

# AEROSPACE MATERIAL SPECIFICATIONS

## AMS 4022C

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

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### ALUMINUM ALLOY SHEET AND PLATE ALCLAD 1Mg - 0.6Si - 0.25Cu - 0.25Cr (Alclad 6061-T4)

- 1. ACKNOWLEDGMENT:** A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.
- 2. APPLICATION:** Primarily for formed, low strength, structural parts which may be subsequently precipitation heat treated and which are required to exhibit maximum corrosion resistance and to approximate the color and appearance of other clad aluminum alloy parts.

#### 3. COMPOSITION:

	Core (6061)		Cladding (7072)	
	min	max	min	max
Magnesium	0.8	- 1.2	Zinc	0.8 - 1.3
Silicon	0.40	- 0.8	Silicon + Iron	-- 0.7
Copper	0.15	- 0.40	Magnesium	-- 0.10
Chromium	0.15	- 0.35	Copper	-- 0.10
Iron	--	0.7	Manganese	-- 0.10
Zinc	--	0.25	Other Impurities, each	-- 0.05
Manganese	--	0.15	Other Impurities, total	-- 0.15
Titanium	--	0.15	Aluminum	remainder
Other Impurities, each	--	0.05		
Other Impurities, total	--	0.15		
Aluminum		remainder		

- 4. CONDITION:** Solution heat treated.
- 5. TECHNICAL REQUIREMENTS:** When ASTM methods are specified for determining conformance to the following requirements, tests shall be conducted in accordance with the issue of the ASTM method listed in the latest issue of AMS 2350.
  - 5.1 Cladding Thickness:** After rolling, the average cladding thickness shall be not less than 4% per side of the total composite thickness. Routine measurements are 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 obligation to conform to or be guided by any technical report. In formulating and applying 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 infringement of patents."

5.2 Tensile Properties: Test specimens shall conform to ASTM E8 and shall be taken across the direction of rolling from widths 9 in. and over and parallel to the direction of rolling from widths less than 9 inches. Sheet type specimens shall be used for material less than 0.5 in. thick and 0.75 in. and over in width. Round specimens shall be used for material 0.5 in. and over in thickness and 0.75 in. and over in width. Material under 0.75 in. wide and under 0.5 in. thick may be tested in either full section or by use of round specimens; for such sizes, elongation requirements apply only when round specimens are used.

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 9,900,000)		Elongation % in 2 in. or 4D, min
		psi, min	Extension Under Load in. in 2 in.	
0.010 to 0.020, incl	27,000	14,000	0.0068	14
Over 0.020 to 0.249, incl	27,000	14,000	0.0068	16
Over 0.249 to 0.499, incl	27,000	14,000	0.0068	18
Over 0.499 to 1.000, incl	30,000	16,000	0.0072	18
Over 1.000 to 3.000, incl	30,000	16,000	0.0072	16

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

5.2.2 Tensile properties of plate over 3.000 in. in thickness shall be as agreed upon by purchaser and vendor.

5.3 Bending: Material shall be capable of withstanding, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to the bend factor times the nominal thickness of the material, with axis of bend parallel to direction of rolling.

Nominal Thickness Inch	Bend Factor
0.010 to 0.249, incl	3
Over 0.249 to 0.499, incl	5

5.4 Properties After Precipitation Heat Treatment: Material after proper precipitation heat treatment shall conform to the following requirements.

5.4.1 Tensile Properties: Test specimens shall conform to ASTM E8 and shall be taken across the direction of rolling from widths 9 in. and over and parallel to the direction of rolling from widths less than 9 inches. Sheet type specimens shall be used for material less than 0.5 in. thick and 0.75 in. and over in width. Round specimens shall be used for material 0.5 in. and over in thickness and 0.75 in. and over in width. Material under 0.75 in. wide and under 0.5 in. thick may be tested in either full section or by use of round specimens; for such sizes, elongation requirements apply only when round specimens are used.

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset or at Extension Indicated (E = 9,900,000)		Elongation % in 2 in. or 4D, min
		psi, min	Extension Under Load in. in 2 in.	
0.010 to 0.020, incl	38,000	32,000	0.0105	8
Over 0.020 to 0.499, incl	38,000	32,000	0.0105	10
∅ Over 0.499 to 1.000, incl	42,000	35,000	0.0111	9
Over 1.000 to 2.000, incl	42,000	35,000	0.0111	8
Over 2.000 to 3.000, incl	42,000	35,000	0.0111	6

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

5.4.1.2 Tensile properties of plate over 3.000 in. in thickness shall be as agreed upon by purchaser and vendor.

5.4.2 Bending: Material shall be capable of withstanding, without cracking, bending at room temperature through an angle of 180 deg around a diameter equal to the bend factor times the nominal thickness of the material, with axis of bend parallel to direction of rolling.

Nominal Thickness Inch	Bend Factor
0.010 to 0.036, incl	3
Over 0.036 to 0.064, incl	4
Over 0.064 to 0.128, incl	5
Over 0.128 to 0.249, incl	6
Over 0.249 to 0.499, incl	10

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

7. TOLERANCES: Unless otherwise specified, tolerances shall conform to all applicable requirements of the latest issue of AMS 2202.

8. REPORTS:

8.1 Unless otherwise specified, the vendor of the product shall furnish with each shipment three copies of a report stating that the product conforms to the chemical composition and technical requirements of this specification. This report shall include the purchase order number, material specification number, thickness, size, and quantity.