



AEROSPACE MATERIAL SPECIFICATION

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AMS 4166A

Superseding AMS 4166

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ALUMINUM ALLOY EXTRUSIONS 5.6Zn - 2.5Mg - 1.6Cu - 0.26Cr (7075-T73)

1. **ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
2. **FORM:** Bars, rods, wire, shapes, and tubing.
3. **APPLICATION:** Primarily for parts requiring high strength and resistance to stress corrosion cracking.
4. **COMPOSITION:**

	min	max
Zinc	5.1	6.1
Magnesium	2.1	2.9
Copper	1.2	2.0
Chromium	0.18	0.35
Iron	--	0.50
Silicon	--	0.40
Manganese	--	0.30
Titanium	--	0.20
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

5. **CONDITION:** Solution heat treated and precipitation heat treated to develop the required mechanical properties and resistance to stress corrosion cracking.
 - 5.1 Unless otherwise specified, extrusions shall be supplied with an as-extruded finish; light polishing to remove minor surface imperfections is permissible provided such imperfections can be removed within the specified dimensional tolerances.
6. **TECHNICAL REQUIREMENTS:** The product shall conform to the following requirements; tensile properties shall be determined in accordance with the latest issue of AMS 2355.

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6.1 Longitudinal Tensile Properties:

Nominal Diameter or 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 or at Extension Indicated (E = 10,300,000)		Elongation % in 2 in. or 4D min
		psi, min	Extension Under Load in. in 2 in.	
0.062 to 0.249, incl				
Area up to 20 sq in., incl	68,000	58,000	0.0153	7
Over 0.249 to 1.499, incl				
Area up to 25 sq in., incl	70,000	61,000	0.0158	8
Over 1.499 to 2.999, incl				
Area up to 25 sq in., incl	69,000	59,000	0.0155	8
Over 2.999 to 4.499, incl				
Area up to 20 sq in., incl	68,000	57,000	0.0151	7
Area over 20 to 32 sq in., incl	65,000	55,000	0.0146	7

6.2 Long Transverse Tensile Properties: Rectangular bars and shapes, when tested in the long transverse direction, shall be capable of meeting the following properties:

Nominal Thickness and Area Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 10,300,000)		Elongation % in 2 in. or 4D min
		psi, min	Extension Under Load in. in 2 in.	
0.062 to 0.249, incl				
Area up to 20 sq in., incl	63,000	55,000	0.0146	3
Over 0.249 to 0.499, incl				
Area up to 20 sq in., incl	66,000	58,000	0.0153	4
Over 0.499 to 0.749, incl				
Area up to 25 sq in., incl	66,000	57,000	0.0151	4
Over 0.749 to 1.499, incl				
Area up to 25 sq in., incl	66,000	56,000	0.0149	4
Over 1.499 to 2.999, incl				
Area up to 25 sq in., incl	63,000	51,000	0.0139	4
Over 2.999 to 4.499, incl				
Area up to 20 sq in., incl	60,000	47,000	0.0131	3
Area over 20 to 32 sq in., incl	57,000	44,000	0.0125	3

- 6.3 Short Transverse Tensile Properties: Bars, rods, shapes, and tubing, when tested in the short transverse direction, shall be capable of meeting the following properties:

Nominal Diameter or Thickness, and Area (bars, rods, shapes) of Nominal Wall Thickness and Area (tubing) Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 10,300,000)		Elongation % in 2 in. or 4D min
		psi, min	Extension Under Load in. in 2 in.	
1.500 to 2.999, incl				
Area up to 25 sq in., incl	60,000	48,000	0.0135	2
Over 2.999 to 4.499, incl				
Area up to 20 sq in., incl	57,000	44,000	0.0125	2
Area over 20 to 32 sq in., incl	54,000	41,000	0.0120	2

- 6.4 If sizes other than those shown are ordered, tensile property requirements shall be as agreed upon by purchaser and vendor.
- 6.5 When a dispute occurs between purchaser and vendor over the yield strength values, yield strength determined by the offset method shall apply.
- 6.6 Hardness: Material should have hardness not lower than Brinell 125 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or not lower than Brinell 130 using 1000 kg load and 10 mm ball, but shall not be rejected on the basis of hardness if other technical requirements are met.
- 6.7 Conductivity:
- 6.7.1 If the conductivity is below 38% IACS (International Annealed Copper Standard), the material is considered unsatisfactory and must be reprocessed, regardless of property level.
- 6.7.2 If the conductivity is 40% IACS or higher and the tensile properties meet specified requirements, the material is considered to be satisfactory.
- 6.7.3 If the conductivity is 38 - 40% IACS, the tensile properties meet specified requirements, and the yield strength does not exceed the specified minimum by more than 11,900 psi, the material is considered to be satisfactory.
- 6.7.4 If the conductivity is below 40% IACS and the yield strength exceeds the specified minimum value by 12,000 psi or more, the material is considered suspect.
- 6.7.5 When material is considered suspect, it may be reprocessed or a sample of the material may be heated for not less than 30 min. at $870\text{ F} \pm 10$ ($465.6\text{ C} \pm 5.6$) and quenched in cold water. Conductivity shall then be measured within 15 min. after quenching. If this measurement exceeds the original measurement on the material by 6% or more, the material is satisfactory. If the difference is less than 6%, the material must be reprocessed.
- 6.8 Stress Corrosion Cracking Test: Material shall be capable of showing no evidence of stress corrosion cracking when subjected to the following test:
- 6.8.1 A suitable test specimen, cut from the material so that the axis of loading of the specimen is parallel to the short transverse direction of the material, shall be stressed to 75% of the yield strength value given in 6.1 and held at constant strain in a suitable fixture. The stressed specimen shall be subjected to cyclic immersion for 30 days in a 3-1/2% solution of sodium chloride conforming to the purity and pH requirements of the issue of ASTM B117 listed in the latest issue of AMS 2350, and maintained at room temperature; each cycle shall consist of 10 min. immersion in the solution and 50 min. out of the solution. Specimens shall be dried prior to each immersion.