

# AERONAUTICAL MATERIAL SPECIFICATIONS

## AMS 4165

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

Issued 6-30-60  
Revised

### ALUMINUM ALLOY EXTRUSIONS 4.5Cu - 1.5Mg - 0.6Mn (2024-T3511) Stress-Relief Stretched and Straightened

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.
2. FORM: Bars, rods, and shapes.
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 may receive minor straightening after stretching of an amount necessary to meet the requirements of Section 8.

6. TECHNICAL REQUIREMENTS:

6.1 Tensile Properties:

Nominal Diameter or Least Thickness or Area Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 10,500,000)		Elongation % in 2 in. or 4D min
		psi, min	in. in 2 in.	
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

- 6.1.1 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.

Section 8.3 of the SAE Technical Board rules provides that: "All technical reports including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."