50 to 75.00, incl			
Area up to 160 cm^2, incl	415	330	2
Over 75.00 to 112.50, incl			
Area up to 130 cm^2, incl	395	305	2
Area over 130 to 205 cm^2, incl	370	285	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 or 130 HB/10/1000 but the 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 40.0% IACS (International Annealed Copper Standard) (23.2 MS/m) or higher and the longitudinal tensile properties meet specified requirements, the product is acceptable.

3.3.3.2 If the conductivity is 38.0% - 39.9% IACS (22.0 - 23.1 MS/m), 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 below 40.0% IACS (23.2 MS/m) and the longitudinal yield strength exceeds the specified minimum by more than 11,900 psi (82 MPa), the product shall be given additional precipitation heat treatment. If, after such treatment, the product meets the requirements of 3.3.1 and 3.3.3.1 or 3.3.3.2, the product is acceptable.

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 (3.5 MS/m) or more, the product is acceptable. If the difference is less than 6% IACS (3.5 MS/m), the product shall be reprocessed.

3.3.3.4 If the conductivity is below 38.0% IACS (22.0 MS/m) 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. (18.75 mm) and over in nominal thickness shall show no evidence of stress corrosion cracking when stressed in the short-transverse (perpendicular to grain flow) direction to 75% of the specified minimum longitudinal (parallel to grain flow) yield strength.

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), conductivity (3.3.3), 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 3.3.1.3), hardness (3.3.2), and stress-corrosion resistance (3.3.4) 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.