

AEROSPACE MATERIAL SPECIFICATIONS

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

AMS 4035E

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ALUMINUM ALLOY SHEET AND PLATE 4.5Cu - 1.5Mg - 0.6Mn (2024-0)

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 structural parts which will be subsequently heat treated. Certain design and processing procedures may cause this material to be susceptible to stress corrosion cracking after heat treatment; ARP 823 recommends practices to minimize such conditions.
3. COMPOSITION:

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

4. CONDITION: Annealed.
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 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, max	Yield Strength at 0.2% Offset or at Extension Indicated (E = 10,500,000)		Elongation % in 2 in. or 4D, min
		psi, max	Extension Under Load in. in 2 in.	
0.010 to 0.499, incl	32,000	14,000	0.0067	12
Over 0.499 to 1.750, incl	32,000	--	--	12

- 5.1.1 When a dispute occurs between purchaser and vendor over the yield strength value, yield strength determined by the offset method shall apply.
- 5.1.2 Tensile properties of plate over 1.750 in. in thickness shall be as agreed upon by purchaser and vendor.
- 5.2 Bending: Material shall withstand, 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 0.032, incl	0
Over 0.032 to 0.063, incl	1
Over 0.063 to 0.128, incl	2
Over 0.128 to 0.249, incl	4
Over 0.249 to 0.499, incl	6

- 5.3 Properties After Solution Heat Treatment: Unless otherwise specified, the material after proper solution heat treatment and aging for not less than 4 days at room temperature shall conform to the following requirements.

- 5.3.1 **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 = 10,500,000)		Elongation % in 2 in. or 4D, min
		psi, min	Extension Under Load in. in 2 in.	
0.010 to 0.020, incl	62,000	38,000	0.0112	12
Over 0.020 to 0.249, incl	62,000	38,000	0.0112	15
Over 0.249 to 0.499, incl	62,000	38,000	0.0112	12
Over 0.499 to 1.000, incl	61,000	38,000	0.0112	8
Over 1.000 to 1.500, incl	60,000	38,000	0.0112	7
Over 1.500 to 1.750, incl	60,000	38,000	0.0112	6

- 5.3.1.1 When a dispute occurs between purchaser and vendor over the yield strength value, yield strength determined by the offset method shall apply.
- 5.3.1.2 Tensile properties of plate over 1.750 in. in thickness shall be as agreed upon by purchaser and vendor.
- 5.3.2 **Bending:** Material shall withstand, 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 0.020, incl	4
Over 0.020 to 0.051, incl	5
Over 0.051 to 0.128, incl	6
Over 0.128 to 0.249, incl	8
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.
- 8.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of material, part number, and quantity. When material for making parts is produced or purchased by the parts vendor, that vendor shall inspect each lot of material to determine conformance to the requirements of this specification, and shall include in the report a statement that the material conforms, or shall include copies of laboratory reports showing the results of tests to determine conformance.

9. IDENTIFICATION: Unless otherwise specified, each sheet and plate shall be marked on one face, in the respective location indicated below. Symbols shall be applied using a suitable marking fluid and shall be sufficiently stable to withstand normal handling.

- 9.1 Flat Sheet and Plate 0.375 In. and Under Thick, 6 - 60 in., Incl. Wide, and 36 - 200 in. Incl. Long: Shall be marked in rows of symbols not less than 3/8 in. in height and recurring at intervals not greater than 3 feet. Rows shall run parallel to the direction of rolling of the piece and shall be spaced approximately 6 in. on centers across the width. Every third row shall show the manufacturer's identification and nominal thickness in inches. The other rows shall show the alloy number and temper, or AMS 4035, and shall be staggered.
- 9.2 Flat Sheet and Plate Over 0.375 In. Thick, or Over 60 In. Wide, or Over 200 In. Long: Shall be marked as in 9.1 above or, at vendor's discretion, shall be marked in one or two rows of symbols not less than 3/8 in. in height and running around the perimeter of the piece. If one row is used, it shall show the alloy number and temper or AMS 4035, manufacturer's identification, and nominal thickness in inches. If two rows are used, one row shall show the alloy number and temper, or AMS 4035; the second row shall show the manufacturer's identification and nominal thickness in inches.
- 9.2.1 If perimetral marking is applied to the full piece as produced but partial sheets or plates are supplied, an arrow shall also be applied near one corner indicating the direction of rolling.
- 9.3 Coiled Sheet: Shall be marked near the outside end of the coil with the alloy number and temper, or AMS 4035, manufacturer's identification, and nominal thickness in inches.
- 9.4 Circles: Shall be marked with the alloy number and temper, or AMS 4035, manufacturer's identification, and nominal thickness in inches, when the circle diameter is 24 in. or more. Circles less than 24 in. in diameter shall be identified as agreed upon by purchaser and vendor.