AEROSPACE
MATERIAL SPECIFICATIONS
SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 4164 B

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ALUMINUM ALLOY EXTRUSIONS
4.4Cu - 1.5Mg - 0.6Mn (2024-T3510)
Stress-Relief Stretched, Unstraightened

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, shapes, and round tubing.

3. APPLICATION: Primarily for parts subject to excessive warpage during machining due to residual stresses, and for parts requiring good strength and whose fabrication does not involve welding.

4. COMPOSITION:

Copper	3.8 - 4.9
Magnesium	1.2 - 1.8
Manganese	0.30 - 0.9
Iron	0.50 max
Silicon	0.50 max
Zinc	0.25 max
Chromium	0.10 max
Other Impurities, each	0.05 max
Other Impurities, total	0.15 max
Aluminum	remainder

5. CONDITION: Solution heat treated and stress-relieved by stretching.

5.1 Unless otherwise specified, 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.

5.2 Material shall be stretched in the solution heat treated condition to produce a nominal permanent set of 1-1/2%, but not less than 1% nor more than 3%.

5.3 Material shall receive no straightening after stretching.

6. TECHNICAL REQUIREMENTS:

6.1 Tensile Properties:

6.1.1 Bars, Rods, and Shapes:

Nominal Diameter or Thickness, and Area Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 10,500,000) psi, min	Extension Under Load in. in 2 in.	Elongation % in 2 in. or 4D min
0.050 to 0.249, incl, all areas	57,000	42,000	0.0120	12
Over 0.249 to 0.749, incl, all areas	60,000	44,000	0.0124	12
Over 0.749 to 1.499, incl, all areas	65,000	46,000	0.0128	10
Over 1.499,				
Area 25 sq in. and under	70,000	52,000	0.0139	10
Area over 25 to 32 sq in., incl	68,000	48,000	0.0131	8

For material of such thickness that a standard specimen cannot be taken, or for material thinner than 0.062 in., the test for elongation is not required.

The tensile property requirements shall be based on the thickness of the portion of the extrusion from which the tensile test specimens are taken. Specimens from sections over 1.5 in. in diameter or thickness shall be taken midway between center and surface.

6.1.2 Round Tubing:

Nominal Wall Thickness and Area Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 10,500,000) psi, min	Extension Under Load in. in 2 in.	Elongation % in 2 in. or 4D(a) min
0.499 and under all areas	60,000	40,000	0.0116	10
Over 0.499 to 1.499, incl, all areas	65,000	46,000	0.0128	10
Over 1.499				
Area 25 sq in. and under	70,000	48,000	0.0131	10
Area over 25 to 32 sq in., incl	68,000	46,000	0.0128	6

(a) Elongation of full section and cut-out sheet type specimens shall be measured on a 2 in. gage length; for cut-out round specimens, elongation shall be measured on a gage length of 4D where D represents diameter of specimen.

6.1.3 When a dispute occurs between purchaser and vendor over the yield strength value, yield strength determined by the offset method shall apply.

6.1.4 If sizes other than those shown are ordered, tensile property requirements shall be as agreed upon by purchaser and vendor.

6.2 Hardness: Material should have hardness not lower than Brinell 100 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or not lower than Brinell 106 using 1000 kg load and 10 mm ball, but shall not be rejected on the basis of hardness if the tensile property requirements are met.

7. QUALITY: Material shall be uniform in quality and condition, clean, sound, smooth, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts.